AFB/PPRC.21/23
28 September 2017

Adaptation Fund Board
Project and Programme Review Committee
Eighteenth Meeting
Bonn, Germany, 10-11 October 2016

Agenda Item 6 t)

PROPOSAL FOR TOGO

Background

1. The Operational Policies and Guidelines (OPG) for Parties to Access Resources from the Adaptation Fund (the Fund), adopted by the Adaptation Fund Board (the Board), state in paragraph 45 that regular adaptation project and programme proposals, i.e. those that request funding exceeding US$ 1 million, would undergo either a one-step, or a two-step approval process. In case of the one-step process, the proponent would directly submit a fully-developed project proposal. In the two-step process, the proponent would first submit a brief project concept, which would be reviewed by the Project and Programme Review Committee (PPRC) and would have to receive the endorsement of the Board. In the second step, the fully-developed project/programme document would be reviewed by the PPRC, and would ultimately require the Board's approval.

2. The Templates approved by the Board (Annex 5 of the OPG, as amended in March 2016) do not include a separate template for project and programme concepts but provide that these are to be submitted using the project and programme proposal template. The section on Adaptation Fund Project Review Criteria states:

> *For regular projects using the two-step approval process, only the first four criteria will be applied when reviewing the 1st step for regular project concept. In addition, the information provided in the 1st step approval process with respect to the review criteria for the regular project concept could be less detailed than the information in the request for approval template submitted at the 2nd step approval process. Furthermore, a final project document is required for regular projects for the 2nd step approval, in addition to the approval template.*

3. The first four criteria mentioned above are:
   1. Country Eligibility,
   2. Project Eligibility,
   3. Resource Availability, and
   4. Eligibility of NIE/MIE.

4. The fifth criterion, applied when reviewing a fully-developed project document, is:
   5. Implementation Arrangements.

5. It is worth noting that since the twenty-second Board meeting, the Environmental and Social (E&S) Policy of the Fund was approved and consequently compliance with the Policy has been included in the review criteria both for concept documents and fully-developed project documents. The proposals template was revised as well, to include sections requesting demonstration of compliance of the project/programme with the E&S Policy.

6. In its seventeenth meeting, the Board decided (Decision B.17/7) to approve "Instructions for preparing a request for project or programme funding from the Adaptation Fund", contained in the Annex to document AFB/PPRC.8/4, which further outlines applicable review criteria for both concepts and fully-developed proposals. The latest version of this document was launched in October 2016 following an update of the Operational Policies and Guidelines in March 2016.

7. Based on the Board Decision B.9/2, the first call for project and programme proposals was issued and an invitation letter to eligible Parties to submit project and programme proposals to the Fund was sent out on April 8, 2010.

8. According to the Board Decision B.12/10, a project or programme proposal needs to be received by the secretariat no less than nine weeks before a Board meeting, in order to be considered by the Board in that meeting.

9. The following project concept titled “Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo” was submitted by the West African Development Bank (*Banque Ouest Africaine de Développement*, BOAD), which is a Regional Implementing Entity of the Adaptation Fund.

10. This is the second submission of the proposal using the two-step submission process. It was received by the secretariat in time to be considered in the twenty-eighth Board meeting. The secretariat carried out a technical review of the project proposal, assigned it the diary number TGO/RIE/Agri/2016/1, and completed a review sheet.

11. In accordance with a request to the secretariat made by the Board in its 10th meeting, the secretariat shared this review sheet with the World Bank, and offered it the opportunity of providing responses before the review sheet was sent to the PPRC.

12. The secretariat is submitting to the PPRC the summary and, pursuant to decision B.17/15, the final technical review of the project, both prepared by the secretariat, along with the final submission of the proposal in the following section. In accordance with decision B.25.15, the proposal is submitted with changes between the initial submission and the revised version highlighted.

Project Summary

Togo – Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

Implementing Entity: *BOAD*
Project/Programme Execution Cost: USD 804,380
Total Project/Programme Cost: USD 9,271,595
Implementing Fee: USD 728,405
Financing Requested: USD 10,000,000

Project Background and Context:

Togo's dominant rain-fed agriculture is implemented by small producers and mainly depends on climatic conditions which greatly vary and disrupt agricultural activities. This strong climate variability throws off farmers in their usual crop farming, often affecting crops in full vegetative phase and causing losses of significant returns. The proposed project aims to improve the level of resilience of vulnerable households in Mandouri by developing water management and irrigation technologies that reduce dependence on rainfall for agricultural production. In addition to the project intends to improve livelihoods by promoting crop diversification and the production of value added agriculture products and provide capacity building to project beneficiaries through knowledge management and training.

Component 1: Improved planning and management of water resources and (agricultural) production (USD 5,000,000)

This component will provide improved food self-sufficiency and sustainable management of land through better water management for agricultural production. Activities will focus on developing 144 ha of land for agriculture production by constructing a basin and furrow irrigation system, purchasing equipment to improve the techniques and means of irrigated production, producing manuals and handbooks on irrigation and the expected ecological & health hazards of irrigation and disseminating the knowledge, and designing and implementing training programs for actors responsible for the operation, maintenance and repair of equipment acquired for the beneficiaries.

Component 2: Support for the diversification of livelihoods and the improvement of the living conditions of the beneficiaries (USD 2,150,000)

This component will promote income generating activities such as rice cultivation, market gardening and processing of fresh produce such as tomatoes and chilies for the market, drying and packaging of produce from the gardens, livestock and fish farming, and also beekeeping. Social infrastructure (warehouses, drying areas for fish, fish ponds, latrines, a communal bakery, a nursery to support agro-forestry, and a mini network of drinking water supply) will be built. Credit lines dedicated to financing agricultural and other income generating activities will be established. Preference to the credit lines will be given to women-led or youth-led groups. In addition, capacity building on financial management and simplified accounting, and training of local technicians in the installation and repair of irrigation and solar equipment will be provided to beneficiaries.

Component 3: Capacity building, environmental and social measures, and knowledge management (USD 1,317,125)

This component will provide improved knowledge of stakeholders for building resilience to climate change and for the prevention and management of environmental and social risks. Activities will focus on designing and delivering capacity-building programs to strengthen the technical capacity of local institutions in the prevention and resolution of climate risk issues, organizing information, education and communication sessions toward local populations on risk management techniques related to climate change, strengthening the capacity of cooperatives and employees of local institutions in the joint management of water resources and conflict management, and establishing a knowledge management system. In addition, information, education and communication programs related to climate change and the achievements of the project will be developed and delivered to local people.

ADAPTATION FUND BOARD SECRETARIAT TECHNICAL REVIEW OF PROJECT/PROGRAMME PROPOSAL

PROJECT/PROGRAMME CATEGORY: Regular-sized Project Concept

Country/Region: **Togo**
Project Title: **Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo**
AF Project ID: **TGO/RIE/Agri/2016/1**
IE Project ID:
Requested Financing from Adaptation Fund (US Dollars): **10,000,000**
Reviewer and contact person: **Farayi Madziwa**
Co-reviewer(s): **Dirk Lamberts**
IE Contact Person: **Almamy Mbengue**

Review Criteria	Questions	Comments 28 August 2017	Comments 15 September 2017
Country Eligibility	1. Is the country party to the Kyoto Protocol?	Yes.	
	2. Is the country a developing country particularly vulnerable to the adverse effects of climate change?	Yes.	
Project Eligibility	1. Has the designated government authority for the Adaptation Fund endorsed the project/programme?	Yes.	
	2. Does the project / programme support concrete adaptation actions to assist the country in addressing adaptive capacity to the adverse effects of climate change and build in climate resilience?	Yes. However, as a general response, the following request for further clarification is made: **CR1:** Please ensure consistency in the description of activities and outputs, e.g. reference to fish farming, nurseries for tree planting and construction of a bakery is not mentioned in Table 4: "Project components and financing", but begin	**CR1:** Addressed.

		to be mentioned under project cost effectiveness. **CR2:** Please clarify the number of direct project beneficiaries as the proposal states that there are 576 farmers or 115 households with an average family size of 5, which equates to 575 people. However, throughout the proposal there is mention of 2880 people. <u>In addition, specific clarification requests related to Part II, Section A are also made as follows</u>: **CR3:** Please provide further clarity on how the project activities under each of the different project components contribute to resilience and are appropriate in responding to the threats posed by the observed climate impacts and likely climate scenarios.	**CR2:** Addressed **CR3:** Partially addressed. The highlighted text at the beginning of page 27 is a duplication of the text directly below it. Component 1 and 2 should describe the project components and how these activities contribute to climate resilience. Whilst a description of the climate risks to the project components is given, it has not been clearly articulated in this section, how the proposed activities contribute to climate resilience and differ from business as usual community development activities. Please describe components 1 and 2 particularly focusing on the concrete adaptation activities, and how these activities contribute to climate resilience.

		CR4: Please demonstrate alignment of project outcomes with the Adaptation Fund fund-level objectives at the project/programme outcome level as described in the document "AF Results Framework and Baseline Guidance – Project level, available at: https://www.adaptation-fund.org/document/results-framework-and-baseline-guidance-project-level/.	**CR4:** Addressed
		CR5: Please explain how, or, if any specific gender elements have been taken into consideration in the design of project adaptation activities and expected outputs.	**CR5:** Addressed. However, the first sentence under the heading "Gender considerations" on page 38 is duplicated in the fifth paragraph of the same page. Beyond enabling women access to land, the project should also consider gender in terms of women being trained as part of the training of 10 to 20 local technicians on driving, installation, repair and maintenance of irrigation and solar equipment access and in terms of access to training programs for actors responsible for the operation, maintenance and repair of equipment acquired for the beneficiaries.
		CR6: Please provide further explanation regarding the processing activities that will be done under component 2, that is, what kind of end products are envisaged, that is, explain what will be milled, processed, and explain what will be packaged and sold	**CR6:** Addressed.

		as fresh vegetables e.g., will end products include canned products, or only washed and packaged vegetables, or vegetable purees etc? **CR7:** Please provide further clarification how the micro-credit system will work. Please explain the differences between establishment of the proposed bonus system and guaranteed loans and describe how they would operate on a practical level, including the flow of money between the parties involved. Please also explain how the project will ensure that the funds invested into the successful micro-credit institutions will benefit project beneficiaries outside of the wider lending portfolio of these institutions e.g., will the micro-credit institutions work independently, what will be the role of the implementing entity, what is the loan approval process etc? **CR8:** Please describe specific activities that will be carried out under component 3 related to the project outputs and outcomes.	**CR7:** Addressed **CR8:** Addressed

	3. Does the project / programme provide economic, social and environmental benefits, particularly to vulnerable communities, including gender considerations, while avoiding or mitigating negative impacts, in compliance with the Environmental and Social Policy and Gender Policy of the Fund?	Yes. However, benefits need to be further clarified upon addressing CR3 through to CR8 above.	
	4. Is the project / programme cost effective?	Unclear. The project has not clearly identified and provided a comparative assessment of alternative options for achieving the same project outputs and outcomes. **CR9:** Please provide an analytical assessment or clear description of alternative options that could have been undertaken in place of the proposed project components or adaptation measures/activities and that would achieve the same outcomes.	**CR9:** Not addressed. Please provide a clear description of alternative options to the proposed measures to allow for a good comparison to other possible interventions that could have taken place to help the population of the prefecture Kpendjal and that of the Canton of Mandouri adapt and build resilience.

	5. Is the project / programme consistent with national or sub-national sustainable development strategies, national or sub-national development plans, poverty reduction strategies, national communications and adaptation programs of action and other relevant instruments?	Yes. However, no demonstration has been provided of how the project aligns with other strategies identified in the proposal. In addition, Togo has submitted three national communications to the UNFCCC to date, and no reference has been made to the third national communication which makes reference to national planning, agriculture, food security and vulnerability. **CR10:** Please provide a description of how the project is consistent with strategies identified on page 43 of the proposal, which include the National Environmental Action Plan (NEAP); the National Environmental Management Program (NEMP); the National Strategy for Sustainable Development etc. **CR11:** Please provide an explanation of how the project is aligned to Togo's third national communication to the UNFCCC.	**CR10:** Partially. The proposal mentions that the main environmental issues are integrated into the Accelerated Growth Strategy and with the ODD. Please explain what ODD is and clarify if the project is consistent with both the Accelerated Growth Strategy and with the ODD. **CR11:** Addressed
	6. Does the project / programme meet the relevant national technical standards, where applicable, in compliance with the Environmental and Social Policy of the Fund??	Yes.	
	7. Is there duplication of project / programme with other funding sources?	No.	

	8. Does the project / programme have a learning and knowledge management component to capture and feedback lessons?	Yes. However, further clarification should be provided on activities related to the establishment of the proposed knowledge management system. **CR12:** Please provide an explanation why component 3 which specifically refers to the establishment of a knowledge management system is not mentioned in this section, but rather only component 1? **CR13:** Please provide a description of how the knowledge management system will work. This includes clarifying what kind of information will be gathered, from where will information be gathered, who the target audience will be, at what point information/data will be gathered, in what form it will be gathered and disseminated, whether information management processes will differ between different target groups and how, what measures will be taken to cater for knowledge needs between different audiences, how knowledge and information will be managed internally, how it will be managed externally, that is, how external audiences will access information etc.	**CR12:** Not addressed. The text in this section still refers to only component 1. Please provide an explanation why component 3 which specifically refers to the establishment of a knowledge management system is not mentioned in Section G of the proposal. **CR13:** Addressed

	9. Has a consultative process taken place, and has it involved all key stakeholders, and vulnerable groups, including gender considerations in compliance with the Environmental and Social Policy and Gender Policy of the Fund?	Yes. However, it is unclear what the outcomes of the consultations were, what grievances or queries were raised and what consultation techniques were implemented and tailored specifically per target group. **CR14:** Please provide a clear description of the consultation techniques used and in particular making reference to approaches used to cater for vulnerable groups, including gender considerations, and describe the issues raised by stakeholders during these consultations, how such issues were addressed in the project design and the outcome of the consultations.	**CR14:** Not addressed. Please refer to the Instructions For Preparing A Request For Project Or Programme Funding From The Adaptation Fund contained in Annex 5 of the Funds Operational Policies and Guidelines, available at: https://www.adaptation-fund.org/documents-publications/operational-policies-guidelines/. Please provide a clear description of the consultation techniques used specifically for each target group of stakeholders and a description of the key consultation findings for each group, including how any issues raised were addressed in the project design.
	10. Is the requested financing justified on the basis of full cost of adaptation reasoning?	Yes.	
	11. Is the project / program aligned with AF's results framework?	Partially: The alignment table needs to be completed in a manner consistent with the language used in the rest of the document. **CR15:** Please use consistent language for Table 4, Table 13 and Table 14 to describe project outcomes.	**CR15:** Addressed

		CR16: Please use the language as stated in the Fund's Results Framework to describe the applicable Fund outputs and indicators that are aligned to the project outcomes.	**CR16:** Addressed
	12. Has the sustainability of the project/programme outcomes been taken into account when designing the project?	Yes. **CR17:** However, please describe how the local database that will be created under knowledge management for the collection and processing, preservation and dissemination of data sheets, educational tools and other training materials will be sustained after project closure.	**CR17:** Addressed
	13. Does the project / programme provide an overview of environmental and social impacts / risks identified, in compliance with the Environmental and Social Policy and Gender Policy of the Fund?	Partially. However, management of ESS needs to be clarified. Please see CR18 through to CR21, and CAR1. The proposal intends that through the micro-credit scheme project beneficiaries will access loans to purchase inputs. In order to adequately address environmental and social risks, it would be useful to provide a description of what these inputs will be and how they will be used?	Addressed. The proposal includes unidentified sub-projects whose environmental and social risks should be assessed during implementation.
Resource Availability	1. Is the requested project / programme funding within the cap of the country?	Yes.	
	2. Is the Implementing Entity Management Fee at or below 8.5 per cent of the total project/programme budget before the fee?	Yes. The fee is 7.86%	
	3. Are the Project/Programme Execution Costs at or below	Yes. The fee is 8.68%	

	9.5 per cent of the total project/programme budget (including the fee)?		
Eligibility of IE	4. Is the project/programme submitted through an eligible Implementing Entity that has been accredited by the Board?	Yes. BOAD is an accredited RIE.	
Implementation Arrangements	1. Is there adequate arrangement for project / programme management, in compliance with the Gender Policy of the Fund?	Yes.	
	2. Are there measures for financial and project/programme risk management?	Yes.	
	3. Are there measures in place for the management of for environmental and social risks, in line with the Environmental and Social Policy and Gender Policy of the Fund?	No. Whilst an ESIA was undertaken as well as a vulnerability assessment, component 2.1 of the proposal contains unidentified sub-projects (USPs), activities (including micro-credit) that have not been identified to the point where meaningful environmental and social risks identification is possible. Compliance with the ESP then requires either the development of a project-wide ESMP that includes a detailed mechanism to identify ESP risks as and when these USPs will have been identified to the point where risk identification is possible, as well as ways to formulate and implement mitigation and management measures. Alternatively, these USPs should be identified prior	

		to submission, with all ESP risks identified. The ESMP included in the ESIA document is therefore inadequate as it is not in line with the ESP. It contains risk mitigation measures that may require further clarification (e.g. p. 76: “Put the back of an ass”). The allocation of roles and responsibilities related to the ESMP lacks resolution and is non-specific (e.g. ‘Contractor/PMU’, ‘proponent’, NEMA…). The ESMP does not take the USPs into account. **CAR1:** Please prepare and ESMP that meets the requirements of the ESP. In addition to the management of the risks for known activities, the ESMP needs to include a detailed description of the process that will be followed during implementation for the risk identification of the USPs and their subsequent mitigation and management, so that their compliance with the ESP is equal to that of project elements that have been sufficiently identified during project preparation. The project is classified as Category A for ESP compliance purposes. However, as the information provided is incomplete and does not allow an adequate appreciation of the risks, this should be confirmed or revised	**CAR1:** Not addressed. There is no indication that the ESMP has been modified. Please prepare and ESMP that meets the requirements of the ESP. In addition to the management of the risks for known activities, the ESMP needs to include a detailed description of the process that will be followed during implementation for the risk identification of the USPs and their subsequent mitigation and management.

		following adequate consideration of the extent of the risks. **CR18:** Please include a description in the proposal document of the findings/results from the environmental and social assessment that was undertaken clearly explaining all major environmental and social risks as well as gender issues, and describing their significance, the plan for their monitoring and mitigation, and including a description of how potential risks associated with the Fund's environmental and social principles will be avoided, minimized or mitigated. **CR19:** Please identify all environmental and social risks as much as is possible in line with the AF ESP, and in particular in relation to the micro-credit scheme. Following this, and considering CAR1 above, please confirm or revise the categorisation of the project, providing adequate justification. Water will be extracted from the Oti river inside the Oti-Keran-Mandouri Wildlife Reserve. The protected area is one of global biodiversity significance, as reflected in its status of UNESCO Man and the Biosphere Reserve and Ramsar site, among others. This information is not presented in the proposal or the ESIA. The risk	**CR18:** Partially addressed. The section II.K has been expanded with a narrative description of some additional expected impacts. The other issues have not been addressed. **CR19:** Not addressed. The categorisation outcome is not changed and no further justification for a category A conclusion is presented.

		identification (Part II, Section K) is therefore inadequate as it does not take adequate management and mitigation measures into account. e.g., the inherent risks to soils of irrigation development are said to be non-existent because of the inherent measures in the implementation of the project. These risks should be identified and mitigation and management measures formulated accordingly. **CR20:** Please provide evidence-based risks identification on the risks to soils for laying down irrigation infrastructure and use of the proposed basin and furrow type irrigation method as well as risks on the source of the irrigation water for all of the relevant aspects: flows, water quality, biodiversity, etc., both at the intake point as well as far downstream as the risks are present.	**CR20:** Not addressed. Please provide evidence-based risks identification on the risks to soils for laying down irrigation infrastructure and use of the proposed basin and furrow type irrigation method as well as risks on the source of the irrigation water for all the relevant aspects.
	4. Is a budget on the Implementing Entity Management Fee use included?	No. A total figure for the fee is included with no breakdown explanation. **CR21:** Please explain why there is no budget breakdown and disbursement schedule for the implementing entity management fee.	**CR21:** Addressed
	5. Is an explanation and a breakdown of the execution costs included?	Yes.	

	6. Is a detailed budget including budget notes included?	Partially. There is no consistency in itemizing the budget notes to provide a clear overview of how the budget will be spent. **CR22:** Please consistently include sub-figures in the budget notes for a clear explanation the budget break down.	**CR22:** Addressed
	7. Are arrangements for monitoring and evaluation clearly defined, including budgeted M&E plans and sex-disaggregated data, targets and indicators, in compliance with the Gender Policy of the Fund?	Yes.	
	8. Does the M&E Framework include a break-down of how implementing entity IE fees will be utilized in the supervision of the M&E function?	Yes.	

	9. Does the project/programme's results framework align with the AF's results framework? Does it include at least one core outcome indicator from the Fund's results framework?	Partially. The description and wording for project outputs and output indicators needs to be reframed to enable clear articulation of appropriate indicators. **CR23:** Please reconsider the phrasing of project outputs and assess the appropriateness of related indicators. Please refer to the Fund Results Framework and Baseline Guidance - Project-level guidance document available here: https://www.adaptation-fund.org/document/results-framework-and-baseline-guidance-project-level/	**CR23:** Partially. Please include risks and underlying assumptions in the project results framework.
	10. Is a disbursement schedule with time-bound milestones included?	Yes. However, it is incomplete. **CR24:** Please clarify why the implementing entity management fee reflects only a lump sum total and has no disbursement schedule.	**CR24:** Addressed

Technical Summary	The proposed project aims to improve the level of resilience of vulnerable households in Mandouri by developing water management and irrigation technologies that reduce dependence on rainfall for agricultural production. In addition to the project intends to improve livelihoods by promoting crop diversification and the production of value added agriculture products and provide capacity building to project beneficiaries through knowledge management and training. The initial technical review found that the proposal had inconsistent figures and language in several sections and had not adequately demonstrated how the proposed concrete measures would contribute to climate resilience. The proposal had not adequately demonstrated alignment of project outcomes with the Adaptation Fund fund-level objectives, had not adequately demonstrated how the project's results framework was aligned to the Fund's results framework, had not demonstrated adequate cost effectiveness, had not provided an adequate description of how the project was consistent with national or sub-national sustainable development strategies, plans, poverty reduction strategies, national communications and adaptation programs, had not provided an adequate description of the proposed knowledge management system, and had not provided adequate information on the

	proposed budget and disbursement schedule. In addition, the proposal had not provided an adequate justification for unidentified sub-projects, had not provided adequate information on the stakeholder consultation process that took place, and had not provided adequate information on measures for the management of environmental and social risks in line with the Environmental and Social Policy and Gender Policy of the Fund. The final technical review finds that while several of the initial clarification requests have been addressed, the revised proposal document has not adequately addressed how proposed concrete measures are linked to climate resilience, has not provided a description of all the identified national or sub-national strategies, plans and programmes, has not resolved inconsistencies in the learning and knowledge management component, has not provided an adequate description of the consultative process taken place, and has not provided an adequate cost effectiveness assessment for the proposed measures. In addition, the revised proposal still needs to provide an adequate description and justification of measures for the management of environmental and social risks in line with the Environmental and Social Policy and Gender Policy of the Fund. The following observations are made, to be addressed by the proponent: a) Please describe components 1 and 2 particularly focusing on the concrete adaptation activities, and how these activities contribute to climate resilience. b) Please provide a clear description of alternative options to the proposed measures to allow for a good comparison to other possible interventions that could have taken place to help the population of the prefecture Kpendjal and that of the Canton of Mandouri adapt and build resilience. c) Please explain what ODD is and clarify if the project is consistent with Togo's Accelerated Growth Strategy and with the ODD. d) Please provide an explanation why component 3 which specifically refers to the establishment of a knowledge management system is not mentioned in Section G of the proposal. e) Please provide a clear description of the consultation techniques used specifically for each target group of stakeholders and a description of the key consultation findings for each group, including how any issues raised were addressed in the project design. f) Please include risks and underlying assumptions in the project results framework. g) Please prepare an ESMP that meets the requirements of the Fund's Environmental and Social Policy and

	address related environmental and social risk assessment issues identified in the initial technical review. In addition, please provide adequate justification for the project category.
Date:	15 September 2017

REQUEST FOR PROJECT/PROGRAMME
FUNDING FROM THE ADAPTATION FUND

The annexed form should be completed and transmitted to the Adaptation Fund Board Secretariat by email or fax.

Please type in the responses using the template provided. The instructions attached to the form provide guidance to filling out the template.

Please note that a project/programme must be fully prepared (i.e., fully appraised for feasibility) when the request is submitted. The final project/programme document resulting from the appraisal process should be attached to this request for funding.

Complete documentation should be sent to:

The Adaptation Fund Board Secretariat
1818 H Street NW
MSN P4-400
Washington, D.C., 20433
U.S.A
Fax: +1 (202) 522-3240/5
Email: afbsec@adaptation-fund.org

ADAPTATION FUND

PROPOSAL FOR TOGO

Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

July 2017

DATE OF RECEIPT :	
ADAPTATION FUND PROJECT ID:	
(For Adaptation Fund Board Secretariat Use Only)	

PROJECT/PROGRAMME PROPOSAL TO THE ADAPTATION FUND

PART I: PROJECT/PROGRAMME INFORMATION

Project/Programme Category:	Regular project
Country/ies:	Togo
Title of Project/Programme:	Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo.
Type of Implementing Entity:	Regional Implementing Agency
Implementing Entity:	Banque Ouest Africaine de Développement (West African Development Bank) [BOAD]
Executing Entity/ies:	Ministere de l'Environnement et des Ressources Forestieres African Sustainability Centre (ASCENT)
Amount of Financing Requested:	10,000,000 (In U.S Dollars Equivalent)

1. Project Background and Context:

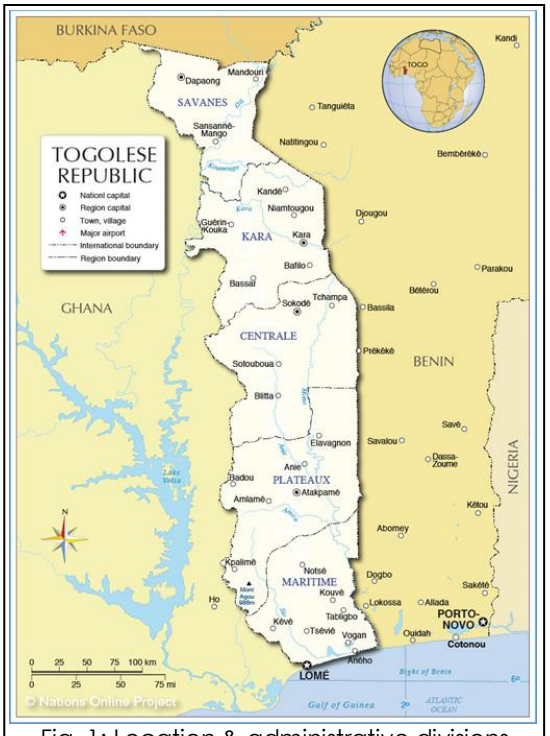


Fig. 1: Location & administrative divisions

Geographical and environmental context

Togo is a West African country located between latitudes 6^0 and 11^0 north, and longitudes 0^0 and 1.40^0 east. It is bounded to the north by Burkina Faso, to the south by the Gulf of Guinea, east by Benin and to the west by Ghana. With an area of 56,600 km², it stretches from north to south over a length of 600 km in a straight line and has a width that varies between 50 and 150 km. It has a coastline of about 50 km, which opens onto the Gulf of Guinea. It is divided into five administrative regions: Savanes, Kara, Central, Plateaux and Maritime where the capital Lomé is located (Figure 1).

Togo's relief consists of rugged terrain, except for the Atakora mountain range that crosses the country in a southwest to northeast line. The typical landscape is composed of deep and narrow valleys that individualize the plateaus. In the far north, a vast eastern plain furrowed by the Oti River and its tributaries extends between 9 ° 20' and 11° north. From the north, the eastern plain rises and extends to the south, giving the plateau bar of land overlooking the lagoon area, which covers more than two thirds of the Maritime Region.

Togo is under the influence of two major climatic

patterns (Figure 2).

- The tropical north Sudanese regime (from the 8th parallel north) with a rainy season that goes from May to October and a dry season that goes from November to April. In this area, annual rainfall varies from 900 to 1100 mm and the plant growth period is less than 175 days;
- The Guinean regime tropical south (south of parallel 7) is characterized by two dry seasons and two rainy seasons of unequal durations. Annual rainfall ranges from 1000 to 1600 mm[1].

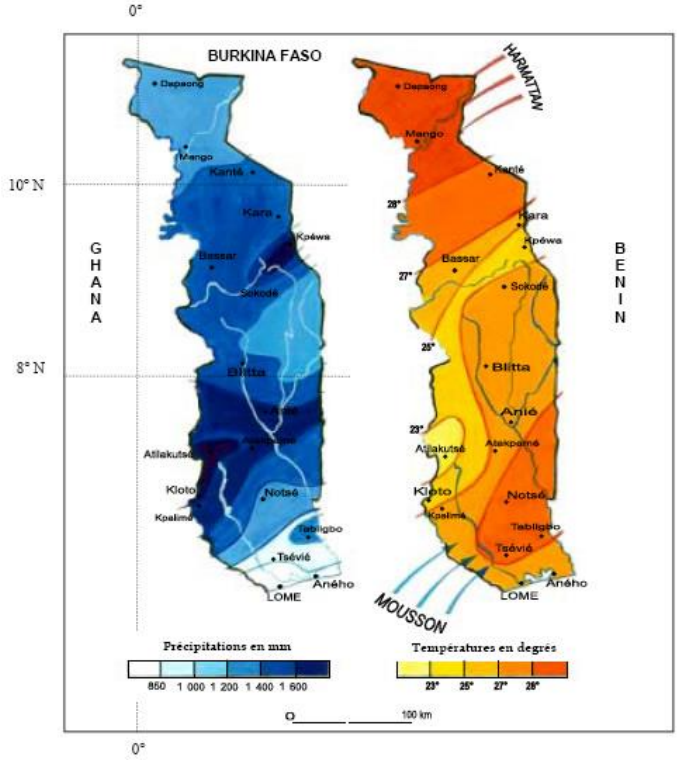


Figure 2: The two maps for climate[2] (precipitation and temperature)

Between the two regimes, there is a transition zone whose ombrothermic curve has a single rainy season with a slight decrease in rainfall in August or September. The average temperature is generally high: up to 28° C in northern areas, 27° C in the coastal zone and between 24[0] and 26° C in the other localities. The average relative humidity is high in the southern areas (73-90%) but low in northern regions (53-67%). The average wind speed is 1.93 m/s and the average duration of insolation is 6h37 minutes per day. The average evapotranspiration can be estimated at approximately 1,540 mm/year[3].

At the watershed level, Togo is divided into three large basins:

- The Oti basin and its tributaries cover about 47.3% of the territory. The high water period is between August and October, and the low water period is from December to June;

- Mono Basin occupies the central third and all of eastern Togo. By area (37.5% of the territory), it is the second basin in the country. There is only one high water period between July and October. The duration of the period without flow varies from 30 days to about 130 days;

- The coastal basin of Lake Togo has three components which Western Component that drains the waters of Zio, the central component that drains the waters of the South and Haho component

[1] Deuxième communication nationale du Togo (2010)
[2] Deuxième communication nationale du Togo (2010)
[3] Deuxième communication nationale du Togo (2010)

formed by the own basin of Lake Togo. The entire coastal basin covers an estimated area of 14.3% with a transitional equatorial regime in connection with the rains: two dry seasons alternating with two rainy seasons.

- The coastal basin of Lake Togo has three components, the western component which drains the waters of the Zio, the central component which drains the waters of the Haho and the southern component formed by the basin of Lake Togo. The whole coastal basin covers an area estimated at 14.3% with a transitional equatorial regime in connection with the rains, of two dry seasons alternating with two rainy seasons.

The National Water Policy (NEP) also reveals that despite a favourable situation in potential availability, Togo suffers from a lack of mobilization of its water resources and is struggling to meet the basic needs of populations, in supplying drinking water and mobilizing these resources for the promotion of a harmonious and coordinated development of the country. It reports also large regional differences in terms of availability and demand of the resource. The distribution of water resources in time and space does not necessarily follow the rules of needs and uses. They are abundant in some areas and sorely lacking in others. Sometimes the most deprived areas represent the most important use areas. Moreover, the problems of availability may be related to quality problems due to salinity, or pollution may arise locally[4].

Concerning flora, Togo has three major categories of natural formations: the dense forest formation (10% of the country), the open and wooded savanna formation (83% of the total area of the country), and riparian formation located in the more or less flooded main river valleys (2% of the total land area).

Togo's vegetation formations are located in a transition zone between the semi-deciduous dense forest and savanna and include:-

a. the Sudano-Guinean forest, degraded and currently mainly located in mountainous areas, especially in the West Plateaux region;
b. the gallery forest bordering the axes of the main drainage watercourse;
c. the dry dense forest or savannah consists of a stand of deciduous species, mainly in the central and north of the country;
d. Savannah southern and central part of the country until the ninth parallel and north of the Togo Mountains in the basins of the Oti and Kara, and in Danyi Plateaux, and Akposso the Akébou; and
e. The shrubby bush is mainly found on the earth bar trays and wet lowland depressions of the Lama.

All formations described above are highly degraded areas with high rural activities. This situation has worsened with the phenomenon of climate change which caused frequent drying up over the past decade in Togo. At the same time, productive savannas decreased at a rate of 6,000 ha/year and fallow increased by more than 22 000 ha/year[5]. The increasing erosion of plant formations including mountain forests is a great concern considering the important role they play in regulating water and rivers and also in the protection of watersheds. The climatic diversity of Togo flows from north to south by a diversity of ecosystems with their characteristic species. These flora and wildlife resource areas include terrestrial ecosystems and aquatic ecosystems[6].

The formations encountered are functions of the physical and geographical conditions, and are generally heavily degraded. The 1994 the National Forestry Action Program (NFAP) of Togo estimated that in 1970, dense forests covered 449,000 hectares, while in 1990 it reduced to 140,000 hectares with a deforestation rate of about 15 000 ha / year.

Tree cutting is the most devastating human activity that causes the destruction of forests throughout

[4] Rapport final vulnérabilité et adaptation ressources en eau-Projet Troisième Communication Nationale (2014)
[5] Deuxième communication nationale du Togo (2010)
[6] Rapport final étude de vulnérabilité et adaptation au changement climatique –Secteur de l'agriculture, foresterie et affectation des terres- Projet Troisième communication (2015)

the national territory in general, and especially in the western part of the Plateau and Central Regions. This deforestation results from bushfires, pressure from farmers practicing slash and burn agriculture, timber operators, and wood energy especially for households in rural and urban areas. Indeed, firewood and charcoal are the two main types of fuel mainly used for cooking food. Ninety-four percent (94.4%) of rural households use firewood for cooking, while 75.4% of urban households used mainly charcoal[7].

2. Socio-economic development context

According to the 2010 Togo Census and Housing Report and its updated data, the country's population grew from 6,191,155 in 2010 to 7,121,673 people in 2015, composed of 51.4% women and 48.6% men.

With an average annual growth rate of 2.84%, the population density rose from 110 inhabitants per square kilometre in 2010 to 133 inhabitants per square kilometre in 2015. This population is predominantly rural (> 60%). Young people under 15 years and 25 years counts respectively for 40% and 60% of the total population.

The macroeconomic context is characterized by a Gross Domestic Product (GDP) which rose from 3.7 billion USD in 2010 to 4.5 billion USD in 2014[8].

The rural sector contributes 41.7% of the GDP of Togo and employs more than 40% of the active population. Agricultural production accounts for 70% of the GDP in this sector. Indeed, only 45% of arable land, i.e. 3.4 million ha, is currently exploited[9].The socio-political crisis that the country went through during the past years has deeply affected the performance of the sector. The trends are currently characterized by an average growth in agricultural production of 4.4% between 2002 and 2005 despite an increase in cultivated area of 3.4% over the same period. This reflects lower yields over the period.

The vast majority of the rural population consists of small producers. They are poorly monetized, as reflected in their low productivity and their inability to take advantage of market opportunities (national or international) to increase their income and to access a number of services that could improve their living conditions.

A 2009 study by IFPRI (International Food Policy Research Institute) on agricultural performance in Togo showed that halving the rural poor would require an annual growth of 9.6% in the agricultural sector during a five-year period. This constitutes a major challenge. Between 2005 and 2008, agricultural growth was 3.9% globally, and 4.8% for food production in particular. In 2009 agricultural growth reached a record level of 8.2%. This shows that significant progress can be rapidly achieved when decisive actions are taken. In the various sub-sectors, the following performances were recorded:-

In the crop production subsector, subsistence farming is the main source of poverty reducing growth both nationally and in rural areas for the next decade. Crop production can be divided into:

a. food crops (maize, sorghum, millet, rice, etc.), tubers (yams, cassava, etc.) and legumes (peanuts, beans, etc.), that in recent years have contributed to 66% of the agricultural GDP; and
b. export crops such as cotton, coffee and cocoa, contributing an average of 9% of agricultural GDP[10].

While grain is the main staple of the population, the cereal balance was in deficit between 2005 and

[7] Questionnaire des Indicateurs de Base du Bien-Etre (2011)
[8] Comptes nationaux du Togo 2010 and Word Bank (http://www.worldbank.org/en/country/togo)
[9] Rapport final étude de vulnérabilité et adaptation au changement climatique –Secteur de l'agriculture, foresterie et affectation des terres- Projet Troisième communication (2015)
[10] Rapport final étude de vulnérabilité et adaptation au changement climatique –Secteur de l'agriculture, foresterie et affectation des terres- Projet Troisième communication (2015)

2008 with a coverage rate of domestic production between 87% and 97%. Since then, through incentives introduced by the Government as part of the Strategy for the revival of agricultural production (AFS), with notable outcomes including:-

a. fertilizer supply has increased from less than 11 000 tons in 2008 to 30 000 tons in 2010 with the key demand leading to the setting up of 110 stores;
b. food seed production recorded about 400 t in 2008 to more than 533 tons, an increase of 12.9% in twelve years, and 750 tons in 2009 and 2010 respectively, an increase of 33% in two years.

Sustainable Land Management (SLM) gradually restored seed production capacity by rehabilitating the Sotouboua seed farm; structuring of the seed sector; and training seed inspectors.

Among cash crops, cotton has suffered a continuous decline since 2005, going from 173,660 tons to 27,900 tons in 2009. Between 2002 and 2009, production in the coffee and cocoa experienced respective annual growths 39% and 79% to 11,000 tons and 13,200 tons in 2009. In addition to the agro-ecological potential available in the country, the Government has undertaken major restructuring to improve cash crops. There is ongoing restructuring and a coordination unit has been established to restore production potential through the close support to producers[11].

The sub-sector of livestock production has contributed to the agricultural GDP with an average of 13.4% in the last five years. The main species found in Togo are: Cattle, sheep, goats, pigs and poultry (chickens, guinea fowl, turkeys, and ducks). In 2009, livestock number estimates included - cattle (307,500 heads), small ruminants (sheep and goats 1,657,400 and 1,870,000 heads respectively), pigs (308,450 head) and poultry (13,878,000). This shows an annual growth of 3%, 10%, 3% and 39% respectively for the four species.

Despite this growth, meat production does no satisfy the demand. In 2009, meat production was at 49,689 tons for a demand of 70,000 tons, with a shortfall of 20,311 tons (30% of the needs) met by imports from the Sahelian countries, and from Europe. Through the National Agricultural Investment Program and Food Security (PNIASA), the Government aims to cover this demand through domestic production.

Over the last ten years, fish production (mostly artisanal) catered for 3.6%of agricultural GDP. In 2009, the average fish production was 27,025 tons, of which 81% comes from the ocean and 19% from rivers, lagoons and fish farming.

The coverage rate of domestic consumption in fisheries products is less than 50% and is likely to worsen in the future. Given the weakness of maritime resources and overexploitation of lagoon resources, the efforts of the Government, to reduce the deficit, are mainly focused on the development of fish farming and the establishment of adequate mechanisms for the sound management of maritime and continental fishery resources.

Socially, there are many conflicts between farmers and herders in Togo related to transhumance especially after crop harvesting. Generally, livestock comes in from the Sahelian countries (Burkina Faso, Mali, Niger, etc.) and Benin. This creates a set of problems with the local sedentary population. The root causes are that transhumance corridors still exist, but with climate change, livestock inevitably increase the pressure on natural resources, sometimes destroying stored crops. There are, however Transhumance Management Committees that hold regular meetings in the prefectures on this issue.

In socio-economic terms, despite the implementation of various economic and social policies, Togo's development indicators are far from satisfactory today. Togo is part of the category of Least Developed Countries (LDC) with a per capita income of 360 US dollars in 2005. The Togolese economy traditionally depends on the primary sector. This represents about 40% of GDP and employs over 70% of the workforce. The secondary and tertiary sectors represent approximately 23% and 36% of GDP in 2004. Agricultural production is primarily dependent on weather conditions and is dominated by small farms

[11] Rapport final étude de vulnérabilité et adaptation au changement climatique –Secteur de l'agriculture, foresterie et affectation des terres- Projet Troisième communication (2015)

conducted using rudimentary techniques and tools. Togo has a liberal economy whose exports, focusing on phosphates, cotton, cement, coffee, and cocoa accounted for an annual average of 34% of GDP between 2002 and 2005, a level well below the average of 45% that prevailed in the 1980s. Also, the degradation of economic activities, followed by worsening poverty have ended up showing the limits of the actions of the state to respond effectively to people's needs. In addition, the skills gap also affects the private sector and civil society.

Clearly, human and social development indicators are lacklustre. Indeed, Togo's human development index of 0.495 ranks the country 147th in the world ranking (UNDP Report 2006). Based on data from the survey on well-being indicators (CWIQ, 2006), it was revealed that the incidence of poverty has increased. There percentage of poor households was 56.2% in 2006 (MEF, 2007) compared to 35.3% in 1998 (RNDHD, 2004). The Human Poverty Index (HPI-1) of Togo was 39.2% in 2006, ranking the country 72th in the world out of 102 developing countries (in 2003, the HPI-1 was 38.5%). The various surveys revealed that over 60% of the Togolese population lives below the poverty line. The incidence of poverty is very high in rural areas where three out of four households are poor against two in five in urban areas. The regions most affected by poverty are the Savanna region (90.5%), the Central region (77.7%) and the Kara region (75%). Moreover, poverty is strongly correlated with undernutrition to the extent that 64.2% of the poor population is undernourished[12].

The main determinants of household poverty are, firstly, household size, health status of members and household factors of production and on the other hand, the level of education, occupational status, sex, age and marital status of the head of the household.

The comprehensive strategy for poverty reduction that the Government intends to implement with the participation of all development actors and beneficiary populations, has the ultimate objective of effectively and sustainably improving people's living conditions by addressing main causes of poverty.

To do this, the government's goal is based on four (04) strategic pillars:
a. strengthening governance;
b. the consolidation of the foundations for strong and sustainable growth;
c. human capital development and,
d. reduction of regional imbalances and promoting development at the base.

These different pillars take into account the cross-cutting issues relating to the environment, AIDS, gender and human rights.

In terms of access to basic social services, there is a great disparity to the chagrin of the poor. In terms of access to education, guidance of public subsidies to education is unfavourable to the poor. The poorest 20% receive an equivalent of 5,607 FCFA as educational grant per head, while the richest 20% receive 10,376 FCFA per capita. Similarly, access to public health grants, is unfavourable to the poor. Indeed, the poorest 50% of the Togolese population has only 20% of public subsidies to University Hospital, and 30% of subsidies to hospitals and health centres. In rural areas that concentrate approximately 80% of the poor, access to health care is done through clinics or health centres. Health huts 9 (clinics) do not receive public subsidies.

The analysis of the access to electricity in Togo shows that the poor do not have access. Only 11.1% of poor people have access to electricity, against 42.9% of non-poor.

As for access to safe drinking water, the divide between the poor and non-poor is relatively low. About 39% of the poor have access to safe drinking water against 53.5% of non-poor.

Women represent the larger fraction of the Togolese population (51.3%), and nearly 75% of the population in rural areas against only 25% in urban areas. In agriculture, they represent nearly 60% of

[12] 12 DSRP-C Togo (2009-2011)

the agricultural workforce and are present in all phases of agricultural production. They are responsible for 40% of ploughing and weeding; 70% of the harvesting; 80% of seeding; and 90% of agricultural processing and marketing activities. They are present in many other activities, and their role in domestic work predominates over that of men.

Compared to men, Togolese women face higher rates of illiteracy that affects their lives. The majority of women are not educated; the female literacy rate is 55.8% according to provisional data from the 2006 CWIQ survey. They rarely go beyond the primary level and even less the secondary level. This situation disallows women from being informed about all the favourable legal provisions present in the Convention on the Elimination of Discrimination against Women (CEDAW) for instance.

The different legal provisions in favour of gender equity and empowerment of women, demonstrate the Government's desire to promote equality and equity between the two components of society. The sociological factors, ignorance of the existence of these provisions, the lack of a clear appeals process, distrust, resignation, partly explain the non- exercise of rights. In general, beliefs and custom still dominate modern law in some areas and oppose the advancement of women and girls. This is, among others, early marriage; female genital mutilation; and the low-participation of women in decision-making. Added to this are the difficulties in accessing credit, land and inputs; easements ritual marked by the placement of girls in fetishist convents; some mourning rites for the widow; and gender-based violence.

To support and implement the commitments made in the framework of the various agreements, the Government of Togo in 1992 devoted to the principle of gender equality in the Constitution of the 4th Republic. Togo ratified all international instruments that protect the Woman (CEDAW), Convention for the Suppression of the Traffic in Persons and of the Exploitation of the Prostitution of Others, the Protocol to the African Charter on Human Rights and Peoples' Rights (ACHPR) on the Rights of Women). However, there are still obstacles that must be overcome to improve women's status and promote their equal participation in the development process. To this end, initiatives should be undertaken to:-

a. promote education and training of the daughter and wife,
b. improve the health of women,
c. ensuring the economic empowerment of women
d. improve and respect the legal and social status of women,
e. develop and take into account women's work, and
f. strengthen the participation of women in decision making spheres[13].

The extractive industries are mainly on phosphate and clinker. Manufacturing industries include the following industrial units: food, beverages and tobacco, textiles, clothing, wood and wood products, printing, paper, publishing, chemical, and metal products.

The overall objectives of the various sectoral policies implemented in areas related to climate change are as follows:

- In **agriculture**, it is to increase the income of farmers and contributing to improving the living conditions of rural people, in a perspective of sustainable development, with particular attention to the poorest populations or most vulnerable, including young people and women;

- In the **energy sector**, the general objective of the Government is to meet the energy needs of households and businesses. More specifically, it will effectively manage energy by reducing losses and waste, to establish an institutional and legal framework for development of the sector, to implement a promising alternative sources development plan for the production of energy, taking into account the environmental dimension and to promote the involvement of private operators;

- In the **forestry sector**, the guidelines of the National Forestry Action Plan (NFAP) concern the

[13] (UNDAF) (2007)

improvement of forest management and strengthening capacities of ecosystems for efficient carbon sequestration. People are called to create private forest areas, to protect existing forest stands and developing urban forestry, suburban and rural;

- In the **transport sector**, the objectives of the Government's policy focus on improving: road infrastructure; the effectiveness of the sector to support the economic recovery and contribute to economic growth; the competitiveness of Togolese products in domestic and foreign markets by reducing transport costs and a better quality of services and the mobility of goods and people and the reduction of poverty and the implementation of an autonomous and sustainable plan of the area;

- In the area of **health**, the general guidelines of the national policy designed to reform the health system in order to adapt to the new challenges of the health sector in Togo; ensure the adequacy of the health system to the needs of the most vulnerable and the poor; and promote physical, economic and policy favourable to health and advocacy to put health at the centre of economic and social development;

- In the field of **hydrology**, this is to enable all people to have access to drinking water in sufficient quantity and quality. To improve the management efficiency of this sub- sector, the Government will resort to the private sector, either through outright privatization or by privatizing some functions such as marketing;

- In the area of **sanitation**, the Government is aware that proper sanitation requires, among other things, public awareness, proper management of household and industrial waste, improving access to individual sanitation systems for households, the prevention of pollution of any kind;

- In the field of **urban planning and housing**, the Government policy aims to control urban development by facilitating access to housing for the most disadvantaged; capacity building of actors in the subsector; mastery of land issues; and institutional strengthening of the Planning Department and Housing;

- In the **environmental sector**, the Government has developed an environmental policy to promote a comprehensive and rational management of the environment, to improve the environment and living conditions of people in the perspective of economic development and social sustainability.

To do this, the Government intends to implement the following measures: -

a. reducing human pressure on natural resources;
b. the promotion of integrated management of the coastal zone;
c. strengthening of cooperation in regional and international environmental management matters;
d. strengthening national environmental management capacities;
e. prevention and fight against pollution and nuisances; and
f. prevention and management of risks and disasters.

In general, the degree of consideration of the issue of climate change in the policies initiated by the Government is significant from one sector to another, but generally insufficient.

3. Climate Change and variability in Togo

- **Trends, climate risks and observed impacts**

Studies conducted in Togo in recent years indicate that there is generally a decrease in rainfall and number of days of rain[14]. The Rainfall-Potential evapotranspiration (P/PET)ratio which is the aridity index is also down, reflecting the trend of climate aridity. Temperatures are rising, those for the high temperature period (February, March and April) can exceed 35 °C (Table 1). Climatic data on climate change shows that the major climatic risks between 1961 and 2012 are summarized with paradoxically

[14]Adjoussi et al, (2012), Adéwi (2012)

extreme situations of drought or flood. Thus, those contradictory extremes follow and create complete confusion on the country level communities. Between 1986 and 2012, observing data indicates also an agitated climatic period by the global warming phenomenon (tables 1 and 2). The warming phenomenon is felt differently from south to the north of the country.

However, since 2005, a resumption of rainfall was recorded in some stations. This recovery is reflected in the intensity and amount of rainfall, which would explain the recurrent floods recorded these last years in the country. This rainfall variability is not without consequences on the occupation and evolution of the ground.

Regions	Average T°C 1961-1985	Average T°C 1986-2012	Variations in T°C
Lomé 06° 10' N / 01°15' E	26,8	27,9	0,69
Atakpamé 07°35' N / 01°07 E	25,8	26,8	1,0
Sokodé 08°59'N / 01° 07' E	26,2	26,9	0,69
Mango 10° 22' N / 00° 28' E	27,9	29,1	1,2

Table 1: Warming evolution in various climatic zones in Togo[15]

Regions	Average rains (mm) 1961-1985	Average rains (mm) 1986-2012	Variations (mm)
Lomé 06° 10' N / 01°15' E	876,0	833,0	-43
Atakpamé 07°35' N / 01°07 E	1363,3	1360,0	-3,29
Sokodé 08°59'N / 01° 07' E	1380,7	1299,7	-81
Mango 10° 22' N / 00° 28' E	1085,1	1048,3	-41,8

Table 2: Evolution of precipitations in various climatic zones in Togo[16]

Following the recurring of floods in Togo and consequences recorded on the national economy and on the poorest people, the government set up Disaster Risk Reduction (DRR) as a national priority. This initiative will enable the government to respond appropriately to the risks of disasters, taking into account sustainability in interventions (NADP, 2010)[17].

Tables 1 and 2 above indicate that in the entire country, temperatures are rising and the annual rainfall show a general downward trend. The rains are concentrated in a short time and dry periods are experienced hardest with temperature thresholds exceeding all averages.

- ***Climate projections and expected impacts***

Changes in annual temperature and precipitation were compared with changes from 1971 to 2000. Scenario studies reveal that climate change will already be perceptible by 2025, both in terms of temperatures and precipitation.

Indeed, there will be a variation in rainfall of 1% in the North from 11° N to -1.5% at Latitude 5 ° N in the south of the country. The Savannah Region will experience a small increase in rainfall, while the other

[15] Direction Nationale de la Météorologie, (2013) in (Scénarios climatiques-Troisième communication nationale 2014)
[16] Direction Nationale de la Météorologie, (2013) in (Scénarios climatiques-Troisième communication nationale 2014)
[17] Programme national de suivi de l'environnement au Togo (PNSET, 2012)

regions (Maritime, Plateau, Central and Kara) will be marked by a decrease (0 to -1.5%). The average annual temperature will have a variation of 0.66 ° C in the South of the country at 0.80° C in the extreme north. On average, high temperatures will be recorded in the Savannah region in April (32.6° C)

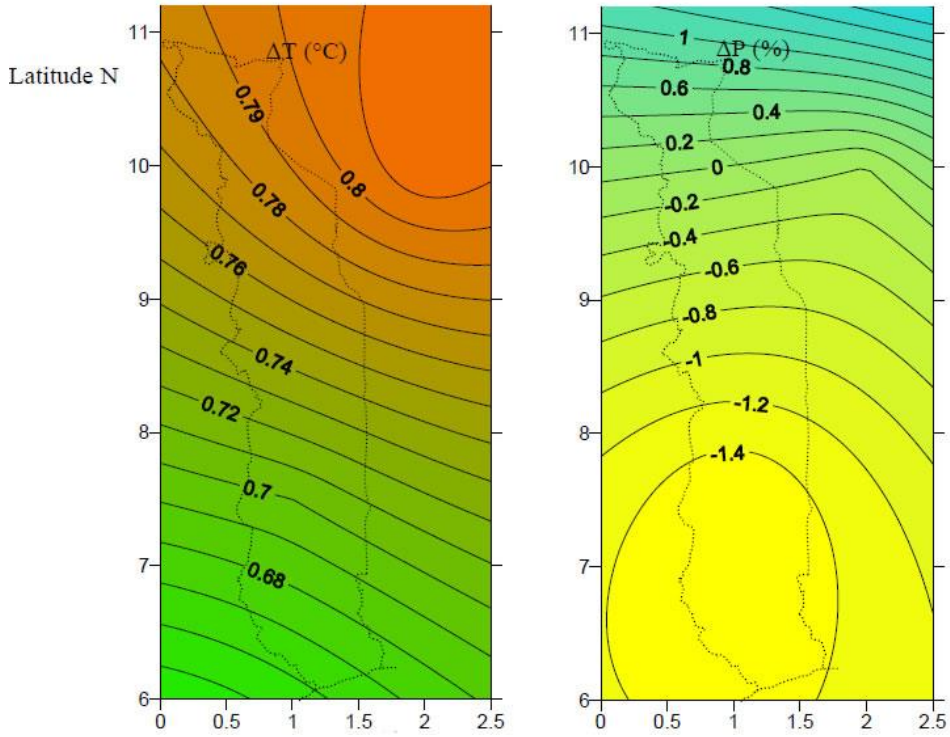


Fig. 3: annual variations of temperature and the rate of precipitation by 2025
(Source: Second National Communication 2011)

Reference scenario
The present time is represented here by the average of the 1986-2005 period atmosphere centred on 1995. The average annual temperatures "**TMean**" range between 21.22° C and 28.62° C with maxima "**TMax**" around 35.22° C in the extreme north and minima "**TMin**" of 16° to the west of the plateau region. The annual rainfall "**Precip**" vary between 850 and 1,715 mm with the lowest values in the maritime region and in the far north of the Savanna region.

Scenarios for 2025 (optimistic assumption RCP2.6)
Depending on the emission scenario defined by the concentration of GHG RCP2.6 trajectory, the highest temperatures will be registered in the extreme northeast with average maximum of almost 36° C. The average temperatures oscillate between 21°C and 29°C in general and the western plateau region is going to experience the lowest temperatures around 17° C on average. Compared to 1995, the maximum temperature limit will increase by 2%.

Precipitation will change in the range 857-1,722 mm against 850-1,715 mm in the reference scenario.

Scenarios to 2050 (optimistic assumption RCP2.6)
The warming trend is noticeable throughout the country by 2050 with average maximum temperatures between 27° C and 36.24° C.

The change in rainfall is not very high compared to the levels of average precipitation in the baseline scenario. However, a slight increase in overall can be noted.

Scenarios for 2025 (worst case RCP8.5)
The results of the pessimistic scenario for 2025 are below:

27°C < TMax < 36.08°C
22°C < TMean< 29.5°C
17°C < TMin < 24.26°C
858.41 mm <Precip< 1,723.30 mm.

Scenarios to 2050 (worst case RCP8.5)
By 2050 the GHG concentration trajectory worst scenario RCP8.5 temperatures will change as below:

27.8°C < TMax < 37°C
22.8°C < TMean< 30.5°C
17.8°C < TMin < 25°C

Rainfall "**Precip**" are in the range from 862.7 to 1,732 mm.

The scenarios impacts on Agriculture
The IPCC Third Assessment Report of the Expert Group noted a loss of 2% to 4% for agricultural production for West and Central Africa regions. Moreover, studies for category B2 SRES showed that by 2080 the changes in meteorological factors will lead to a loss of agricultural potential. Land area for rainfed agriculture and grain production potential will decline remarkably.

Other risks that can be expected are the risks of erosion and declining agricultural product yields in rainfed areas and reduced crop growth periods. Climate variability, climate change and changes in socioeconomic variables can also have negative impacts on the fisheries and livestock especially the risk of pest invasions.

On the West African regional level, it is recognized that climate change has already led to a desert encroachment of 25-35 km to the South West Africa. Consequently, areas of arid and semi-arid regions will increase by 5% to 8%.

For Togo, the projections show that agricultural produce needs (namely food grains, tubers and legumes and protein) will continue to increase in the country to feed itself in the future. The population is estimated at 5,212,000 inhabitants in 2005, but projections are close to 8 million by 2050, and 17 million by 2100.

Thus the limiting factor for food production is the availability of arable land. The area of arable land is estimated at 2.5 million hectares. The arable lands still suffer from degradation due to the combined effects of human activities and climate change. Indeed, many areas of land have already lost their vegetation cover and exposed to leaching especially on hillsides and mountains of the Atakora chain, and observable laterisation process east of the Plateau Region namely the prefectures of Est-Mono, the Middle Mono and Notsé.

In Togo, degraded lands were estimated at 163,400 ha in 2005. The projections foresee around 4 million hectares of managed ecosystems, including agricultural land, irrigated areas, pastures and forest plantations in 2050. Thus, the achievement of this goal of 4 million hectares of landscaped space is impossible under business-as-usual circumstances. Socio-economic impacts are also numerous. There will be a decline in the contribution of the agriculture sector to Gross Domestic Product due to lack of arable land available after 2050.

According to the evaluation of GCE reports there will also be a decline in food production per capita, a situation that will force the country to depend more on imports for food.

4. Non-climatic vulnerabilities

The main environmental and social constraints are: land degradation, deforestation and biodiversity

loss, pollution inputs, including pesticides and social conflicts related to land access. It is especially clear that the access to land by inheritance is difficult for women. Note, however, that apart from pollution by inputs that may be specific to cotton, other problems are common to the entire agricultural sector. The ecological impacts of land degradation are:

a. the increase in the planted area;
b. chemical pollution of water resources;
c. loss of agricultural productivity;
d. changing the flow regime;
e. deterioration of the landscape, and
f. the loss of plant cover and biodiversity. Habitat loss and terrestrial flora in Togo is largely due to forest clearing related to shifting cultivation system practiced by slash and burn farmers.

The sub-sector of plant production still faces a number of constraints, namely a low crop productivity due to –

1. low investment in the sub-sector,
2. the application of marginal technologies caused by the failure the extension system and agricultural advisory support and
3. an insufficiently oriented development research; edaphic and degradation of forest resources due to -
    a. over-exploitation in some areas,
    b. the low use of soil conservation techniques,
    c. the degradation of forest and tree resources, due to the extension of cultivation, overexploitation of firewood and charcoal, and cultural constraints of land for replanting, and
    d. Excessive dependence vis-à-vis a small number of export crops (cotton, coffee, and, marginally, cocoa) which sectors have the other fragilities in organizational terms and sensitivity to world prices.

Problematic

Togo's agriculture is rain-fed agriculture dominated by small producers. Indeed, it mainly depends on climatic conditions vary greatly disrupt agricultural activities. This high variability is characterized often by a late start and an early end to the rainy season compared to the usual crop calendar, the onset of dry spells and poor spatial and temporal distribution of rainfall. This strong climate variability disorients farmers in their usual crop often affecting crops in full vegetative phase and causing losses of significant returns.

The most northern regions (Kara, Savannah) are regularly affected by famine, a consequence of climate anomalies that significantly reduce agricultural production. This demonstrates the relatively high level of vulnerability of the agricultural sector of Togo to the adverse effects of change and climate variability reinforced by vulnerability studies conducted as part of the Second National Communication on Climate Change. Indeed, this study demonstrated only horizons 2025, 2050 and 2100, Togo would record losses of production of its main food crops (maize and rice) respectively 5% to 10% accompanied by huge losses in farm receipts small producers, thus weakening the country's food security. This situation will exacerbate rural poverty and significantly reduce the capacity to withstand climate shocks.

Yet despite, sufficient water resources and a potential irrigable land of about 86000 ha, control of water for irrigation is still in its infancy.

It is for this purpose that this project is an appropriate adaptive response to the strong climate variability through the water control to secure agricultural production activities of the communities. Beyond securing the production, this project intends to promote the diversification of livelihoods, the development of agricultural products and the improvement of local governance for better support adverse effects of change and variability climate[18].

[18] Rapport final étude de vulnérabilité et adaptation au changement climatique –Secteur de l'agriculture, foresterie et

5. Recommended adaptation measures

In connection with the analysis of climate, socioeconomic and environmental scenarios, the following adaptation measures are recommended at national level[19]:

- **Support to the Ministry of Environment and Forest Resources**

Main objectives - Awareness and training of local people on adaptation measures at local level: the development of social cohesion, confidence in oneself and savings opportunities.

- **Food security and agriculture sub-sector**

General objectives for agricultural development and food security:

- increase in crop yields, livestock and fisheries products, all economic regions of the country concerned;
- increase of spaces allocated to agricultural practices, all economic regions of the country concerned; and
- development of the Environmental and Social Management Framework in the implementation of agricultural intensification program.

The measures to adapt to climate change to limit the declines in output and yields of agricultural products

- Support to the Ministry of Agriculture, Livestock and Fisheries (MAEP) in its Agricultural intensification program with food security objectives.

The specific objectives are:

  - Introduction of livestock species adapted to drought,
  - Introduction of crops adapted to drought.
  - Development of water control mechanisms for crop diversification and for self-food sufficiency and activities generating incomes.

All economic regions are concerned but specifically savannah regions and Kara.

6. Project target area

The project will be located in Mandouri, capital Kpendjal prefecture in the Savannah region in Togo. The project area is located in the canton of Mandouri

The project site is located 2 km from the city of Mandouri and consists of 4 parcels of 36 ha each or 144 ha in total.

In general, beneficiaries are made up of the population of the prefecture Kpendjal including that of the Canton of Mandouri, about 155 091 inhabitants of which 80,628 are women.

Specifically, there are two (02) categories of direct beneficiaries which are:

- 2880 people will be directly affected which are 576 farmer households[20]; given the average household size of 5 people per household
- the population of the city of Mandouri (about 5203[21] inhabitants) that will benefit from social measures from the construction of mini water supply consisting of equipped drilling, a mini network, water tower and fountains powered by solar equipment. In addition, the project also includes the

affectation des terres- Projet Troisième communication (2015)

[19] Etudes de la vulnérabilité et de l'adaptation aux changements climatiques – secteur de l'agriculture, Foresterie et affectation des terres (Troisième communication nationale)

[20] 576 farmer households: All activities will seek to include both or all adults especially as a means to increase women and youth ownership

[21] Rapport du recensement général de la population et de l'habitat du Togo de 2010

The population of the Savannah region is estimated at 828 224 inhabitants, representing 13.4% of the total population of Togo. The population density is 96 people / km² and the annual growth rate in this region is 3.18%. The Savannah region is populated by 397,996 men and 430,228 women.

Kpendjal prefecture has a population of 155 091 inhabitants; by residence, the urban population is 5,203 inhabitants (3.35%) against 149 888 (96.65%) and rural population distribution is as follows: Men: 74,463 (48.01%) Women: 80,628 (51.99%). The population of the city of Mandouri is estimated at 5203 inhabitants.

The percentage of households owning land in the Savannah region is about 89.3%. An estimated 82.8% of households are owners of their home. The assessment of the food situation by WFP in 2008 found that the Savannah region was affected with 13.6% of households in severe food insecurity and 28.8% moderately[22] food insecure.

The climate is tropical Sudan type with two contrasting strongly seasons: a 5-month rainy season (May to October) and a dry season during the remaining seven months of the year. The temperatures vary between 17 and 39 °C in the dry season and between 22 and 34 °C during the rainy season.

6.1 Background of the target area of Mandouri

The site of Mandouri is located an area where flooding problems, poor access to drinking water, soil erosion, drought are the major constraints to development. This region also records the highest poverty rate in the country (90.5%) and thus remains highly vulnerable to adverse effects of the change and climate variability.

Indeed, the local economy is mainly based on smallholder agriculture which occupies 96% of the population of Kpendjal and depends on largely very variable weather conditions that are not mastered by producers. Moreover, the mode of production has accommodated a highly climate-sensitive type of subsistence farming and which essentially revolves around the cultivation of rice and corn. This situation, combined with a total lack of diversification of livelihood activities creates the high degree of community vulnerability worsened by lack of mastery of cropping calendar.

In terms of production, 56.4% of active people are women who play an important role and are the driver of agricultural development. Despite this importance in the development of agricultural activities in the community, they are marginalized and have little access to land of good quality, because it is only the men who own land. Young people are unemployed and are often lured into emigration from the rural areas. Particular attention will be paid to these groups in the development and implementation of this AF project.

The targeted beneficiary communities consist of structured smallholder families (women, youth, market gardeners, low-income workers).

The area of intervention is also an area of pastoral activities and ultimate passage of cattle transiting south in search of pasture and water points during the dry season. This is the source of often deadly conflicts between farmers and herders.

In this respect, particular attention should be given during the implementation of the projection, the management of conflicts between farmers and pastoralists.

In the project area, people draw their drinking water from rivers, boreholes and individual wells. Rural households have much less access than urban households with drinking water. The populations face two crucial problems:

- In the rainy season, surface water is polluted and exposes populations to waterborne diseases (diarrheal diseases, parasitic diseases, malaria) with very difficult health consequences for

[22]Enquête rapide sur la sécurité alimentaire des ménages dans les régions de la Savanes et de la Kara. Avril 2010[22]

vulnerable populations. During floods (e.g. the period of floods in August 2013), the water of the rivers are muddy, but still consumed by people who have the river as the only source of water;
- In the dry season, people and animals lack clean water.

The indicator of access to drinking water in the region of savannas in 2007[23] is 38.4%. The drinking water is a problem in general in the prefecture of Kpendjal with an access rate of 14.1%. This rate of access to safe water is only 6.3% and 6.5% in the municipality and the canton of Mandouri respectively according to data from the Poverty Mapping[24]. Women have generally the responsibility in the household to collect water, which is time consuming and difficult task when they have to carry over long distances heavy buckets or water cans. They undergo consequences on their health, but also on education and income-generating activities. This situation, greatly contributes to their vulnerability to climate change.

6.2 Status of the agricultural sector and irrigation sub-sector

The agricultural sector in Mandouri

Agriculture is dominated by farms ranging from under 1 to over 5 hectares and characterized mainly by food crops. Agricultural employment concerns permanent family workers and paid labour. Solidarity is practiced frequently in the form of work against invitation to share meals, where the person who invite must provide food and drink to those who come to work in his farm. Paid work varies based on effort and equipment used:

- Sharecropping without food equivalent to 500 F or 600 F per day for all agricultural operations;
- Sharecropping with food is charged to 250 F or 350 F per day for all agricultural operations;
- Ploughing and ridging are respectively 10 000 F to 12 000 F per ha per operation.

Agricultural employment in the Prefecture is on average equal to 99.34%. Agricultural production is the main activity of the Prefecture: 96% of jobs and 90% of revenues. There are 30,000 farmers in Togo who exploit 110,000 ha annually. The highest land use is in the north. (+ 80%) sectors of available land are in the south. Women's participation in economic life is marked by work in the farms, processing and marketing of agricultural products.

The main food crops in the project area are: maize, millet (3 months, 6 months of millet), sorghum, rice, cowpeas, and soybeans. Millet of 3 months is used as solder culture. The main cash crops are: cotton and peanuts. It should be noted that in all over the Savannah Region, 28 000 hectares of cotton crops were planned, but 27,139 hectares were completed during the 2011/2012 agricultural year, with an achievement rate of 97%. Vegetable crops are composed of: onions, tomatoes, watermelons, carrots, okra, Guinea sorrel, cabbage, peppers...

Animal traction and use of tractors would allow obtaining significant yields. Unfortunately, agricultural equipment failures and lack of skilled labour for repairs as well as the weather and climate are bottlenecks for agriculture throughout the prefecture Kpendjal.

Status of the irrigation sub-sector

The irrigation sub-sector in the project area is not operational. The development studies and the exploitation of lowlands launched by the Support Project for Agricultural Development in Togo (PADAT) led to the identification of two types of lowlands.

It is estimated that about 718 hectares developable land in PADAT area are found in the prefecture of Kpendjal. The lowland experiences significant exceptional floods. That is why a type 2 development is needed to allow flood discharge from structures. For the lowland where type1 development is needed, there are no ravines or waterways. These are not rough lands. But their watersheds have significant topography and runoff is not grouped in flows during periods of flooding. In total, 156 lowlands were

[23] Direction Générale de l'Eau et de l' Assainissement-2007
[24] Cartographie de la pauvreté, Lomé 2011

identified and selected in the Savannah Region to be developed with an area of 2520 ha. These lowlands are located in 129 villages within 24 cantons and 4 prefectures.

Mandouri City is not spared from the flooding caused by torrential rains that fall in the Savannah Region with property damage. Apart from roads and houses, there are thousands of hectares of maize, sorghum and rice which are flooded.

Livestock - Fishing
Kpendjal prefecture is an area where the breeding of animals is traditionally practiced. It has some advantages for the success of animal production:
- Villagers traditionally own cattle;
- Presence of Fulani herdsmen experienced in livestock keeping;
- Areas of low population density where herds can stay in dry season.

However, the following are on the flipside:
- An unfavourable health situation;
- There are areas where population density is very high and therefore causes the migration of cattle;
- The scarcity of water points;
- Insufficient food production to eventually allow food complement.

7. Project Objectives:

7.1 Overall objective:

To develop water management and irrigation technologies that reduces dependence on rainfall for agricultural production

The overall objective of the project is to improve the level of resilience of vulnerable actors in the agricultural sector in Togo, particularly in Mandouri (Savannah Region), by developing water management and irrigation technologies that reduce dependence on rainfall for agricultural production.

The Adaptation Fund project aims at increasing agricultural production while improving conditions and living standards of people in the project area to reduce the vulnerability of producers through the water control for production and promoting crop diversification for food security improvement and development of products for improved incomes.

7.2 Specific objectives:

More specifically, the project aims to:
a. help secure local rice production and reduce the national deficit in rice production by an additional 9,900 tons of paddy rice; and
b. promote, improve and diversify the incomes of beneficiary families.

This will involve:-
a. construction of a water network for the irrigation of 144 hectares of land;
b. a combination of basin and furrow irrigation techniques;
c. improvement of the availability of drinking water for people and;
d. promotion of diversification and valorisation of products to improve the income of beneficiaries' families.

7.3 Expected results

Expected results focus on the following aspects:
a. food self-sufficiency and sustainable land management through better water management for agricultural production is achieved;
b. resilience of producers is raised up by improving their income and promoting new income-generating activities ;

c. new agricultural production techniques are adopted by farmers, breeders and fish farmers ;
d. cooperative structures are boosted ;
e. technicians are trained and population is sensitized to the technical use of surface water for irrigation of crops ;
f. populations and local representatives of the region have a better understanding of climate change impacts and can become involved in the implementation of adaptation measures ;
g. Climate protection practices are prioritised at the local level and mainstreamed into policy development at the local scale systematically.

Project Components and Financing:

Table 4: Project components and financing

Project/Programme Components	Activities	Expected Concrete Outputs	Expected Outcomes	Amount (US$)
1. Improved planning and management of water resources and (agricultural) production	1.1 Develop 144 ha for agricultural production, equipped with a combined basin and furrow system, powered by a solar pumping system 1.2 Improve techniques and means of irrigated production 1.2.1 Acquire communal farm machinery and kits (one 75 hp tractor + 3 discs ploughs + one 10x10 drive sprayer + one sub-soiler with 3 teeth + one trailer + one harvester + one rotavater + one huller) 1.2.2 Train farmers in irrigation techniques and the proper use of agricultural inputs (technical itinerary) 1.2.3 Produce manuals / handbooks on irrigation, expected ecological & health hazards of irrigation and disseminate the knowledge 1.3 Design and implement training programs for actors responsible for the operation, maintenance and repair of equipment acquired for the beneficiaries.	**Output 1**: Construction of basin and furrow irrigation system on 144 ha of land powered by solar power **Output 2**: production yields improved through mechanized means of production and improved agricultural practices by:- - the purchase of equipment (2 vehicles for delivery of products are acquired to facilitate access to market; 4 agricultural production kits are made available to producers) - the training of at least **576 farmer households** in improved agricultural techniques - the training of 10 to 20 local technicians on driving, installation, repair and maintenance of irrigation and solar equipment	**Outcome**: food self-sufficiency and sustainable management of land through better water management for agricultural production improved	5,000,000
2. Support for the diversification of livelihoods and the improvement of the living conditions of the beneficiaries	2.1 Promote the development of income generating activities 2.1.1 Design and deliver capacity building programs to cooperatives and their members for diversification of income-generating activities (gardening, guinea-fowl rearing, bee-keeping, composting, etc.), the simplified financial management	**Output 1**: Income-generating activities are practiced and products are promoted and sold, i.e. - The surplus cereal production (rice and corn) and garden production (tomatoes, peppers, etc.), are processed for marketing - Credit lines dedicated to financing agricultural and other income generating activities are available	**Outcome**: Increased resilience of producers through the promotion of new income-generating activities, improvement of their income, and improvement of the living conditions of the beneficiary population through:	2,150,000

	and accounting, and the management of cooperative organizations 2.1.2 Establish the infrastructure and equipment needed to develop the values chain of agricultural production, processing, packaging and marketing, i.e. - Build a warehouse(s) - Build drying areas - Acquire corn and tomato mills - Train producers in processing, packaging and marketing techniques - Facilitate access to markets 2.2 Implement simplified funding mechanism for producers (micro-credit) 2.3 Build latrines for sanitation 2.3.1 Build social infrastructures 2.3.2 Build mini drinking water supply (DWS) network	from MFIs. **Output 2**: basic social infrastructure is realized for the beneficiaries. i.e. - Construction of a mini-network of drinking water supply coupled with fountains and 1 borehole equipped + 1 mini network + 1 water tower + 3 fountains + solar pumping system and 3 latrines will be built for the benefit of the beneficiary communities+1 large communal bakery powered by solar+ the construction of fishponds, a drying area and assistance for fish production techniques+ agroforestry: set up nursery stores	- Improved availability of potable water for consumption - Improved sanitation of the city of Mandouri - Reduction of water-borne diseases	
3. Capacity building, environmental and social measures, and knowledge management	3.1 Design and deliver capacity-building programs: 3.1.1 Strengthen the technical capacity of local institutions in the prevention and resolution of climate risk issues (bush-fires, resource use and agricultural production conflicts, sustainable management of natural resources) 3.1.2 Organize information, education and communication (IEC) sessions toward local populations on risk management techniques related to climate change 3.1.3 Strengthen the capacity of cooperatives and employees of	**Output 3.1**: local institutions and communities are more aware and climate change issues are better understood and taken into account in local development policies, i.e. - Capacity building programs are offered - The capacity of members of the Conflict Management Committee in conflict management and awareness strengthened - Mandouri and Kpendjal populations are sensitized on the joint management of water resources - Mandouri and Kpendjal populations are sensitized on conflict management on pasture, crop	**Outcome**: Improved knowledge of stakeholders (public, local elected officials in the region, officials of local institutions, etc.) for the building of resilience to climate change and the prevention and management of environmental and social risks.	1,317,125

	local institutions in the joint management of water resources and conflict management. 3.2 Implement measures of the Environmental and Social Management Plan 3.3 Establish a knowledge management system (production, capitalization, vulgarization, etc.)	production-livestock production conflicts, etc. - The environmental and social management plan is implemented and beneficiaries are aware and trained on the implementation of the ESMP and environmental monitoring (ecological and human health aspects, management of fertilizers and pesticides, etc.) **Output 2**: lessons learned from projects in progress at the national level are capitalized on and a system to disseminate the knowledge acquired in the project is implemented at the local level, i.e. - A system of information sharing of knowledge related to climate change is implemented - Information, education and communication programs related to climate change and the achievements of the project are developed and delivered to local people.		
Project Execution Cost				**804,380**
Total Project/Program Cost				**9,271,595**
Project/Programme Cycle Management Fee charged by the Implementing Entity (if applicable)				**728,405**
Amount of financing requested				**10,000,000**

Projected Calendar:

Milestones	Expected Dates
Start of Project/Programme Implementation	December 2017
Mid-term Review (if planned)	July 2019

Project/Programme Closing	October 2021
Terminal Evaluation	July 2021

PART II: PROJECT / PROGRAMME JUSTIFICATION

A. Describe the project components, particularly focusing on the concrete adaptation activities of the project, and how these activities contribute to climate resilience. For the case of a programme, show how the combination of individual projects will contribute to the overall increase in resilience.

One of the most imminent threats that currently undermine economic and social development of Africa in general and West Africa in particular is climate change. This phenomenon impacts negatively all developing sectors of countries including agriculture, livestock and fisheries. These effects result in lower yields of crops, livestock and fisheries due to changes in rainfall, long droughts and / or floods, drastic reduction of water resources, reduction of pasture, accentuation of desertification, land degradation, etc.

In Togo, a major concern is the availability of drinking water. Water resources are not always easily accessible and of good quality due to the depth of the aquifers and the process of salinization. Moreover, the favourable situation of surface water is reduced by seasonal and regional variations as well as the filling of streams and their fast drying in the dry season. The balance between withdrawals and contributions that are made for the city of Lomé and the Maritime region is too precarious to ensure the water needs of the region that includes 40% of the population and 90% of the country's industries.

The Togolese economy is traditionally based on agriculture, which occupies a prominent place since it accounted for 35.1% of GDP in 2000 and 38% on average during recent years. It provided more than 20% of export earnings and sustains 2/3 of the workforce. In 2010, the added value of the sector was 394.9 billion remained almost stable compared to 2009. This is mainly due to the decline in food agriculture whose added value passes from 270.9 billion in 2009 to 237.7 billion in 2010, a decrease of 1.2%. This decline is attributed to adverse weather conditions.

The project of raising the level of resilience of the actors vulnerable to climate change of agriculture sector in Togo and more specifically in the area of Mandouri finds its justification by the central role played by agriculture in the national economy (41% of the GDP in 2012) in general and population food security in particular. About 70% of the population depend directly on agriculture. Moreover, at the local level, the vulnerability of the populations is accentuated by the weakness of their capacities; which prevents them from reacting to external shocks.

Indeed, the production activities are characterized by the small size of plots exploited, non- water control for the production and use of rudimentary production tools. The productions are quite low and highly dependent on rainfall variability and revenues generated are insufficient to meet the needs. Furthermore, the low diversification of production activities in the project area causes the growth of population vulnerability level and poses a real problem of food security.

The project is part of an overall objective to reduce constraints of dependence for production activities. Its implementation is consistent with the objectives of the Accelerated Growth Strategy and Employment Promotion (SCAP), the National Strategy for the long-term development based on MDGs and the National Action Plan for Climate Change Adaptation and the policy of agricultural recovery. Indeed, the development of irrigation system will control the water resources to support the economic recovery by increasing agricultural production. This will contribute to improving the food situation (fight against malnutrition and undernourishment), increasing the income of affected communities (poverty reduction) and thus to work for local development by reducing the vulnerability of communities involved in local agriculture.

For the purposes of the project, the site has been donated to the state of Togo by the beneficiaries of Mandouri. A mandate which copy is attached has been established for this purpose.

People mainly practiced rain-fed agriculture (see p18 and 19), whose future remains threatened because of the high variability within and between seasonal rainfall. Indeed, climate change is causing

a shift of the rainy season and the crop calendar. The onset of the rainy season has moved from April-May to June or July during some years while the end occurs early (September).

In the northern region of Togo, which includes the area of this project, it has been observed between 1961 and 2012, a rise in temperature average of 1.2 °C and lower rainfall of 41.8 mm. Thus, people have had to change their farming and eating habits: the short-cycle maize (about 2 months) became a dominant culture substituting rice, millet and sorghum.

Other coping strategies consisted of the combination of several agricultural crops (millet maize and cowpeas) in the same plot in order to maximize the chances of harvesting at least one product at the end of the season. None of these strategies in place were robust enough to cope with the impacts of the strong climate variability that continues to be manifested through droughts, floods, higher average temperatures and lower rainfall.

In summary, the project aims to reduce the vulnerability of producers affected by a very high spatial and temporal variability of rainfall, by initiating water control, and diversification of production activities and strengthening of local governance for better management of issues related to climate change.

Thus, the practical adaptation actions will focus on the following activities:

Component 1: Improved planning and management of water resources and (agricultural) production

Expected Outcomes: *Improvement of food self-sufficiency and sustainable management of land through better water management for agricultural production*

The poverty reduction strategy paper indicates that the vulnerability rate is higher in rural areas (87.4%) with the savannah region (where the project site is located) still by far the poorest region of the country with an estimated incidence of poverty of 90%. The vulnerability is exacerbated by their low capacity to external climatic shocks.

Regarding information provided by the 2nd (pages 56-57) and the 3rd (pages 27-39) national communications to UNFCCC, combined with Togo's INDC Report (page 6), the project area is strongly vulnerable to climate change. It's expected that the extreme north-eastern part of Togo where the project area is located (Mandouri), will be affected by the increase of temperature (RCP 2.6: 28.8-29.3°C (2025), 35.6-36°C (2050), 35.6-36.2°C (2075), 35.6-36.2°C (2100);RCP8.5: 35.4-36.0°C (2025), 36.4-37.0°C (2050), 37.6-38.2°C (2075) and 39.0-39.6°C(2100). In the meantime, there will be rainfall upsurges, causing extreme weather and climate events such as floods, which will increase vulnerability of the Mandouri communities and landscape more than ever. In the same perspective, it's projected that agricultural sector will be affected by the loss of incomes, land degradation, loss of biodiversity, the invasion of insects harmful to crops and livestock, loss of wetlands, etc. imperilling once again Mandouri community and landscape resilience. In addition, Togo's INDC Report mentions that, in consideration of current and forecast demographic growth rates, the water supply would be severely affected, with a drop in stocks due to climate change and heavy pollution of drinking water reserves as a result of flooding, etc.

This project will bring adaptation strategies by providing the possibilities to develop and sustain rainfed agriculture by improved water management during the wet season, and diversification of agricultural activities in the dry season (because up to now, no gardening activities were possible during the dry season due to lack of proper water management). The warehouse will allow Mandouri's farmers to store their produce with a threefold advantage: first, access to crops during lean periods; then, keep them in a safe place that respect building standards, away from heat and moisture, and finally, do not discount their produce to get rid of them as in the past; all these issues will contribute to food security in Mandouri and the country at large.

During the consultation process at local level, populations of Mandouri had raised a strong concern

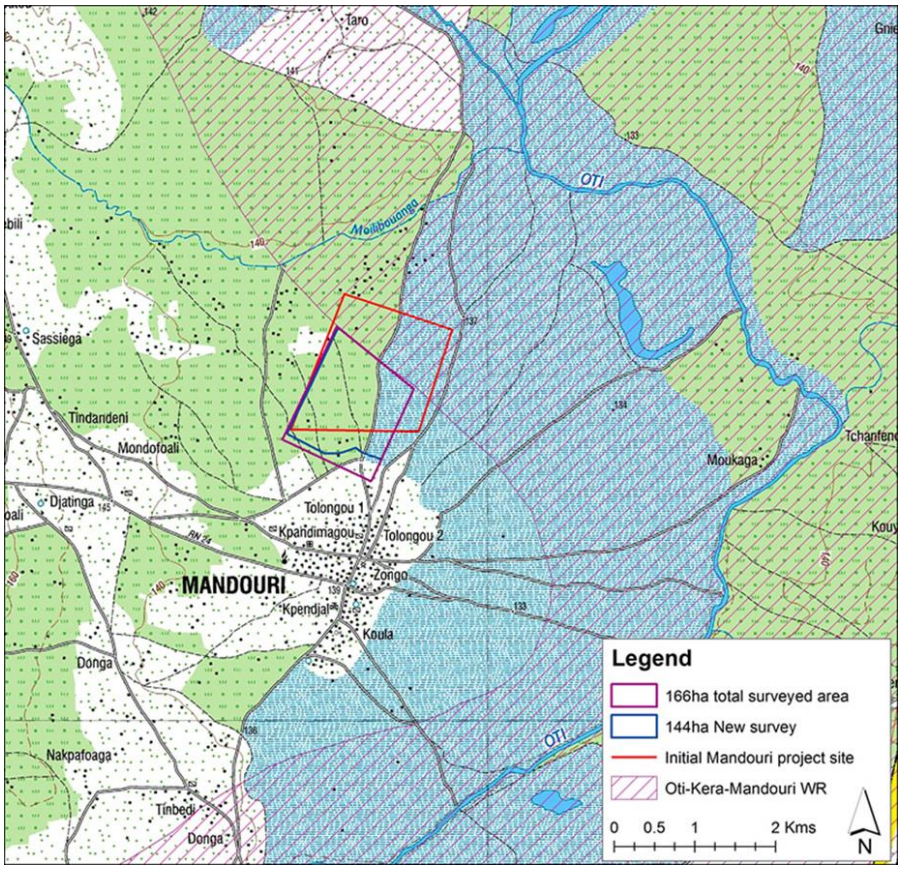
related to the difficulties agricultural production is facing in relation to strong climate variability (drought, floods). Water management and control would be a considerable asset to enable people to better manage changes and impacts of climate variability on the production activities.

The system designed for Mandouri will be a combination of basin and furrow irrigation with water delivery to the blocks via UPVC pipes. UPVC pipes are always buried, at a depth of between 1 and 1.2 m.

Expected Concrete Output 1: Construction of the combined basin and furrow irrigation system on 144 hectares of land powered by solar.

In the last survey of the project site (May-June 2017), an ASCENT technical team designed the Mandouri irrigation model. The model delineates a gross area of 106.38 ha with a net irrigation area of 100ha. There is an additional 38 ha potential area for future irrigation expansion. More information is given in separate irrigation design documents.

Map 1: Site survey areas, May-June 2017



The irrigation area is split into 5 blocks: 1, 2, 3, 4 and 5 as shown in **Fig. 4**. Sub-division of the area was based on the following:

- Topography – blocking of areas with similar topographical features;
- Existing drainage system (natural waterways/depressions) – used to form boundary between blocks;
- Soil types – areas with similar soils grouped together as much as possible;
- Discussions and agreements with farmers' representatives on the boundaries.

Fig. 4: Irrigation blocks

The project site will be divided into a number of irrigation blocks and a combination of the two techniques (basin and furrow) will be used. In basin irrigation, water is applied to levelled surface units (basins) which have complete perimeter dikes to prevent runoff and to allow infiltration after cut off (**Fig. 5**). Basin size is limited by available water stream size, topography, soil factors, and degree of levelling required. Basin may be quite small or as large as 15 ha or so. Level basins simplify water management, since the irrigator need only supply a specified volume of water to the field. Suitable for close growing crops (e.g., paddy), though many other crops can also be grown in basins: e.g., maize, sorghum, trees.

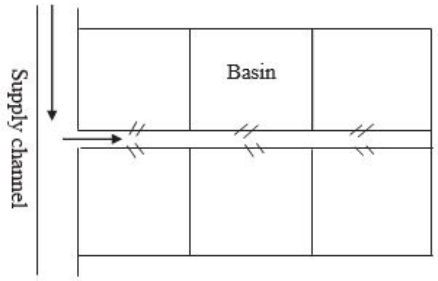


Fig. 5: Basin irrigation

A furrow is a small, evenly spaced, shallow channel installed down or across the slope of the field to be irrigated parallel to row direction (**Fig. 6**). In this method, water is applied to furrows using small discharges to favour water infiltration while advancing down the field. The furrow method is an efficient system if properly managed. For this method, fields must have a mild slope and inflow discharge must be such that advance is not too fast and produce excessive runoff losses, nor too slow to induce excessive infiltration in the upper part of the field. Alternatively, short blocked furrows with manually controlled water applications are practiced by traditional irrigators.

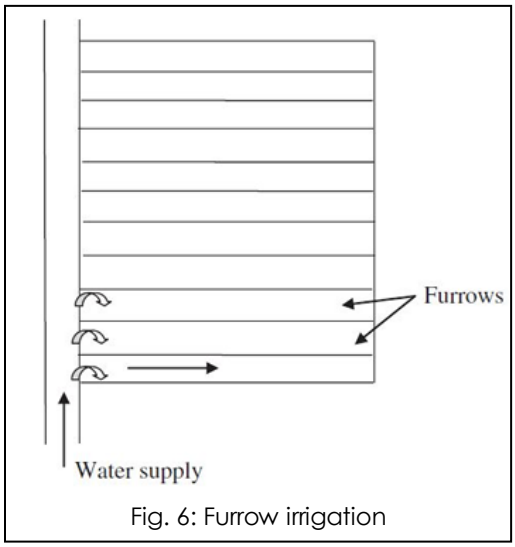


Fig. 6: Furrow irrigation

Furrow irrigation is best used for irrigating widely spaced row crops such as potato, maize, vegetables, and trees.

In implementing the combined basin and furrow irrigation systems, work will focus on:

1. irrigation network construction, drainage networks, trail networks;
2. the acquisition and installation of pumps and accessories;
3. the acquisition and installation of solar equipment, and
4. Additional works will consist of ploughing, clearing, planning and the delimitation of driving axes.

It is planned to install a basin and furrow type of irrigation system that is best suited to the context of the site because of the following considerations:

- rational use of water (reduction of losses through evaporation and infiltration);
- easy to use and require less maintenance.

The installation of the irrigation system will permit not only, rice production but also improve the yields and the practice of market gardening during the dry season. The gardening ultimately contributes to improve the nutritional value of food for populations and will increase and diversify population's incomes and reduce rural exodus. Besides, concerning rice cultivation, several high yielding varieties (average yield 6 t / ha with a potential of 10 t / ha), have been identified for the project site. These include ADNI 11, BG 90-2, the Wassa (IR 32000), irrigated Nerica, and Wat 310, to improve productivity. NERICA lowland rice (IR 841) has been recommended in the irrigation model for Mandouri.

The main climate risk that could have an impact on these investments is flooding. However, the site dedicated to rice farming is not located in the river bed and the main irrigation facilities will be buried. To avoid this risk, everything will be done, thought and built, taking into consideration the risk of flooding. The other risk is the possible increase extremity of the floods due to erratic rainfall which could damage the crops and other assets further increasing the vulnerability of the people in the province. This AF project safeguards them in the following ways:

- The storage of flood water for irrigation during the dry season manages flooding effectively
- The burying of pipe network safeguards the installations from floods
- The year-round crop farming increases overall productivity thereby strengthening food security
- Increased variety of crops produced will increase the economic standing and hence better livelihoods with greater resilience

Expected Concrete Output 2: production yields improved through mechanized means of production and improved agricultural practices

This will be the acquisition of farm machinery kits (one 75 hp tractor + one 3 discs plough+ one 10x10 drive sprayer + one sub-soiler with 3 teeth + one trailer + one harvester + one rotavator + one huller), 2

vehicles for delivery of products are acquired to facilitate access to market.

This output increases the resilience of the beneficiaries through ensuring high and possibly increasing productivity despite climate variabilities.

- the project will support beneficiaries in selecting rice varieties and other adapted crops to produce. The production support will also focus on supporting producers on agro- pastoral, fisheries and forestry production techniques.

- The acquisition of agricultural equipment aimed to improve productivity (better preparation of fields, capacity to cultivate on more land, etc.). Notwithstanding the use of high yielding varieties, and acquisition of farm equipment will also contribute to food security.

In addition, the project will support beneficiaries in selecting rice varieties and other adapted crops to produce. The production support will also focus on supporting producers on agro- pastoral, fisheries and forestry production techniques.

The acquisition of agricultural equipment aimed to improve productivity (better preparation of fields, capacity to cultivate on more land, etc.). Notwithstanding the use of high yielding varieties, and acquisition of farm equipment will also contribute to food security.

The main climate risk that could have an impact on these investments is flooding. To avoid this risk, agricultural equipment will housed on an area outside the flood zone, in consideration of local climatic conditions.

Component 2: Support for the diversification of livelihoods and the improvement of the living conditions of the beneficiaries

The particular threats posed by the observed climate impacts and likely climate scenarios include acute exposure in times of crop failure. The community mainly practices monoculture –rice only. When crop failure occurs, the food shortage affects them and the entire region, with ramifications nationally. This component seeks to create resilience against climate threats like rainfall shortage or extreme flooding or both; that in turn lead to exposure to shortage and sudden poverty increase should the once crop fail, through diversification and strengthening market systems.

Expected Outcomes: Increase of the resilience of producers through the promotion of new income-generating activities, improvement of their income and improvement of the living environment of the beneficiary population

Expected Concrete Output 1: income-generating activities are practiced and the products are promoted and sold

Production activities have been defined by the beneficiaries during field consultations. They include: intensive cultivation of rice and maize in the irrigated area during the rainy season and gardening in dry season. The plant material will consist of selected rice varieties with high yield (average yield 6t/ha with a potential of 10t/ha), such as ADNI 11, BG 90-2, the Wassa (32000 IR), the irrigated Nerica, and Wat 310. For vegetable production, considered as diversification crops, the choice will be focused on the onion, tomato, pepper, with possibility of adding, at small scale, okra, carrot, ademe, cucumbers and cabbage.

Regarding diversification, in addition to gardening, the project will focus on: -

a. Support for the development and diversification of income-generating activities (grinders, guinea fowl rearing, bee-keeping, composting, etc.);
b. Improving access to micro-credit, and

c. The development of value chain and access to market.

The project will support fishing activities through the construction of the fish ponds, a drying area and assistance for fish production techniques. Fishing is practiced as a livelihood activity and drying is used as a method of preservation.
For agroforestry, the project will set up nursery stores.

Retained production options will allow farmers to ensure their living and generate income through the selling of products. This is also the focus of this project, namely: -
a. Improve food security of beneficiary populations, and
b. Promote, improve and diversify the sources of incomes of beneficiary families.

This component aims to strengthen the livelihoods of beneficiaries through the development of market gardening and poultry. Furthermore, the project will support the beneficiaries for conservation (storage rooms and drying structures i.e. two (2) warehouses and two (2) drying areas will be built); and also processing and marketing of market garden crops.

Among processing facilities will include:

- Rice processing and storage facilities complete with drying, grading, de-husking, packaging and warehousing
- Drying and packaging of garden produce including peanuts, cashew nuts, and cereals such green grams, etc., grading and packaging for marketing
- Fruit and fresh produce processing: this includes handling facilities such as cold storage, drying, desiccation and packaging/canning. Juicers and puree making facility will also be set up. Tomato produce is expected to be high and a puree making facility

The construction of warehouses will offer people the following possibilities:-
a. The storage of their produce all year in a safe place;
b. Access and availability of surplus production that can cover food needs during the dry season, and
c. The selling of part of agricultural surpluses throughout the year in order to diversify incomes. Delivery vehicles will also be made available to producers to improve the transportation of goods to markets.

The main climate risk that could have an impact on these investments is flooding. To avoid this risk, the warehouse will be built out of a flood zone and will respect the climate norms in terms of orientation, airflow, and moisture.

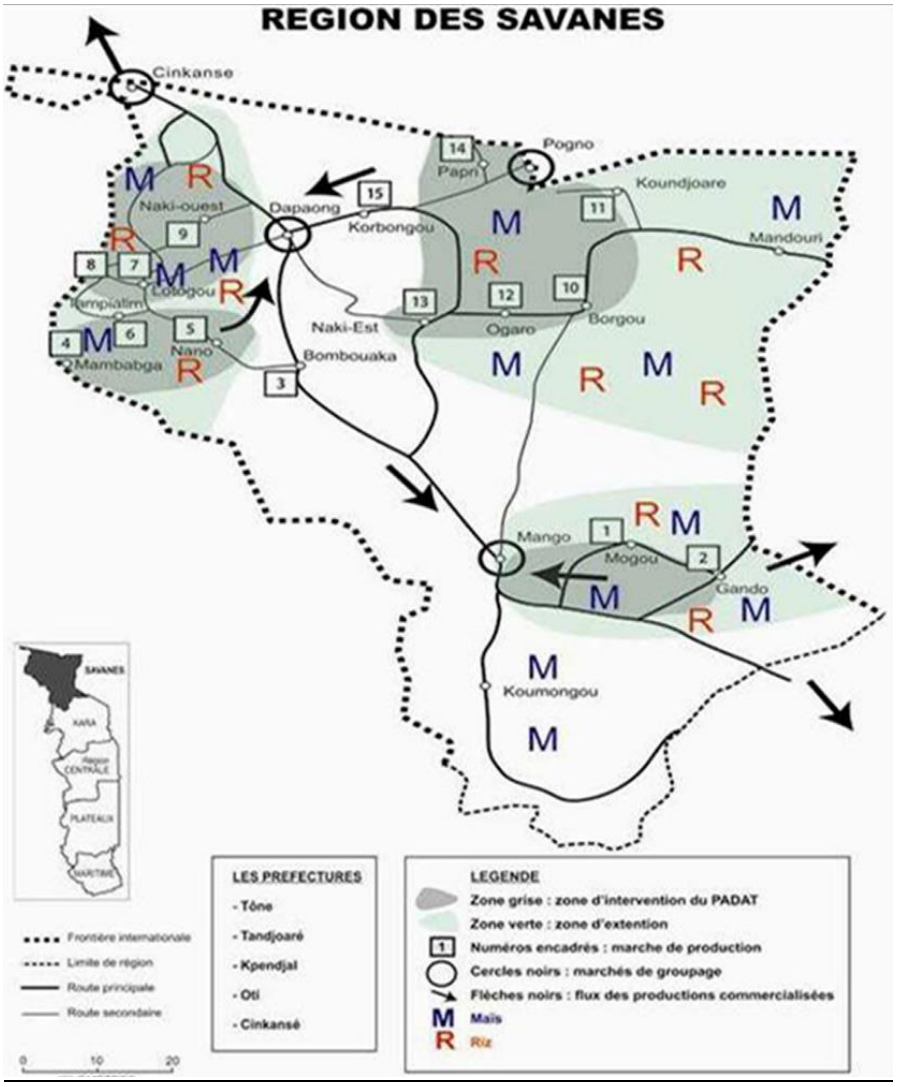
Concerning the transformation and conservation, NGOs at the local level may be involved in strengthening community capacity and organizing them for better control of production activities.

For marketing, the project will ensure strengthening the capacities of the populations on the information required for decision making and advantageously allow better interaction with the different actors of the chain for mutual benefit. Farmers will be trained in market investigation to ensure a balance between availability and demand of the local and national market. They will learn to recognize, understand and implement the components of the supply chain. They will also understand how to connect with consumers. At this level, production and knowledge management will be important. The project will identify all stakeholders in a participatory evaluation process of the market needs and identifying specific solutions.

The markets targeted by the project are:-
a. The Mandouri prefecture market (the biggest market in the prefecture),
b. the secondary cantonal markets, and
c. The Dapaong regional market that is accessible through the National Highway 24 under construction.

To date, it takes about 1 hour and 30 minutes to connect Mandouri to Dapaong. The finishing of the National Road is planned in 1 year and should improve access to markets, but at the moment all these localities are accessible through tracks. Farmers can access the different weekly markets of Mandouri (Thursday), Dapaong (Wednesday and Saturday), Koundjoaré (Tuesday) and Bagre (Monday).

Map 2: Production flows of goods sold in the Savannah region



Expected Concrete Output 2: Strengthening financial management of cooperatives and beneficiaries; maintenance of engineering equipment

This will involve strengthening the capacity of beneficiary communities regarding:-

a. Financial and simplified accounting management;
b. Cooperative organization; and
c. Training of local technicians in the installation and repair of irrigation and solar equipment.

The institutions with the skills to train farmers in various areas include:

- Institut de Conseiletd'Appui Technique (ICAT): with a mission to contribute to the support to the rural world. It works in the promotion of rural areas, through the dissemination of appropriate crop management and support for the structuring of professional organizations.

- The Centre d'AnimationRurale of Tambimong-Ogaro (CARTO): dynamic in the region, provides training and resettlement of young farm couples in their original environment. This centre has an accommodation capacity of 24 couples per year. The training is mainly focused on soil conservation techniques, improved fertility, animal traction, and peasant organization.

- The NGO Recherche Appui et Formation aux Initiatives d'Auto-développement (RAFIA): works in empowering grassroots organizations and increase their self-development; capitalized and support community development initiatives; form for capacity building at the grassroots; capitalize on and disseminate the experience gained in self-development; promoting community relations in economic and social self-development; support basic initiatives aimed at the protection and sustainable management of the environment; promote all income-generating activities for vulnerable populations, including young people and women.

- The Centre de Formation Rurale of Tami (CFRT): provides training to young rural couples to allow these families to improve their living conditions, and to achieve food self-sufficiency. It works for agricultural training, learning animal traction, the use of selected seeds and natural fertilizers, breeding, gardening. It also trains on literacy, mathematical ability, hygiene, childcare, sewing, knitting, cooking recipes.

- Coordination Togolaise des Organisations paysanneset de Producteurs Agricoles (CTOP): works in promoting and constantly defending the value of a professional agriculture, competitive, dynamic and sustainable for family farmers' farms. To do this, it undertook in particular to develop and implement rural information education and communication policy, support for the development of concerted and aggressive strategies of business development, supports its members in accessing and using new information and communication technologies (ICT), negotiate and link its members with banking institutions and decentralized financing, organization of seminars and thematic workshops training, conferences, etc., organizing debates and conferences on media.

- NGO IT-Village has a professional technical training school called Centre Bonita. This Centre trains young people on among other things, modern carpentry, masonry modern, beekeeping, agroforestry, business management accounting.

The target groups which will be trained and sensitized include:
- Agricultural producers including farmers' cooperatives;
- Associations of women and youth;
- Mandouri community;
- The mixed farmer- herders groups; and
- Decentralized technical services such as the prefectural Agriculture service, Livestock service and Fisheries service, the prefectural service for management of the environment and forest resources

Training kits, a communication strategy with a communication plan will be developed. These documents will define the main target groups, essential and specific messages and target group the training profile.

In order to facilitate access to inputs, a micro-credit scheme will be implemented. It will cover a funding of about USD 116,000 to be placed in micro-credit institutions in favour of producers, for the financing of agricultural activities and other income generating activities.

To date, the three microfinance institutions operating in the project area include:-
- Union des Caisses Mutuelles d'Epargne et de Crédit des Savanes (U-CMECS) ;
- Coopérative d'Epargne et de Crédit Mandouri (COOPEC MANDOURI) affiliated to FUCEC-TOGO Network ;
- Coopérative d'Epargne et de Crédit pour le Soutien aux Initiatives des Femmes pour l'Autopromotion (COOPEC SIFA) ; and
- Fonds National de la Finance Inclusive (FNFI).

The project will not create a microcredit institution. The objective is to facilitate access to credit for

producers. To this end, the project will build on the most successful microcredit institutions in the project area. According to the socioeconomic study and consultations with people and the Togolese part, farmers face difficulties in ensuring a sustainable procurement of agricultural inputs mainly because of the cost of credit. Indeed, due to the impacts of climate change on production and yields, crops productions are no longer sufficient to supply food for consumption and selling. This causes delays in reimbursement or unpaid credit. In addition, the project area was remote, making it difficult to access markets for the selling of products.

As support, the project proposes to select the successful microcredit institutions with support from the Ministry for the Economy and Finance for the establishment of a more accessible financing system. The thoughts have focused on the establishment of a bonus system or guaranteed loans to farmers including the land users of the site and the product processing cooperatives.

The AF resources will be used purely as capital to offer credit. For increased protection of the capital for borrowers with limited collateral capability, the fund will only loan groups rather than individuals. This way, peer guarantees will be applied. These groups will then be allowed to borrow against a business plan developed after training on the commercial venture they are borrowing for or against an existing business establishment/operation. The MFIs processing the loans will use their internal procedures as licenced by the law. The loans will only attract a one-off administration fee of under 5% to keep it affordable. Repayment and administration remains with the MFIs selected. The resources injected will be managed separately from the overall portfolio of the MFIs hence will be audited separately. Guarantees will only be corporate to create leverage for new resources so as to build up the resource. The Project will ensure the entire supply chains of the produce are well connected so as to further safeguard the credit loaned out; for instance, paying for equipment or inputs directly to the supplier rather than disbursing cash to the farmer group. All groups must be constituted according to the Laws of Togo and preference will be given to women-led or youth-led groups- so far a lesser fees has been found more attractive. As a rule, there will be maximum loan limit for first-time borrowers regardless of the intended use and only qualify for higher amounts upon successfully servicing first loan. Additionally, the groups will be required to bank with the MFI from which they borrow for ease of loan monitoring and an additional security.

In order to ensure the sustainability of the project, it is envisaged a loan bonus system that is aimed to reassign AF resources to selected institutions (for this purpose a loan contract at subsidized rate will be signed between the State and these microfinance institutions) to reduce credit interest rates. This will also help sustain the resources that will be restored gradually as repayments contrary to a guarantee fund, which could run out in the short and medium term.

For better loan repayment, there will be a capacity building of credit institutions for the management and monitoring of loans, and recipients (women's cooperatives, farmers, poultry, etc.). For recipients, the capacity building program will emphasize the mechanism and the need for ownership of a simplified financial management and value chain.

These funds will allow agricultural inputs supply and product processing. The construction of the Mandouri-Dapaong road will facilitate access to the regional markets.

Women's access to microcredits will be strengthened to improve their market gardening production and product processing. The access terms to credit for all beneficiaries (male, female and young) will be determined fairly with financial institutions to be selected, the Togolese authorities and beneficiaries and will take into account the AF gender policy.

Expected Concrete Output 2: basic social infrastructures are realized for the beneficiaries

The most common diseases in the project area are: malaria, waterborne diseases (diarrhoea and dysentery), respiratory diseases, meningitis, onchocerciasis or river blindness. Among the top ten causes of disease, malaria is a heavy burden with 12,145 cases, or 25%, followed by IRA 8,474 cases (17.1%),

intestinal parasites 8.93%, STI (3.28%) with most often cases encountered at the Mandouri Hospital (360 STI cases). The frequent causes of hospitalization are: malaria 37.77%, snakebite (26, 25%) and infectious diseases (13.75%). The main causes of death are related to infectious diseases (50%), abdominal syndromes (16.6%) and severe malaria (16.6%). Concerning health facilities, latrines and modern water point, the situation needs improvement.

The drilling of a well for water consumption and latrines should improve the sanitary conditions of the beneficiary population. It is planned within the framework of the project, social measures will be implemented consisting of the construction of mini water supply composed of equipped borehole, a mini water network, water tower and fountains, powered by solar energy. In addition, the project also includes the construction of three (3) latrines to improve sanitation at the village level. These investments will be accompanied by the sensitization of beneficiaries on the water management and sanitation, in order to minimize the health risks related to the spread of certain diseases related to water and food (malaria, cholera, etc.).

The irrigation system will certainly involve the use of pesticides; however, such agricultural inputs are subject to certification by the National Certification Committee, which takes into consideration the environmental standards. The Committee relies on national chemicals management programs such as the National Profile on Chemicals Management adopted and revised in 2013 and the national implementation plan of the Strategic Approach for International Chemical Products Management (SAICM) developed in 2015. Farmers will be trained on the optimal use of chemicals through strict adherence to spreading standards of each product.

The project has planned to support fishing activities through the construction of fishponds, a drying area and assistance for fish production techniques. Fishing is practiced as a livelihood activity and drying is used as a method of conservation. For agroforestry, the project will set up nursery stores.

Component 3: Capacity building, environmental and social measures and knowledge management

The particular threats posed by the observed climate impacts and likely climate scenarios is ignorance (lack of awareness) on the climate threats and ways to manage them; both by the communities and by Government entities responsible for policy and planning. This keeps leads to repetition of mistakes and continued exposure to the threats of a changing climate due to inadequate or absence of planning.

Expected Outcome: Improved knowledge of stakeholders (public, local elected officials in the region, officials of local institutions, etc.) for the building of the resilience to climate change and the prevention and management of environmental and social risks

Expected concrete output 1: local institutions and communities are more aware and climate change issues are better understood and taken into account in local development policies

The capacities of the different actors and stakeholders will be strengthened in order to move "from climate risk to resilience". It has been proven that, risk reduction can be a substantial contribution to adaptation to climate change. Therefore, **capacity building will be provided on risk assessment, risk reduction, vulnerability assessment, and adaptation technologies**.

In addition, this component will also focus on strengthening the technical, organizational and environmental actors regarding:
a. Environmental skills;
b. Joint management of water resources and conflict management, and
c. Environmental monitoring.

Regarding the environmental and social measures, the activities envisaged are:

1. Implementation of environmental measures prescribed in the Environmental and Social Management Plan (ESMP),
2. **Development of Risk Assessment and management plans**,
3. Implementation of the Resettlement Action Plan
4. Establishment of a restoration plan for the production zones
5. Establishment of the Stakeholder Engagement Plan to strengthen ownership of the project;
6. Establishment of the Grievance Resolution Plan in order to resolve any conflicts that might impair the operation of the project;
7. Implementation of an Integrated Pollution (from phyto-sanitary inputs) Prevention and Management plan.

Indicative Activities for Output 3.1:
Activity 3.1.1: Train regional extension officers and local community members on climate change adaptation technologies, including water conservation practices, climate-smart agricultural techniques and ecosystem based adaptation (EbA) to climate change activities.

In an area where flooding is perennial, these techniques and activities will develop awareness amongst locals of the different approaches to climate change adaptation. Additionally, trainees can train others –fellow community and household members – thereby promoting replication of the interventions.

Activity 3.1.2: Establish demonstration sites for climate change adaptation technologies at the processing site as well as around the project area

Here, best-practice water conservation practices, climate-smart agricultural techniques and EbA activities will be implemented to demonstrate the techniques and activities in 3.1.1 above.

Activity 3.1.3: Organise information exchange field activities and visits where people from communities surrounding the project area of Mandouri and similar ecosystems elsewhere are exposed to the climate change adaptation technologies.

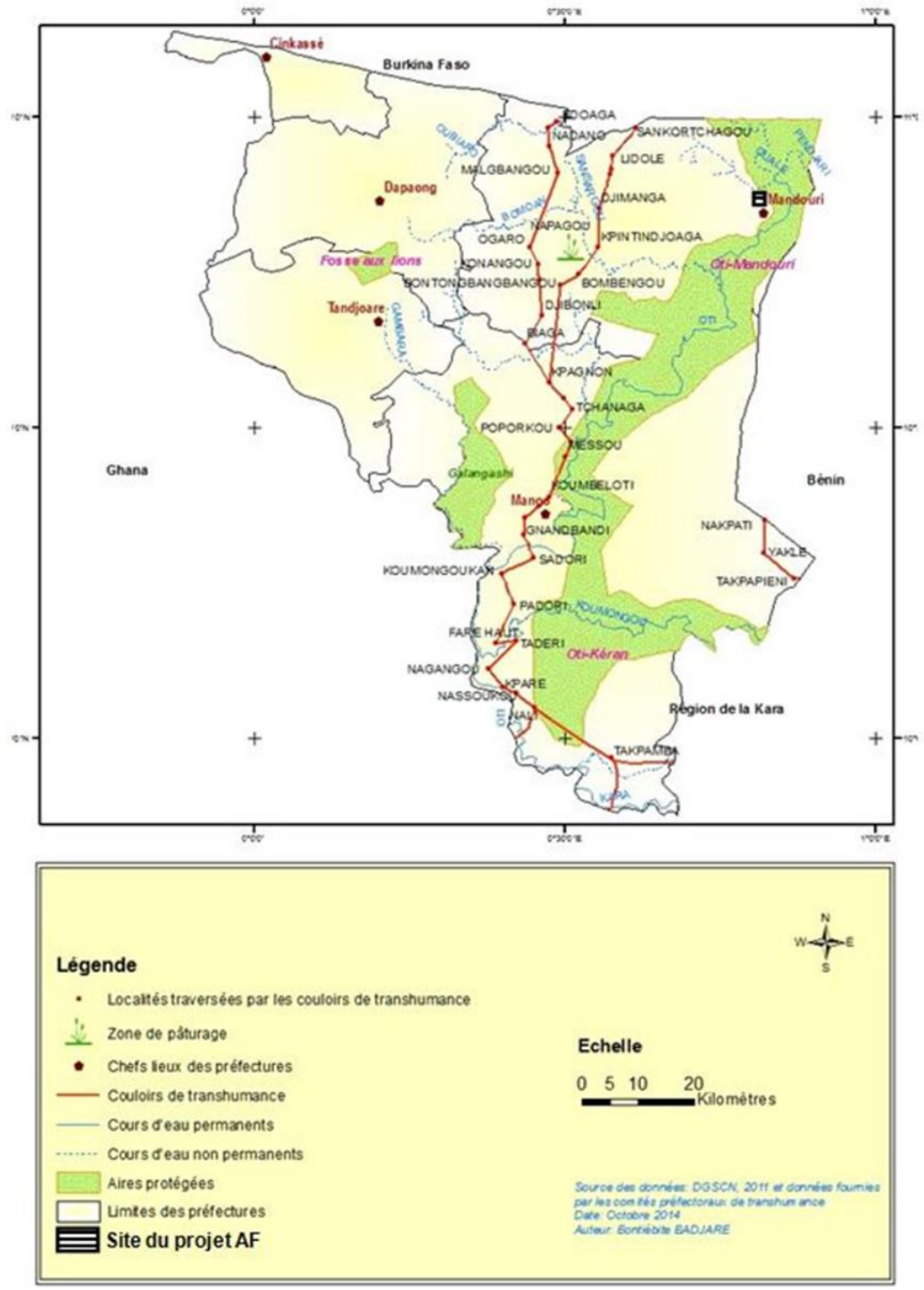
These are organised around regular meetings that the prefecture already runs in the project are to discuss general issues and well-being. Information on this project – progress and can be disseminated at these gatherings.

Conflicts between farmers and herders that were recorded in the Savannah area are those related to transhumance. To overcome these problems, Togo has developed a new map that defines transhumance corridors, reception areas and grazing areas (see Map 3).

The transhumance management is ensured by a national committee. The committee's work is done by a regional committee and at the prefecture level by a prefectural committee. Thus, the committee of the Kpendjal prefecture is chaired by the Prefect and includes several actors including herders and farmers.

Transhumance corridors that have been clearly defined by the Togolese authorities in accordance with Regulation No. 0072007/cm/UEMOA related to the security of plants, animals and food in the UEMOA which Article 75 deals with cross-border transhumance states that "Member States implement the necessary procedures and actions to facilitate the movement of transhumance animals and, in particular, adopt international transhumance certificate of ECOWAS" published by the Council of Ministers of UEMOA dated April 6, 2007.

Map 3: Trans-humance corridors



Note that according to the map of transhumance corridors of the Savannah region, the project site is located far from the corridors. However, there are in the area of the project, conflicts from wandering animals in farming period. These conflicts are managed through consultation between farmers and herders. Strengthening the methods of storage of agricultural by-products for animal feeding will interest farmers in the project and prevent conflicts.

In any case, the project will rely on NGOs involved in the community, the local authorities and the experience of the existing committees in charge of settling disputes at the local level, to raise awareness. Moreover, the focus will be on boosting frameworks for dialogue between the various stakeholders and the project will assist in tracing and securing grazing areas to prevent and manage the risks associated with conflicts.

Follow up missions were conducted in January 2017 and May 2017 to the Project site. The former comprised of BOAD, government and EA representatives, while the latter consisted of government and EA technical team representatives. This was another opportunity for project developers to espouse on the success factors of the project, including the involvement and ownership of the project by all stakeholders. The project beneficiaries were actively engaged in both visits, including during the site-specific survey of the irrigation blocks in the latter visit.

Expected concrete output 2: lessons learned from projects in progress at national level are capitalized and a system to disseminate the knowledge acquired in the project is implemented at the local level

This will involve establishing synergies between the project and existing projects at the national level including:

- PGCIT project partially funded by the GEF5 regarding the operationalization of the early warning system;
- ADAPT GEF and IFAD, which aims to reduce the impact of climate change on rural vulnerable groups, as well as the natural resources essential to sustain agricultural production and increase food security.

Good agricultural practices that are adopted will be disseminated through training / awareness sessions, spots broadcast in local radio and documentary films. Information on the project will be produced and disseminated among the authorities, technical and financial partners and beneficiaries.

Moreover, a local database will be created for the collection and processing, preservation and dissemination of data sheets, educational tools and other training materials for their replication.

Indicative Activities for Output 3.2:
Activity 3.2.1: Apply findings/lessons learned from past and current projects/programmes to identify potential project intervention sites.

Activity 3.2.2: Stocktaking: Conduct a stocktake of adaptation interventions detailed in existing national strategies and action plans, recommendations from other regional projects and findings of scientific research to identify appropriate adaptation technologies to be implemented regionally.

At all stages of implementation, a series of data gathering functions will be conducted along with baseline assessments and studies. These will provide advice before activity implementation, especially those involving infrastructure and technology transfer.

B. Describe how the project provides economic, social and environmental benefits, with particular reference to the most vulnerable communities, and vulnerable groups within communities, including gender considerations. Describe how the project / programme will avoid or mitigate negative impacts, in compliance with the Environmental and Social Policy and Gender Policy of the Adaptation Fund.

Economic benefits:
The current climate variability, particularly in rainfall patterns, with reduced precipitation in some years, or offset them against the crop calendar, cause a decrease in rice production, generating episodes of famine.

Rice cultivation is still the main source of food for the people of the area Mandouri, whose surplus production also serve as main source of income. The project will secure the supply of water in rice production in order to free it from dependence on increasingly changes in frequent rainfall / rainfall. It will also –

a. Increase the area currently under cultivation,
b. Diversify agricultural production through the development of market garden production especially in the dry season, and
c. Strengthen small livestock producers.

Accompanying people in their agricultural way will also improve yields and reduce input requirements. Securing rice production and increasing yields, and the diversification of agricultural production, will not only ensure food security but also generate income, reducing food shortages and enabling the poorest to have access to a food and minimum income.

Generally, in the prefecture of Kpendjal, animal traction and use of tractors has improved production through larger areas sowed. With regard to Mandouri, implantation area of the project, there is to date only one tractor for 50 ha in ZAAP perimeter. The project will contribute to the mechanization of agricultural production in Mandouri throughout the year as a result of the irrigation system, improve production to ensure better food security and selling of products (raw and processed), that would allow the generation and diversification of income.

The project will also diversify and increase revenue through the supports that will be made to improve farming.

Indirectly increased production will generate more activities and transactions that will have a beneficial effect on local employment, especially for young labour in the rice fields and women in market gardening production and trade. Support will be provided to encourage micro-credit that will benefit women's groups.

This project will also enable:

a. A more complete utilization of biomass with the use of agricultural residues (rice stalks, residues of market gardeners) mainly for cattle feed. This system will improve pastoral production (meat, milk) and contribute to the improvement of people's living conditions;
b. Improvement of inputs. : The development of livestock will enable the production of organic fertilizer which will enter in the soil amendment The use of organic manure will cause a decrease in the use of chemical fertilizers, thus lower production costs to the producer and the conversation of soil carbon;
c. Local firewood production: the introduction of trees and shrubs in plots contribute to meeting the food needs of the people first and also to meet the demand for fuel wood and timber used by local populations. This has the advantage of contributing to the conservation and preservation of heritage and wood existing biodiversity.
d. The introduction of an agricultural system in equilibrium with its environment. This system will bring local people to develop an economy based on the respect of environmental balances that enable them to sustainably produce at lower cost, while preserving natural resources for future

generations.

Social advantages:
The implementation of the project will enable the development of socio-economic activities in which young people will benefit (labour), the achievement of food self-sufficiency reducing food purchases, contributing to the improved health coverage (construction of health infrastructure), improving access to drinking water (repairing water towers), and strengthening women's economic capacity.

Women in the prefecture of Kpendjal constitute an important workforce. The majority of women are active in the agricultural sector where they are present at all phases of production. The Women Leaders Network's actions for Disaster Risk Reduction (DRR) are very visible in Mandouri. It may be noted to their credit, reforestation of 400 feet Palmyra in the prefecture. However, many barriers limit the active and effective participation of women in local development processes.

Gender Considerations
The implementation of Mandouri AF project will take into account the gender aspects by assigning a quota of developed plots to women and / or women's associations. Preference is selecting the 576 households will be given to women-led or children led house-holds. The capacity development and trainings is designed for households rather than heads of households so that it empowers all adult family members including women and youth. Additionally, during the studies, the revenue control mechanisms in existent currently favour men; the project deliberately segregates plot ownership to have women groups retaining full control of their value chains, hence of their incomes. The additional revenue generated by this project AF may be invested in the education of children.

A gender inequalities study is included in the project preparation phase and has identified the inequalities in term of land access, land ownership, labour, etc., and will mainstream the gender equity and women's empowerment issues in the project. Specifically, value addition which have direct bearing on reduction of drudgery for women and girls while increasing revenues will be preferred on women and youth.

The implementation of Mandouri AF project will take into account the gender aspect by assigning a quota of developed plots to women and / or women's associations. The additional revenue generated by this project AF may be invested in the education of children.

A gender inequalities study is included in the project preparation phase and has identified the inequalities in term of land access, land ownership, labour, etc., and will mainstream the gender equity and women's empowerment issues in the project.

The new irrigation system will save time that can be reinvested to develop other economic activities, and increase the added value of agricultural production through primary processing such as husking rice.

Environmental benefits:
On the environmental level, the project will:-

- Improve the conservation of the ecosystem through the implementation of reforestation actions including planting trees to act as windbreaks area and hedgerows, and also the planting of multi-purpose trees than can yield wood for construction, fuelwood, fodder, and even fruits.
- Improve water management by reducing evaporation losses and making possible the availability of water in the dry season). The irrigation system will consist of buried pipelines that will take water to the irrigation blocks. This system saves water that could be lost through evaporation and will be built to withstand floods.
- Improve soil quality through the establishment of Soil Defence and Restoration works, to generally improve the productive potential in the project site.
- The use of organic fertilizers and biological pesticides will contribute to reducing the use of chemical fertilizers, and also in reducing water, soil and ecosystem pollution. The use of organic

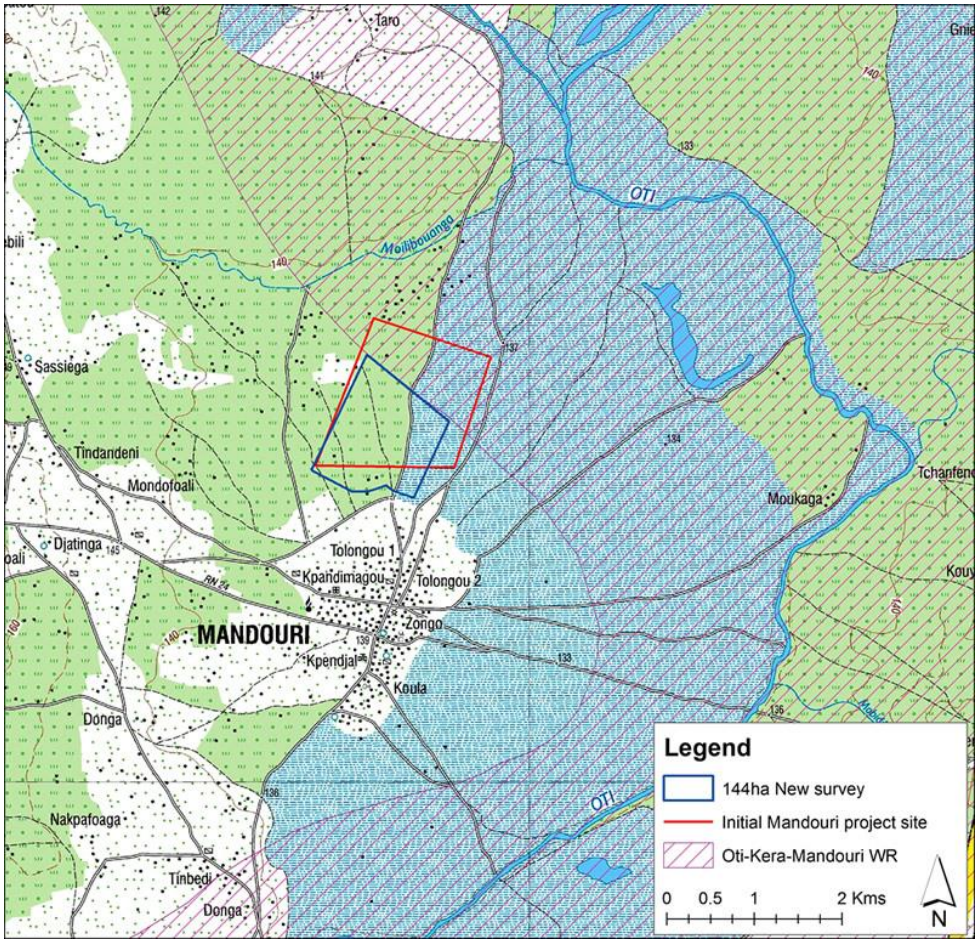
manure and biological pesticides also contribute to improving the quality of food products (organic products.

Regarding biodiversity conservation, the development of the Mandouri agrosylvopastoral perimeter will encourage populations move out of parts of the Mandouri-Oti-Keran Wildlife Reserve that they have entered in recent years. The development of this area will not generate additional deforestation because the right-of-way of the project was already exploited by the producers of the ZAPP project.

Regarding the conservation of biodiversity, the project will strengthen the efforts of the government and its technical and financial partners. Indeed, one of the major causes of the invasion of protected areas by local residents is the search for fertile land. This is a consequence of the extensive practice of slash and burn agriculture.

The project will be organized so farmers can concentrate farms on the same perimeter. This will prevent uncontrolled expansion of cultivated areas. Thus, the project falls within the framework of the development of accompanying actions of local populations of protected areas through the development of land and improved cultivation techniques resilient to climate change. This is a complementary project to the "projet de Renforcement du rôle de conservation du système national d'aires protégées in Togo" (PARFT) funded by GEF, UNDP, UEMOA, FAO and the Government of Togo. The project site will not encroach on the new boundaries of the Oti-Kera-Mandouri complex as indicated in the Map 1 of the project site location out of the reserve.

Water will be transported in a pipeline from the River Oti uptake point through the nature reserve. This intake does not affect the conservation of the wildlife area. Care will be taken to minimize effects on biodiversity as per the ESMP requirements.



Map 3: Project site location

Reduction in the consumption of fossil fuels

In terms of CO_2 balance and the type of technology used, the use of solar panels for the pumping station will prevent the emission of greenhouse gases from a fossil fuel run generator(s). Besides pollution due to accidental spillage is limited to a very small extent in the construction and decommissioning project stages.

The designed power requirement for the irrigation project is 110 kW – 150 HP, to drive a pump of 600 m^3/hr with a total head of 40 meters. The PV power generation will require 848 260w solar panels.

Fuel (diesel) consumption estimates for a 100 kW generator /motor at full load is 7.4 gallons/hr[25] (28.012 litre/hr).

Assuming a 6 hour operation per day, fuel use is estimated at 28.012 x 6 = 168.072 litres/day or 5,042.16 litres/month. Pumping will be done for at least 6 months in the dry season, with an estimated fuel consumption of 30,252.96 litres of diesel.

The project by reducing fossil fuel consumption reduces GHG emissions resulting from their combustion in diesel motor pumps. Considering that the burning of a litre of diesel emits 2.68 Kg of CO_2[26] into the

[25] 1 gallon = 3.78541 litres
[26] Independent Statistics & Analysis. US Energy Information Administration. https://www.eia.gov/~

atmosphere, the project, through the 30,252.96 litres of fuel not consumed, would have reduced emissions by about 81 tons of CO_2 in one year. Additionally, these avoided emissions may be traded on the carbon market during the course of the project's operational life.

tools/faqs/faq.php?id=307&t=11

C. Describe or provide an analysis of the cost-effectiveness of the proposed project

The Mandouri project's activities under Component 1 (Improved planning and management of water resources and (agricultural) production) will promote improved food self-sufficiency and sustainable management of land through better water management for agricultural production. To achieve this, it will make investments that scale up (and commercialise) existing practices and permanently transform water management and agricultural production. Specifically, Mandouri is already a major producer of rice and vegetables produced on rain-fed and floodwater cropping, on only one part of the year. The proposed project's investment will be used to set up infrastructure that has never been in the area over an entire 144ha land and turn it into a year-round irrigated farmland. This component will also acquire communal farm machinery large enough to cover the entire project are, which has never happened before. Once this is done, the economic vibrancy of the farming activities- more rice and a commercial horticultural/market gardening sub-sector will emerge. It will complete safeguard the communities in and around Mandouri from climate variability threats. Therefore, the disproportionately large benefit of the interventions under Component 1 are reflected in the equally large proportion of the proposed project's investment.

The cost-effectiveness of the project's adaptation interventions through Component 3 will be greatly enhanced by the EbA approach being applied with and among the local community. This approach result in higher benefit-cost ratio compared to the implementation of hard infrastructure. Yet, this project combines both EbA and hard infrastructure. The investment of US$5 million to put 144ha of land under intensive food production translates to not only high revenue returns but also savings on the countries food budget and foreign exchange.

Component 2 involves market-based approaches for strengthening resilience which will ensure sustenance of the interventions. One, the component seeks to harness maximum production capacity without the concerns of how to handle harvest. The investment made for this is only on storage and processing for marketing; which is minimal. Two, the use of credit mechanisms means that the farmers are able to access capital to invest in their agribusiness based on sound business models. The same capital is reinvested and lent to others over and over. This delivers highly cost-effective means with disproportionately large benefits and high return on the investment. The investment planned for this is $2.15 million to completely and permanently cushion 2,880 people from climate vulnerability.

The nexus approach to water-energy-food security prioritised by the project is by definition a cost-effective approach. Instead of adaptation efforts and plans being prepared to meet sectorial goals, focused on sectorial and project-based activities, without adequate consideration or coordination of cross sectorial interactions among key climate-sensitive sectors such as water, energy, and food, this project considers all is pursuing multiple results at 3 sectors and at different levels and scales concurrently. This makes it highly cost-effective as opposed to addressing each sector independently.

The project which is in an area which has been a top priority area for Togo but never managed to solve the challenges, will benefit from data, results and consultation processes conducted by key partners and stakeholders in the context of national scale planning. Under usual context, a similar adaptation programme would have had to allocate resources to conduct parallel consultation and validation processes.

The adaptation measures prescribed in the projected, are selected to mitigate the impacts of climate change and increase the resilience of the agriculture sector in Mandouri, Northern Togo. Changes in the weather conditions leading to more frequent extreme events such as floods and droughts and their costs and financial implications are taken into account. The project aims to diminish and in some cases avoid such costs.

Climate change affects negatively the yields in agriculture and crop patterns, as can be seen in the region due to unpredictable water resources. According to the documents available for Togo, mainly

the third National Communication (2015) to the UNFCCC[27], the NAPA[28] and the 2015 INDC[29], changes in temperature and precipitation are expected to reduce yields and disturb crops.

Table 5: Project cost-effectiveness

Existing climate threats	Activities designed to mitigate threats
Decreased precipitation, disruption of the rainy season and the crop calendar. Indeed, the start of the rainy season has moved from April-May to June or July, while the end occurs early (September).	• Mobilization of water to compensate the water deficit in the crop cycle via irrigation. • Development of agricultural area (Mandouri perimeter) to help farmers increase their productivity. • Diversification i.e. increased crop production in the dry season, value addition and income generating activities (IGAs)
Drinking water shortage especially in the dry season.	• Provision for a mini water supply system through boreholes and a mini water network in the project.
Between 1961 and 2012, a rise in average temperature of 1.2 ° C and lower rainfall of 41.8 mm have been observed for the northern part of Togo	• Creation of nurseries of multi-purpose tree species (fruit, food, fodder etc.) to encourage reforestation based on trees species adapted to new climatic conditions • Irrigation technology (basin and furrow) to enable crop production in the dry season • Dry season farming through irrigation will result in diversified crop production, and potentially create more jobs for women and the youth.
Risk of flooding due to the increase in the intensity of rainfall	• Buried pipes in the basin and furrow irrigation system to withstand flooding

The mode of irrigation adopted is justified by the need to rationalize the use of water. The combined basin and furrow system significantly reduces losses by seepage and evaporation, compared to the open channel system which exhibits relatively large losses. Compared to other solutions (sprinklers, drips), the latter in spite of their real benefits in saving water, require more expensive equipment and a higher level of maintenance.

The Adaptation Fund investment will cover 144 ha of land, introducing sustainable adaptive practices in agriculture and natural resources management. This will include water and land management. In addition, interventions will also include policy improvements with the integration of climate change related considerations and training materials, which will indirectly benefit the entire savannah region. The resources from the Adaptation Fund will be mainly allocated to field activities, by promoting the adoption and replication of best practices by the local communities of Mandouri and its vicinities. The interventions will strengthen the experience of the country, in terms of adaptation and environmental policy, for a scaling-up at the national level. It is planned that the activities will mainly benefit the local communities of Mandouri. This priority given to the final beneficiaries should enable an optimal cost effectiveness of the project. The table below summarizes these social and economic benefits.

Table 6: Social and economic benefits

[27] http://unfccc.int/resource/docs/natc/tgonc3.pdf
[28] http://unfccc.int/resource/docs/napa/tgo01f.pdf
[29] http://www4.unfccc.int/submissions/INDC/Published%20Documents/Togo/1/INDC%20Togo_english%20~ version.pdf

Social benefits	Economic benefits
576 farmer households will be benefiting from plots managed with adaptive methods	144 ha will be developed using sustainable adaptive techniques for water management and irrigation, and improved production techniques will be introduced such as short cycle seeds, high production varieties, etc.
Rural communities will be trained and better organized around income-generating activities including diversified crop production in the dry season, value addition to produce, etc.	The communities will benefit from demonstration centres both technically but also economically, as they will consider various income-generating activities such as shops to sell products with high added value.
Participation of the civil society, through the involvement of NGOs, including women's groups already mentioned above will increase the attractiveness of the region, together with consultations of stakeholders in the decision making process related to climate change, and to the reduction of land degradation and information and awareness activities.	Microfinance activities will enable people to invest in agricultural production techniques related to the changing climatic context of the region.
Stakeholders will be formed to monitor, promote and develop the integration of climate change in agriculture. The population will not find themselves as "abandoned" (considering that Mandouri is an extremely isolated site)	In the long term, food security will be improved following the implementation of adaptation practices. This will come from increased production in the agriculture sector (e.g. by introducing innovations such as high yielding / drought resistant crops).
576 farmer households will be benefiting from plots managed with adaptive methods	144 ha will be developed using sustainable adaptive techniques for water management and irrigation, and improved production techniques will be introduced such as short cycle seeds
Rural communities will be trained and better organized around income-generating activities	The communities will benefit from demonstration centres both technically and also economically, as they will consider various income-generating activities such as shops to sell products with high added value. With availability of solar energy, value addition to agricultural produce can be taken to the next level for instance to run a communal bakery, tomato pulp/paste making installations, etc.
Participation of the civil society, through the involvement of NGOs, including women's groups already mentioned above will increase the attractiveness of the region, together with consultations of stakeholders in the decision making process related to climate change, and to the reduction degradation land, and information and awareness activities	Microfinance activities will enable people to invest in agricultural production techniques related to the changing climatic context of the region. Agricultural production will be possible in the dry season, presenting job opportunities for women and youth who raised concerns on the lack of opportunities for almost half of each year due to drought.
Stakeholders will be formed to monitor, promote and develop the integration of climate change in agriculture. The population will not find themselves as "abandoned" (considering that Mandouri is an extremely isolated site)	In the long term, food security will be improved following the release of adaptation practices. This will come from increased production in the agriculture sector (e.g. by introducing innovations such as early maturation / crops resistant to drought)

The water control was proposed because it best meets the concerns of the people of Mandouri who can no longer control their cropping calendar due to recurring floods and droughts that affect all production activities. The proposed method will enable them to secure production activities by storing and redistributing water even in times of floods or droughts.

During the project design process, studies have been conducted to establish the baseline. This has better demonstrated the benefits and cost-effectiveness of the project as well as adaptation measures

recommended. The irrigation project will be powered by solar power. During the rainy season, there is plenty of water. While at the same time the solar component generates power. This power can be channelled to other uses like a planned communal bakery form the project, as well as other income generating activities like preparation of tomato pulp (value addition). In the drier season, irrigation will be practised for cultivation of vegetables and other crops. This not only complements the diets in the project area, but it is also a source of income from the sale of the agricultural produce.

D. Describe how the project is consistent with national or sub-national sustainable development strategies, including, where appropriate, national adaptation plan (NAP), national or sub-national development plans, poverty reduction strategies, national communications, or national adaptation programs of action, or other relevant instruments, where they exist.

This project fully reflects the priority measures identified by the Togolese Republic in its NAPA and Strategy for Accelerated Growth and Employment Promotion (SCAPE) 2013- 2017, and contributes to the development and success of the country as to the achievement of key objectives of the new program for sustainable development, following the MDGs.

The national action plan for adapting to climate change has identified agriculture as one of the priority areas that need to implement urgent adaptation measures. Among the recommended measures include:

- The adaptation of agricultural production systems in three regions including the savannah region in the implementation of cultivation techniques integrating climate change and improving the agro-meteorological information;
- Development of small irrigation in lowland areas for groups of existing gardener of Central, Kara and Savannah likely to slow down the rural exodus.

This measure will:

a. improve the living conditions of vulnerable communities in Central, Kara and savannah (area of the project area) with the development of vegetable crops against- season through increased food availability during the lean season;
b. increase the income of producers,
c. develop against-season crops and
d. strengthen the capacities of producers.

According to PANA, adaptation measures developed by local people in the savannah region to cope with climate change are:

- Crops association;
- Adapting cropping calendars;
- Varieties resistant to drought;
- Introduction of improved breeds;
- Storage of agricultural by-products for animal feed;
- Colonization and exploitation of lowlands;
- Change in eating habits;
- Movement of populations in search of good land;
- Implementation of erosion control devices.

Agriculture, the main livelihood activity and one of the driving forces of Togo's economy, is a top priority for the government which, through the national agricultural development policy of Togo (PNDAT) 2013-2022 and national Program for Investment and Agriculture for Food Security (PNIASA), was involved in a number of programs, such as:

- Promotion of efficient varieties resistant to climate change;
- Strengthening the management of integrated soil fertility;
- Mapping and establishment of zones and transhumance corridors;
- Construction and / or improvement of reservoirs for micro-irrigation and watering livestock in rural areas in all regions;
- Support mapping of vulnerable areas to climate change;
- Support for the dissemination of good agro-ecological practices;
- Promotion of rice production systems with very low water consumption and low greenhouse gas emissions (ISR: rice intensification system).

In addition, the Government of Togo has demonstrated its commitment to integrating environmental considerations in its public policy of economic development. This politic is illustrated, among others, in the National Environmental Action Plan (NEAP); the National Environmental Management Program (NEMP); the National Strategy for Sustainable Development (December 2011); National Capacity Building for Environmental Management Strategy (October 2008); the National Strategy for Disaster Risk Reduction in Togo (December 2009); the National Medium-Term Priorities Framework (NMTPF) for Togo (2010-2015) and the National Action Plan for the management of coastal and marine environmental resources.

Therefore, the main environmental issues are integrated into the Accelerated Growth Strategy and promotion of employment as a development framework for filling the General Policy Statement of Togo (DPG) based on the MDGs, and finally with the ODD.

In seeking to align the NEAP with Togo's development planning, The World Bank has prepared a study, Towards Environmentally Sustainable Development in West Central Africa, which takes stock of national development efforts in the face of degrading natural resources and alarming demographic trends. The study concludes, however, that high population growth, high poverty levels and the direct dependency of most poor families on natural resources for subsistence, low levels of environmental awareness at all levels of society, market and policy failures, and institutional weaknesses, all point to the need for redoubling and redirecting environmental efforts. This project directly addresses these issues and contributes to their correction. The NEAP therefore identifies these factors as priority problems from national planning exercises:

(i) land degradation;
(ii) deforestation and loss of biodiversity;
(iii) water availability and quality among others

This AF project takes direct action on each of these problems which if no action is taken will increasingly constrain the options for sustainable development.

The National Capacity Building for Environmental Management Strategy (October 2008) makes it clear that the next major phase towards Environmentally Sustainable Development (ESD) is to mainstream environmental issues into national development planning in all sectors and at all levels of society. This project takes an on-the-ground approach towards ensuring environmental issues are mainstreamed with each component of this project carrying an aspect of awareness and proactive action to climate adaptation among other environmental issues.

Togo's Third National Communication of 2015 indicates that Togo intends to contribute to climate protection by strengthening the resilience of its production systems and means by embarking on a carbon-lean development path. These aspirations are also captured in the National Adaptation Programme of Action (NAPA) for climate change, produced in December 2008 and whose objectives relate to:

(i) the protection of human lives and livelihoods, resources, infrastructure and the environment;
(ii) the identification of grassroots communities' urgent, immediate needs for adaptation to the harmful impacts of climate change and variability; and
(iii) the incorporation of adaptation measures and objectives into sectoral policies and national planning.

This on-the-ground AF project is well aligned with these strategic aspirations. The project also deploys large scale solar irrigation as part of the mitigation plans around the energy-water nexus as captures in the 3rd NC. Key among the mitigation measures singled out is rice growing. The NC of 2015 states that for the rice sub-sector, the actions will target the identification and promotion of varieties of rain-fed rice, and support and guidance in the better use of organic matter (for faster decomposition) in the paddy fields. This is exactly the way this project is designed.

E. Describe how the project meets relevant national technical standards, where applicable, such as standards for environmental assessment, building codes, etc., and complies with the Environmental and Social Policy of the Adaptation Fund.

Togolese national standards will be applied to the project. Those standards are the ones concerning the obligation to ESIA, infrastructure construction standards, the water code, including those concerning the use and sharing of water in the case of joint management of the resource for irrigation, agricultural development guidelines, standards on the protection of biodiversity, the master plans of the territory and those of local authorities will be considered to ensure consistency with the proposed hydro-agricultural development.

In addition, projects entering the BOAD's portfolio are analysed to ensure not only their compliance with national standards, but also with BOAD's environmental and social safeguards standards, which are aligned with international standards (World Bank Environmental and social safeguards policies and the IFC Performance Standards). BOAD also operates the ESIA's quality control before allowing projects to continue through the internal project cycle.

The ESIA for this project was carried out in accordance with:

a. Decree No. 2006-058 / PR establishing the list of work, activities and planning documents submitted to the environmental impact study and the main rules of this study;
b. Order No. 013 / MERF regulating the procedure, methodology and content of environmental impact studies; and
c. Order No. 018 / MERF laying down the terms and procedures for informing and consulting the public in the environmental and social impact study process.

This present Adaptation Fund project will be carried out in accordance with the following:

- For water, environment, forestry: the water code (Act No. 2010-004 with Water Code), the Environmental Code (Act No. 2008-005 of 30 May 2008 with Framework Law on Environment) and the forestry Code of Togo. (Act No. 2008-009 of 19 June 2008 on the Forest Code);
- For spatial planning: Law No. 2007-011 of 13 March 2007 on decentralization and local freedom; and Order No. 12 of 6 February 1974 on agricultural land reform;
- For working conditions: Act No. 2006-010 of 13 December 2006 on the Labour Code.

In addition, the project is consistent with key national strategies that include – The National Environment Policy, the National Environmental Action Plan (NEAP); the National Environmental Management Program (NEMP); the National Strategy for Sustainable Development (**NSSD**), and the Energy Policy among others.

The **National Environment Policy** (**NEP**), adopted by the Government of Togo on 23 December 1998, defines the overall policy framework for the promotion of sound management of the environment and natural resources with a view to sustainable development in all sectors activities. It focuses on:

a. addressing environmental concerns in the national development plan;
b. the mitigation, elimination and / or reduction of negative environmental impacts of public or private development projects and programs;
c. strengthening national capacities in environmental and natural resource management; and
d. improving the living conditions of the population.

Accordingly, the **National Environment Policy** aims among other things, to promote sanitation through the implementation of wastewater and storm water disposal systems in human settlements and the implementation of a policy of reducing domestic waste. The Mandouri project site undergoes flooding in the rainy season with inherent waste water and sanitations issues posing challenges to the inhabitants. In addition, the project development with come with varying environmental challenges from minor pollution during construction to potential water and soil pollution in the operating stage. In terms of the applicable measures, these are those relating to the prevention and control of pollution and nuisances.

Togo's **National Environment Action Plan** (NEAP), adopted in June 2001, constitutes a strategic framework that complements the National Environment Policy. It takes into account the concerns of the different actors in the national socio-economic life and helps to stimulate the ecological consciousness of the different categories of actors and decision-makers to make them take into account the environmental dimension in the planning and management of programs and development projects.

The NEAP, in its foundations and strategic orientations, aims to reconcile, in a global participatory approach, the requirements of environmental quality with those of increased productivity and economic profitability in a fluctuating national and international context. As a result, solving environmental problems related to agricultural production activities such as in the Mandouri project will involve:

a. assessment of the impact of the project on the environment;
b. the development and implementation of performance indicators for environmental monitoring;
c. the application of environmental standards;
d. the taking into account of safety measures to minimize adverse effects on populations, and the environment;
e. encouraging the use of technological know-how to ensure safe evacuation of harmful waste;
f. the development, implementation, monitoring and rigorous monitoring of environmental management plans; and
g. Periodic environmental audits of ongoing activities likely to have a negative impact on the environment and / or the living environment.

The **National Environment Management Program (NEMP)** document is a programming of actions identified for the implementation of the **National Plan of Action for the Environment Policy** (**NPAEP**) over the next fifteen (15) years. This document has the same objectives and the foundations of the NPAEP, comprising of five strategic directions:

a. Strengthening national capacities in the management of the environment;
b. Promote an ecological conscience nation based on the mastery of knowledge and the development of positive attitudes in the face of the environment;
c. Effectively take into account environmental concerns in the planning and management of development;
d. Promote sound and sustainable management of natural resources and the environment; and
e. Strengthen sub-regional and international cooperation for a concerted management of environmental problems.

The Mandouri project espouses all the 5 objectives, given its siting near the border with Benin and Burkina Faso, its planned environmentally conscious climate change resilience activities.

The Togo **National Strategy for Sustainable Development** (**NSSD**) document was approved in September 2011 in Lomé and is a valuable tool for planning of the country's development. Its Vision of a Sustainable Togo is to build a society on the basis of harmonious economic and social development, with cultural respect and support for the environment by 2030. A society in which economic, ecological and social sustainability, solidarity, human rights, democracy, and good governance are the barometers of its development. The general objective that the actors have set out in this document is to ensure economic, ecological, cultural and social development in Togo. In other words, to work for an ecologically viable economic system that guarantees acceptable conditions and living conditions for present and future generations.

This document is based on four strategic axes:

- Consolidation of the economic recovery and promotion of sustainable production and consumption patterns;
- Revitalization of the development of the social sectors and promotion of the principles of social equity;

- Improved environmental governance and sustainable management of natural resources; and
- Education and skills for sustainable development.

By planning to actively involve all social groups, including women and youth in its activities, the plan to revitalize agricultural production in the dry season through solar powered irrigation, income earning activities supported by solar power and a micro-finance sub-component, and education and skills on climate change resilience, the Mandouri project is indeed in line with the NSSD objectives.

Togo has had an **Energy Policy** since 2011 to guide interventions in the sector. The main strategic axes of the energy policy are organized around the reduction of energy dependency, the reduction of the energy bill, a better matching of energy supplies to the needs of the population.
Togo's energy policy is based on the following axes: -

a. Secure energy supply and control costs;
b. Increase access to electricity;
c. Improve the supply of electricity for industrial consumers;
d. Fostering energy efficiency on supply and demand;
e. Developing national renewable energy sources; and
f. To enable the Directorate-General for Energy to play its central role in the sector.

The Policy addresses the potential energy resources of the country (oil, natural gas, coal, wood energy, solar, wind, and hydroelectricity). The Mandouri project has in its design opted for a renewable energy source that meets one of the **Energy Policy** axes.

Other national policies of interest include **National Water Policy** adopted in August , 2010 with the objective of contributing to the fight against poverty and to sustainable development by providing appropriate solutions to the problems related to water, so that it becomes a limiting factor in socio-economic development.

And the **National Strategy and Plan of Action for Biodiversity** in Togo (**NSPAB 2011-2020**), an accession by Togo to the general framework set up not only by the biodiversity-related conventions. The aim of this framework is to "live in harmony with nature", and by 2050 to ensure that "biodiversity is valued, conserved, restored and used wisely, ensuring the maintenance of services provided by Ecosystems, maintaining the planet in good health and providing essential benefits to all peoples". The conservation, restoration and enhancement of biological diversity at the project site plans to maintain the long-term functioning of ecosystems and its resilience to climate change, in part by creating green areas and planting tree hedges all around and within the enclosure of the site.

In fulfilment of its commitment to UNFCCC, Togo prepared its **third communication** in 2015. Some key observations relating to the Mandouri project include agricultural production, and potential effects of climate change. The report recognized that the agricultural sector is dominant in the economy, accounting for only 35.1% of GDP in 2000 and an average of 38% in recent years, translating to about 20% of export earnings. This sector supports two-thirds of the working population and offers the most opportunities to accelerate growth, ensure food security, create jobs, increase income for the poor and contribute to the development of the agro-industry. The main food speculation is cereals, tubers and legumes, accounting for 70% of agricultural GDP. Livestock, poultry and small ruminants comprise the main meat production in Togo. However, this production caters for only 65.9% of national requirements. The Mandouri project will play a part in revitalizing the agricultural sector via both the production of rice and livestock. In addition, solar powered irrigation will enable the production of vegetables to diversify diets; and additionally, the solar power generated offers potential for value addition of agricultural produce i.e. tomato pulp, bread making, etc.

According to the **third communication**, scenario studies in annual temperature and precipitation reveal that climate change will already be perceptible by 2025, both in terms of temperatures and precipitation. The Savannah Region in particular will experience a small increase in rainfall, while the other regions (Maritime, Plateau, Central and Kara) will be marked by a decrease (0 to -1.5%). The

average annual temperature will have a variation of 0.66 ° C in the South of the country at 0.80° C in the extreme north. On average, high temperatures will be recorded in the Savannah region in April (32.6° C). These will have marked effect on the Mandouri project site, in an area that gets flooded during the rainy season, and is very dry for about six months every year.

The planned irrigation project will bring resilience to the project area. Buried pipes in the basin and furrow irrigation system will be designed to withstand flooding. This irrigation technology will also enable crop production in the dry season. Dry season farming through irrigation will result in diversified crop production, and potentially create more jobs for women and the youth. And tree nurseries will be created comprising of multi-purpose tree species (fruit, food, fodder etc.) to encourage reforestation based on trees species adapted to new climatic conditions.

F. Describe if there is duplication of project with other funding sources, if any.

The project does not overlap with or support activities that are already supported with other funding sources. Furthermore, the project will complement, build on and learn from a number of ongoing projects, where opportunities for mutual exchanges or synergies exist. These initiatives already existing or under implementation include:

- Project to support agricultural development in Togo (PADAT) co-financed by BOAD; the Agricultural productivity Program in West Africa - Togo project (WAAPP - Togo);
- the Project to support the agricultural sector (PASA); and
- the initiatives planned for agricultural Development Zones (ZAPP).

Furthermore, the project activities will be in synergy with those of the regional project for the promotion of smart agriculture in West Africa promoted by BOAD and the ECOWAS, as regards the mastery of good agricultural practices, and collection and use of weather data.

The project will support the population through the establishment of plant nurseries for the development of fruit trees. In this context, the project will build on the Women Leaders Network for Disaster and Risk Reduction for the implementation and management of this component. It should be noted that the issue of the provision of fruit plants is a request of the population.

Table 7: Projects with similar interventions

Project	Objective	Components	Possible Synergies
Project to Support Agricultural Development in Togo-PADAT (2011-2016)	• To contribute to the improvement of food security and incomes of small farmers through the improvement of production and productivity of the targeted farms rice, maize and cassava as well as through the promotion and marketing targeted agricultural production.	• supporting production and productivity • promotion of products • adaptation of agricultural production to climate change	• adaptation to climate change component; • Integrated soil fertility management component; • development of lowlands and watersheds; • establishment of storage and marketing infrastructure; • diversification (market gardening, small livestock and fish farming) • Environmental Protection; • management of pastoral areas for transhumance operation(water points, reception area, • transhumance corridor);
Planned areas for agricultural development (ZAPP)	• Occupation of land all year • Avoid pressure on the forest during the dry season • Exceeding 6 tons / hectare production of rice often obtained from the site, ZAAP Mandouri	• Development and Support for the production and processing	• Partnership with products that enhance the forest
Project to support the agricultural sector (PASA)	• Rehabilitate and strengthen the productive capacities of targeted *beneficiaries in selected sectors • Promote an institutional environment suitable to the development of the agricultural sector in Togo.	• Promotion of strategic food crops, export crops and inland fish production • Revival of the livestock sub-sector • Support for capacity building and sectoral coordination	• diversification (cash crop, livestock, fish); • institutional and actors capacity building; • Environmental Protection development and • dissemination of technologies resistant to climate change

Project	Objective	Components	Possible Synergies
Agricultural Productivity Program in West Africa – Togo Project (PPAAO - Togo)	• Generate, adapt and disseminate a range of improved sustainable production technologies of the main plant products (corn, rice, sorghum, cassava, yam, cowpea, groundnut, tomato, pineapple, cashew) and animals (poultry, small ruminants and swine); • Improve the efficiency and performance of agricultural research by strengthening agricultural research institutions capacity in technical, administrative, financial and planning field; • Enhance the efficiency, performance and sustainability of agricultural extension services to make them more operational.	• Promotion of conditions for sub regional cooperation in the creation, dissemination and adoption of agricultural technologies • Strengthening adaptive technology transfer and research capacity. • Support for demand-driven technology Support for demand driven technology generation, dissemination and adoption, via the priority-based funding agricultural research and advisory services in the participating countries, and complementing the activities of the core program	• dissemination of the system of rice intensification(SRI);
Project for the strengthening of the role of conservation of the national system of protected areas in Togo (PARFT)	• Strengthen the management of the system of protected areas of Togo in order to improve its contribution to the conservation of biodiversity by applying effective approaches for the rehabilitation and management of AP.	• Improvement of the framework of action, legal and institutional framework of the field of AP covering approximately 578.000 hectares; • To promote the effective management of the complex of AP OKM (with 179.000 ha in area of protected areas) to counter the threats that the poaching, the lights not controlled and grazing pose on biodiversity.	• Sustainable management of protected areas
Hydro-agricultural development projects • PARTAM • PBVM • PDPRK • PDRPD • PDRI-Mô • PATA - OTI	• Increase agricultural production; • Contribute to improving incomes and living conditions of the beneficiary populations.	• Study, monitoring and • control and overall project supervision Rehabilitation works and areas development • Support to Agricultural Production Environmental measures and support • Awareness, organization, training and support	• irrigated land; • Rice; • Management development; • organization of producers, • microcredit
Project of hydro-agricultural development - PATA-OTI	• Increase agricultural production, including rice and contribute to the improvement of incomes and living conditions of the beneficiary populations.	• Development and rehabilitation of the perimeters • Support to agricultural production (rice) • Construction of rural tracks • Awareness, extension and training	• Agricultural Sector / vegetable production and fishing
Draft hydro in agriculture in the lower valley of the River Mono (PBVM)	• Contribute to the improvement of the food security and to the reduction of the poverty of rural	• Amenities in the perimeters and related equipment • Monitoring and control of	Agricultural Sector/vegetable productions: cereals (rice, maize), legumes (peanut, cowpea) and vegetables

Project	Objective	Components	Possible Synergies
	populations through the increase of agricultural production of food crops, particularly rice	the work • Support to the development and commercialization	
Project for the development of rice production in the Kara (PDPR-K)	• Increase the income of producers in the rice sector and reduce the level of imports through the improvement of the self-supply the national market	• Strengthening the organizational capacity of the producers of the chain • Hydro-agricultural • Support to the development of sites • Marketing and valuation of products	Rice
Integrated Rural Development Project (IRDP) of the plain of mô	• Contribute to the reduction of poverty through the improvement of access to basic social services and in agricultural incomes in the conditions of sustainable development, with particular attention to the disadvantaged.	• Structuring of village organizations • Sustainable development of agriculture • Strengthening of infrastructure	Agriculture, Livestock, transport, education, health, environment, crafts, water, AGR, sanitation,
Program of Rural and Agricultural Development (ProDRA)	• Ensure the establishment of pilot models for the agro-food carriers, micro-rural enterprises and promote sustainable production systems	• Promotion of Carrier Sectors • Promotion of small and medium-sized enterprises as well as capacity building of attendants • Promotion of the production of biomass and of agroforestry • Support-council in the regulatory framework and in the planning	Support to agricultural production -Training, Awareness, and extension
Presentation of the draft rural development of the plain of the ITO, Zone 4 and Zone 5 (PDRO-4)	• To intensify agricultural production mainly rice, diversify the speculation, while improving access to basic social services;	• Development of irrigated agricultural lands • Support to agricultural production • Training, Awareness, and extension	Rural infrastructure and agriculture
Development of the plain of Djagblé	• Intensify the culture of rice and the achievement of related works with a view to contribute to the creation of wealth	• Development of Agricultural Land • Support to agricultural production • Training, Awareness, and extension	Rural infrastructure and agriculture
Project for the development and rehabilitation of agricultural land in the area of Mission Tové (PARTAM)	• Increase agricultural production, including rice and contribute to the improvement of incomes and living conditions of the beneficiary populations.	• Development and rehabilitation of the perimeters; -support to agricultural production • Awareness, extension and training	Agricultural Sector / vegetable production and fishing
National project for the promotion of rural entrepreneurship and medium (PNPER)	• Diversify and strengthen the instruments for the development of the rural entrepreneurship;	• Facilitation of access to non-financial services • Facilitation of access to	Rural Entrepreneurship upstream and downstream of the carrier sectors

Project	Objective	Components	Possible Synergies
	• Improve the supply of quality services in training, support Council, intermediation by NGOS, private firms and the public structures; • Increase the production of quality goods and services by the members	financial services	
Draft Education and Technical and Vocational Training (Agricultural EFTPA)	• Ensure the anchor of a sustainable system of qualification and training of farmers in the PNIASA.	• Improved the skills of stakeholders for the development of a policy EFTPA. • The capitalization and dissemination of good practices in the field of agricultural training in Togo • Development of Priority Reforms EFTPA in cooperation with relevant public institutions, the private sector and the OPA.	Entrepreneurial training and agriculture
Project for the integrated management of disasters and land (PGICT)	• Strengthen the institutional capacity of the targeted institutions to manage the risk of flooding and land degradation in rural and urban areas targeted. • Extend the sustainable land management (GDT) in the targeted landscapes and in areas vulnerable climatically of Togo	• Restoring the natural channels of the water flow by dredging rivers • Bank stabilization by reforestation with Rhizophora and bamboo; • Channelling of waters of rain by the construction of gutters in areas vulnerable to flooding • Promotion of good practices of sustainable management for the improvement of agricultural yields thus allowing to recover the degraded land or uncultivated • Securing the vegetation cover existing on the promotion of community forestry with improvement of governance, the valorisation of forests by the development of beekeeping, and ecotourism • Extension the vegetative cover on the bare land by the reforestation of the flanks of the mountains, banks, rural land etc. • The promotion of improved homes	• Sustainable management of the land • Sustainable management of forests • Disaster Risk Reduction

Mandouri project's micro-credit facility

As mentioned in **Part II: Component 2**, a micro-credit scheme will be implemented in the Mandouri project to the tune of USD 116,000 in order to facilitate access to inputs for agricultural and income generating activities. These funds will be placed in micro-credit institutions.

To date, the three microfinance institutions are operating in the project area. These include:-

- Union des Caisses Mutuelles d'Epargne et de Crédit des Savanes (U-CMECS);
- Coopérative d'Epargne et de Crédit Mandouri (COOPEC MANDOURI) affiliated to FUCEC-TOGO Network;
- Coopérative d'Epargne et de Crédit pour le Soutien aux Initiatives des Femmes pour l'Autopromotion (COOPEC SIFA), and
- Fonds National de la Finance Inclusive (FNFI).

From discussions with community members at the project site, issues raised concerning micro-credit included –

- High interest rates of up to 18%.
- Loans given too little i.e. FCFA 30,000 or approximately USD 50.

A key weakness of most micro-credit institutions is the fact that many cooperatives for instance are promoted by outsiders, and are overly dependent on government or donor support[30]. Other weaknesses of microfinance institutions (MFIs) include the fact that microfinance is not is not financially sustainable for the MFIs, especially those that also want to serve the very poor. Microfinance is also potentially harmful to women's well-being as domestic abuse may result from husbands' jealousies of their wives' new financial power[31].

The Mandouri micro-credit scheme thus will have to be different to be sustainable and make meaningful impact for the local communities. It will have the following embodied tenets -

- A "Strategy for self-sustainability" will be included with development a collective asset base. To become sustainable, the identified partner MFIs should identify more members and form clusterisation groups whereby they can identify dynamic markets and commercialize in a close and open circle all their produces.

- Development of capacity for business analysis and risk taking, through training of both MFIs/cooperatives and the targeted community members

- Avoid being isolated in its / their business operations mostly in their communities, by getting resourceful (useful) contacts and networks beyond their community. This will expand their resource base especially in terms of human and social capital, in turn expanding the scope of ventures and ability of the MFI/cooperatives progressing in a sustainable manner.

- Work hard to have certification of their products. This means, be more engaged in GAP (Good Agricultural Practices), therein they will be able to conquer internal and external markets.

[30] Enabling rural cooperatives and producer organizations to thrive as sustainable business Enterprises Collection of contributions received. Discussion No. 82 from 12 July to 3 August 2012 http://www.fao.org/fsnforum/sites/default/files/file/82_cooperatives/PROCEEDINGS_82_Rural_cooperatives.pdf

[31] Microfinance in Africa. Overview and Suggestions for Action by Stakeholders. UN office of the Special Adviser on Africa. February 2013. http://www.un.org/en/africa/osaa/pdf/pubs/2013microfinanceinafrica.pdf

G. If applicable, describe the learning and knowledge management component to capture and disseminate lessons learned.

The project idea is based on building community capacity regarding climate risks analysis and climate change impacts, integration into local and national policies and cultural practices in order to improve people's means of livelihoods. Thus, the component 1 of the project includes a subcomponent dedicated to the establishment of "Knowledge Management and Learning" system in the project.

This will concretely consist of -

a. Assessing the existing knowledge,
b. Collecting all the sheets and training modules for all capacity building activities carried out under the project for dissemination, in order to replicate them throughout the region;
c. Dissemination of knowledge on project activities through, workshops, scientific for a, etc. and
d. Establishment of a computerized system for the collection and management of meteorological information.

More specifically, the knowledge management system will articulate the level of the project's intervention area at the global, local, sub-national, national and regional levels. It relies on online and offline activities. The offline activities will enable the data generated by the project to be collected from the actors at the operational and strategic levels on a half-yearly basis. They will be gathered in the online platform set up with the project. The online activities will consist of sharing knowledge through online platforms/networks. Data will include community farm management practices, sustainable agronomic practices, and practices for managing hydro-farming equipment. They also address the management of environmental and social risks, and include gender. Once collected, the data is processed by the project team to produce practical knowledge / lessons. This knowledge / lessons are documentaries in the form of policy briefs, videos. The target groups for the dissemination of knowledge produced within the project are policy makers at local, national and international level, producer organizations, NGOs, central and decentralized government services techniques, administrative and local microfinance institutions, development agencies. With regard to broadcasting, programs in the mainstream media (community radio stations at the local level, print media, TVs), social networks, online platforms, workshops at national level and international fora will be used.

A map index with simplified financial management and crop techniques adapted to climatic shocks will be made available to agricultural cooperatives for duplication of good management practices and crop techniques with water control.

The project will organize study trips for the benefit of farmers, in areas with the same problems of vulnerability and the area of direct intervention of the ongoing projects in Togo including PADAT project, to understand the strategies that have been developed there in order to replicate them.

This will allow interactions and experience exchanges between Mandouri's farmers and other farmers. In addition, BOAD as RIE will, through the executing entities and NGO in charge of capacity building, report all activities and educational tools in order to ensure that the community will benefit and use day to day lessons learnt and other knowledge coming from the project.

Furthermore, BOAD will conduct a final evaluation of all projects six months after the end of the project in order to draw lessons learned on the project. The conclusions of this evaluation are disseminated at the country level and projects and lessons are systematically taken into account in the following projects:

ASCENT periodically conducts retrospective evaluation of projects to measure their performance and their impact on the beneficiary communities. This assessment is validated at the end of a workshop of information sharing with beneficiaries; the findings are disseminated to all stakeholders and on various websites.

The knowledge acquired in the project will be posted on the MERF, BOAD and ASCENT's websites.

H. Describe the consultative process, including the list of stakeholders consulted, undertaken during project preparation, with particular reference to vulnerable groups, including gender considerations, in compliance with the Environmental and Social Policy and Gender Policy of the Adaptation Fund.

Stakeholders were consulted during the development phase of the project feasibility study. This activity consisted of meetings with the central and decentralized structures of Ministries, producer organizations, NGOs, customary and opinion leaders, women's groups and young people. The objective of this activity was to (i) identify the stakeholders, (ii) classify them according to their influence and interest in the study (iii), and engage them through the assignment of responsibilities. This whole process was carried out with gender groups, including young people and women. To carry out this activity, the tool "Stakeholder analysis grid" was used. The meeting minutes show the presence of key stakeholders in discussions on the project design. The project feasibility phase allowed the stakeholders and direct beneficiaries to express their views. There is a consensus on the usefulness of the project, not only on the part of beneficiaries whose livelihoods will no longer depend on weather conditions, but also from institutional who see the consistency of the project with national development that have targeted this area, until recently recluse, as part of local development priorities.

In accordance with BOAD, projects cycle instruction, a team of experts in the areas of adaptation, environmental and social and Rural Engineering conducted a field visit and was able to confirm that there was not social blockage or technical constraints that could question the feasibility of the project.

The BOAD evaluation team put a lot of emphasis during site visits, in meeting women groups, to ensure that their views had been taken into consideration during the stakeholder consultation phase of the feasibility study.

The main consultations were held as follows:

- For the project feasibility phase, consultations were held at the regional, prefectural and village levels. They have included environmental data collection (impact and environmental measures) and discussions with beneficiaries. Three (3) public consultations have been undertake to date. They included -
    - Individual interviews with officials of the Ministries of Environment and Forestry Resources (Regional Director, Director and Head of Post Prefectural Forest);the Ministry of Agriculture and its specialized departments (Regional Director, Director and Head of Prefectural CITA);Projects and Programs teams; NGOs and associations working in the project area; and key informants from diverse backgrounds. These interviews focused on the project components.
- For the ESIA Phase: The talks focused on the organizational framework of the implementation of the identified development and environmental measures planned in the Environmental and Social Management Plan. These consultations were also held at the regional, prefectural and villagers.
- Village public workshops were held for each village involved in the project. These workshops brought together: -
    a. the managers of local technical services (agricultural representative, representative ICAT, DP Farmer, Chief ranger station),
    b. the district chief and his secretary,
    c. members of the Village Development Committee,
    d. farmer groups and women representatives.
- Discussions with local populations focused on project activities; the positive and negative impacts of the project; and mitigation measures.

During each of the consultative sessions, an attendance list was prepared and these are attached as **Annex 2**.

I. Provide justification for funding requested, focusing on the full cost of adaptation reasoning.

Regarding information provided by the 2nd (pages 56-57) and the 3rd (pages 27-39) national communications to UNFCCC, combined with Togo's INDC Report (page 6), the project area is strongly vulnerable to climate change. It's expected that the extreme north-eastern of Togo where the project area is located (Mandouri), will be affected by the increase of temperature (RCP 2.6: 28.8-29.3°C (2025), 35.6-36°C (2050), 35.6-36.2°C (2075), 35.6-36.2°C (2100); RCP8.5: 35.4-36.0°C (2025), 36.4-37.0°C (2050), 37.6-38.2°C (2075) and 39.0-39.6°C (2100). In the meantime, rainfall is likely upsurge, causing extreme weather and climate events such as floods, etc. that will increase vulnerability of Mandouri community and landscape more than ever. In the same perspective, it's projected that agricultural sector will be affected by the loss of incomes, land degradation, loss of biodiversity, the invasion of insects harmful to crops and livestock, loss of wetlands, etc. jeopardizing once again Mandouri community and landscape resilience. That's why, this project will improve adaptation strategies by providing the possibilities to develop and sustain rainfed agriculture by water control during the wet season, diversification (because up to now, no gardening activities were possible during the dry season due to lack of water control). The warehouse will allow Mandouri's farmers to store their crops with a threefold advantage: first, access to crops during lean periods; then, keep them in a safe place that respect building standards, away from heat and moisture, and finally, do not discount their crops as in the past; all these issues will contribute to food security concern in Mandouri.

The project plans to go deeper in vulnerability issues with appropriate tools at the beginning and realize a baseline study for better quantifying vulnerability assessment of project site.

Component 1: Improved planning and management of water resources and production (without the project):

In general, the levels of productivity and crop yields are low, for both food crops and cash crops. They vary from 1 to 2 tons / ha for cereals; from 0.5 to 1 ton / ha for pea family crops and about 10 ton / ha for tubers (yam and cassava). These yields are less than 50% of the levels achievable in optimal culture conditions. The result is a low level of value of production per hectare, which is between 330,000 and 440,000 FCFA / ha. The best value gross returns per hectare are crops of yam about 1.8 million FCFA / ha. Production has increased substantially with the extension of cultivated areas and much less with improved yields[32].

ABIP (Agri-Business Information Point) at constant prices per agricultural worker in 2014 is 315,378 FCFA substantially equal to the GDP per capita (326,689 FCFA[33]).

The years 2007 and 2008 were particularly marked by the disastrous floods with social and economic consequences for the country: it was noted the loss of human lives, the massive destruction of roads, residential houses and fields. These phenomena, formerly located in the Maritime Regions (Gulf, Zio Lakes) and Savannah (Kpendjal) have become widespread in recent years across the country. However, the two above-mentioned areas remain the major risk areas and vulnerable.

At the prefecture of Kpendjal Mandouri which is the County Headquarter, irrigated agriculture in the project area remains to be developed. In addition, agricultural production is still characterized by low levels of agricultural mechanization and malfunctioning of some equipment and the effect of weather conditions. The planning studies and development of lowlands launched by the Support Project for Agricultural Development in Togo (PADAT) led to the identification of several sites whose construction has not yet been realized.

In September 2007, the drama endured by the populations of prefectures Kpendjal to Tône and Oti, caused the death of 20 people and caused several wounded, 24,000 displaced people, destroyed

[32] Ecowap+10, 2015
[33]Chiffres du comité de PIB

22,129 boxes, 111 broken bridges and culverts, smashed or swept away. Also 46 educational institutions (schools and colleges) were damaged or destroyed, 3 clinics were closed. In 2007, the number of flood victims throughout the national territory was estimated at more than 231,147 (flood report in February 2008).

Situation with the project: The project will enable people to adapt to Climate Change by improving the access and the control of water for the production, with total water control throughout the year. In addition, the project will provide to the beneficiaries agricultural equipment and assistance for the adoption of good agricultural practices for improving rice yields, expected to reach 6 to 10 tonne/ha. For this purpose, synergies will be created, including the regional project, to promote smart agriculture promoted by BOAD and some ongoing projects in Togo especially ADAPT.

Component 2: Support to the diversification of livelihoods
Baseline: To date, the crop calendar in the project area is completely dependent on rainfall. Moreover, the remoteness of the area imped the correct flow of goods and the lack of infrastructure for storage, force producers to sell at a loss. Their production obtained during good rainy seasons. On the top of that it should be noted that the supply of input is not ensured due to the fault rate of payment and the debt ratio of the population. For these reasons the population has very limited access to micro agricultural credit.

Situation with the project: with better management of water resources, crops can be diversified and can be produced throughout the year. This will ensure the producers' food security, through better means of subsistence. Through innovative funding mechanisms such as microfinance activities oriented towards new farming techniques, new seed varieties, access to micro-credit will be facilitated to ensure a sustainable supply of inputs and yields will be improved. The strengthening of capacities planned in Component 3 sensitizes beneficiaries on how to use these credits funds and the necessity to reimburse them. For this purpose, simplified financial management training will be provided.

Component 3: Institutional support, capacity building and knowledge management
Reference scenario: local institutions and rural communities are not sufficiently sensitized to the problems which climate change posed in the agricultural sector in Togo. Given the non- existence of this type of project in the project area, the response capabilities of the actors are insufficient regarding to the variability of rainfall and the production, the processing and marketing of products.

Situation with the project: The project will allow:
- Managers of national administration and local decision-makers to take full extent of these impacts on agricultural output and food security;
- Producers to understand the impacts of climate change and learn managing strategies.

The project will also capitalize on the experience of adaptation projects underway in Togo and to make available to communities one of the good practices database that will be broadcast through local media, exchange sessions.

J. Describe how the sustainability of the project outcomes has been taken into account when designing the project.

The sustainability of the project results will be done through a close collaboration with communities to ensure that their needs in terms of adaptation to climate change and variability have been properly taken into account. The innovation in the project is the fact that the project is not thought for the communities but thought with communities in order to solve their problems. Communities were involved together to identify the main constraints and solutions to them on the basis of their expertise in the early stages of project identification. At this level, consultations were held with all communities across different groups (old adults; women; youth) to ensure that everyone's needs are properly addressed. The diagnosis based on endogenous dynamics of communities is an important pillar of sustainability of the project results.

In addition, the project area is characterized by the existence of some development projects which can induce a low level of population susceptibility. To this end, the project beneficiaries should receive support throughout the project to improve the structure and capacity building through awareness and training sessions on management and local governance to allow greater participation in implementation and ownership of the results of the sustainability pledge project.

There are already organized and functional groups in various areas in Mandouri and its surroundings. The daily management of the infrastructures will be assigned to these groups, like other similar projects in the areas or drinking water supply projects. The mechanism is the following: the groups will be trained and supported by existing support organizations (ICAT, NGOs, etc. ITRA) in technical and financial management (use and servicing), books and rural organization (setting up of management and advice committees). A revolving fund will be set up and supply by regular contributions of group members (beneficiaries) under conditions defined by them. These funds will be used for expenses related to the management and maintenance of infrastructures. For major repairs, state technical organizations will be solicited.

This mechanism described **Part II, A. Component 2 Expected Concrete Output 2: Strengthening financial management of cooperatives and beneficiaries; maintenance of engineering equipment**, is envisaged to ensure the sustainability of the facility. It has two advantages namely:

- For micro credit institutions: as the project resources are donations, they will improve their ability to respond;
- For beneficiaries: the mechanism will allow access to credit at a reduced rate. Finally, to support the implementation, monitoring and sustainability of the mechanism, the parties directly involved will benefit from capacity building.

Table 8: Sustainability measure per project output

Project Components	Expected Concrete Outputs	Sustainability measures
1. Improved planning and management of water resources and (agricultural) production	1.1 Construction of the basin and furrow irrigation system powered by solar power on 144 ha of land 1.2 Production yields improved through mechanized means of production and improved agricultural practices by:- 1.2.1 The purchase of equipment (2 vehicles for delivery of products are acquired to facilitate access to market; 4 agricultural production kits are made available to producers) 1.2.2 The training of at least **576 farmer households** in improved agricultural techniques	• The project will support the scaling up of farm-based pilots where these are producing surpluses and providing benefits to people, linking them to markets to improve returns. This bottom-up approach which rewards successes with economic benefits will be self-sustaining. • Mainstreaming adaptation practices into the existing systems of the Ministry of Agriculture / extension services supports scaling up and sustainability.

Project Components	Expected Concrete Outputs	Sustainability measures
	1.2.3 The training of 10 to 20 local technicians on driving, installation, repair and maintenance of irrigation and solar equipment	
2. Support for the diversification of livelihoods and the improvement of the living conditions of the beneficiaries	2.1 Income-generating activities are practiced and products are promoted and sold, i.e. 2.1.1 The surplus cereal production (rice and corn) and the garden production (tomatoes, peppers, etc.), are processed for marketing 2.1.2 Credit lines dedicated to financing agricultural and other income generating activities are available from MFIs.	• The project will support the scaling up of farm-based pilots where these are producing surpluses and providing benefits to people, linking them to markets to improve returns. This bottom-up approach which rewards successes with economic benefits will be self-sustaining.
	2.2 Basic social infrastructure is realized for the project beneficiaries. i.e. 2.2.1 Construction of a mini-network of drinking water supply coupled with fountains and 1 borehole equipped + 1 mini network + 1 water tower + 3 fountains + solar pumping system 2.2.2 Three (3) latrines are built for the benefit of the beneficiary communities	
3 Capacity building, Environmental and Social Measures, and Knowledge Management	3.1 Local institutions and communities are more aware and climate change issues are better understood and taken into account in local development policies, i.e. 3.1.1 Capacity building programs are offered 3.1.2 The capacity of members of the Conflict Management Committee are strengthened in conflict management and awareness 3.1.3 Mandouri and Kpendjal populations are sensitized on the joint management of water resources 3.1.4 Mandouri and Kpendjal populations are sensitized on conflict management on pasture, crop production-livestock production conflicts, etc. 3.1.5 The environmental and social management plan is implemented and beneficiaries are aware and trained on the implementation of the ESMP and environmental monitoring (ecological and human health aspects, management of fertilizers and pesticides, etc.)	• The project will design innovative education and awareness materials that will be educational, desirable, and re-useable.
	3.2 Lessons learned from projects in progress at the national level are capitalized on and a system to disseminate the knowledge acquired in the project is implemented at the local level, i.e.	• Capacity building activities will use the Action Learning approach, which is tied to practical implementation. This will extend the reach of the project beyond its own activities, as all who participate will

Project Components	Expected Concrete Outputs	Sustainability measures
	3.2.1 A system of information sharing of knowledge related to climate change is implemented 3.2.1 Information, education and communication programs related to climate change and the achievements of the project are developed	be empowered to take climate change adaptation into their own work. • Providing platforms for lessons-sharing will catalyse learning, sharing and networking, investing in the development of a culture that supports adaptation. This will support learning beyond the project. • The local database will be handed over to the Ministry of Agriculture. This Ministry has the mandate to develop agriculture, livestock and hydraulics in Togo. The database will be integrated in its database to ensure an appropriate management of the database.

K. Provide an overview of the environmental and social impacts and risks identified as being relevant to the project

The ESIA carried out within the framework of the development of the project has identified some potential adverse environmental and social impacts as presented below. Despite the fact that these potential adverse impacts appear not to be significant as they are few in number, not widespread, reversible and can be mitigated, it should be noted that the project site of more than 100 hectares is located in a Sudanese climate region and adjacent to the sensitive Oti-Keran-Mandouri wildlife reserve. The Oti-Keran_Mandouri wildlife reserve is also categorised as a UNESCO Man and the Biosphere Reserve and is also a Ramsar site. Water uptake for the project, will be from the River Oti, about 3km NE of the project site. The water will then be transported via a buried pipe passing through the Oti-Keran-Mandouri reserve.

Project impacts were re-examined during the updating of the existing ESIA at the full proposal stage of the project in May-June 2017. Technical studies undertaken between 2012 and 2014 were also updated during the same period. Initially, the technical studies had as outputs 7 sub-sector reports including an agro-economic report, an ESIA report, a fisheries report, a hydrological report, a pedological report, a topographic report, a socio-economic report, and the design of main technical development report. The key areas re-visited in 2017 technical studies were the ESIA so as to incorporate the solar power component, and the design of the irrigation component.

Household representative were also interviewed, and their views sought on the solar powered irrigation project, and project activities, including desired crops to grow and assistance sought; and also on their social wellbeing . Rice was the number one crop in the project site followed by maize, cowpeas, sorghum and millet. Poultry and goats led in livestock production followed by cattle, sheep and donkeys. Malaria, eye infection, ulcers, toothache and pneumonia topped the diseases mentioned. Though most basic infrastructure is accessible in the project site (electricity, water, church, mosque, nursery and primary schools, chemist, dispensary, etc.), tertiary institutions, big markets for produce, public library, etc. are not available. Vegetable production is also scanty. Big markets for produce mentioned include Koundiare 22 km away, and Simou 17km. Issues raised concerning services and infrastructure included the need for improved social services, availability of drinking water, construction of a library, a youth centre for training and information and leisure, and a toilette.

The water uptake system will consist of a mixture GI and uPVC pipes for conveyance from the River Oti and distribution at the site. Since there is no open water channel through the wildlife reserve, there will be minimal disturbance to biodiversity, except for a little distraction when laying down the pipe. The buried pipe will also minimize on evaporation and also on water-borne disease vectors.

However, it was noted in the ESIA, that irrigation comes with potential negative impacts. These include the danger of over-abstraction from the River Oti, resulting in reduced water downstream. Irrigation can also potentially interfere with soil structure and also potentially cause salinization. In addition, use of agro-chemicals can result in pollution of water and soil. Eliminating the dry season gap and creating a wetter micro-climate can also result in increased pests and plant diseases. And the elimination of the natural vegetation will also result in a loss of biodiversity.

Potential social impacts of the project will include a population influx due to job attraction and agricultural production opportunities. Given the location of the project site this could even be international influx of people. With businesses and the proposed operations of the irrigation project, coupled with the increase in the influx of population, a tremendous rate of production of solid waste is expected. During the operating phase, the livestock in the area of the project could damage the crops in the irrigated area, resulting in conflicts. The increase of the population which results in the project area is likely to lead to many commercial activities in the region, with a potential increase of cases of insecurity. Malaria is already a concern in the area of the project. If not well managed, the irrigation project can increase waterborne diseases such as bilharzia and diarrhoea, among others. The increase in the growth of the population with the social change associate may also lead to communicable

diseases such as STDs, HIV / AIDS, etc.

Baseline data on flora and fauna indicate that, the Oti-Kera-Mandouri is today a pale shade of its former glory due to the socio-political disturbances that the country had in the 1990s. A few animals have been reported including the Kob (Kobus kobkob), the desert warthog (Phacochorus aethiopicus), teals and wild ducks. Although the natural reserve of Oti-Keran near does not have a lot of wildlife currently, the anticipated increase in the population could increase the anthropogenic pressure on the reserve.

Based on the above characteristics of the potential negative impacts, and, because of the size of the project and the significant potential impact of the water intake located in the sensitive Oti-Kera-Mandouri wildlife reserve, the project is classified in category A according to the standards of environmental safeguards of AF as well as BOAD's Environmental and Social Policy. In addition, based on principle 8 (Involuntary Resettlement) of AF environmental safeguards, the project will cause a temporary restriction of land use during the land preparation for agricultural purposes.

The site of the project is a grassy savannah in which we distinguish two strata of plants:

- a shrub layer, scanty and very poor in plant species. The few species encountered are: Lophinalanceolata, Piliostigmathonningii.
- a herbaceous layer, more abundant and dominated mainly by three species: Panicum maximum, Cyperussp, and Sporoboluspyramidalis.

Positive impacts of project implementation on the environment

The full implementation of the perimeter facilities, will have the following impacts:

- intensification of counter season crop and market gardening;
- strengthening producers' capacities and their overarching structures;
- jobs creation during the construction phase;
- increasing incomes of the population through the exploitation of the perimeter;
- Improvement of the local budget revenues by levying taxes (pickups aggregates, water abstraction, clearing taxes, operating taxes perimeter, etc.);
- strengthening health coverage through the construction of health infrastructure;
- improving access to drinking water;
- intensification of agriculture through application of technological packages;
- Intensification of livestock production by the use of crop residues (rice stalks, etc.).

Negative impacts of installation on the environment and their responses

Table 9: Environmental impacts and their mitigation

Domain	Issues	Responses
Social	• Cohabitation between Fulani stockbreeders and farmers;	• Conflict resolution committees for dialogue between farmers and Fulani stockbreeders
	• Increasing the phenomenon of immigration by the economic attraction of the zone	• Control of immigration by the village committee
	• The exacerbation of the conflicts between established groups	• Management by the village Committee and establishment of codes of conduct
	• Monopolization of the plots by the financial elites to the detriment of local populations not assignees of plots	• Establishment of Committee of plots attribution

Domain	Issues	Responses
	• Exacerbation of the land pressure	• Strict control of the zone of irrigation • Support with the organization and the territorial installation of the zone to avoid land speculation
	• Propagation of the HIV/AIDS by the arrival of the workers out of zone	• Awareness campaigns on health among the populations
	• Development of diseases related to the stagnation of water	• Awareness campaigns on health among the populations • The combined basin and furrow system of irrigation will limit the development of parasites along open water channels.
	• Influx of population	• Engagement of local administration • Resettlement plan
	• Crop Production - Livestock Conflicts	• Enclose the project area and the support of breeders in the construction of cattle pens • Formulation of a Conflict Resolution Mechanism
	• Micro-credit	• Offer affordable interest rates (< 18%.) • Offer reasonable loans (> USD 50). • partner MFIs should identify more members and form clusterization groups whereby they can identify dynamic markets and commercialize in a close and open circle all their produces. • Development of capacity for business analysis and risk taking, through training of both MFIs/cooperatives and the targeted community members • Avoid being isolated in its / their business operations mostly in their communities, by getting resourceful (useful) contacts and networks beyond their community. • Work hard to have certification of their products. This means, be more engaged in GAP (Good Agricultural Practices), therein they will be able to conquer internal and external markets.
Environmental	• Loss of vegetation when clearing for agriculture	• Spare as many standing trees as possible • Increase tree cover by planting green buffer zones and hedges • Cultures of horticultural trees and green spaces
	• Air pollution / Methane emissions / C02 / N20	• Controlled water regime to lessen methane production (i.e. in use of basin and furrow) • Practise low-input agriculture to reduce carbon footprint • Compost inputs for organic fertilizer (e.g. rice stalks) before use in farm plots
	• Destruction of biotopes in particular those of the birds	• Implementation of the Environmental and Social Management plan
	• Modification of soil structure	• good maintenance of the canal and irrigation infrastructure; • adoption of conservation and tearing tillage

Domain	Issues	Responses
		systems to control hardening and improve infiltration • Use of soil erosion control techniques which disperse erosive energy and avoid concentrating by providing good vegetative cover to disperse the energy of rain drops and contour drainage to slow down surface runoff,
	• Salinization	• Controlled water regime via use of improved irrigation technologies (basin and furrow) to increase the effectiveness
	• downstream water shortage	• To increase the availability of water, a storage tank is proposed as an alternative source for the project of the water of the water during the high flows for use during low flows • Abstraction guided by hydrological report
	• Water and soil pollution	• Implementation of ESMP • Safe storage and disposal of agro-chemicals must be observed
	• Seeds and Plant Diseases / Invasive Species	• reduction of inputs and release of nutrients (nitrogen and phosphorus) from cultivated fields • use of organic rather than chemical fertilizers to the extent possible. • Implementation of ESMP • Formulation of an Integrated Invasive Species' management Plan • Remove invasive species on detection
	• Carbon footprint	• Solar energy, a non-polluting source of energy, will be used for irrigation
	• Destruction of the soil and groundwater contamination by the pesticide residues and chemical fertilizers	• Implementation of the Environmental and Social Management plan • Development of a Fertilizer / Pesticide Integrated Management Plans at project inception • Support to develop the organic manure • Water quality monitoring
	• Reduction in the flow of River Oti	• Preliminary analyses of the capacities of sampling • Conservation of the ecological flow as per hydrological modelling
Climatic	• The planned integrated protective actions, measures and practices.	• Dimensioning of the works

Risks and dangers

Risks and hazards associated with project activities in all phases include:

- Minor accidents at construction phase;
- accidents related to the use of vehicles and trucks;
- contamination of water and soil by waste from the construction site during the construction phase and;
- transmission of STIs, HIV-AIDS and other communicable diseases, due to the influx of workers.

Analysis of project activities against the principles of the Adaptation Fund

Table 10: Project activities analysed against AF principles

Checklist of environmental and social principles as per AF Policy	Potential impacts and mitigation measures	No further assessment required for compliance	Further assessment and management required for compliance
Principle 1 : Compliance with the law	The project will comply with Togolese national law and possibly international when national standards are lacking, as described in Section E of Part I.		X The ESIA update ESIA update done (May-June 2017) has notably assessed and proposed mitigation for project impacts on natural habitat and biodiversity in the target area, as well as ensuring that relevant national permit requirements and international laws are respected.
Principle 2 : Access and Equity	The project will not impede access to basic health services, clean water and sanitation, energy, education, housing, safe and decent working conditions to any group of the population. The pressure on the distribution of land could be at the origin of conflicts. The Local Advisory Committee (LAC) as presented in Section A of Part III will notably ensure a fair and equitable access to the project benefits. Priority in loans and distribution of plots will be given to local villagers. This committee will also be in charge of settling conflicts. Further assessment will be carried out in order to mitigate discrimination and inequalities regarding access to micro-credit loans, taking into consideration the gender inequalities study.		X Vulnerability studies and stakeholder mapping done (May-June 2017), covering potential gender inequalities Vulnerability studies and stakeholder mapping done (May-June 2017), covering potential gender inequalities
Principle 3 : Marginalized and vulnerable groups	The project will not impose any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS. The poor, women, young, old will have the opportunity to improve their income and living conditions due to the project.	X	
Principle 4 : Human rights	The project does not have potential risks with regard to human rights The project area is not located on transhumance corridors defined by the Togolese authorities (as shown on map 2 at page 31).	X	

Checklist of environmental and social principles as per AF Policy	Potential impacts and mitigation measures	No further assessment required for compliance	Further assessment and management required for compliance
	Particular attention will be given during the implementation of the project on the management of conflicts (e.g. conflicts between farmers and herders). In case of conflicts between farmers and herders, the Local Advisory Committee will help to settle issues.		
Principle 5 : Gender Equity and Women's Empowerment	Women and men will be able to participate fully and equitably in the project and both will receive comparable social and economic benefits. Women's access to financial services will be strengthened notably through a preferential support that the project will provide to the existing women micro-finance. In addition, the project plans to assign a quota of plots to women and / or women's associations.		X Vulnerability studies and stakeholder mapping done (May-June 2017), covering potential gender inequalities.
Principle 6 : Core Labour Rights	The project will be managed with respect to the Togolese labour law which forbids forced labour, children's labour and discrimination, and which allows freedom of association.	X	
Principle 7 : Indigenous people	There is no indigenous peoples present in the project implementation area	N/A	
Principle 8 : Involuntary Resettlement	The project will not generate involuntary resettlement as there will not be physical displacement (relocation or loss of shelter) or permanent economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood). The beneficiaries of this project live together in the village. Some plots used currently for agricultural production areas will be temporarily disturbed during the construction works, and affected populations will be assigned temporary plots until the end of works.	X	

Checklist of environmental and social principles as per AF Policy	Potential impacts and mitigation measures	No further assessment required for compliance	Further assessment and management required for compliance
Principle 9 : protection Natural Habitats	The potential of the project to impact upon natural habitats is low, as the project area is located in a highly disturbed area where, for many years, local populations are settled and have been practicing agricultural production, although the position of the site is closed to the boundaries of a wildlife reserve. The Togolese government is in the process of declassifying a part of this reserve and redefines the boundaries of the wildlife Reserve.		X The ESIA update ESIA update done (May-June 2017) has notably assessed and proposed mitigation for project impacts on natural habitat and biodiversity in the target area as well as water extraction from River Oti through the Oti-Kera-Mandouri wildlife reserve; and the possible contribution of the project to local emissions.
Principle 10 : Conservation Biological Diversity	The project will not generate significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species. The project area has been exploited for many years and biological diversity is already low. The project will not significantly disrupt the current biodiversity. Reforestation activities in the project area will improve biodiversity. No invasive species will be introduced into the area, and the type of crops to be used in the project are those currently used.		X Additional technical studies done (May-June 2017) and the perimeter of the boundary of the 144 ha actualized, taking into considerations the Oti-Kera-Mandouri wildlife reserve. ESIA update done (May-June 2017) with and assessment and mitigation of project impacts on natural habitat and biodiversity in the target area as well as the water extraction from River Oti through the Oti-Kera reserve and the possible contribution of the project to local emission done.
Principle 11 : Climate Change	The project activities will not result in a significant or unjustified increase in greenhouse gas emissions or other drivers of climate change. The project will minimize the production of greenhouse gas by adopting solar energy instead of thermal power for pumping water from the River Oti and conduct it to the farm sites. Rice is the currently cultivated crop on the planned site for the project, using the natural seasonal flooding. The project will extend the currently exploited surfaces, but at the same time a better rationalization of the flooding of crops offset the expansion of rice fields and extra methane emissions from rice cultivation. Furthermore, plantations of shrubs and planned reforestation will capture CO_2 and capture surplus of greenhouse gases.	X	

Checklist of environmental and social principles as per AF Policy	Potential impacts and mitigation measures	No further assessment required for compliance	Further assessment and management required for compliance
Principle 12 : Pollution Prevention and Resources Efficiency	The project will maximize its energy efficiency by using solar energy instead of thermal power for pumping water. The combined basin and furrow irrigation system will allow real water savings by avoiding infiltration and evaporation during transportation and streamlining distribution. This system will minimize the use of water. All rice fields infrastructures are made from locally building materials. Inorganic amendments can be precisely distributed in the irrigation system, thus limiting to the quantities strictly necessary. For better pollution management, a pesticides management framework will be adapted at local level. Building local capacity to use organic manure will limit the use of chemical inputs and enable effective recycling of agricultural and livestock by-products in a circular ecology system.		X
Principle 13 : Public Health	The environmental and social impact assessment of the project has identified some potential health impacts of the project, mainly during the construction phase (e.g. impact of dust, noise, STD/AIDS propagation with the arrival of foreign workers to the zone). These impacts are subject to mitigation measures presented in the Environmental and Social Management Plan. The project also plans to build up the capacity of health services at the village level and improve access to potable water that will reduce water-borne diseases and improve hygiene. The choice of combined basin and furrow type of irrigation system will limit the development of waterborne parasites as there won't be any open water channels.	X	

Checklist of environmental and social principles as per AF Policy	Potential impacts and mitigation measures	No further assessment required for compliance	Further assessment and management required for compliance
<u>Principle 14</u> : Physical and Cultural Heritage	The project and its components are not in an area known to have physical cultural resources, cultural sites, and sites with unique natural values. In case of discovery of any cultural resources, the Togolese Ministry of Culture will be notified for further dispositions.	X	
<u>Principle 15</u> : Lands and Soil Conservation	Measures to prevent mitigate or control soil erosion and degradation will be implemented during the implementation of the project. For example, the project will include anti-erosion measures such as protection of banks of rice fields with shrubs that will prevent soil degradation. The project will also contribute to the restoration of soil fertility by promoting the use of organic manure instead of chemical fertilizers. The existing soils are in most cases already used for agricultural purposes, there will be no significant change on land use.	X	

PART III: IMPLEMENTATION ARRANGEMENTS

A. Describe the arrangements for project implementation.

Contracting authority and Promoter

The contracting authority of the project is the Government of Togo (GoT), represented by the Ministry of Environment and Forest Resources (MERF). The Executing Agency is appointed by the MERF or AF Focal Point. BOAD is obliged to contract the Executing Agency (EA)[34] appointed by the Government of Togo through the Adaptation Fund Focal Point. The EA reports to BOAD and coordinates all project activities.

Division of Responsibilities:

- **BOAD** is the **Implementing Agency (IA)** for this AF project. BOAD shall in its role of AF Implementing Agency as a Multilateral Implementing Entity (MIE) accredited by the Adaptation Fund Board, provide project oversight to ensure that AF policies and criteria are adhered to and that the project fully meets its objectives and achieves expected outcomes in an efficient and effective manner. It shall also in partnership with the Ministry of Environment and Forest Resources, Ministry of Agriculture, AGETUR and other key project partners engage in promoting the project to mobilize resources and create partnerships.
- Project supervision missions by the Task Manager shall constitute part of the project supervision plan. BOAD will perform the liaison function between Togo and the AF Secretariat and report on the progress against milestones outlined in the approval letter to the AF Secretariat. BOAD shall inform the AF Secretariat whenever there is a potentially substantive implementation change (i.e. one affecting the project objectives, the underlying concept, scale, scope, strategic priority, conformity with AF criteria, likelihood of project success, or outcome of the project). It shall rate, on an annual basis, progress in meeting project objectives, project implementation progress, risk, and quality of project monitoring and evaluation, and report to the AF Secretariat through the Project Implementation Review (PIR) report prepared by the Executing Agency (EA).

- **Africa Sustainability Centre (ASCENT) is the Executing Agency (EA)** In line with the relationship between the Ministry of Environment and Forest Resources (MERF) and ASCENT. ASCENT is the premier African sustainability think-tank providing solutions to foster innovation and interdependence in Africa.

  ASCENT will participate fully in the successful implementation of the Project and in close collaboration with BOAD in order to achieve all Project Objectives and in strict compliance with the budget lines. Under the direction of BOAD, ASCENT will be able to represent it where necessary, in accordance with the Protocol governing their relations. The Project Coordinator and more generally the project management unit are under the authority of the Executing Agency.
  The Executing Agency (EA) shall take responsibility to ensure that the project is implemented in accordance with the agreed objectives, activities and budget and deliver the outputs and demonstrate its best efforts in achieving the project outcomes. For that purpose the EA will sign a MOU with the relevant national stakeholders.

  ASCENT will also advise all stakeholders including the PSC in line with institutional capacity development.

- **AGETUR Togo** will assist the contracting authority in the implementation of the engineering activities.

[34] The Government of Togo has appointed an Executing Agency who will have a contract with BOAD to execute it on BOAD's behalf

The management setup of the project will comprise of the following bodies: -

A national Project Steering Committee (PSC) responsible for the strategic direction, monitoring and supervision of the implementation of the project will be established to oversee the AF agricultural resilience project in Togo. As an indication, the PSC will consist of:

Members

- Minister of MERF or representative (Chair)
- AF – Operational Focal Point (OFP);
- Representative of farmers organisation
- GEF Operational Focal Point
- Representative of the AGETUR
- Ministry of Agriculture, Livestock and Water (MAEH);
- A representative of each of these ministries:
    - Ministry of Territorial Administration and Decentralization and Local Government to involve local administrative officials in assisting beneficiary communities
    - Ministry of Economy and Finance (MEF);
    - Ministry of Development Planning (MPD);
    - Ministry of Social Action, Advancement of Women and Literacy (MASPFA);
    - Ministry of Commerce, Industry, Promotion of the private sector and Tourism;
- Representative of the Private Sector, elected by peers
- Project Coordinator (as rapporteur);
- Executing Agency as appointed by BOAD
- Two representatives of civil society chosen by the stakeholder platforms to be established in the project area
- Representative of researchers

The Project Steering Committee (PSC) will be chaired by MERF, and will meet twice a year, or extraordinarily as may be warranted to from time to time. The Steering Committee is composed of representatives of key stakeholders. The NSC provides general supervision, guidance, inter-sectoral coordination and monitoring of compliance of project activities with national sector policies and strategies. The two times a year meetings are to review and approve the Work Programmes and Annual Budgets and the activity reports and audit of Project accounts. The PSC reports to the President of the CPP, the Minister of the Environment and the BOAD.

The roles of the PSC include:

a. Provide overall guidance and ensure coordination between all parties;
b. Provide monitoring of project implementation progress;
c. Review and adopt the annual work plans and budgets prepared by the Project Coordinator and Technical Adviser, in conformity with the project objectives and subject to the rules of AF and BOAD;
d. Review the biannual progress reports to be prepared by Project Coordinator and oversee the implementation of corrective actions, when necessary;
e. Enhance synergy between the AF project and other initiatives being implemented in the project areas; and
f. Provide advice on policy and strategic issues to be taken into account during project implementation.

INTERNAL MANAGEMENT STRUCTURE

A Project Management Unit (PMU): The Executing Agency (EA) will create a PMU which will be responsible for project implementation. The PMU will be lodged in the city of Dapaong. The management of the project will be provided by the Project Management Unit equipped with an administrative and financial autonomy. This Unit will be headed by a Project Coordinator who meets the requirements set out in the TORs appointed by EA, approved by the PSC, and assisted by a Financial Manager / Project accountant as well as a Rural Development expert- Agronomist/agricultural engineer and a Monitoring, Evaluation and learning expert to work to follow on technical activities and

to document and promote the project's evidence to a wider audience.

The Project Coordinator will provide overall direction for contractual, technical and administrative aspects of the project, in accordance with annual work plans and budgets adopted by the Project Steering Committee. The Project Coordinator, who will respond to the EA, will be responsible for day-to-day operational and administrative aspects of the project within the Project Area and for ensuring the achievement of project outcomes, the delivery of project outputs and the realization of project activities and expenditures in accordance with the Annual Work Plans and Budgets (AWPBs) approved by the Project Steering Committee. The Project Coordinator will lead the development of the project M&E plan to be adopted by the PSC.

Individual roles:
- Project Coordinator
- Rural development expert- Agronomist/agricultural engineer
- Environmental officer
- M, E & Learning Expert
- Financial Management Officer/Project Accountant (locally recruited).
- An expert in procurement
- Driver (ideally a Ministry Staff).

The internal management roles are further elaborated in **Annex 6 - Consultants to be hired for the project.**

- **The Project Coordinator** and the Financial Management Officer/Accountant will be recruited competitively by a joint selection committee whose members are representatives of ASCENT, BOAD and 1 or 2 identified key stakeholders. (MERF?).

- **MERF – EA – AGETUR Tripartite quarterly coordination Process**: A quarterly coordination meeting is established between the 3 agencies to ensure that the project is delivering as planned but most importantly delivering according to the national project objective and in line with the deliverables agreed between the 3 entities. This meeting will provide corrective measures as necessary in consultation with BOAD. The EA may represent either by its Chairman or the Project Coordinator. The 3 institutions can also conduct joint monitoring of project activities.

- **Fiduciary responsibilities:** The financial management and procurement responsibilities will be defined by the provisions of the Project Coordination Agreement (PCA) between BOAD and the Executing Agency (ASCENT). The BOAD ensures that procurement and accounting of funds and equipment is carried out in accordance with the procedures and agreements in force between the executing agency and the BOAD.

- **ASCENT** through the Project Coordinator will be jointly responsible for ensuring that procurement, and accounting for project funds are conducted in accordance with national executing agency (EA) procedures and agreement signed with BOAD.

Technical Committee (TC)

The Technical Committee (TC) includes representatives of major technical bodies involved in the implementation of the project. The Technical Committee provides technical monitoring of the implementation of project activities and make recommendations to improve project implementation and report to the Project Steering Committee. It includes representatives of the MERF, AGETUR, MEF, the Ministry of Agriculture, Livestock and Water (MAEH), ANGE, MFIs and their support structures and control (CASIMEC and APIM), local relay Agencies (RLA).
To implement the project, the TC will be expanded to Promotion Agency of the SME Guarantee and Financing / PMI (ANPGF). The TC is chaired by the AGETUR.

EXTERNAL STRUCTURE

- **Collaboration with other projects:** The project has been prepared, and will be implemented, in close coordination with other projects working in the area. Coordination with other key projects by the relevant ministries will be achieved at the Steering Committee Meetings and by holding regular technical coordination meetings to ensure administrative efficiency, streamlining of budgeted annual work-plans and close coordination of activities. The project will establish a technical working group on specific thematic issues and the Steering Committee will guide the project team in choosing the appropriate

- **Engagement of local CSOs, Service Providers and Private Sector.** Many CSOs, service providers and private sector actors are active in the Project area although there are only one or two active around some of the PAs. They are key implementing partners for activities. The PMU will engage the services of CSOs / service providers and the private sector as needs arise. The Project will "contract" CSOs / local service providers / private sector to support local community groups to implement agreed activities on the ground. ASCENT will negotiate Conventions with these organizations / service providers using procedures adopted in the PSC.

- **Engagement with local stakeholders:**
  At local level, various stakeholders groups will play important role in the project execution. These include among others:

  - **Community based organizations (CBOs)**

  These are various local organizations in the project region whose role is important in the social balance of the communities. Under the project, their role will be to:

  a. Bring together the social conditions for the execution of the project in their respective localities and offer to draft a framework for dialogue and Community Exchange.
  b. Create a basis for commercialising smallholder farming to run agro-based businesses
  c. Contribute to the resolution of possible conflicts in the context of the implementation of the project
  d. Help the beneficiaries of the project in decision-making activities

  - **Youth groups**

  These groups will play an important role in project activities. They will specifically:

  a. Contribute to the planning of activities targeting the youths particularly components 2 and 3.
  b. Stimulate and encourage the participation of youth in capacity-building and knowledge sharing sessions.
  c. Participate in the follow-up of the activities of the project and collection of necessary information related to youth involvement in the project
  d. The management of assets, equitable access to community facilities acquired or installed through the project.

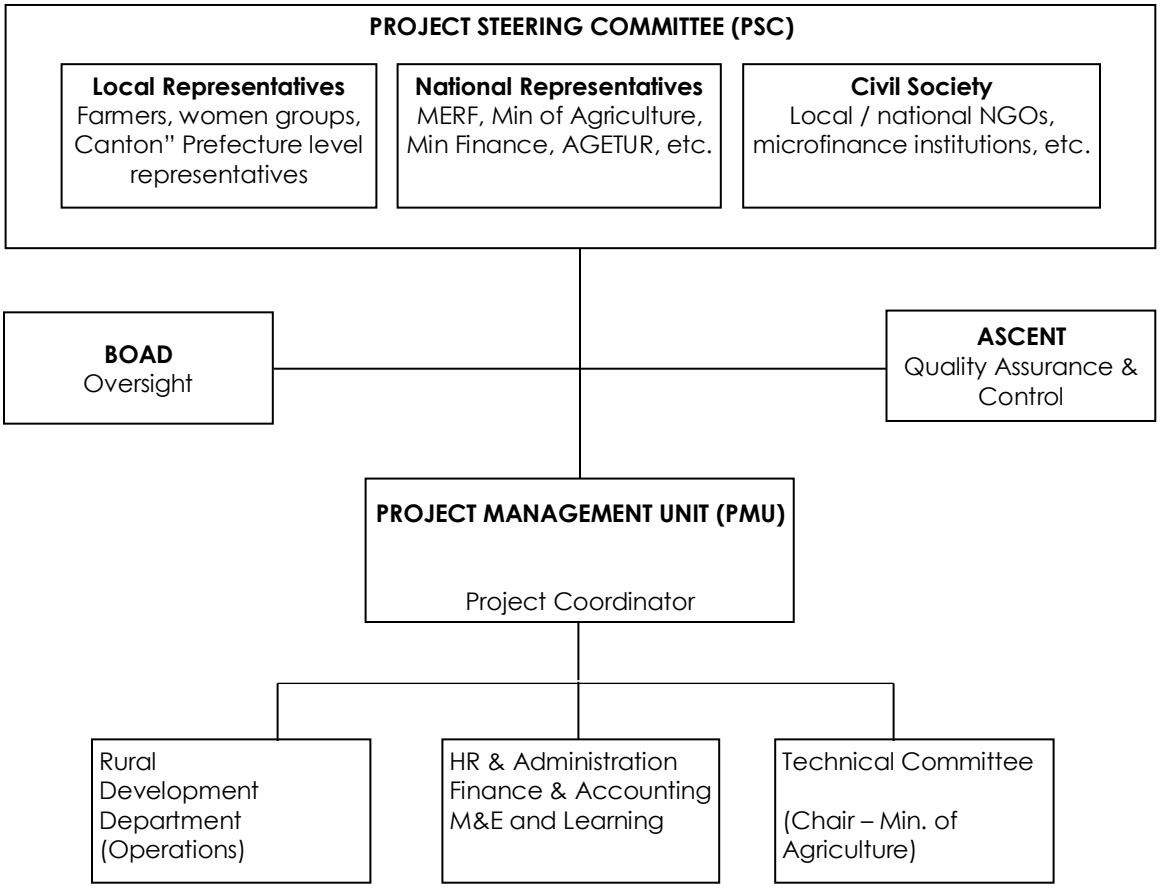
  - **Organised women groups:**

  These groups will be important in ensure that the activities designed for women of properly carried out and the expected results are fully achieved. Their role will be specifically to:

  a. Contribute to activities for women by ensuring equitable membership and participation of women in organised groups and the participation of these groups the activities to be performed.
  b. Stimulate and encourage the participation of women in capacity-building, business development and knowledge sharing programmes and sessions. For this purpose women's groups will participate in the diagnosis leading to the identification and evaluation of their training needs in order to effectively design appropriate capacity-building programmes.
  c. Participate in the follow-up of the activities of the project through their availability to collect and provide the necessary information related to women and the project activities in which they are involved

d. The management of assets, equitable access to community facilities acquired with the project. These groups of women will be adequately trained to do so.

Fig. 7: Project organizational structure



- **Coordination:** The following components will require close coordination with other Ministries, Projects and partner organizations. The relationship between the GEF Project and these partners will be governed by Memorandums of Understanding (MoUs) to be negotiated during Project Inception phase.

  During implementation, ASCENT will draft MoUs for the implementation of the various sub-components listed above where BOAD/AF project intends to collaborate with other partners (as identified above) and negotiate with identified partners as required.

OVERSIGHT MECHANISM

The project Steering Committee will receive periodic reports on progress and will make recommendations to BOAD concerning the need to revise any aspects of the Results Framework or the M&E plan.

Project oversight to ensure that the project meets BOAD and AF policies and procedures is the responsibility to the Task Manager in BOAD-DEFIC. The Task Manager will also review the quality of draft project outputs, provide feedback to the project partners, and establish peer review procedures to

ensure adequate quality of scientific and technical outputs and publications.

Details of Project Monitoring & Evaluation, including external evaluations are provided in various other sections.

A national technical planning workshop will be organized once a year, prior to the first session of the Project steering Committee. This workshop will bring together all actors involved in the technical implementation of the project.

PMU Launching of tender documents
This involves the preparation, approval and launching of Tender Documents. Given the specificity of equipment, implements and of installation, work will be done by the PMU. During this stage, the PMU will select, in accordance with the regulations in force in Togo and procedures of AF and BOAD, companies for the acquisition of equipment, development work and accompanying infrastructure. To ensure the quality of work and guarantee the operation of equipment, the Technical Committee will comprise consulting engineers to be recruited by the project. Within the framework of the project the irrigation equipment (semi-California channel network, solar panels and accessories), the surface preparation of land, the planting as well as monitoring and supervision of works are fully covered. Component 2 and 3 covers enabling of farmers to commercialise and diversify agricultural practices. An aspect of creating a framework for MFI arrangement is also factored with seed capital availed by the project to specifically offer credit to smallholder farmers.

Implementation of the Project
The perimeters and hydraulic work arrangements will be performed by selected companies. The training will be provided by the competent technical services and/or by external service providers. The other operations (reforestation, IGA of women, institutional support) will be carried out by the Project Management Unit with, if necessary, the support of local technical services (water and forestry services, rural engineering, hydraulics in particular) on the basis of memoranda of understanding. Short-term loans will be made by financial institutions present in the area on their own resources, with, if necessary, the contribution of the beneficiaries of the project. The investments, including the rehabilitated and developed areas, will be given to beneficiary organizations which will be organized for their operation with the support of competent technical consulting services for their care and maintenance. A network of craftsmen maintainers will be set up at each administrative area concerned in order to ensure the monitoring and maintenance of solar equipment.

Roles and stakeholders' interventions

- The Ministry of Environment and Forest Resources (MERF) through the Directorate of Environment and Forestry Resources and the National Agency of Environmental Management (ANGE) ensure the effective implementation of the project, environmental monitoring, the analysis of environmental parameters and the implementation of the environmental and social management Plan (ESMP). The Ministry also has the AF FP, and is a member of both the PSC and TC.

- The Ministry of Mines and Energy (MME), will speak through its Directions notably through the Directorate General of Energy (DGE), the Electric Power Company of Togo (CEET) and the Sector Regulator Energy (ARSE). These agencies will be involved in ensuring conformity and standards of the power infrastructure set up by the project for both electrification and water pumping.

- The Ministry of Economy and Finance (MEF) will assist in the establishment and operationalisation of financial mechanisms and incentives, as well as domestic banks. It will also intervene in the context of the monitoring of decentralized financial systems (SFD) through the Support Unit and Mutual Institutions Monitoring and Savings and Credit Cooperatives (CAS-IMEC) whose mission is to supervise and control the SFD. It will also help to support and facilitate the financing of businesses through the National Agency for the promotion and guarantee of funding for SMEs and SMIs (ANPGF).

- The Ministry of Agriculture, Livestock and Water (MAEH) will participate in ensuring agricultural practices are in accordance with the policy. The implementation of construction of the elaborate irrigation and water supply systems as well pesticide and fertiliser usage also falls under this Ministry. A member of the CT.

- The Ministry of Development Planning (MPD) will participate in the program through its Regional Directorates and the Directorate General of Statistics and National Accounting (DGSCN) that intervene in the monitoring and evaluation system through the realization of starting investigations , mid-term and end of execution;

- The Ministry of Social Action, Advancement of Women and Literacy (MASPFA) intervene for the integration of gender aspects and functional literacy beneficiaries through the Directorate of Literacy and non-formal education (DAENF).

- The Ministry of Commerce, Industry, Promotion of the private sector and Tourism will participate in the program by promoting private sector development mechanisms. A member of the PSC.

- Domestic banks and micro-finance institutions participate in the implementation of measures facilitating access to credit for businesses, youth and economic interest groups.

The beneficiaries will participate in the design and implementation of the project.

B. Describe the measures for financial and project risk management.

Financial and project risks measures will be assessed as an on-going process throughout the implementation of the project. The primary financial, project and institutional risks, their significance and associated response measures are described in Table 11.

Table 11: Financial, project and institutional risks.

Risks		Degree of perception	Measures
FINANCIAL	Ineffective management of project funds affects project implementation.	Low	A Financial and Admin officer will be appointed to strengthen the PMU, and ensure appropriate management of project funds. In addition, RIE oversight audits and EE quality control will ensure that there is no ineffective use of project funds.
	Delays in the disbursement of funds, procurement and institutional inefficiencies (e.g. lengthy approval processes result in delayed recruitment of staff and delayed project implementation.	Low	The RIE and PMU will work closely to ensure optimum conditions for timely disbursement of funds, contracting, monitoring and financial reporting. The Project Coordinator and the Financial and Admin officer will develop and regularly update a Procurement Plan in line with BOAD guidelines. Key project staff will be in place prior to the project inception meeting.
	Fluctuations in exchange rate (USD - F CFA) which could affect the funding available for implementation and lead to budgetary constraints.	Medium	The Financial and Admin officer to closely monitor USD – F CFA exchange rate and communicate any implications to the Project Coordinator, for adaptive project management. The PMU and UMDM officials will collaborate closely with the RIE should exchange rates fluctuate to the extent that budget reallocations are required.
	Difficult access to credit inputs supply	Low	The project will introduce a guarantee fund for loans to farmers to facilitate their access to finance. Moreover, capacity management capabilities and financial planning will improve monitoring and repayment of loans. The project will also ensure a sustainable supply of inputs to farmers.
	Insufficient training in financial management	Middle	The project will implement measures to strengthen capacities of actors in the areas identified for improving knowledge and good practices.
PROJECT	Non acceptance or non-support of the project by the population	Low	The project was designed on the basis of a consultation of the concerned population and the identification of their different needs. All the project activities and the work plan of the PMU will be defined by a committee composed of local authorities, NGOs and population representative.
	Insufficient training in water management and farming techniques.	Middle	The project will implement measures to strengthen capacities of actors in the areas identified for improving knowledge and good practices.
	Climate risk	Middle	The main climate risk that could have an impact on these investments is flooding. To avoid this risk, the warehouse will be built out of a flood zone and will respect the climate norms in terms of orientation, airflow, moisture. The same observations are valid for the parking station of agricultural equipment. In addition, site dedicated to rice farming is not located in the river bed and the main irrigation facilities will be buried; everything will be thought, done, and built taking into consideration the risk of flooding.

	Failure to involve adequate representation of vulnerable communities, particularly women, and therefore failure to create ownership of the project at the community level at project sites.	Low	The project will avoid a "top down" approach and create community ownership of the project interventions by building the capacity of community members at an early stage in the project. Engagement and capacity building will adopt a gender-sensitive approach. The development of detailed implementation plans will be undertaken in a participatory manner, encouraging input from all community members, including women.
INSTITUTIONAL	Lack of awareness of communities and stakeholders on climate change and its potential impacts	Low	The project will conduct awareness activities on climate change issues and strengthen the capacity of stakeholders on adaptation and mitigation and their impacts. This activity will involve all the beneficiary communities.
	Low capacity, awareness and acceptance on tackling climate change impacts among key stakeholders will limit the support for the project and also the likelihood of project outputs being mainstreamed into plans and budgets.	Low	The project includes a capacity building programme for project beneficiaries, local elected officials in the region, officials of local institutions, etc. on the importance of mainstreaming adaptation responses into planning, budgeting and policy development processes.
	Poor coordination with other climate change projects in the Prefecture / Country limits the potential to learn from and build on the experiences of related projects.	Low	The relevant institutions will be invited to the inception workshop, and the PMU and Mandouri community, with assistance from the EE where necessary, will facilitate the signing of the required data sharing agreements at the inception phase of the project.
	Limited capacity of project partners to coordinate and deliver project outputs.		Project partners all have experience in coordinating, implementing and delivering outputs in their relevant spheres of expertise, as demonstrated by the successful implementation of previous projects. Additionally, the NIE will play an oversight role, providing further expertise if required.

C. Describe the measures for environmental and social risk management, in line with the Environmental and Social Policy and Gender Policy of the Adaptation Fund.

Based on a screening against the stipulated principles in the AF ESP, the project is adjudged to be a Category A i.e. a project likely to have significant adverse environmental or social impacts that are for example diverse, widespread, or irreversible. Indeed, the project is anticipated to have numerous economic, social and environmental benefits (see Section II.B for a summary of such benefits).

Based on the above characteristics of the potential negative impacts, and, because of the size of the project and the significant potential impact of the water intake located in the sensitive Oti-Kera-Mandouri wildlife reserve, the project is classified in category A according to the standards of environmental safeguards of AF as well as BOAD's Environmental and Social Policy. In addition, based on principle 8 (Involuntary Resettlement) of AF environmental safeguards, the project will cause a temporary restriction of land use during the land preparation for agricultural purposes.

An Environmental and Social Risk Management Plan has been described in **Part II. Component 3. Expected concrete output 1: local institutions and communities are more aware and climate change issues are better understood and taken into account in local development policies to ensure that risks are avoided**, and that, where this is not the case, they are timely detected and appropriately mitigated; and that all positive impacts are enhanced.

An Environmental and Social Risk Management Plan has been developed (see **Annex V**) to ensure that risks are avoided, and that, where this is not the case, they are timeously detected and appropriately mitigated.

D. Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan, in compliance with the ESP and the Gender Policy of the Adaptation Fund.

The project will be monitored through the following M&E activities.

Project start:
A Project Inception Workshop will be held within the first 2 months of project start with those with assigned roles in the project organization structure, BOAD and where appropriate/feasible regional technical policy and programme advisors as well as other stakeholders. The Inception Workshop is crucial to building ownership for the project results and to plan the first year annual work plan.

The Inception Workshop should address a number of key issues including:
a. Assist all partners to fully understand and take ownership of the project. Detail the roles, support services and complementary responsibilities of BOAD staff vis-à-vis the project team. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff will be discussed again as needed.
b. Based on the project results framework and the relevant AF M&E tools if appropriate, finalize the first annual work plan. Review and agree on the indicators, targets and their means of verification, and recheck assumptions and risks.
c. Provide a detailed overview of reporting, monitoring and evaluation (M&E) requirements. The Monitoring and Evaluation work plan and budget should be agreed and scheduled.
d. Discuss financial reporting procedures and obligations, and arrangements for annual audit.
e. Plan and schedule Project Board meetings. Roles and responsibilities of all project organization structures should be clarified and meetings planned. The first PSC meeting should be held within the first 12 months following the inception workshop.

An Inception Workshop report is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting.

Periodic Monitoring through site visits:
BOAD will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the PSC may also join these visits. A Field Visit Report/BTOR will be prepared by BOAD and will be circulated no less than one month after the visit to the project team and PMC members.

Mid-term of project cycle:
The project will undergo an independent Mid-Term Review at the mid-point of project implementation. The Mid-Term Review will determine progress being made toward the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, terms of reference and timing of the Mid-Term Review will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-Term Review will be prepared by BOAD based on guidance from the AF. The management response and the evaluation will be uploaded to BOAD corporate systems. The relevant AF M&E tools will also be completed during the Mid-Term Review cycle.

End of Project:
An independent Final Evaluation will take place three months prior to the final Project Board meeting and will be undertaken in accordance with BOAD and AF guidance. The final evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the Mid-Term Review, if any such correction took place). The final evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental

benefits/goals. The Terms of Reference for this evaluation will be prepared by BOAD based on guidance from the AF.

The Terminal Evaluation should also provide recommendations for follow-up activities and requires a management response which should be prepared.

The relevant AF M&E tools will also be completed during the final evaluation.
During the last three months, the project team will prepare the Project Terminal Report. This comprehensive report will summarize the results achieved (objectives, outcomes, outputs), lessons learned, problems met and areas where results may not have been achieved. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's results.

Learning and knowledge sharing:
Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums.

The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation though lessons learned. The project will identify, analyse, and share lessons learned that might be beneficial in the design and implementation of similar future projects.

Finally, there will be a two-way flow of information between this project and other projects of a similar focus.

Audit Clause:
The project audit will be conducted in accordance with applicable BOAD audit policies.

The costs associated with implementing the M&E system are detailed below.

Table 12: Budgeted M&E system

Task	Responsible parties	Timeframe	Budget US$
Inception workshop and Report	Project coordinator, BOAD	Within the first 1 month after project start up	5,000
Monitoring project site visits	Project Coordinator; PSC representatives	Twice per year (in rainy and dry periods)	50,000
Quarterly progress / status reports	Project coordinator	End of each quarter	None
Annual progress reports (Annual Project Review – APR / Project Implementation Reports - PIR)	Project coordinator, BOAD	End of each year	5,000
Meetings of the Project Steering Committee (PSC)		Every 6 months	25,000
Mid-term Evaluation (MTE)	Project Coordinator; Technical Adviser; BOAD; External evaluation team (international and national consultants).	Mid-point of project implementation	25,000

Task	Responsible parties	Timeframe	Budget US$
Final Evaluation (FE)	Project Coordinator; Technical Adviser; BOAD; External evaluation team (international and national consultants).	At least 3 months after end of project implementation	25,000
Project Terminal Report	Project Coordinator; Technical Adviser; BOAD	At least 3 months after end of the project	None
Learning and knowledge sharing (Project publication, publicizing in scientific workshops, etc.)	Project coordinator; M&E and Learning officer	After year one	20,000
Financial audit	Project coordinator, BOAD	End of project	15,000
TOTAL COST			**175,000**

E. Include a results framework for the project proposal, including milestones, targets and indicators.

Table 13: Results framework, milestones, targets and indicators

Project Objective(s)	Indicator(s)	Baseline	Target	Means of verification
To improve the level of resilience of vulnerable actors in the agricultural sector in Mandouri (Savannah Region) by developing water management and irrigation technologies that reduce dependence on rainfall for agricultural production.	Number of people with reduced risk to climate change-driven floods, fires and drought, as a result of project interventions.	0 women and 0 men.	Direct beneficiaries: 2,880 rural population (48% men, 52 % women); Other beneficiaries: 5,203 urban population (Mandouri town)	Review of project training and implementation material; gender-sensitive field surveys undertaken with representative populations of the target areas.
		87.4% vulnerability	Lower vulnerability value	
Component 1: Improved planning and management of water resources and (agricultural) production				
Outcome 1.0: Improvement of food self-sufficiency and sustainable management of land through better water management for agricultural production	Increase in yield from farms and home gardens as a result of project interventions.	Average of 1-2 t/ha for cereals from current farms in project area. Average of 0.5 – 1t/ ha for pea family	Between 6 t/ha to 10 t/ha for rice from climate resilient farms in project area; and over 2 t/ha for the pea family.	Crop sampling/analysis from representative farms / community gardens in the target areas.
	Increase in access to markets for Mandouri farmers as a result of project interventions.	0 access to markets for farmers	50-100 % increase in access to markets for farmers in Mandouri.	Gender-sensitive field surveys undertaken with representative populations of Mandouri
Output 1.1: construction of the semi combined basin and furrow irrigation system on 144 hectares of land powered by solar.	Area of farms/community land in target areas in which climate-resilient project interventions are being implemented	0 ha.	144 ha	Gender-sensitive field surveys undertaken on representative populations of the project site / area. Field inspections
	Number of small scale farmers in target areas benefitting from climate resilient agricultural practices Introduced through the project.	0	Direct beneficiaries - 576 farmer households or 2,880 people Mandouri town residents (5,203 people)	
Output 1.2: production yields improved through mechanized means of production and improved agricultural practices	Area of project site under irrigation in the dry season	0 ha	144 ha	Gender-sensitive field surveys undertaken on representative populations of the project site / area. Field inspections
	No of households with improved livestock production	0 (minimal)	576 farmer households	
Component 2: Support for the diversification of livelihoods and the improvement of the living conditions of the beneficiaries				

Project Objective(s)	Indicator(s)	Baseline	Target	Means of verification
Outcome 2.0: Increased resilience of producers through the promotion of new income-generating activities, improvement of their income, and improvement of the living conditions of the beneficiary population through: - Improved availability of potable water for consumption - Improved sanitation of the city of Mandouri Reduction of water-borne diseases	Percentage of population living above the poverty line ($ 2 per day) (90.5% poverty incidence for the Savanna region)	0	576 farmer households	Gender-sensitive income and livelihood survey undertaken on representative populations of the project site / area.
Output 2.1: Income-Generating Activities (IGAs) are practiced and the products are promoted and sold	No of households with IGA activities	0 (minimal)	576 farmer households	
Output 2.2: Strengthening of the financial management of cooperatives and beneficiaries and maintenance of engineering equipment	No of cooperatives with credit facilities	0 (minimal)	3 Cooperatives are boosted (to administer project credit fund)	Gender-sensitive field surveys undertaken on representative populations of the project area.
	Community members / groups trained on book-keeping, and access to credit	0 (minimal)	At least: 3 women groups; 3 men groups; 3 youth groups are trained on credit outlets and management	
	No of community members trained as technicians	0 (minimal)	20 Technicians are trained on maintenance of equipment	
Output 2.3: basic social infrastructures are realized for the beneficiaries	No of households with access to potable water connection	0 (minimal) households {6.0% of Mandouri canton rate of access}	1 Mini water supply network consisting of equipped drilling; solar powered	Gender-sensitive field surveys undertaken on representative populations of the project area.
	No of household / population with access to modern toilets	0 communal modern latrines in Mandouri	3 latrines to improve sanitation at the village level.	
	No of bread making outlets in the project area	0 (minimal)	1 large communal bakery powered by solar	
Component 3: Capacity building, environmental and social measures and knowledge management				
Outcome 3.0: Improved knowledge of stakeholders (public, local elected officials in the region, officials of local institutions, etc.) for the building of the resilience to climate change and the prevention and management of environmental and social risks	Percentage of community members in target area with increased awareness as a result of the project, of climate change adaptation and options to enhance climate resilience.	0 beneficiaries trained.	80 % (for both women and men) of beneficiaries with increased knowledge on climate change adaptation and options to enhance climate resilience.	Pre-training and end-of project assessment of representative sample of project beneficiaries

Project Objective(s)	Indicator(s)	Baseline	Target	Means of verification
Output 3.1: local institutions and communities are more aware and climate change issues are better understood and taken into account in local development policies	Number of project beneficiaries trained on climate change adaptation and options to enhance climate resilience.	0 beneficiaries trained.	At least: Community leaders – 10 Women groups – 5 Men groups – 5 Youth groups – 5 trained	Review of learning material; Summary reports from training experts.
	Percentage of beneficiaries with improved knowledge of climate change adaptation and options to enhance climate resilience.	No improvement in knowledge.	Training workshop certificates issued	Review the certificates
	Manuals and toolkits on different aspect of irrigated irrigation, crop production, livestock production and human health produced	0 manuals and toolkits	Manuals on – Phytosanitary chemicals' use Irrigation and vector borne diseases Pests and invasive weeds, etc.	Gender-sensitive field surveys undertaken on representative populations of the project area.
Output 3.2: lessons learned from projects in progress at national level are capitalized and a system to disseminate the knowledge acquired in the project is implemented at the local level	Number of platforms to share project outputs and experiences.	0 platforms.	At least: 8 reflection workshops; 3 learning exchanges; and 3 conferences.	Review of proceedings/summary reports from reflection workshops, learning exchanges and conferences.
	Number of national policy conferences and scaling up workshops based on project lessons learned.	0 conferences or scaling up workshops.	At least: 3 national policy conferences; and 3 scaling up workshops.	Review of proceedings/summary reports from reflection workshops and conferences.

F. Demonstrate how the project aligns with the Results Framework of the Adaptation Fund

The project will be in harmony with the Strategic Results Framework of AF, whose general purpose is to "**assist developing country Parties to the Kyoto Protocol that are particularly vulnerable to the adverse effects of climate change in meeting the costs of projects and concrete adaptation programs to implement resilient to climate change**."

Table 14: Alignment of results framework to Adaptation Fund

Project Objective(s)[35]	Project Objective Indicator(s)	Fund Outcome	Fund Outcome Indicator	Grant Amount(USD)
The overall objective of the project is to improve the level of resilience of vulnerable actors in the agricultural sector in Togo and in particularly in Mandouri (Savannah Region) by developing water management and irrigation technologies that reduce dependence on rainfall for agricultural production.	Number of people with reduced risk to climate change-driven floods, storms, fires and drought, as a result of project interventions.	Outcome 1: Reduced exposure at national level to climate-related hazards and threats	1. Relevant threat and hazard information generated and disseminated to stakeholders on a timely basis	10,000,000
		Outcome 2: Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	2.1. No. and type of targeted institutions with increased capacity to minimize exposure to climate	
			2.2. Number of people with reduced risk to extreme weather events	
		Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	4.1. Development sectors' services responsive to evolving needs from changing and variable climate 4.2. Physical infrastructure improved to withstand climate change and variability-induced stress	
			4.2. Development sectors' services responsive to evolving needs from changing and variable climate 4.2. Physical infrastructure improved to withstand climate change and variability-induced stress	

[35]The AF utilized OECD/DAC terminology for its results framework. Project proponents may use different terminology but the overall principle should still apply.

		Outcome 5: Increased ecosystem resilience in response to climate change and variability-induced stress	5. Ecosystem services and natural assets maintained or improved under climate change and variability-induced stress	
		Outcome 6: Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas	6.1 Percentage of households and communities having more secure (increased) access to livelihood assets	
			6.2. Percentage of targeted population with sustained climate-resilient livelihoods	
Project Outcome(s)	**Project Outcome Indicator(s)**	**Fund Output**	**Fund Output Indicator**	**Grant Amount (USD)**
Improvement of food self-sufficiency and sustainable management of land through better water management for agricultural production	Increase in yield from farms and home gardens as a result of project interventions.	Output 1: Risk and vulnerability assessments conducted and updated at a national level 1.1.	No. and type of projects that conduct and update risk and vulnerability assessments	5,000,000
		Output 4: Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.1. No. and type of health or social infrastructure developed or modified to respond to new conditions resulting from climate variability and change (by type)	
			4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	
		Output 5: Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	5.1. No. and type of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type of assets)	
		Output 6: Targeted individual and community livelihood strategies strengthened in relation to	6.1.1.No. and type of adaptation assets (physical as well as knowledge) created in support of individual or	

		climate change impacts, including variability	community-livelihood strategies	
			6.1.2. Type of income sources for households generated under climate change scenario	
	Increase in access to markets for Mandouri farmers as a result of project interventions.	Output 4: Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.1. No. and type of health or social infrastructure developed or modified to respond to new conditions resulting from climate variability and change (by type)	
			4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	
		Output 5: Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	5.1. No. and type of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type of assets)	
Increased resilience of producers through the promotion of new income-generating activities, improvement of their income, and improvement of the living conditions of the beneficiary population through: - Improved availability of potable water for consumption - Improved sanitation of the city of Mandouri - Reduction of water-borne diseases	Percentage of population living above the poverty line ($ 2 per day) (90.5% poverty incidence for the Savanna region)	Output 6: Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.1.1.No. and type of adaptation assets (physical as well as knowledge) created in support of individual or community-livelihood strategies	2,150,000
			6.1.2. Type of income sources for households generated under climate change scenario	
Improved knowledge of stakeholders (public, local elected officials in the region, officials of local institutions, etc.) for the building of the resilience to climate change and the prevention and management of environmental and social risks	Percentage of community members in target area with increased awareness as a result of the project, of climate change adaptation and options to enhance climate resilience.	Output 3: Targeted population groups participating in adaptation and risk reduction awareness activities	3.1.1 No. and type of risk reduction actions or strategies introduced at local level	1,317,125
			3.1.2 No. of news outlets in the local press and media that have covered the topic	

	Number of project beneficiaries trained on climate change adaptation and options to enhance climate resilience.	Output 2.1: Strengthened capacity of national and regional centres and networks to respond rapidly to extreme weather events	2.1.1. No. of staff trained to respond to, and mitigate impacts of, climate-related events	
	Percentage of beneficiaries with improved knowledge of climate change adaptation and options to enhance climate resilience.	Output 2.1: Strengthened capacity of national and regional centres and networks to respond rapidly to extreme weather events	2.1.1. No. of staff trained to respond to, and mitigate impacts of, climate-related events	
	Manuals and toolkits on different aspect of irrigated irrigation, crop production, livestock production and human health produced	Output 5: Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	5.1. No. and type of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type of assets)	
	Number of platforms to share project outputs and experiences.	Output 2.2: Targeted population groups covered by adequate risk reduction systems	2.2.1. Percentage of population covered by adequate risk-reduction systems	
		Output 3: Targeted population groups participating in adaptation and risk reduction awareness activities	3.1.2 No. of news outlets in the local press and media that have covered the topic	

G. Include a detailed budget with budget notes, a budget on the Implementing Entity management fee use, and an explanation and a breakdown of the execution costs.

Table 15: Detailed budget showing execution costs

	Budget notes (USD)	USD
1. Improved planning and management of water resources and (agricultural) production		**5,000,000**
1.1 144 ha developed for agricultural production, equipped with a solar powered irrigation system	The budget is broken down per output. Each output is divided in items. Each item has been budgeted, which represent the sub-figures that are highlighted in yellow • Pump - 150 kw,500 m3/hr, pump shed **(USD 10,000)**; • Backup pump; UPVC piping (40cm 1.5 km from R. Oti, 10 km across the 5 irrigation blocks); end caps; couplers **(USD 2,526,000)** • PV modules – 3000 250w, 24v; Module mounting, cabling, switches, auxiliary components; x2 Inverters - 550v DC, x1transformer - 400v 20kv, switchgear; etc. **(USD 1,318,000)** • Block preparation x7 blocks **(USD 2000,000)** • Close protection of site work (fencing, tree planting, etc.) **(USD 100,000)**	*4,154,000*
1.2 Improve techniques and means of irrigated production		***796,000***
1.2.1 *Acquire farm machinery kits (one 75 hp tractor + 3 discs plough + one 10x10 drive sprayer + one sub-soiler with 3 teeth + one trailer + one harvester + one rotavator + one huller)*	The following details is for 01 agricultural kit. The project aims to acquire four (04) kits • 75 hp tractor (**USD 45,000**) • Tractor accessories (3 disc plow = ***USD* 3,250;** • Subsoiler-2m, 7 tines= ***USD* 3,300,** • 10m mounted boom sprayer – 800 litre = ***USD* 3,400,** • Trailer-18 ton tandem axle= **USD 28,200,** • Harvester-trailed, 2 row= ***USD* 36,400,** • rotavator – 1.8m= *USD* 6,800, • Huller; manure spreader – 3.0 c mu= ***USD 7,500***	*535,400*
1.2.2 *Train farmers in irrigation techniques and the proper use of agricultural inputs*	• *Organize 30 training sessions for 576 farmers in improved agricultural techniques. Each training session will gather 19 farmers and will cost*	*210,600*

		Budget notes (USD)	USD

		*USD 3686,66, including the consultation and training material costs. The total will be **USD110,600***
		• *Organize five (05) training sessions for 20 local technicians on 1) driving irrigation and solar equipment, 2) installation irrigation and solar equipment, 3) repair and maintenance irrigation and solar equipment. The training will be followed by practical exercises. Each training will cost:*
		  • *training material **(USD10,000),***
		  • *consultation services (**USD 5,000 per training**),*
		  • *coaching of trainees **(USD 1000 per trainee**)*
		  • *training local (**USD 5000 per training**),*
		  • *accommodation of participants (**USD 5000 per training**)*	

	1.2.3 *Produce manuals / handbooks on irrigation, expected ecological & health hazards of irrigation and disseminate the knowledge*	• *Production of 100 Manuals & toolkits on irrigation **USD 18,000*** • *Production of 100 Manuals & toolkits on expected ecological & health hazards of irrigation **USD 17,000*** • *Attending 04 international events like Fora, COPs etc. to disseminate the knowledge **USD 3,750 per event** including cost of side event)* *The whole amount for this output is (USD 50,000*	*50,000*
1.3	Design and implement training programs for actors responsible for the operation, maintenance and repair of equipment acquired for the beneficiaries.	*Design of training program for 1.2.2 above **(USD 50,000)***	***50,000***
2.	**Support for the diversification of livelihoods and the improvement of the living conditions of the beneficiaries**		***2,150,000***
2.1	Promotion of the development of income generating activities		*1,246,000*
	2.1.1 *Design and deliver capacity building programs to cooperatives and their members for diversification of income-generating activities (gardening, guinea-fowl rearing, bee-keeping, and composting, etc.); and simplified financial management and accounting, and the management of cooperative organizations.*	• *Capacity building needs analysis and design on IGA and diversification **(USD 10,000);*** • *Training of farmer cooperatives **(USD 20,000);*** • *Training of farmers-herder groups **(USD 20,000);*** • *Training of women and youth groups **(USD 20,000)*** • *Training of decentralised services (agriculture extension, livestock, fisheries, etc.) **(USD 20,000)***	100,000
	2.1.2 *Establish the infrastructure and equipment needed to develop the values chain of agricultural production,*	*Build warehouses* *Build drying areas* • *Set up corn and potato mills **(USD***	*1,146,000*

		Budget notes (USD)	USD
	processing, packaging and marketing, i.e. build a warehouse(s), build drying areas, set up corn and tomato mills, train producers in processing, packaging and marketing techniques; and facilitate access to markets.	***400,000)*** • *Set up tomato pulp* ***maker*** ***(USD 400,000)*** • *Train producer in processing, packaging and marketing* ***(USD 50,000)*** • *Access to markets / marketing* ***(USD 150,000)***	
2.2	Implement simplified funding		***604,000***
2.2.1	*Build social infrastructures*	• *Set up IGAs – crop diversification, guinea fowl rearing, bee keeping, composting for organic fertilizer, etc.* ***USD 57,000*** • *Set up revolving fund* ***USD 116,000*** • *Build fish-ponds* ***USD 68,000*** • *Build fish drying area* ***USD 43,000*** • *Set up a tree nursery for agro-forestry* ***USD 20,000***	*304,000*
2.2.2	*Build mini drinking water supply (DWS) network*	*Set up an equipped borehole* ***USD 120,000*** *Set up a mini network, water tower and fountains all solar powered* ***USD 180,000***	*300,000*
2.3	Build latrines for sanitation		***300,000***
		Build 3 latrines	*300,000*
3	**Capacity building, environmental and social measures, and knowledge management**		**1,317,125**
3.1	Design and deliver capacity-building programs		***606,000***
3.1.1	*Strengthen the technical capacity of local institutions' agents in the prevention and resolution of climate risk issues (bush-fires, resource use and agricultural production conflicts, sustainable management of natural resources)*	• *Develop a Resettlement Action Plan* ***USD 179,000*** • *Develop a Restoration Plan for the production zones* ***USD 159,000*** • *Develop a Stakeholder Engagement Plan* ***USD 24,000*** • *Set up a Grievance Resolution Plan* ***USD 54,000***	*416,000*
3.1.2	*Organize information, education and communication (IEC) sessions toward local populations on risk management techniques related to climate change*	*Information dissemination on Climate Change* ***USD 40,000*** *Risk Assessment & Management* ***Plans*** ***USD 50,000***	*90,000*
3.1.3	*Strengthen the capacity of cooperatives and employees of local institutions in the joint management of water resources and conflict management*	*Organize training sessions for farmers' cooperatives and employees of local institutions on water and natural resources sustainable management* ***USD 65,000*** *Implement conflict management* ***plan*** ***USD 35,000***	*100,000*
3.2	Implement measures of the Environmental and Social Management Plan	*Develop Risk Assessment & Management Plans* ***USD 197,000*** *Develop Integrated Agricultural Inputs (fertilizers / pesticides) Management plans* ***USD 149,000*** *Capacity building on ESMP implementation* ***USD 54,000***	*400,000*
3.3	Establish a knowledge management system (production, capitalization, vulgarization, etc.)	• *Create a local database for the collection, preservation and dissemination of datasheets, educational tools and training materials* ***USD 45,000***	*311,125*

	Budget notes (USD)	USD
	• *Knowledge sharing workshops with decision makers* ***USD 64,450*** • *Explore and build synergies with other projects & similar interventions* ***USD 20,000*** • *Share disseminate via radio spots and film the good practices from similar interventions* ***USD 74,225*** • *Create partnerships with tertiary institutions that support students to study project interventions* ***USD 30,225*** • *Provide platforms for project stakeholders to share experiences nationally and internationally* ***USD 47,225*** • *Setup of a regional spatial database / GIS-Training* ***USD 30,000***	
Total Project Cost		**8,467,125**
Execution costs		***804,380***
Implementation costs		***728, 495***
Amount of Financing Requested		**10,000,000**

Execution Costs – Budget (USD)

Table 15: Disbursement schedule of execution costs

YEAR	2017	2018	2019	2020	
Staff	48 364	87 055	87 055	87 055	
Travel Expenses	25 137	45 246	45 246	45 246	
Equipment	120 657	0	0	0	
Monitoring & Evaluation	33 331	59 996	59 996	59 996	
Total	227 489	192 297	192 297	192 297	804 380

IE Management Fee – Budget (USD)

Implementing Entity (BOAD) Specialized Technical Services

The implementing entity fees will be utilized by BOAD to cover its indirect costs in the provision of general management support and specialized technical support services. The table below provides an indicative breakdown of the estimated costs of providing these services.

YEAR		2017	2018	2019	2020
Staff	Indicative Services Provided by BOAD	Sept-2017	Dec-2017	Dec-2018	Dec-2019
Identification, Sourcing and Screening of Ideas	Provide information on substantive issues in adaptation associated with the purpose of the	72,849.49	48,566.33	24,283.16	0

	Adaptation Fund (AF). Engage in upstream policy dialogue related to a potential application to the AF. Verify soundness and potential eligibility of identified idea for AF.				
Feasibility Assessment / Due Diligence Review	Provide up-front guidance on converting general idea into a feasible project Source technical expertise in line with the scope of the project. Verify technical reports and project conceptualization. Provide detailed screening against technical, financial social and risk criteria and provide statement of likely eligibility against AF requirements. Determination of execution modality and local capacity assessment of the national executing entity. Assist in identifying technical partners. Validate partner technical abilities. Obtain clearances from AF.	36,424.75	49,637.125	49,637.125	10,000
Development & Preparation	Provide technical support, backstopping and troubleshooting to convert the idea into a technically feasible and operationally viable project. Source technical expertise in line with the scope of the Project needs. Verify technical reports and project conceptualization. Verify technical soundness, quality of preparation, and match with AF expectations. Negotiate and obtain clearances by AF. Respond to information requests, arrange revisions etc.	36,424.75	49,637.125	49,637.125	10,000
Implementation	Technical support in preparing TORs and verifying expertise for technical positions. Provide technical and operational guidance project teams. Verification of technical validity / match with AF expectations of inception report.	45,233	45,233	45,233	10,000

	Provide technical information as needed to facilitate implementation of the project activities. Provide advisory services as required. Provide technical support, participation as necessary during project activities. Provide troubleshooting support if needed. Provide support and oversight missions as necessary. Provide technical monitoring, progress monitoring, and validation and quality assurance throughout. Allocate and monitor Annual Spending Limits based on agreed work plans. Receipt, allocation and reporting to the AFB of financial resources. Oversight and monitoring of AF funds. Return unspent funds to AF.					
Evaluation and Reporting	Provide technical support in preparing TOR and verify expertise for technical positions involving evaluation and reporting. Participate in briefing / debriefing. Verify technical validity / match with AF expectations of all evaluation and other reports Undertake technical analysis, validate results, and compile lessons. Disseminate technical findings	36,424.75	36,424.75	36,424.75	36,424.75	
Total		227,356.74	229,498,33	205,215.16	66,424.75	728,494,74

H. Include a disbursement schedule with time-bound milestones.

Table 16: Disbursement schedule

	Upon Agreement Signature	End of Year 1	End of Year 2	End of Year 3	End of Year 4	Total (USD)
Schedule Date (Tentative)	Dec 2017	Dec-2018	Dec-2019	Dec-2019	Dec-2020	
Project Funds	5 404 000	1 289 198	1 289 198	1 289 198	0	**9,271,595**
Execution cost	227 489	192 297	192 297	192 297	0	**804,380**
IE Fee	227,356.74	229,498,33	205,215.16	66,424.75	0	**728,494.74**

PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. Record of endorsement on behalf of the government[36]

Provide the name and position of the government official and indicate date of endorsement. If this is a regional project/programme, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an annex to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:

Thiyu ESSOBIYOU Directeur de l'Environnement du Togo	January 7th, 2016

B. Implementing Entity certification

Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project/programme contact person's name, telephone number and email address

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans (PANA), Stratégie de Croissance Accélérée et de promotion de l'Emploi (SCAPE), Politique Nationale de Développement Agricole du Togo (PNDAT), programme national pour l'Investissement et l'Agriculture pour la Sécurité Alimentaire (PNIASA) and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.	
Almamy MBENGUE Directeur de l'Environnement et de la Finance Climat (DEFIC) Implementing Entity Coordinator	
Date: January 10th, 2016	Tel. :+228 22 23 25 24 email:ambengue@boad.org
Project Contact Person: Mrs Fatoumata T. SANGARE	Tel. :+228 22 23 27 96 Email: ftoure@boad.org

[36] Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.

Annex1: Letter of Endorsement

REPUBLIQUE TOGOLAISE
Travail Liberté Patrie

Ministère de !'Environnement et des Ressources Forestières

Direction de l'Environnement

ADAPTATION F U N D

Letter of Endorsement by Government

Lomé, 7th January, 2016

To: The Adaptation Fund Board

C/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Subject: Endorsement for Project "INCREASING THE RESILIENCE OF VULNERABLE COMMUNITIES IN THE AGRICULTURE SECTOR OF MANDOURI IN NORTHERN TOGO"

In my capacity as designated authority for the Adaptation Fund in Togo, I confirm that the above project proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in Togo.

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by Banque Ouest Africaine de Développement (BOAD) and executed by Direction of Environment.

Sincerely,

Direction de l'Environnement
Le Directeur

Thiyu K. ESSOBIYOU
Director of Environment
Adaptation Fund National Designated Authority

Annex 2: Participant lists for meetings with communities

a. ESIA update - interview sessions, 21-22 May, 2017

Number of people interviewed 9 key informants and 41 stakeholders.

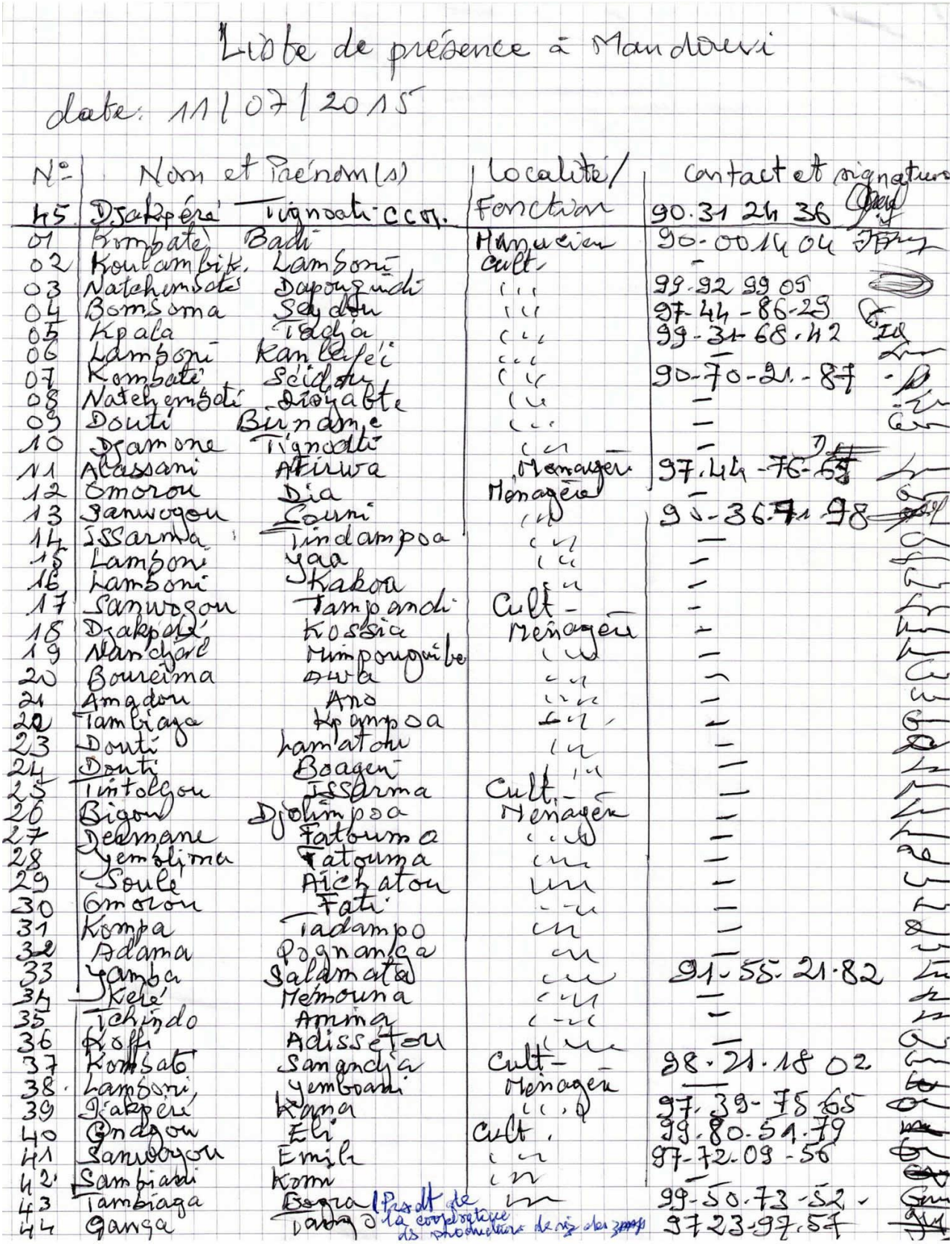
Name	**Contacts / Cell no**
Key informants	
1. GEVAPAF?	KADA Odane, Program manager, 20285278
2. Prefecture	KOLANI Yempabe, 90011797
3. Prefecture	Gnoithe DOUTI, Manager, 99291599 / 90346815
4. Local Authority	DJAKPERE Tignoiti, Canton Chief, 90312436
5. DPAEH / Kpendjal (Regional Directorate of Agriculture, breeding and Hydraulics/ savannas (DRAEH/S))	NADJAGOU KanfieniLalle, 90200945
6. Prefecture Department of the Environment and Forest Resources	GBENIN Kodjo Benjamin, Director
7. Committee of breeders	BARRY Arzouma, Vice-chairman, 98553444
8. Livestock market	AMADOU Amidou, Assistant Treasurer, 98555572
9. School	MAMA I Ababeni, Teacher, 90843492

Name	**Sex**	**Cell no.**
Other stakeholders		
1. LAMBONI Yendou	M	None
2. KOMBATE Syli	M	None
3. TAMBIAGA Bogra	M	90759657 / 99507352
4. KOMBATE Badi	M	90001404 / 99003908
5. ARZOUMA Boukhari	M	97489166
6. GANGA Tango	M	97239757
7. DOUTI Gnoithe	M	None
8. YALO Boudandja	M	None
9. KOMBATE Digaguibe	M	None
10. KOLANI Bayé	M	99877110
11. KOMBATE Kolanbigua	M	None
12. SANWOGOU Mary	F	90367198 / 97657911
13. Sakina OMOROU	F	90589819
14. KOMBATE Awa	F	91989387
15. MAMOUDOU Issa	M	97465881
16. KOLANI Mr. Joseph	M	90147159 / 98634722
17. KOMBATE Bibate	M	93805963
18. ABDOULAYE Dramane	M	90346978
19. GNAGOU Nanfangue	M	99805179
20. TALATA Karimou	M	None
21. Achetou ARBILA	F	93575670
22. MOUSSA Adama	M	None
23. NATCHEMBATE Dapauguidi	M	99929909
24. KOUMONGUA Dramane	M	None
25. NATCHENDE Songuimpale	M	98519533
26. SAMBIANI Goumpouguini	M	90981069 / 98049091
27. ILIASSOU Idrissou	M	99769885
28. Sabime slab	M	None
29. SANWOUGOU Dimounoba	M	99956638
30. KOUMONGUA Fataou	F	97245005
31. MAMAH Abibah	M	91092027
32. ARZOUMA Soule	M	90724346 / 99997129
33. DRAMANI Oumorou	M	None

Name	Sex	Cell no.
34. SAMBIANI Pouguimba	F	None
35. YEMBLIMA Souguetemba	M	98707480
36. ISSARBA Kambirba	M	99450079
37. NATCHEMBATI Djanle	M	96386352
38. KOMBATE Kolitchieme	M	98224453
39. SAMBIANI Boundandja	M	None
40. LAMBONI NabonleBarthelemy	M	98019257
41. SAMBIANI Boulo	F	None

b. Initial community consultations

Liste de présence à Mandouri : 11.07.2015



Liste de présence à Mandouri

date: 11/07/2015

N°	Nom et Prénom(s)		Localité/ Fonction	Contact et signature
45	Djakpéra	Tignoati C.C.T.		90.31.24.36
01	Kombaté	Badi	Pharmacien	90-00-14-04
02	Koulambiba	Lamboni	Cult.	—
03	Natchembaté	Dapougnadi	"	99.92.99.05
04	Bombama	Saydou	"	97-44-86-29
05	Kpala	Tadja	"	99-31-68-42
06	Lamboni	Kanlapéi	"	—
07	Kombaté	Saidou	"	90-70-21-87
08	Natchembaté	Diabate	"	—
09	Douti	Bindame	"	—
10	Djamone	Tignoati	"	—
11	Alassani	Afiwa	Ménagère	97.44-76-65
12	Omorou	Dia	Ménagère	—
13	Sanwogou	Couni	"	91-36-71-98
14	Issarma	Lindampoa	"	—
15	Lamboni	Yaa	"	—
16	Lamboni	Kabora	"	—
17	Sanwogou	Tampandi	Cult. - Ménagère	—
18	Djakpéra	Kossia	"	—
19	Nandjaré	Nimpouguibe	"	—
20	Boureima	Awa	"	—
21	Amadou	Ano	"	—
22	Tambiaga	Kpampoa	"	—
23	Douti	Kamatou	"	—
24	Douti	Boagni	"	—
25	Tintolgou	Issarma	Cult. - Ménagère	—
26	Bigou	Djolimpoa	"	—
27	Dekmane	Fatouma	"	—
28	Yembiima	Fatouma	"	—
29	Soulé	Aichatou	"	—
30	Omorou	Fati	"	—
31	Kompa	Tadampo	"	—
32	Adama	Pognanga	"	—
33	Yamba	Salamata	"	91.55.21.82
34	Kéré	Memouna	"	—
35	Tchindo	Amina	"	—
36	Kaffi	Adissétou	"	—
37	Komsaté	Samandja	Cult. - Ménagère	98.21.18.02
38	Lamboni	Yemboadi	"	—
39	Djakpéra	Kana	"	97.39-75.65
40	Gnadjou	Eli	Cult.	99.80.51.79
41	Sanwogou	Emile	"	97-72.09-56
42	Sambiani	Komi	"	—
43	Tambiaga	Bogra	Prés. dt de la coopérative de riziculture de riz étuvé	99-50-73-52
44	Ganga	Tabaga		9723-97.57

MINISTERE DE LA PLANIFICATION DU DEVELOPPEMENT

REPUBLIQUE TOGOLAISE

Travail-Liberté-Patrie

SECRETARIAT GENERAL

DIRECTION GENERALE DE LA MOBILISATION DE L'AIDE ET DU PARTENARIAT

DIRECTION DE LA COOPERATION MULTILATERALE

Réunion : Restitution de la mission BOAD d'évaluation du Projet de relèvement du niveau de résilience des acteurs vulnérables du secteur agricole.

DATE : 15 juillet 2015

LISTE DE PRESENCE

N°	NOM ET PRENOM	TITRE ET STRUCTURE	CONTACT (TEL +MAIL)	EMARGEMENT
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4	TAMAKLOE Melissa	DGMAP, chargé OCDE	9034 8077 leofils1@gmail.com	
5	KOUGBLENOU Koffi	DFCEP ; chargé d'étude	91-92-56-90 / 22-19-28-46 ballaektime@gmail.com	
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7	KOULOUMA Patchali	BGR/BAP/BGTCP/MEFPD	22381042 Koulounac@yahoo.fr	
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9	LITAABA-KASSOU Baya	CAS-IMEC/MEFPD	96987682 bayakas@yahoo.fr	
10	BAKATIMBE Tchaamba	DE/MERF	90385874 bakatim2006@yahoo.fr	
11	ESSOBIYOU Thiyu	DE/MERF	90021935 essobiyou@hotmail.com	
12	FALL Boubacar	BOAD/DEFIC/BEI	boubafall@yahoo.fr	
13	BERGER Ronald	BOAD/DEFIC/AT BEI	ron_berger@hotmail.com	
14	MOUSSA Mamou	BOAD	22329595 mmoussa@boad.org	
15	AILECHI Sofiane	BOAD	ayayi@boad.org	
16	SANGARE Fatoumata	BOAD	ftoure@yahoo.fr	
17	ATCHOLI K. Eglin	MPDAT/ACB	atchochrist83@yahoo.fr	

MINISTERE DE LA PLANIFICATION DU DEVELOPPEMENT

SECRETARIAT GENERAL

DIRECTION REGIONALE DE LA PLANIFICATION,
DU DEVELOPPEMENT ET DE L'AMENAGEMENT
DU TERRITOIRE DES SAVANES
DAPAONG
BP : 04 Tél : Fax : 27-70-83-09
N°_____/2015/MPD/SG/DRPDAT - RS

REPUBLIQUE TOGOLAISE
Travail – Liberté – Patrie

Dapaong, le 10 /07/2015

REUNION D'ECHANGE ENTRE LA MISSION D'EVALUATION DU PROJET DE RELEVEMENT DU NIVEAU DE RESILIENCE DES ACTEURS VULNERABLES DU SECTEUR AGRICOLE DE KPENDJAL ET LES ACTEURS REGIONAUX DE DEVELOPPEMENT

DATE : **le 10 Juillet 2015**
LIEU : **DRPDAT / Savanes**

LISTE DE PRESENCE

N°	Nom et Prénoms	Structure	Fonction	Contact	Mail	Signature
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2.	MOUSSA MOROU	BOAD	Ing G.R	22232595	mmoussa@boad.org	
3.	FALL Boubacar	BOAD/DEFIC	Consultant	97588361	boubafall@yahoo.fr	
4.	BERGER Renaud	BOAD/DEFIC	Consultant	93440593	renn_berger@hotmail.com	

5.	Jean Baptiste LARE	Croix-Rouge	Point Focal	90243669	dangale1971@yahoo.fr	
6.	LABANDE Idrisson	PAM	Resp. Reg°	90256070	ilalande@yahoo.fr	
7.	KOUPOKPA Kossi	Environn.	Rep. D.R.	93399682	-	
8.	DERMANE Moutala	MDBAJEJ/S	Responsable Régional	90937759	dertala@yahoo.fr	
9.	MOUIDAGUETE Kanlanfai	Hydraulique	Sociologue	90-19-62-61	timotheemouidaguete@yahoo.fr	
10.	BAKONA Batobakou	DRAEP	Repr. DR Agri	94858201	bakonaherve@yahoo.fr	
11.	LARE Dodi	UCAECS	Responsable Exploitation	90936806	ladoudille@yahoo.fr	
12.	POUNPOUNI Koumoi	DRE- Sé	DRAS PF-A	90457203	protectiondelenfant@yahoo.fr	
13.	BIGNANG Kiziouvei	chef Projets	AGEROUTE-TG	90057275	kbignangjp@yahoo.fr	
14.	BAKATIMBE Tchanmiki	Amenagiste forestier	DE/IMERF	90385874	bakatim2006@yahoo.fr	
15.	NAM Pakedame	DRPDDT-25	DR	90104845	nampakedanga	
16.	DJOBO Gouba	Ministère Plan	chargé Dossier BOAD	91337750	djobogouba@yahoo.fr	
17.						
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MINISTERE DE LA PLANIFICATION DU DEVELOPPEMENT

SECRETARIAT GENERAL

DIRECTION GENERALE DE LA MOBILISATION, DE L'AIDE ET DU PARTENARIAT

DIRECTION DE LA COOPERATION MULTILETERALE

REPUBLIQUE TOGOLAISE
Travail – Liberté- Patrie

Lomé, le 7/07/2015

LISTE DE PRESENCE

Prise de contact ; Mission BOAD d'évaluation du projet de relèvement du niveau de résilience

N°	Nom Prénoms	Fonction/Structure	Emargement	Téléphone	E-mail
1	DJOBO Gouba	Chargé Dossier BOAD DGMAP		91 33 77 50	djobogouba@yahoo.fr
2)	AWADE Essobozou	Directeur de la Coop Multilatérale		90 05 78 22	pierreawade@hotmail.com
3	KPIZING Esodong	Coordonnateur CAS-IMEC MEF		90 09 60 63	kesodong@gmail.com
4	BOLOR [illegible]	bolorjean@yahoo.fr		90 09 65 42	bolorjean@yahoo.fr
5	ANIMAOU Tchiou	[illegible] Directeur / ENSEED		90 02 29 58	atchiou@yahoo.fr
6	MAWUENA Komlan	chargé d'étude à la DGMAP		90 81 73 44	mawuena2020@yahoo.fr
7	LITABBA-KASSOU Baya	chef de service contrôle des 3D / CAS-IMEC / MEF		90 98 67 82	bayakas@yahoo.fr
8.	YAOU Méry	chef Division Direction de l'Environnement		90 14 87 44	ymery6@yahoo.fr

MINISTERE DE L'ENVIRONNEMENT
ET DES RESSOURCES FORESTIERES

SECRETARIAT GENERAL

DIRECTION DE L'ENVIRONNEMENT

REPUBLIQUE TOGOLAISE
Travail-Liberté-Patrie

LISTE DE PRESENCE A LA REUNION DE SYNTHESE DE LA MISSION DE TERRAIN/BOAD/ADAPTATION

****

DATE : 13 juillet 2015
LIEU : Salle de réunion de la direction de l'environnement

N°	Nom et Prénom(s)	Institution	Fonction	Contact et adresse E-mail
1	BAKATIMBE Tchamniki	DE/MERF	Aménagiste forestier	90385874 bakatim2006@yahoo.fr
2	SALIFOU Daoudou	DAEMA/MAEH	Agronome	90885015 padaoud14@gmail.com
3	DJOBO Gamba	DCM/MD	Chargé Dossiers BOAD	91337750 djobogamba@yahoo.fr
4	MOUSSA Morou	BOAD	Ingénieur Génie Rural	22232595 mmoussa@boad.org

N°	Nom et Prénom(s)	Institution	Fonction	Contact et adresse E-mail
5	BIGNANG Kizitouvei FALL Boubacar	AGETUR-TOGO BOAD/DEFIC	chef de Projets Consultant	90057275 kbignangjp@yahoo.fr boubafall@yahoo.fr
6	ALLECHI Solange	BOAD	Environnementaliste	22232646 sallechi@boad.org
7	SANOGARE Fatoumata	BOAD/DEFIC	Analyste financier	22232796 fsanoe@boad.org
8	BERGER Ronald	BOAD/BEI	consultant DEFIC	ron.berger@hotmail.com
9				
10				
11				
12				

MINISTERE DE LA PLANIFICATION DU DEVELOPPEMENT

SECRETARIAT GENERAL

DIRECTION GENERALE DE LA MOBILISATION, DE L'AIDE ET DU PARTENARIAT

DIRECTION DE LA COOPERATION MULTILETERALE

REPUBLIQUE TOGOLAISE
Travail – Liberté- Patrie

Lomé, le 7/07/2015

LISTE DE PRESENCE

Prise de contact ; Mission BOAD d'evaluation du projet de relèvement du niveau de résilience

N°	Nom Prénoms	Fonction/Structure	Emargement	Téléphone	E-mail
1	DJOBO Gouba	Chargé Dossier BOAD DGMAP/MPD		91 33 77 50	djobogouba@yahoo.fr
2)	AWADE Essobozou	Directeur de la Coop Multilatérale		90 05 78 22	pierreawade@hotmail.com
3	KPIZING Esodong	Coordonnateur CAS-INFEC MEF		90 09 60 63	kesodong@gmail.com
4	BOLOR [illegible]	bolorjean@yahoo.fr		90 09 66 42	bolorjean@yahoo.fr
5	ANIMAOU Tchiou	[illegible] Directeur / ENSEED		90 02 29 58	atchiou@yahoo.fr
6	MAWUENA Komlan	chargé d'etudes à la DGMAP		90 81 73 44	mawuena2020@yahoo.fr
7	LITABBA-KASSOU Baya	chef de service contrôle des SFD/CAS-INFEC/MEF		90 98 67 82	bayakas@yahoo.fr
8.	YAOU Méry	chef Division Direction de l'Environnement		90 14 87 44	ymery6@yahoo.fr

MINISTERE DE LA PLANIFICATION DU DEVELOPPEMENT

SECRETARIAT GENERAL

DIRECTION GENERALE DE LA MOBILISATION,
DE L'AIDE ET DU PARTENARIAT

DIRECTION DE LA COOPERATION MULTILETERALE

REPUBLIQUE TOGOLAISE
Travail – Liberté- Patrie

Lomé, le

LISTE DE PRESENCE

N°	Nom Prénoms	Fonction/Structure	Emargement	Téléphone	E-mail
	BAKATIMBE Tchamnibi	DE/MERF		90385874	bakatim2006@yahoo.fr
	BAMALI Tahontan Didier	DE/MERF (PNA).		90201666	dibamail@yahoo.fr
	KOUGBLENOU Koffi	DFCEP/MEF		91945690 22193246	ballacktime@gmail.com
	AGBAVO Sophie	DPPD/MPDAT		91591261	sophie_agbavo@yahoo.fr
	M'GBOOUNA L. Bagui bafélé	DDP/MEFPD		90936834	christbagui@gmail.com
	KOULOUMA Patchali Béma	DGD/DDP/MEFPD		22381042	Koulouma@yahoo.fr
	LEBIGAZA Meindou	DT/AGETUR		90100890	meindou@Yahoo.fr
	BIGNANG Kizionwèi	chef de Projets		90057275	kbignangjp@yahoo.fr
	FALL Boubacar	Consultant BOAD		97588361	boubafall@yahoo.fr
	BERUER Ronald	Consultant BEI/BOAD		93446193	ron_berger@hotmail.com
	MOUSSA Moloh	Ing. G.R BOAD		92729803	mmoussa@boad.org

MINISTERE DE LA PLANIFICATION DU DEVELOPPEMENT

SECRETARIAT GENERAL

DIRECTION GENERALE DE LA MOBILISATION,
DE L'AIDE ET DU PARTENARIAT

DIRECTION DE LA COOPERATION MULTILETERALE

REPUBLIQUE TOGOLAISE
Travail – Liberté- Patrie

Lomé, le

LISTE DE PRESENCE

N°	Nom Prénoms	Fonction/Structure	Emargement	Téléphone	E-mail
	ALLECHI Solange	BAD		+228 22 23 26 46	syayi@bad.org
	AZIAKA Messan	DFC/AGETUR-TOGO		22261446	maziaka.gil62@gmail.com

MINISTERE DE L'ENVIRONNEMENT
ET DES RESSOURCES FORESTIERES

SECRETARIAT GENERAL

DIRECTION DE L'ENVIRONNEMENT

Division de la Lutte contre les Changements Climatiques

REPUBLIQUE TOGOLAISE
Travail-Liberté-Patrie

Atelier de validation du document du « Projet de relèvement du niveau de résilience des acteurs vulnérables du secteur de l'agriculture à Mandouri, au nord du Togo » : LISTE DE PRESENCE

==========

Date: 29 Juin 2017 **Lieu** : Salle de conférence de la BOAD à Lomé

N°	NOM ET PRENOMS	TITRE	STRUCTURE REPRESENTEE	COORDONNEES	SIGNATURE
1	Nom : BAMALI Prénoms : PA Tahantan	Point focal PNA	Direction de l'environ.	Tél : 90201666 E-mail : dipamail@yahoo.f	
2	Nom : YOUA Prénoms : YACOUBOU	Préfet de KPENDJAL	Préfecture de KPENDJAL	Tél : 90055206 E-mail : pharmacielasauvegarde@gmail.com	
3	Nom : ASSOGBA Prénoms : Akouvi	Assistante Financière	DE/MERF	Tél : 90180782 E-mail : assolga2006@yahoo.fr	
4	Nom : AMENUNYA Prénoms : Kokou Elolo	GR	DAEMA	Tél : 91819886 E-mail : godsonamenunya@yahoo.com	
5	Nom : DJAMESSI Prénoms : Kofi Agbémehia	Chef section	DGMAP/MPD	Tél : 90304940 E-mail : djamesihermann@gmail.com	

N°	NOM ET PRENOMS	TITRE	STRUCTURE REPRESENTEE	COORDONNEES	SIGNATURE
6	Nom : ZOUPOTA Prénoms : Kutuna	Correspondant scientifique Suivi Evaluation	ITRA	Tél : 90026856 E-mail : ekezenyonya@yahoo.fr	
7	Nom : KOUDAHE Prénoms : Komlan	chargé d'études	ADA Consulting Africa	Tél : 90817769 E-mail : Koudahe_Komlan@yahoo.fr	
8	Nom : ADANI Prénoms : Afiya	Chargée d'études	Direction des Filières Végétales	Tél : 90908559 E-mail : adanikilanou@gmail.com	
9	Nom : BEGUE ALFA Prénoms : P'ham	Biologiste, Assistant au chef section Promotion des Pêches	Direction des Pêches et de l'Aquaculture (DPA/DAEH)	Tél : 90522298 E-mail : ibn_fabrice@yahoo.fr	
10	Nom : OKOUMEN Prénoms : Katchiya	Chef division	DRF	Tél : 90128405 E-mail : okoumenkatchiya@yahoo.fr	
11	Nom : BIGNANG Prénoms : Kiziouvèi	Chef de Projet	AGETUR-TOGO	Tél : 90057275 E-mail : kbignangjp@gmail.com	
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13	Nom : YAOU Prénoms : Mary	Chef Division Lcc	DE	Tél : 90 14 27 44 E-mail : ymary69@yahoo.fr	
14	Nom : DITOATOU T. Prénoms : Kanfitina	Chargé d'études	SG/MERF	Tél : 90 96 81 39 E-mail : ditoatou@yahoo.fr	
15	Nom : LAMBONI Prénoms : Matéyendou	Chef Section Agropastoralisme	Direction de l'Elevage	Tél : 90851789 E-mail : lamboni@hotmail.fr	

N°	NOM ET PRENOMS	TITRE	STRUCTURE REPRESENTEE	COORDONNEES	SIGNATURE
16	Nom : AGOUDA Prénoms : Kpadja	Chef de Division	Direction des Ressources en Eau	Tél : 90 26 62 86 E-mail : agoudakpadja@yahoo.fr	
17	Nom : ESSOBIYOU Prénoms : Thiyu Kohoja	Directeur	Direction de l'Environnement	Tél : 90 02 19 35 E-mail : essobiyou@hotmail.com	
18	Nom : LITAABA-KASSAU Prénoms : Bayaa	Coordonnateur	CAS-IMEC	Tél : 90 98 67 82 E-mail : bayakas@yahoo.fr	
19	Nom : BASSAN Prénoms : Koffi A	Enseignant/Chercheur	Ecole Supérieure d'Agronomie/UL	Tél : 91 00 59 55 E-mail : koffibassan@yahoo.fr	
20	Nom : KARAMOU Prénoms : Arouna	Environnementaliste	ABETUR-TOGO	Tél : 91 52 26 79 E-mail : arounakaramou@gmail.com	
21	Nom : ASSIH Prénoms : Hodabalo	chargé d'étude	Direction Générale de l'Energie	Tél : 90 18 13 98 E-mail : h.assih2@gmail.com	
22	Nom : SEMEGLO Prénoms : Komlavi A.	chef service suivi PGES	ANGE	Tél : 90 96 97 74 / 99 00 15 11 E-mail : martinnozi@yahoo.fr	
23	Nom : BOUKARI Prénoms : Bassoumy	PDS - Kpendjal	Conseil Préfecture Kpendjal	Tél : 91 42 49 17 E-mail :	
24	Nom : BADJOZE Prénoms : Amimanton	Chauffeur	D-E	Tél : 92-49-22-01 E-mail :	
25	Nom : Prénoms :			Tél : E-mail :	

Annex 3: Photographs from public consultation

a. 19-22 January, 2017 – MERF Mandouri site visit

Main meeting under the big tree

Discussion with women

Discussions with men

Farm land (project area) in the dry season

b. Technical studies 26 May – 2 June 2017

Farm land just before the rainy season (End of May-June)

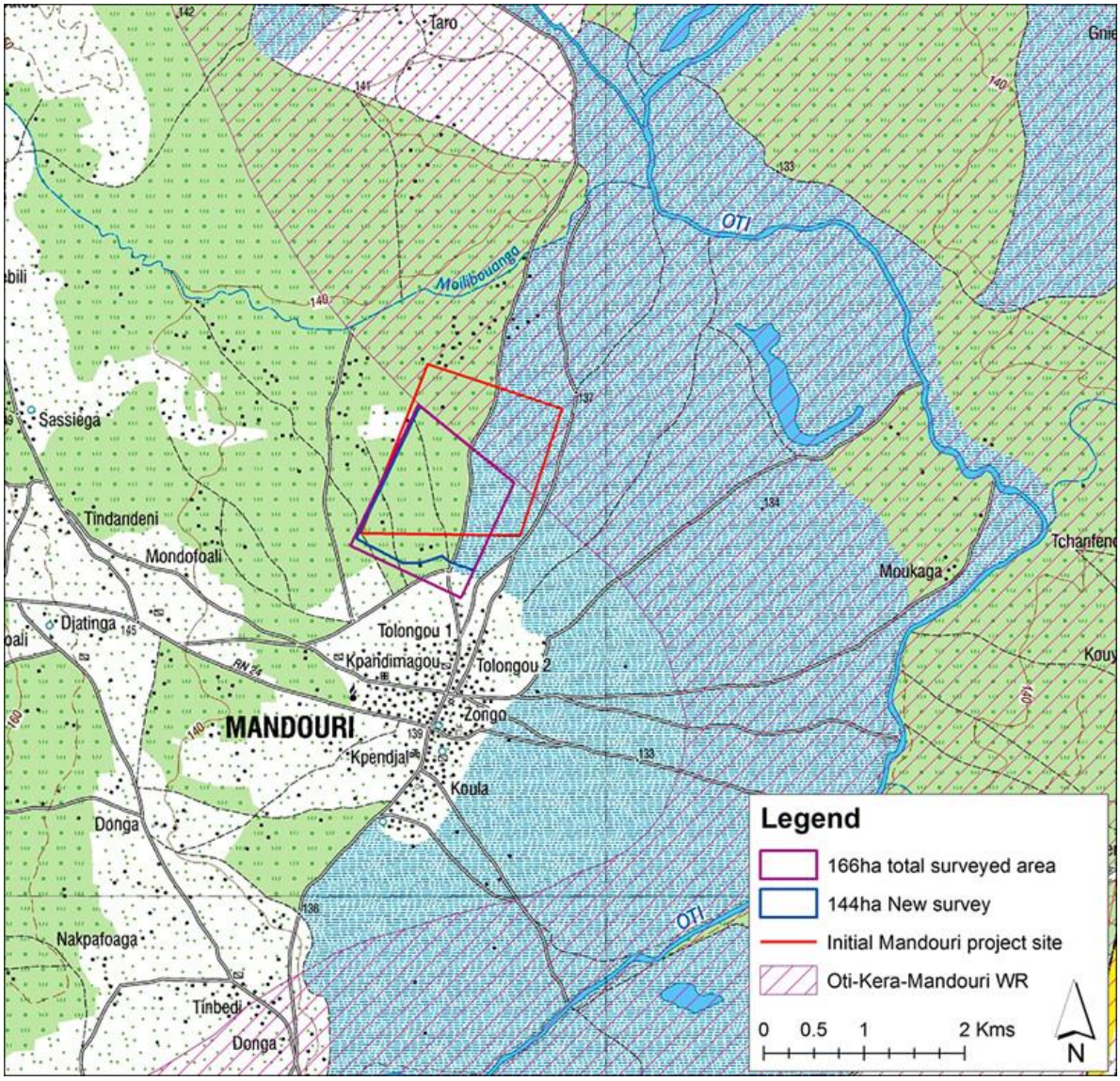
Cattle in Mandouri

Survey team

Survey team recce

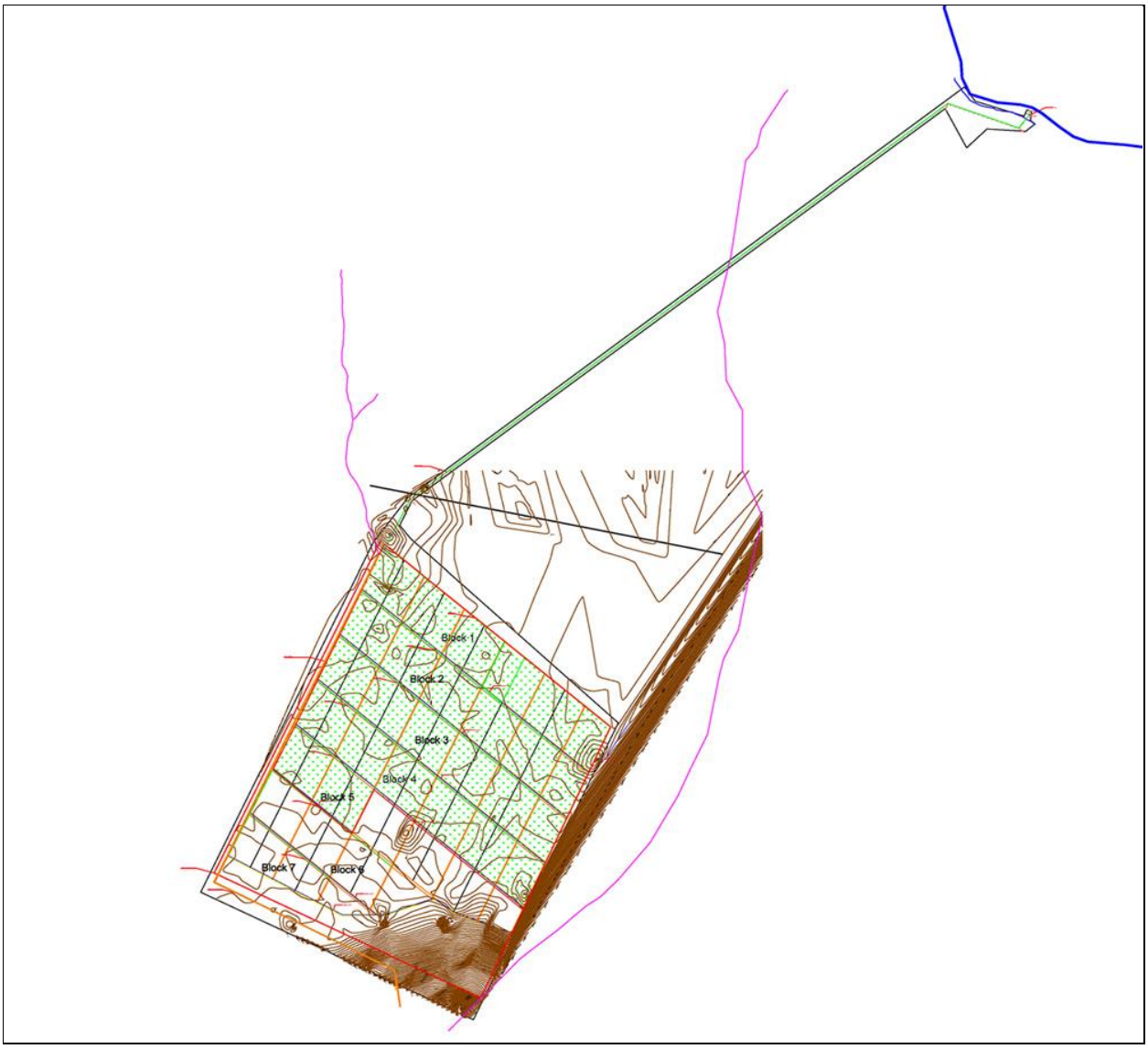
Annex 4. Irrigation project technical design

a. New surveyed blocks on topo map of Mandouri

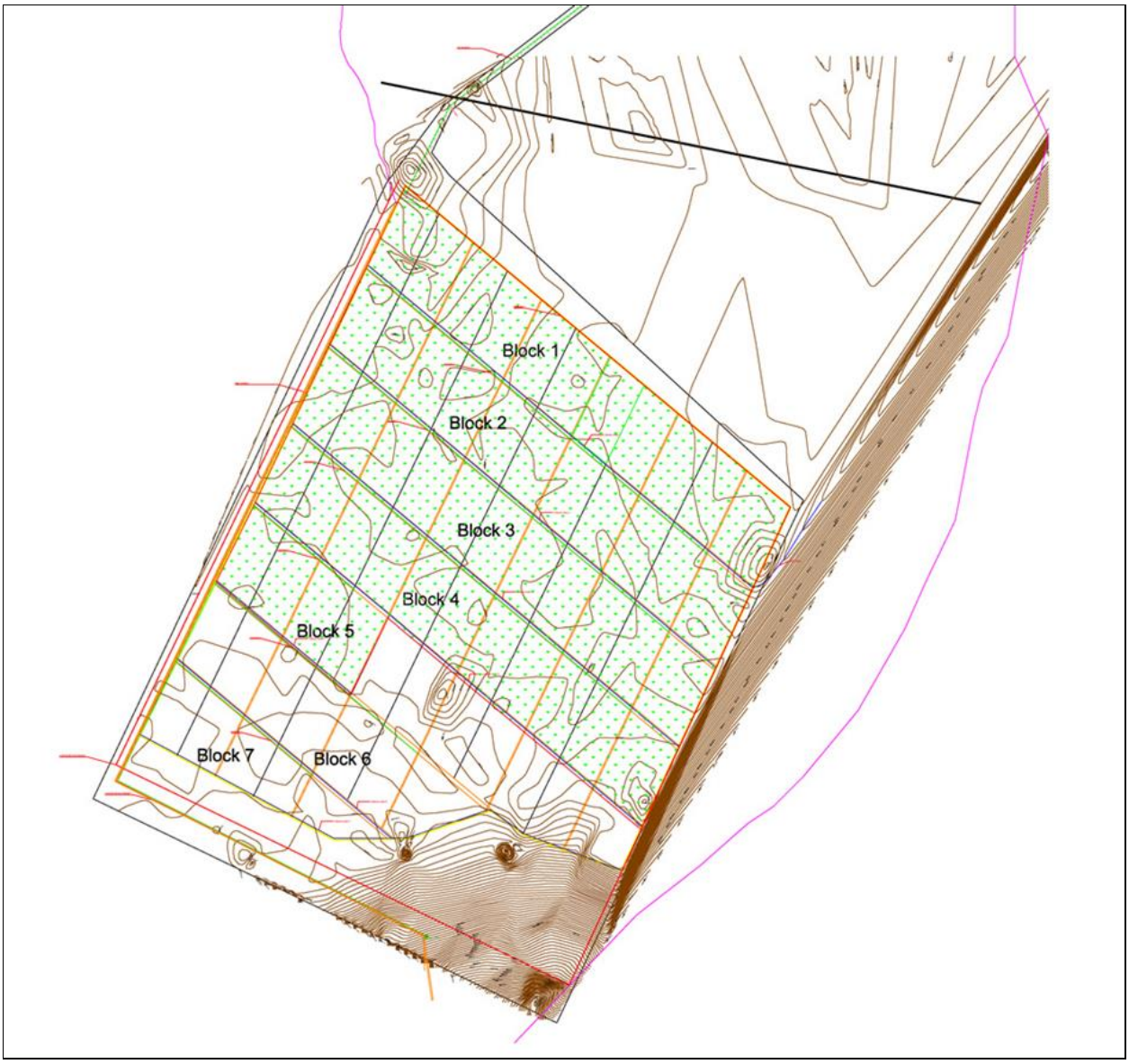


There is need for a definitive clarification on the Oti-Kera-Mandouri wildlife reserve boundary. Is this boundary from DE source the final one?

b. New survey from June 2017 showing water offtake from River Oti (Blue line - NE)



c. New survey June 2017 showing the 144ha irrigation blocks 1-7,



The system designed for Mandouri will be a combination of basin and furrow irrigation with water delivery to the blocks via GI and UPvc pipes[37]. The UPVC pipes will be buried, at a depth of 1 m and 1.2 m.

[37] For detailed information see separate report on irrigation design.

Annex 5. Mandouri Agricultural Resilience Project Environmental and Social Risk Management Plan

The NIE has noted its responsibility to ensure compliance with the Adaptation Fund Environmental and Social Policy (ESP). It will manage this by providing relevant materials and training during project inception, and by ensuring that all project forecasting, monitoring, evaluation, reporting and governance processes are able to detect such risks timeously so that they are managed accordingly. The Mandouri Agriculture Resilience project has been carefully designed to beneficiate local communities and the environment in its focus areas and is not expected to result in any adverse social or environmental impacts. This Environmental and Social Risk Management Plan has been developed to ensure that any unintended adverse impacts are avoided, and that, where this is not the case, they are timeously detected and appropriately mitigated.

The plan will ensure that:

- adequate capacity building for risk management is provided at project start-up;
- activity forecasts are screened for potential risks and that associated disbursement is not approved where these arise;
- project reporting processes have a particular focus on detection of environmental and social risks;
- the project oversight and governance processes are designed to ensure that risks are avoided where possible and appropriately mitigated in the unlikely event of these occurring; and
- stakeholders are aware of a mechanism to raise concerns relating to risks with the Project Coordinating Committee (PCC) and the National Implementing Entity (NIE) Steering Committee should concerns relating to risks not be adequately addressed by the Executing Entity (EE).

This is elaborated as follows:-

Project Start-up

During the project start-up phase, the NIE will engage directly with the EE and other project partners on the operating procedures that will apply to the management of the project, and that will be necessary to ensure compliance with ANGE and AF policies and procedures.

An Operating Procedures Manual will be developed to support this process.
Focus will be placed on the AF ESP, and a dedicated capacity building session will be held to ensure that the EE and other project partners are able to competently detect environmental and social risks in future project planning, monitoring, evaluation and reporting processes.

In this regard, attention will be given to ensuring that projects do not impact adversely on any priority biodiversity areas or ecosystem support areas, and that there are no negative impacts on local communities, including vulnerable groups and indigenous people. No such adverse impacts are anticipated.

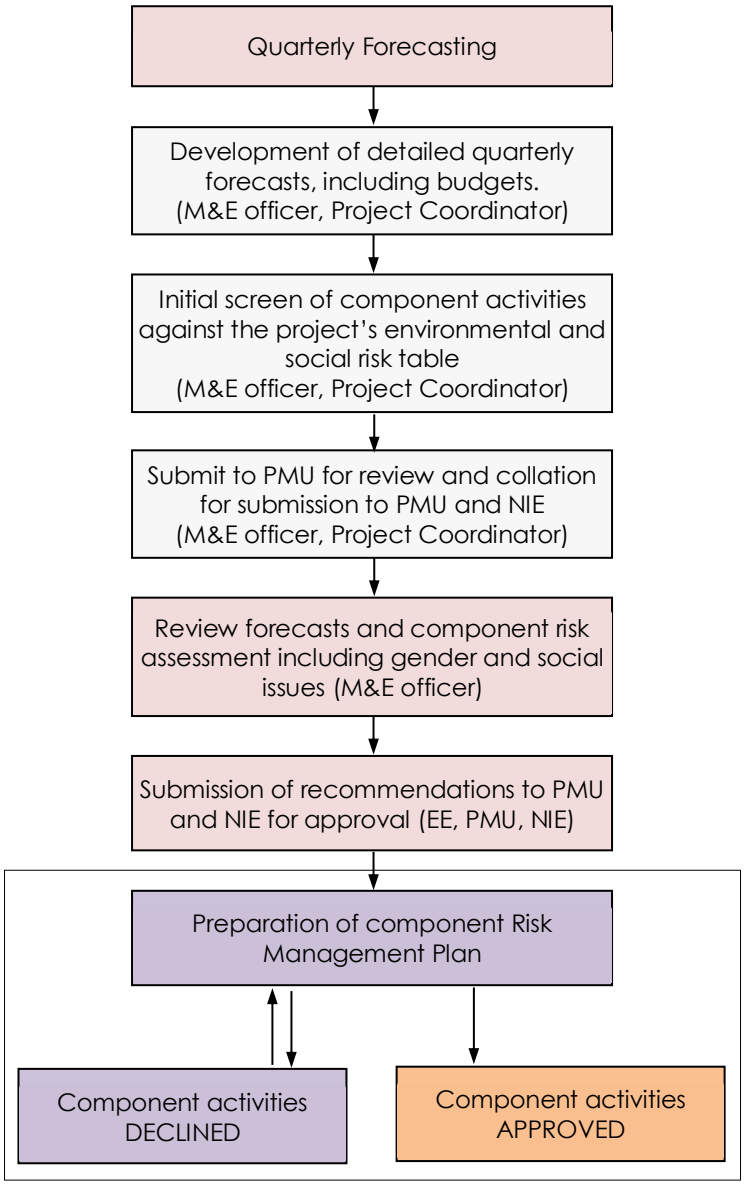
Roles and Responsibilities:
NIE – lead capacity building for risk screening.
EE, sub-Executing Entities and partners, PMU – participate in and develop competencies to give effect to risk screening.

Empowerment of local communities

During the participatory planning processes that are described throughout the project, local communities will be empowered to detect and mitigate environmental and social risks, as set out in the AF ESP and the project's Environmental and Social Risk Management Plan. Processes to build local community capacity to do this will be integrated in the capacity building activities that are envisaged during the early stages of each project component, and will be essential in ensuring that local communities understand the intentions of the project and can contribute to the design of subcomponent activities accordingly, know their rights and are aware of the recourse they may have for raising any risk-related issues should these arise.

Forecasting and Screening
The project's forecasting and risk management plan is set out in Figure 1 and described below.

Figure 1: Mandouri Agriculture Resilience project risk assessment plan.



In order for funds to be disbursed, the EE will need to submit detailed quarterly forecasts to the NIE that are built up from anticipated project activities.

In an effort to strengthen risk screening, and to ensure that no unintended negative impacts are caused or not mitigated, the project coordinator and M&E officer will be required to submit a basic environmental and social risk table with their forecasts. These tables will need to be submitted to the PMU as part of the forecast approval process.

In the lead up to project inception, the EE will modify the AF"s ESP table for this purpose. All risks will be included, but the table will be elaborated upon to create a set of clear and easy to understand

activities that will need to be cross checked. This risk screening process will ensure compliance with the principles of the AF ESP and National legislation.

Project activities that pose social or environmental risks that are not easily mitigated will not be approved during the detailed quarterly forecasting process.

Quarterly forecast review and risk assessment
All quarterly forecasts, including risk assessments, will be reviewed by the PMU with support of the M&E officer. These reviews will be tabled with recommendations to the PMU and NIE for approval.

Risk Management
Where minor risks that can easily be mitigated are detected, the EE may be required to develop a sub-Environmental and Social Risk Management Plan, commensurate with the severity of the risk associated with the relevant sub-component activity. The EE will need to know that costs associated with this can be provided within the project budget, and this will need to be approved by the NIE.

Reporting
Particular attention will be given to the monitoring of unanticipated environmental and social risks in the quarterly reporting process. The EE will be expected to scrutinize National Executing Entity reports for such risks, and to provide the PMU and NIE with their appraisals for verification. The NIE will work closely alongside the EE to ensure that PMU staff have the capacity to undertake the required screening, and to provide the necessary scrutiny.

Roles and Responsibilities:
EE, National Executing Entities and partners – risk screening.
PMU – risk screening oversight.
NIE – capacity building, risk screening scrutiny and verification.

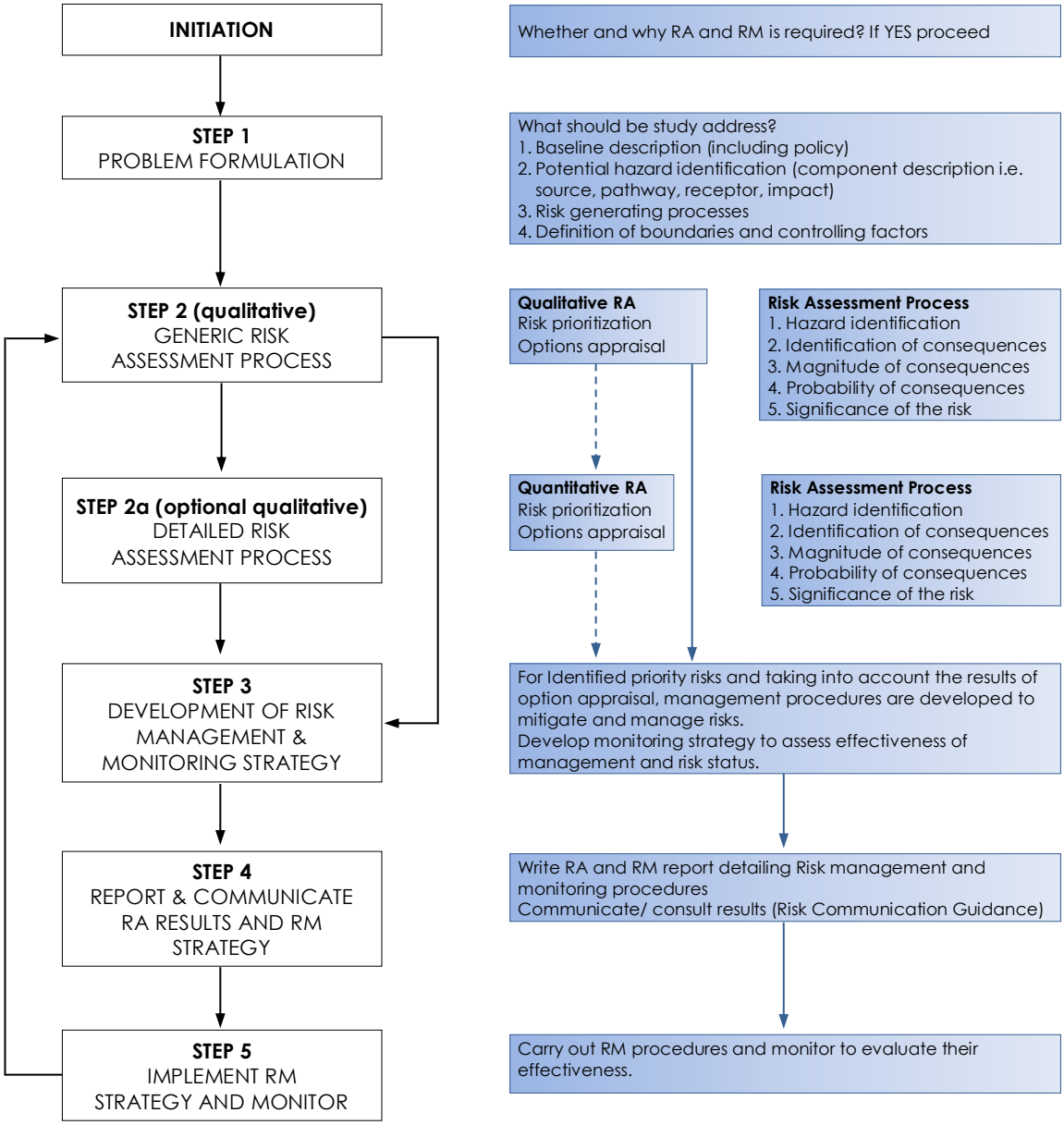
Mid-term and terminal evaluations
Mid-term and terminal evaluations will include a focus on environmental and social risks, and ensure compliance with no-risk assessments in terms of the AF ESP.

Roles and Responsibilities:
Consultants – risk evaluation.
EE, National Executing Entities and partners – risk management responses (in the unlikely event that these should arise).
PMU – risk management oversight.
NIE – risk management verification.

Governance and Oversight
The EE will report any unintended social and environmental risks that are detected through the project monitoring, evaluation and reporting processes to the NIE via the PMU, together with a proposed risk management plan that shows how these risks will be mitigated. In response to this, the NIE and PMU may propose the redirection of project funds to risk management activities, or the withholding of the next tranche of payment until satisfactory risk management actions are determined and agreed.

Grievance Procedures
During project inception workshops and the component launch workshops, stakeholders will be informed that any concerns relating to the design or management of the project, including social and environmental risks, should be raised with the EE. Where these are not adequately addressed, these may be escalated to the PMU and if necessary the NIE Steering Committee.

Fig. 2: General framework on Risk Assessment and Risk Management



Source: Ecological Risk Management Framework for the Irrigation Industry. 2005

Annex 6. Key consultants to be hired for the project using Adaptation Fund resources

Position Titles	*$/ Person Month**	*Estimated Person Months***	*Tasks to be performed*
FOR PROJECT MANAGEMENT			
Key personnel			
Project Coordinator	2,500	36	- Coordinate and manage the project team, and project activities in line with the project document; - Initiate and manage partnerships with other projects and programs; - Prepare periodic project activity plans and technical reports for internal and external reporting; - Consult regularly with ASCENT's president for the proper implementation of activities; - Manage consultants to be recruited under the project. - Contribute to the recruitment of experts; - Facilitate technical and managerial project meetings and prepare reports of these meetings; - Prepare TORs for services and expert for services to be outsourced; - Provide technical control of the results produced by the experts and other providers; - Provide periodic monitoring and evaluation.
Environment and Social Safeguards Officer	2,000	36	- Oversee environmental awareness and climate change mainstreaming in the project. - Conducting field visits and supporting in community consultation on environmental and social issues - Assisting in assessment of environmental and social safeguard issues in project activities; - Formulation of risk assessment and management plans - Implementation of Environmental and Social Management Plan (ESMP) - Development of Integrated Agricultural Inputs' Management Plans (fertilizers, invasive species, pests)
M&E and Learning Expert	2,000	36	- Supervise regular data collection through implementing partners and ensure quality of the data by random verifications and validations; - To record, manage and preserve monitoring and evaluation data in a safe and accessible way; - Analyse and discuss findings based on regular monitoring data; - Provide technical support on M&E and evidence-based recommendations to the relevant Project Manager and Partners. - Ensure that implementation of field activities adheres to project's monitoring and evaluation system; - Support partners in conducting baseline surveys; - Participate actively in program planning processes, budgeting, quality assurance and fundraising;
Financial Management Officer / Accountant	2,000	36	- Implement Finance and administrative systems of the Project - Preparation of periodic budgets and procurement plans; - Ensure payments are promptly remitted, received, processed and filed in an accessible manner - Facilitate preparation and carrying out of audits on the project as may be required by AF/BOAD;

Position Titles	*$/ Person Month**	*Estimated Person Months***	*Tasks to be performed*
			- Participate in meetings and other activities relating to the project;
Water supply and irrigation engineer			- Assessment of future water demands, - Oversee agricultural activities and irrigation technologies, - cooperative farming and agricultural marketing, - training on water use and agronomic practices to the community-based organizations - to create conditions for promotion and expansion of income-generating activities - including marketing of products **Required qualifications** An advanced degree in fields related to water resources management, and water supply schemes, notably as they relate to agricultural use. Experience in working at the community level is an essential requirement of the post.
Short-term consultants			
Agricultural Business development expert	2,000	6	- Develop an agricultural business plan for the project covering diversification in agriculture, Income generating activities (IGAs) and value addition of produce
Sociologist / Community worker	2,000	6	- Develop a Stakeholder Engagement Plan - Develop a Resettlement Action Plan - Develop a Restoration Plan for the production zones - Develop a Grievance Resolution Plan
Procurement expert	2,000	6	- Devise and use fruitful sourcing strategies - Negotiate with external vendors to secure advantageous terms - Approve the ordering of necessary goods and services - Assist financial Management officer in coming up with procurement plans
International			
Justification for travel, if any:			
FOR TECHNICAL ASSISTANCE			
Local			
International			
Justification for travel, if any:			

REPUBLIQUE TOGOLAISE
Travail Liberté Patrie

Ministère de l'Environnement et des Ressources Forestières

Secrétariat Général

Direction de l'Environnement

N° 0582/DE

ADAPTATION FUND

Letter of Endorsement by Government

Lomé, 14th July, 2017

To: The Adaptation Fund Board

C/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Subject: Endorsement for Project "INCREASING THE RESILIENCE OF VULNERABLE COMMUNITIES IN THE AGRICULTURE SECTOR OF MANDOURI IN NORTHERN TOGO"

In my capacity as designated authority for the Adaptation Fund in Togo, I confirm that the above project proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in Togo.

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by Banque Ouest Africaine de Développement (BOAD) and executed by Direction de l' Environnement.

Sincerely,

Direction de l'Environnement

Thiyu K ESSOBIYOU
Directeur de l'Environnement
Adaptation Fund National Designated Authority

B.P. : 4825 – Tél : (228) 22 21 33 21 / 22 21 51 97 – Fax (228) 22 21 03 33 / 22 21 51 97
247, Rue des Nîmes – E-mail : denv_togo@yahoo.fr

MINISTERE DE L'ENVIRONNEMENT
ET DES RESSOURCES FORESTIERES

REPUBLIQUE TOGOLAISE
Travail-Liberté-Patrie

ARRETE n° 025 / MERF/CAB/ANGE/DEIE/CCE

PORTANT DELIVRANCE DU CERTIFICAT DE CONFORMITE ENVIRONNEMENTALE DU PROJET DE RELEVEMENT DU NIVEAU DE RESILIENCE DES ACTEURS VULNERABLES DU SECTEUR DE L'AGRICULTURE A MANDOURI AU NORD TOGO

LE MINISTRE DE L'ENVIRONNEMENT ET DES RESSOURCES FORESTIERES,

Vu la constitution de la IV^{ème} République du 14 octobre 1992 ;

Vu la loi n° 2008-005 du 30 mai 2008 portant Loi- cadre sur l'Environnement ;

Vu le décret n° 2006-058/PR du 05 juillet 2006 fixant la liste des travaux, activités et documents de planification soumis à étude d'impacts sur l'environnement et les principales règles de cette étude et de ses arrêtés d'application n° 013/MERF du 1er septembre 2006 et n°018/MERF du 09 octobre 2006 ;

Vu le décret n° 2009-036/PR du 22 avril 2009 portant attribution, organisation et fonctionnement de l'agence nationale de gestion de l'environnement (ANGE) ;

Vu le décret n° 2011-041/PR du 16 mars 2011 fixant les modalités de mise en œuvre de l'audit environnemental ;

Vu le décret n° 2011-178/PR du 07 décembre 2011 fixant les principes généraux d'organisation des départements ministériels ;

Vu le décret n°2012-004/PR du 29 février 2012 relatif aux attributions des ministres d'Etat et ministres ;

Vu le décret n°2012-006/PR du 07 mars 2012 portant organisation des départements ministériels ;

Vu le décret n°2015-041/PR du 28 juin 2015 portant composition du gouvernement, modifié par le décret n° 2016-086/PR du 1er août 2016 et le décret n° 2016-087/PR du 02 août 2016,

Vu la lettre n°787/MERF/SG/DE du 10 juillet 2017 du ministre de l'environnement et des ressources forestières enregistrée sous le n° 251/DEIE du 10 juillet 2017 à l'agence nationale de gestion de l'environnement , transmettant le rapport provisoire de l'étude d'impact environnemental et social du projet de relèvement du niveau de résilience des acteurs vulnérables du secteur de l'agriculture à Mandouri au Nord Togo en vue de la délivrance du certificat de conformité environnementale ;

Vu la consistance du plan de gestion environnementale et du plan de gestion des risques prévus dans le rapport d'étude d'impact environnemental et social du projet de relèvement du niveau de résilience des acteurs vulnérables du secteur de l'agriculture à Mandouri au Nord Togo;

Vu le compte-rendu n° 969/ANGE/DEIE du 13 juillet 2017 du directeur général de l'ANGE adressé au ministre de l'environnement et des ressources forestières avec un avis technique favorable sur la délivrance du certificat de conformité environnementale

ARRETE:

Article 1er : Le présent certificat de conformité environnementale est délivré à la direction de l'environnement pour servir et valoir ce que de droit, dans le cadre de l'exécution du projet de relèvement du niveau de résilience des acteurs vulnérables du secteur de l'agriculture à Mandouri au Nord Togo, qui prend en compte, de manière acceptable, les préoccupations d'environnement et de développement durable après analyse du rapport d'étude d'impact environnemental et social.

Article 2 : Les conditions d'octroi du certificat sont définies dans l'arrêté n° 025 /MERF/CAB/ANGE/DEIE/CCE du 14 JUIL 2017 portant prescriptions relatives à la délivrance du certificat de conformité environnementale pour l'exécution du projet de relèvement du niveau de résilience des acteurs vulnérables du secteur de l'agriculture à Mandouri au Nord Togo.

Fait à Lomé, le 14 JUIL 2017

Le ministre de l'environnement
et des ressources forestières

André Kouassi Ablom JOHNSON

N. B : Le présent Certificat est établi en un seul exemplaire

MERF

ADAPTATION FUND

BOAD
BANQUE OUEST AFRICAINE DE DÉVELOPPEMENT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT

Directorate of Environment (DE)

INCREASING THE RESILIENCE OF VULNERABLE COMMUNITIES IN THE AGRICULTURE SECTOR OF MANDOURI IN NORTHERN TOGO

Provisional Report

July 2017

Africa Sustainability Centre
ASCENT

Directorate of Environment (DE)

Increase the resilience of vulnerable communities in the agricultural sector of Mandouri in northern Togo

Environmental and Social Impact Assessment

Provisional Report

July 2017

DECLARATION

This study report of environmental impact assessment (EIA) is submitted on behalf of the proponent (Directorate of the Environment) for the draft agricultural resilience proposed in the township of Mandouri, in the prefecture of Kpendjal, in the north of Togo. The study of EIA has been carried out in accordance with the provisions of Decree No. 2008-005 on the environment and the Decree No. 013 _MERF on the rules of procedure, methodology and content of the studies of EIA.

For and on behalf of	
Africa Sustainability Centre (ASCENT)	
Approved by:	Bakary Kante
Signed:	
Designation:	Chairman
Date :	30th July 2017

This report has been prepared by the Africa Sustainability Center (Ascent), with all the skills, care and diligence required in the terms of the contract with the customer mentioned here as the proponent.

I. TABLE OF CONTENTS

II. List of Tables

III. List of Figures

IV. List of pictures

V. List of Abbreviations and Acronyms

APRS	Agricultural Production Recovery Strategy
CAADP	Comprehensive Africa Agriculture Development Program
CAADP	Comprehensive Africa Agriculture Development Program
CCPU	Construction Coordination and Programming Unit
CINTECH	CINTECH Consulting Engineers
DE	Directorate Environment
DGI	Directorate General of Taxes
ECOWAS	Economic Community of West African States
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
GWP	Global Water Partnership
GWP-WATAC	GWP West Africa Technical Advisory Committee (
HIV/AIDS	Human Immuno-Deficiency Syndrome / Accquired Immuno-Deficiency
ICAT	Institute for Technical Advice and Support
ITRA	Institute Togolese Agricultural Research Institute:
MEF	Ministry of Economy and Finance
MERF	Ministry of Environment and Forest Resources
NAP	National Action Plans
NAPA	National Adaptation Plans for Climate Change
NAPE	National Action Plan for the Environment
NAPWSS	National Action Plan for the Water and Sanitation Sector
NEAP	National Environment Action Plan
NEMA	National Environmental Management Authority
NEPAD	New Partnership for Africa's Development
NFSP	National Food Security Program
NSPAB	National Strategy and Plan of Action for Biodiversity in Togo (2011-2020)
PNIASA	National Program for Agricultural Investment and Food Security
PPE	personal protective equipment
PRSP-C	Comprehensive Poverty Reduction Strategy Paper
RMP	Risk Management Plan
SCAPE	Accelerated Growth Strategy and Promotion of Employment
STD	Sexually Transmitted Diseases
	Syndrome
UEMOA	West African Economic and Monetary Union
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Framework Convention on Climate Change
WAEMU	Commission of the West African Economic and Monetary Union
WAP	W-Arli-Pendjari complex

VI. Non-technical summary

1. Presentation of the project

This environmental and social impact assessment (ESIA) is on the Adaptation Fund project on the improvement of the resilience of vulnerable actors in the agriculture sector in Mandouri, Northern Togo. The project is divided into three major components namely: -

- Support for improved planning and management of water resources and (agricultural) production,
- Diversification of livelihoods and the improvement of the living conditions of the beneficiaries, and
- Capacity building, environmental and social measures, and knowledge management.

2. Objectives of the project

The objective of this project is to increase the level of resilience of vulnerable actors of the agriculture sector in Togo, including Mandouri in the prefecture of Kpendjal.

More specifically, the project aims to:

a. Contribute to the securing of rice production and to the reduction of the national deficit in rice by an additional production of 9 900 tonnes of paddy rice;
b. Promote, improve and diversify the income of recipient families of the project through the construction of irrigation infrastructure; use of modern irrigation (combined basin and farrow) techniques in 144 ha of land; the improvement of the availability of drinking water for the populations; and the promotion of diversification and the valorisation of products.

3. Presentation of the proponent

The project proponent is the Ministry of the Environment and Forest Resources (MERF). The delegated project management will be entrusted to the AGETUR and the Direction of the Environment will be in charge of the project management.

For the effective monitoring of the implementation of the project, a Project Management Unit (PMU) will be put in place within the Directorate of the Environment prior to the start of the activities.

4. Methodology for the realization of the study

The approach adopted in carrying out this environmental and social impact assessment includes: documentary research, field visits, identification and assessment of impacts, proposals for environmental management measures and risk management. The identification and evaluation of the impacts were carried out according to the Leopold matrix and on the basis of the Fecteau grid. Measures have subsequently been proposed to reduce, mitigate or prevent adverse environmental impacts as well as risks and also measures to improve the positive impacts.

5. Policy, legal and institutional frameworks for the project

The project as a whole is part of a political, legal and institutional framework.

On the political level, the following may be mentioned: the National Environment Policy, the National Action Plan for the Environment, the National Strategy for the Implementation of the

United Nations Framework Convention on Climate Change and The Accelerated Growth and Employment Promotion Strategy, etc.
On the legal level, Togo has ratified a number of conventions at the international level. It also has legislative and regulatory texts that the project will have to take into account.

Some of the conventions to which Togo is a party to, include the United Nations Framework Convention on Climate Change and its Kyoto Protocol, the United Nations Convention on Biological Diversity (Rio de Janeiro, 1992), the United Nations Framework Convention on Climate Change ECOWAS Convention, Stockholm Convention on Persistent Organic Pollutants, etc.

On the national level, the following may be mentioned: Constitution of the Fourth Republic of Togo, Law No. 2008-005 of 30 May 2008 on the framework law on the environment, Law n ° 2007-011 of 13 March 2007 on the Decentralization and local freedoms, Law n ° 2006-010 of 13 December 2006 establishing the Labour Code of the Togolese Republic, Decree No. 2011-041 / PR of 16 March 2011 laying down detailed rules for the implementation of the environmental audit, Decree No 2006-058 / PR of 5 July 2006 laying down the list of works, activities and planning documents submitted to the Environmental Impact Assessment and the main rules of this study, Order No 013 / MERF of 01 September 2006 Regulation of the procedure, methodology and content of EIA, Order n ° 018 / MERF of 09 October 2006 laying down the procedures and procedures for public information and participation in the environmental impact assessment process .

In the absence of accepted national standards, the international standards of the European Union, WHO, etc. Applicable to the project will be used.

At the institutional level, the Ministry of Environment and Forest Resources, the Ministry of Agriculture, Livestock and Water Resources, AGETUR Togo etc.

6. Analysis of alternatives

The project presents three options. Option 1: The 'No-Project' alternative; Option 2: Alternative design and technology; and Option 3: Alternative project site. In view of the advantages and disadvantages of each option, the current proposed action is the most viable.

In this option, there are variations in relation to the technology. The variant with combined basin and furrow irrigation and using solar energy is the most appropriate because it has the merit in the medium and long term to accumulate more social, economic and environmental benefits.

7. Current State of the project sites : the biophysical and human environments

The project will be located at Mandouri, the capital of the prefecture of Kpendjal, in the region of Savannah in Togo. The project area is located 2 km from the city of Mandouri and the site covers an area of 144ha.

The site of the project is a grassy savanna characterized by two strata, namely a shrub stratum, very scanty and very poor in plant species including Lophina lanceolata, Piliostigma thonningii and a very abundant herbaceous stratum dominated mainly by three species Panicum maximum, Cyperus Sp, Sporobolus pyramidalis.

The site is close to the Mandouri Wildlife Reserve, which is much depleted of wildlife resources due to poaching, flooding by the populations, etc.

The population of the canton of Mandouri is 10,589 in 2010, spread over an area of 238 km²; an average density of 44 inhabitants/km². This population is made up of 76.6% of rural people and 3.4% of urban. Depending on the average rate of increase of 3.18 per cent, the population of the Mandouri Township is estimated at 12,800 in 2016 and will increase to 15,400 in 2022, 17,500 in 2026 and close to 20,000 By 2030.

More than 90% of the population of Mandouri farm. It is a traditional and family type of agriculture. The main speculation produced is sorghum, maize, paddy rice, yam, peanut, cotton, soybeans.

8. Potential Impacts of the project and mitigation measures

The positive impacts are:

The positive impacts are:

a. Improving food security: The project will allow local communities to practice the following crops: in the dry season, tomato, okra, watermelon, etc. In the rainy season, rice, maize, sorghum;
b. Job creation: The project will create employment opportunities for communities especially young people and women. Skilled and unskilled workforce will be needed during the implementation of the project. During the installation of the solar system and maintenance, jobs will be created on a full-time and part-time basis, which will improve the local micro-economy and contribute to poverty reduction.
c. Improved natural resource management: the project will promote the creation of green hedges, improved land management and optimal use of land
d. Possibility of improved research and development: the project will serve as an intelligent engineering model for agriculture.
e. National and international negotiating opportunities: the project is strategically located in a region not far from Benin and Burkina Faso, and can potentially be a good site for trade both locally and internationally.
f. Improved water use / flood moderation: Implementation of the project will help improve water use in both rainy and dry seasons. The use of water in irrigation and other activities in the area will be a way of controlling the flow of water downstream of the project area.
g. Environmental benefits associated with the use of solar energy: Significant reductions in emissions will be achieved by the production of photovoltaic electricity (PVe) since PV does not generate noise or chemical pollutants during normal operation
h. Social impacts related to the use of solar energy: Some direct benefits are related to direct use in the implementation of community activities. The design of the project includes a solar community bakery. Therefore, PVe improves quality of life and reduces immigration.

The negative impacts with a relative importance or a medium severity or high are:

In the phase of preparation and construction:

- Air pollution
- Noise pollution
- Pollution of water and soil
- Loss of the coverage of the natural vegetation
- Public Health

In the Operation Phase

- Soil erosion
- Loss of Biodiversity
- Modification of the structure of the ground
- Registration of water and salinization
- Effects of the ecosystem downstream of the river
- Pollution by the chemical products
- Seeds and Plant Diseases Invasive Species
- Flows of population
- Management of solid garbage
- Production of crops - Conflicts of rearing
- Increased insecurity
- Increase in poaching
- Increase in communicable diseases

In the decommissioning phase of the project

- Noise pollution
- Air pollution
- Production of solid waste

9. Risks related to the project

The risks related to the project are:

- Risk of traffic accidents
- Risk of accidents at work
- Risk of fire
- Risk of drowning
- Risk of infection from HIV/AIDS
- Risk of water contamination by faeces
- The risk of infection from water-borne diseases
- Risk of migration of people
- Risk of development of waterborne diseases
- Risk of theft of solar installations
- Risk of poor management of solar installations
- Risk of Flooding of facilities
- Risk of conflicts between producers
- Risk of insecurity of land tenure to the exploitation of the Perimeter
- Risk of Apparitions of pests and invasive vegetation

Environmental and Social Management and Risk Management Plans

The above-mentioned impacts and risks, environmental and social management plans and risk management are proposed to mitigate and / or offset impacts and prevent risks.

Effective implementation of the mitigation measures proposed in this study will minimize negative impacts and prevent risks. It is enough to put in place a rigorous plan of management of risks. This project is thus ecologically executable.

The proponent is required to monitor and monitor the environmental components affected by the project in order to test the effectiveness of mitigation measures. The National Agency for Environmental Management (ANGE) has a mandate to monitor the implementation of the measures to mitigate the negative impacts and the preventive measures of the risks of the project. It will carry out its mission jointly with the institutions concerned.

The total cost of implementation of the ESMP and the environmental monitoring and control of the project amount to **40,940,000 FCFA**

The costs of the implementation of the risk management plan amounted to **18,900,000 CFA** francs for the first 5 years and to **500,000** francs per year for the operating phase due to the guarding of the solar installations.

Table below summarizes the Environmental and Social Management Plan (ESMP).

A. Environmental and Social Management Plan (ESMP)

Sources of impacts / Activities	Impacts	Mitigation Measures	Implementation Periods	Responsible for Execution	Responsible for monitoring and control	Indicators for Monitoring	Means of Verification	Cost of implementation in FCFA
PREPARATION PHASE AND CONSTRUCTION								
Development of access paths Clearing and cleaning areas, Development of the perimeter, Construction of the Pumping Station Installation of solar equipment	Air pollution	Train all the staff assigned to the project before the start of the activities	During the execution of the work	DE/PMU	ANGE	Number of training session	Site visit Activity Report	300 000
		Educate drivers to avoid unnecessary travel	During the execution of the work	DE/PMU	ANGE	Number of awareness session	Site visit	PM
		Ensure the good condition of the gear	During the execution of the work	DE/PMU	ANGE	Technical visit to day	Activity Report	PM
		Scour only the useful surfaces	During the execution of the work	DE/PMU	ANGE	Stripped area	Site visit Activity Report	PM
	Noise pollution	Make a routing of trucks noise sensitive areas	During the execution of the work	DE/PMU	ANGE	Number of complaint	Site visit Activity Report	PM
		Reduce the amount of engine idle time for trucks pick-up or other small equipment	During the execution of the work	DE/PMU	ANGE	Number of complaint	Site visit Activity Report	PM
		Provide the worker the EPI and vigils to their actual port	During the execution of the work	DE/PMU	ANGE	Status of the areas of borrowing	Site visit Activity Report	1 000 000
	Pollution of soils	Educate drivers on the contamination linked to the leaks of motor oils and of fuel on the ground	During the execution of the work	DE/PMU	ANGE	Numbers of Awareness	PV of Awareness Activity Report	100 000
		Do the control and maintenance of mandatory gear used on the site	During the execution of the work	DE/PMU	ANGE	Status of gear used on the site	Thumbnail of technical visits to day	PM

Sources of impacts / Activities	Impacts	Mitigation Measures	Implementation Periods	Responsible for Execution	Responsible for monitoring and control	Indicators for Monitoring	Means of Verification	Cost of implementation in FCFA
		Develop an area for the cleaning and the draining of the gear.	During the execution of the work	DE/PMU	ANGE	The presence of developed area and waterproof	Site visit	1 000 000
Development of the perimeter, Construction of the Pumping Station Installation of solar equipment	Modification of the structure of the soil of banks	Limit the clearing of the banks to the portion useful for the opening of the tracks of access	During the execution of the work	DE/PMU	ANGE	The Band of the Riverbank cleared does not exceed 20 m long	Site visit Activity Report	PM
		Backfill and levelling the lower parts of the bank and then transplant the clumps of grasses on the embankments in order to allow the rapid regeneration of the vegetation	During the execution of the work	DE/PMU	ANGE	Bank State Transplanted surface of tufts	Site visit Activity Report	500 000
		Create gentle slopes at the level of the banks of the tracks of access at the perimeter and at the pumping station	During the execution of the work	DE/PMU	ANGE	State of banks	Site visit Activity Report	PM
	The destruction of the plant cover	Scour only the portion useful to develop the tracks	During the execution of the work	DE/PMU	ANGE	Stripped surface	Report of Activities Site Visits	PM
		Avoid putting the rubble on the areas not pickled and covered in vegetation	During the execution of the work	DE/PMU	ANGE	Status of the areas stripped	Site visit Activity Report	PM
		Make a compensatory reforestation of the vegetation destroyed (10 ha)	During the operation	DE/PMU	ANGE	Replanted area	Site visit Activity Report	6 000 000
	Destruction of wildlife habitats	Limit the stripping only to the portion useful	During the execution of the work	DE/PMU	ANGE	Status of the areas stripped	Site visit Activity Report	PM
		Raise the awareness of the population in the preservation of wildlife	During the execution of the work	DE/PMU	ANGE	Number of awareness session	Site visit Activity Report	PM
		Avoid putting the rubble on the areas not pickled and	During the execution of the	DE/PMU	ANGE	Status of the areas stripped	Site visit Activity Report	PM

Sources of impacts / Activities	Impacts	Mitigation Measures	Implementation Periods	Responsible for Execution	Responsible for monitoring and control	Indicators for Monitoring	Means of Verification	Cost of implementation in FCFA
		covered in vegetation	work					
Development of the perimeter, Construction of the Pumping Station Installation of solar equipment	Destruction of food crops	To compensate the owners of affected crops	Prior to the start of work	DE/PMU	ANGE	Number of people compensated Number of Complaints	Received of payment Field visits	PM
		Raise the awareness of the population on the timetable of work	Before starting and during the work	DE/PMU	ANGE	Number of awareness session	Site visit Activity Report	PM
		Carry out the work in dry season after the crops	During the work	DE/PMU	ANGE	Number of Complaints	Field visits	PM
Operating Phase								
Operation of the Perimeter Operation of machines and pumps	Insalubrity of the perimeter by solid waste	Recover solid waste and especially non-biodegradable plastics that will litter the ground	During the operation	DE/PMU	ANGE	State of the soil	Site visit Activity Report	240 000
		Awareness of producers on the need not to abandon or lay the solid waste and the plastic bags	During the operation	DE/PMU	ANGE	Number of awareness	Site visit Activity Report	100 000
		Put the garbage in the provision of the workers on the sites.	During the operation	DE/PMU	ANGE	The number of bins	Site visit Activity Report	100 000
	Pollution of the soil by the oils	Use the gear in good condition to avoid leaks of motor oil	During the operation	DE/PMU	ANGE	Absence of engine oil to the ground	Report of Activities Site Visits	PM
Operation of the Perimeter Operation of		Educate drivers on the contamination linked to the leaks of motor oils and of fuel on the ground	During the operation	DE/PMU	ANGE	Numbers of Awareness	PV of Awareness Activity Report	100 000

Sources of impacts / Activities	Impacts	Mitigation Measures	Implementation Periods	Responsible for Execution	Responsible for monitoring and control	Indicators for Monitoring	Means of Verification	Cost of implementation in FCFA
machines and pumps		Do the control and maintenance of mandatory gear used on the site	During the operation	DE/PMU	ANGE	Status of gear used on the site	Thumbnail of technical visits to day	PM
		Develop an area for the cleaning and emptying of gear	During the operation	DE/PMU	ANGE	The presence of developed area and waterproof to drain	Site visit Activity Report	PM
Operation of the Perimeter Operation of machines and pumps	Soil Erosion	Educate drivers of trucks so that they limit the speed of vehicles to 40 km/h at the village level	During the operation	DE/PMU	ANGE	Numbers of Awareness	PV of Awareness Activity Report	PM
		Use of equipment in good condition	During the operation	DE/PMU	ANGE	Status of gear used on the site	Thumbnail of technical visits to day	PM
		Tilting materials transported by trucks	During the operation	DE/PMU	ANGE	Number of Trucks sheeted	Site visit Activity Report	PM
	Loss of Biodiversity	Scour only The useful portions	During the operation	DE/PMU	ANGE	Stripped surface	Report of Activities Site Visits	PM
		Make a compensatory reforestation	During the operation	DE/PMU	ANGE	Replanted area	Site visit Activity Report	PM
Operation of the Perimeter Operation of machines and pumps	Modification of the structure of the ground	Make a regular maintenance of the pipes	During the operation	DE/PMU	ANGE	State of water ponds	Site visit Activity Report	PM
		Adopt a system of conservation tillage and tear to check the hardening and improve the infiltration	During the operation	DE/PMU	ANGE	State of banks	Site visit Activity Report	PM
Operation of the	Registration of water and salinization	Use of irrigation technologies improved	During the operation	DE/PMU	ANGE	Number of worker equipped	Site visit Activity Report	PM
		Apply an alternation of culture on the perimeter	During the operation	DE/PMU	ANGE	Cultural practice used	Site visit Activity Report	PM

Sources of impacts / Activities	Impacts	Mitigation Measures	Implementation Periods	Responsible for Execution	Responsible for monitoring and control	Indicators for Monitoring	Means of Verification	Cost of implementation in FCFA
Perimeter Operation of machines and pumps	Emission of methane in the atmosphere	Use of irrigation technologies improved	During the operation	DE/PMU	ANGE	Technology used	Site visit Activity Report	PM
		Awareness of producers to the strict observance of the requirements	During the operation	DE/PMU	ANGE	Number of awareness session	Site visit Activity Report	PM
		Apply an alternation of culture on the perimeter	During the operation	DE/PMU	ANGE	Cultural practice used	Site visit Activity Report	PM
	Effect on the ecosystem downstream	Build a withholding of water	During the operation	DE/PMU	ANGE	Existence of a withholding of water	Site visit Activity Report	
		Awareness of producers on good practices	During the operation	DE/PMU	ANGE	Number of awareness	Site Visits PV awareness raising meetings	PM
	Development of plant diseases Invasive Species	Make appropriate planning and management of activities	During the operation	DE/PMU	ANGE	Number of Complaints	Report of Activities Site visit	PM
		Awareness of producers to the strict observance of the requirements	During the operation	DE/PMU	ANGE	Number of awareness	Site Visits PV awareness raising meetings	PM
		Use of Chemicals biological	During the operation	DE/PMU	ANGE	Number of sensitization meeting Moist soil	PV of outreach meetings Site Visits	200 000
Operation of the Perimeter Operation of machines and pumps	Production of crops and conflicts of rearing	Develop and put in place a mechanism for the resolution of conflicts producers and breeders	During the operation	DE/PMU	ANGE	State of the soil	Site visit	PM
		Training producers and ranchers in the peaceful cohabitation	During the operation	DE/PMU	ANGE	During the operation	Site visit Activity Report	PM
		Support the farmers by the construction of pens of cattle	During the operation	DE/PMU	ANGE	The presence of pens of cattle	Site visit Activity Report	PM

xvi. ***Mandouri Agriculture Resilience Project***

Sources of impacts / Activities	Impacts	Mitigation Measures	Implementation Periods	Responsible for Execution	Responsible for monitoring and control	Indicators for Monitoring	Means of Verification	Cost of implementation in FCFA
	Increase in poaching	Ensure compliance with the Regulation on the conservation of wildlife	During the operation	DE/PMU	ANGE	Number of complaint	Site visit Activity Report	PM
End phase of Project (decommissioning)								
Demolition of the facilities	Loss of Employment	Subscribe producers to an insurance policy	During the operating phase	Proponent	ANGE	Insurance Policy		
	Air pollution	Train all the staff assigned to the project before the start of the activities	Before the start of the dismantling	Proponent	ANGE	Number of training session	Site visit Activity Report	300 000
		Educate drivers to avoid unnecessary travel	During demolition	Proponent	ANGE	Number of awareness session	Site visit	PM
		Ensure the good condition of the gear	During demolition	Proponent	ANGE	Technical visit to day	Activity Report	PM
Demolition of the facilities	Noise pollution	Make a routing of trucks noise sensitive areas	During demolition	Proponent	ANGE	Number of complaint	Site visit Activity Report	PM
		Reduce the amount of engine idle time for trucks pick-up or other small equipment	During demolition	Proponent	ANGE	Number of complaint	Site visit Activity Report	PM
		Provide the worker the EPI and vigils to their actual port	During demolition	Proponent	ANGE	Status of the areas of borrowing	Site visit Activity Report	1 000 000

B: Flowchart of the Risk Management Plan

The activities	Risks	The measures	Implementation period	Responsible For monitoring	Responsible for monitoring and surveillance	The indicators	Cost
Installation of the site, construction of the works, Development of the Perimeter	Accidents at Work	- Communicate the codes of risk; - Place copies of the system of codification of the risks to the outside of the facility, to the location of the entrance doors and systems of connection for fire emergencies; - Share with the emergency services personnel and security, in a proactive manner the information regarding the types of hazardous materials stored, processed or used in the installation - Do participate periodically (all quarters) the representatives of the emergency services and local security to orientation visits and inspections of the installation, in order to familiarize themselves with the potential risks present	Before and during the construction	ANGE	Proponent/PMU	- Contract of Insurance Policy - Number and types-of panels - Percentage of sensitized persons - Existence of tags - Level of speed in crossing of agglomeration - Status of vehicles and gear - Number of meetings - State of the Headlights - Absence of strollers on the construction site - Number of accident	PM
Led construction machinery, borrowing, and transport of materials.	Traffic accidents and work	- Raise the awareness of drivers on the prudence, the limitation of the speed to 40 km/h at the crossing of the villages and the City of Mandouri especially to the HOURS output of students and the inappropriate use of the horn; - Implement the signage of the output of the trucks at the crossroads of the tracks of access; - Regularly maintain the tracks;	During the preparation and construction	ANGE	Proponent/PMU	- State of soils - Quantity of recyclable materials - Amount of recycled material - Quantity of green waste on site - Amount of dredged material used - The number of bins - Effective use of waste bins - Amount of non-hazardous waste collected	200000

The activities	Risks	The measures	Implementation period	Responsible For monitoring	Responsible for monitoring and surveillance	The indicators	Cost
		- Educate especially taxi drivers-bike to the respect of the signs and the caution on the tracks - Educate drivers on the divagation of animals and the passage of the transhumant herds - Raising the awareness of women to take care of the children; - Put the back of an ass; - Take charge of the wounded; - Insist on the Vigilance drivers of equipment and trucks - Always circulate headlights on for the equipment and trucks, even in full day - Away any person not required on the construction site - Warn the gendarmerie in case of accident				- Sorting of waste	
Installation of the yard, storage of hydrocarbons	Risk of fire:	- Prohibit any incandescent object when the supply of fuel; - Have on the site of equipment anti-fire adequate;	During the preparation and construction	ANGE	Proponent/PMU	- Number of panels of appropriate signage on the site - Existence of equipment anti-fire	P/M
Construction of the Pumping Station	Risk of drowning	- Educate employees on the risk of drowning; - Avoid to perform work in the water and under the rain; - Intensify work in dry season (January to May) in order to be immune to the floods which accentuate the risk of drowning; - Training workers to swimming and first aid; - Train the members of the Committee SSHE to the	During the preparation and construction	ANGE	Proponent/PMU	- Number of awareness - Number of Complaints - Schedule of Activities - Number of workers trained - Number of Trained Worker - Number of cases of drowning	200000

The activities	Risks	The measures	Implementation period	Responsible For monitoring	Responsible for monitoring and surveillance	The indicators	Cost
		swimming; - Monitor the dropped water from the dam of Kompiengua; - Warn the gendarmerie in the case of drowning					
Installation of the yard, development of the Perimeter	Risk of contamination to STI/HIV/AIDS	- Educate employees on the respect of local mores; - Take appropriate measures to raise the awareness of workers on STIS AND HIV/AIDS, and comply with the provisions of the Labour Code in the recruitment of workers to avoid the work of children.	During the preparation and construction	ANGE	Proponent/PMU		PM
Installation of the yard, development of the perimeter, construction of the Pumping Station	Risk of water contamination by faeces.	- Prohibit the labourers to do their need in the water and on the banks; - To put at the disposal of the workers a toilet mobile construction and the empty in appropriate conditions. - To put at the disposal of the producers of the Toilet	During the preparation, construction And Exploitation	ANGE	Proponent/PMU	- The presence of a note of Prohibition - State of the water and banks - The presence of a toilet construction site - The presence of toilet for producers	PM
Intensification of productions agro-sylvo-pastoral	Risk of Apparitions of pests and invasive vegetation	Maintains the channels of irrigations, fixing of banks, rational use of agricultural inputs	During the operation	ANGE	Proponent/PMU	Linear of Channels maintained, hectares of banks set, quantity of agricultural inputs used	PM
Installation of the yard, development of the perimeter, construction of the Pumping Station	The risk of contamination of water-borne diseases	- Prohibit the workers to use the river water as drinking water; - Prohibit to the workers and to personal to swim in the river water; - To put at the disposal of the staff and workers of the drinking	During the preparation and construction	ANGE	Proponent/PMU	- The presence of posters of the prohibition on the construction site - The presence of posters of the prohibition on the construction site - Presence of a device for	1000000

The activities	Risks	The measures	Implementation period	Responsible For monitoring	Responsible for monitoring and surveillance	The indicators	Cost
		water; - Have permanently on a master-swimmer on the site in case of implementation of the work in the course of water.				the supply of drinking water on the site	
Operation of the Perimeter	Risk of migration of people	- Raise the awareness of the population and the producers on the respect of local mores; - Take appropriate measures to raise awareness among populations and the producers on STIS AND HIV/AIDS, and comply with the provisions of the Labour Code in the recruitment of workers to avoid the work of children.	During the operation	ANGE	Proponent/PMU	- Number of awareness session - Number of Complaints	PM
Operation of the Perimeter	Risk of development of waterborne diseases	- Raise the awareness of the population and the producers on the respect of water-related diseases; - Strengthen the Health Center of Mandouri in equipment and pharmaceutical products; - Put in place a program of monitoring of the epidemiological diseases and water.	During the operation	ANGE	Proponent/PMU	Number of awareness session Number of Complaints State of facilities	5000000
Exploitation of solar installations	Risk of theft of solar installations	- Raise the awareness of the population and the producers on the compliance and monitoring of the facilities; - Recruit a local labour for the caretaking 24h/24 of facilities; - Build a strong fence around the solar facilities;	During the operation	ANGE	Proponent/PMU	Number of awareness session Number of Complaints	2500000

The activities	Risks	The measures	Implementation period	Responsible For monitoring	Responsible for monitoring and surveillance	The indicators	Cost
Exploitation of solar installations	Risk of poor management of solar installations	- Raise the awareness of the population and the producers on the compliance and monitoring of the facilities; - Form a local labour for the maintenance of facilities	During the operation	ANGE	Proponent/PMU	- Number of awareness session - Number of Complaints - State of facilities - Number of trained person	PM
Operation of the pumping station and solar installations	Risk of Flooding of facilities	- Build the pumping station to a dimension which allows to shelter equipment; - Build the solar park in a non-flood area.	During the operation	ANGE	Proponent/PMU	- Number of Complaints - Number of cases of flooding	PM
Operation of the Perimeter	Risk of conflicts between producers	- Develop and put in place a program for the management of conflicts related to the exploitation of the perimeter and facilities; - Develop a management manual the perimeter of the area and the facilities.	During the operation	ANGE	Proponent/PMU	- Existence of a program management of conflicts	5000000
Operation of the Perimeter	Risk of insecurity of land tenure to the exploitation of the Perimeter	- Make the administrative documents required to secure the tenure of the perimeter; - Sign contracts for the exploitation of the perimeter between owners, producers and the State.	During the operation	ANGE	Proponent/PMU	- Number of Complaints - Existence of administrative documents of the land	5000000

PREFACE

Togo's economy is based on the agriculture sector. This sector is confronted with the adverse effects of climate change, the consequences of which are expressed in terms of reduced production, threatening to destabilize food security and dispossessing two-thirds of the working population of their livelihoods. This threat is all the more serious since Togolese agriculture is a rain-fed agriculture dominated by small-scale producers. Indeed, it depends essentially on the very variable climatic conditions which greatly disrupt agricultural activities. This high variability is due to the worsening climate variability characterized by:

1. Unpredictable start of the rainy season;
2. The early cessation of rains in relation to the usual cultural calendar;
3. Seasonal shifts;
4. Poor spatial and temporal distribution of rainfall, characterized by the occurrence of dry breaks and the concentration of rains over short periods;
5. The lengthening and / or severity of the drought;
6. Floods;
7. High heat; and
8. High winds.

This high climatic variability disorients farmers in their cultivation practices affects crops in the vegetative stage, leading to significant losses in yields and decimating animals, which seriously undermine the country's food security and its economy. Thus, the most northern regions of the country (Kara, Savannah) enjoying unfavourable climatic conditions are regularly affected by famine, a consequence of climatic abnormalities which considerably reduce agricultural productions. According to vulnerability studies, the region of Savannah on the edge of the Sahel is the region most vulnerable to climate change in Togo.
However, with annual cumulative rainfall between 900 and 1100 mm, the Savannah region receives between 7 and 8 billion cubic meters of water per year. This quantity of water can, thanks to the techniques of control and optimal exploitation of the surface water, make it possible to reduce the vulnerability of the actors of agriculture in the region. Unfortunately, the control of water for irrigation is still in an embryonic state in Togo.
It is for this purpose that the project to increase the level of resilience of actors vulnerable to climate change in the agricultural sector in Togo and more specifically in Mandouri (Savannah region) through water control is an answer appropriate adaptation to the strong climatic variability to secure the activities of agricultural productions. Beyond safeguarding production, this project aims to promote diversification of livelihoods, valorisation of agricultural products and improvement of local governance to better take into account the adverse effects of climate change and variability.

Aware of the environmental and social issues associated with such activities and the entry into force of the framework law on the environment and regulatory texts relating to environmental and social impact assessment in Togolese territory, Environmental and Social Impact Assessments with Environmental and Social Management Plans (ESMPs) and Risk Management (PMP) including mitigation measures, compensation for negative impacts or risk prevention related to the implementation of the project Is carried out.

This Environmental and Social Impact Assessment Report of the project to increase the level of resilience of vulnerable stakeholders to climate change in the agricultural sector in Mandouri is structured as follows:

1. Background to the project;
2. Methodology of the study;

3. Political, legal, normative and institutional frameworks;
4. Description of the receiving environment of the project;
5. Analysis of options, variants and project;
6. Identification, description and evaluation of project impacts;
7. Environmental and Social Management Plan;
8. Risk analysis and management;
9. Monitoring and follow-up programs.

1.0 Putting it in context of the project

1.1 Presentation of the proponent

This document presents the assessment of environmental and social impacts (ESIA) for the project entitled "increasing the resilience of vulnerable communities in the agricultural sector of Mandouri, in the north of Togo". It is ready to meet the regulatory requirements of Togo. The project proponent is the Ministry of the Environment and Forest Resources (MERF) by the intermediary of the Directorate of the Environment (DE). The main stakeholders are the communities of Mandouri.

MERF proposes to develop an irrigation project of 144 ha with pumping technology Solar, in the prefecture of Kpendjal, in the north of Togo, and has commissioned the development of this ESIA standards of local permit in order to ensure that the environmental and social impacts and potential related to the development of the project are identified, assessed and managed in an appropriate manner.

1.2 Project Objectives

Most of the regions of the North of Togo (Kara and Savannah) are regularly affected by famine, and the anomalies due to the climatic changes that significantly reduce agricultural production. The proposed project plans to deal with the vulnerability to climate change in the agriculture sector in a region of Savannah (Mandouri) by the installation of infrastructure and the improvement of food security. The project plans to install the technology of irrigation and the equipment, including the solar technology, to improve the quality of the water and the supply of the Community in the area of the project. The proposed project will also include the diversification of means of subsistence in supporting the production of livestock and integrating the management of knowledge in the framework of the project.

1.3 *Presentation Project summary*

1.3.1. Proposed location of the project

The project will be located in Mandouri, capital of the prefecture of Kpendjal in the Savannah region of Togo. The project area is located in Mandouri Township. The site of the project is located 2 km from the town of Mandouri and the extents of the site are given by the following coordinates.

A - 100 52' 37.2" N, 00 49' 01.20" E
B - 100 52' 12" N, 00 49' 30.8" E
C - 100 51' 43.2" N, 00 49' 15.6" E
D - 100 51' 54" N, 00 48' 39.6" E

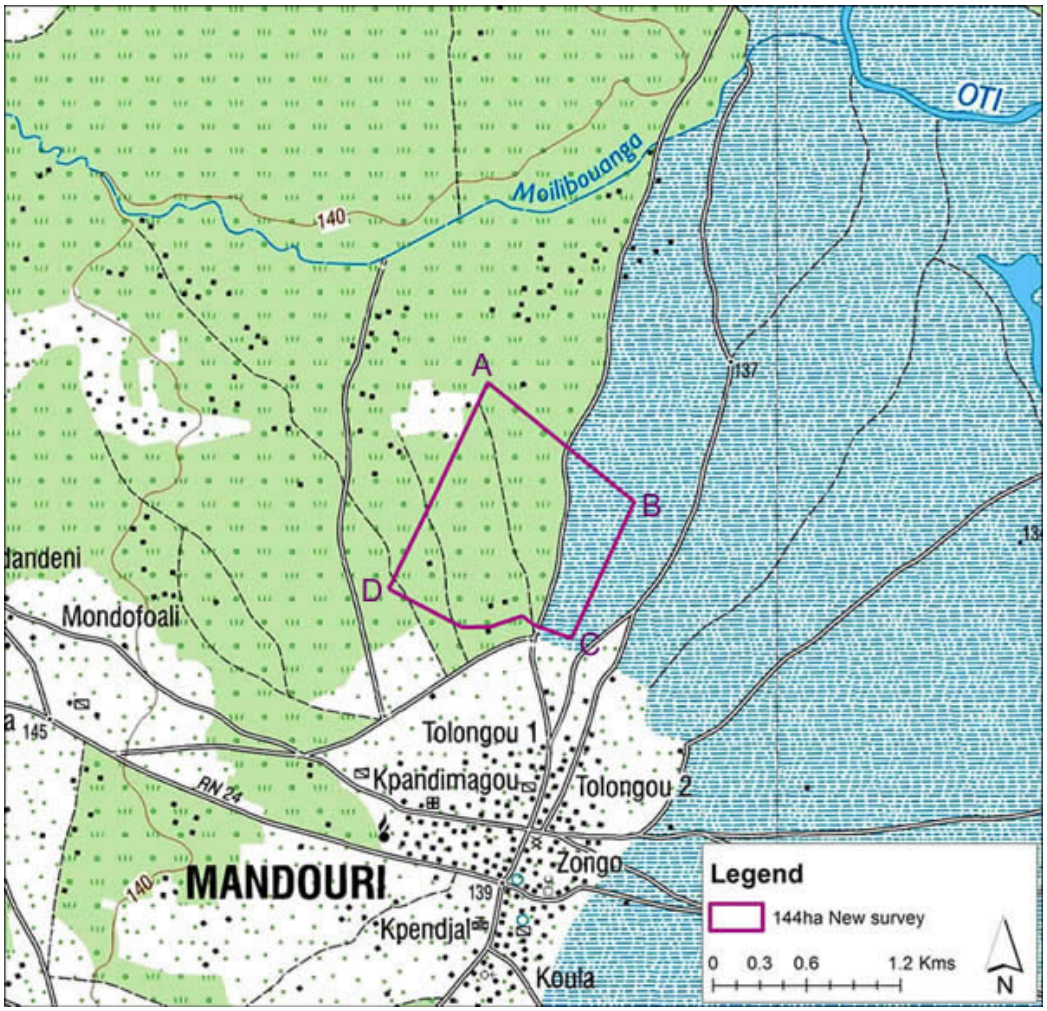


Figure 1: Map of the area of the project

1.3.2. Type of Activity

The proposed project is an irrigation project. The project plans to install irrigation technologies and equipment, including solar technology, to improve water quality and community supply in the project area. The proposed project will also include diversification of livelihoods by supporting livestock production and integrating knowledge management into the project.

1.3.3 Overview of the programs and the planned activities

The cost of the irrigation project proposed will be estimated at $10 million, including the audit activities by NEMA Togo. The planned activities of the project are categorized in three main components, summarised in the table 1.

Table 1: Projects of irrigation projects and planned activities

Component	Activities
1. Improved planning and management of water resources and (agricultural) production	1.1 Develop 144 ha for agricultural production, equipped with semi California irrigation system, powered by a solar pumping system 1.2 Improve techniques and means of irrigated production 1.3 Design and implement training programs for actors responsible for the operation, maintenance and repair of equipment acquired for the beneficiaries.

2. Diversification of livelihoods and the improvement of the living conditions of the beneficiaries	2.1 Promote the development of income generating activities 2.2 Implement simplified funding mechanism for producers (micro-credit) 2.3 Build latrines for sanitation
3 Capacity building, environmental and social measures, and knowledge management	3.1 Design and deliver capacity-building programs 3.2 Implement measures of the Environmental and Social Management Plan 3.3 Establish a knowledge management system (production, capitalization, vulgarization, etc.)

The flagship irrigation initiative will involve the use of solar power for pumping water from the River Oti to the project site. The ultimate goal is to allow crop production even in the dry season.
A solar panel farm will be set up to produce power that will be used to drive a 110 kW pump with capacity of 600 m^3/hr with a total head of 40 meters.

The solar component will consist of 848 260w PV modules (solar panels) that will effectively produce 212 kW. The extra power produced will be used to complement irrigation activities in the community i.e. use in Income Generating Activities (IGAs) including a planned communal bakery project. More information is given in separate documents on the irrigation project design.

1.3.4. Project Schedule

Subject to the permit approvals necessary, and taking account of the nature of the activities, the project will begin immediately.

1.3.5. Unforeseen events

It is possible that unforeseen events occur during the phases of implementation, operation or decommissioning of the project. These events can include:

- The environmental incidents, including or in consequence of climate change;
- Natural disasters generals such as floods, fires or drought;
- The individual emergencies such as injuries, disease, the bites of snakes, the drug reaction; or
- Medical emergencies;

The proposed project will include emergency procedures for responding to such incidents.

1.3.6. Implementation of the initiative of solar irrigation to Mandouri

The design and implementation of the initiative of solar irrigation to Mandouri will include the following elements:

1. Improvement of the planning and management of water resources and the production (farm), namely irrigation techniques, solar energy, the management of equipment, etc.
2. Diversification of the means of subsistence and improvement of the living conditions of the beneficiaries. Income-generating activities, sanitation, etc.
3. The strengthening of capacities, the environmental and social actions and the management of knowledge, that is to say the implementation of the environmental and social management plan.

2.0 Methodology of the study

This report is the result of work carried out in two phases:

1. A first phase, carried out by the CiNTECH and AG7 office consortium, which consisted of the completion in 2014 of an ESIA study for a first version of the 144 ha development of the agro-sylvo-pastoral and fisheries perimeter.
2. A second phase, carried out by ASCENT, consisted in the updating and adaptation of this initial study so that it would be in line with the evolution of the project in 2017, increasing the resilience of agricultural producers with the development of 144 ha of agro-sylvo-pastoral and fisheries perimeter with the use of solar energy as a source of energy.

2.1 Visits to the sites of the project

Visits have been organized in the framework of the realization of the SEIA of this project. They have helped to ascent to make a first analysis of the location of the project. These visits have also allowed to know the sites, to analyse the physical, biological and human environments of the area of the project. A public inquiry was necessary in order to collect information and to collect the appraisals and grievances of the population likely to be impacted by the project.

2.2 Documentary research

The documentary research has helped to make the point on the policies, conventions, laws and other regulatory texts applicable in the sectors affected by the project. It has also been useful in the analysis and synthesis of the methodologies for the determination and assessment of the impacts and risks of the project on the environment.

Exchanges with the local authorities (township chief, village chief, etc.) NEMA and the Directorate of Environment have also been carried out.

2.3 Identification, description and assessment of the impacts

2.3.1 Identification and description of the impacts

The impacts have been identified and described according to the different phases of the project to know: planning, construction, operation and end of project.

The identification of the impacts is made from the Leopold's matrix, for the identification of the interactions between the issues, the components and phases of the project.

Table 2 : Leopold Matrix for the identification of potential impacts

The elements Environmental / Phases, The activities And Elements Of the project		Biophysical Environment							Human environment							
		Air	Soil and rocks	Surface water	Groundwater	Acoustic environment	Vegetation and flora	Wildlife	Accidents	Income and Employment	Agriculture	Demography	Socio-cultural environment	Habitat and framework of life	Health / Security	Land heritage
PHASES	Activity															
	Activity															
	Activity															

2.3.2 Assessment of the identified impacts

The assessment of impact is based on a methodology that integrates the parameters of duration, extent, impact intensity and value of the affected component. The first three parameters are aggregated into a summary indicator to define the absolute importance of the impact. The fourth parameter is added to the absolute importance of the impact to give the relative importance of the impact or the severity of the impact.

The significance of an impact is thus an indicator of synthesis, of overall judgment and not specific to the effect that an element of the given environment undergoes as a result of an activity in a given reception environment. This analysis must take into account the level of uncertainty that affects the assessment and the likelihood that the impact will occur.

- **Duration of the impact**

The duration of the impact specifies the period of time during which the changes to the components of the environment will be felt. This duration factor is grouped into three classes:

- It is **short**, when the effect of the impact is felt at a given moment, especially when the action is accomplished.
- It is **average**, when the effect of the impact is felt continuously but for a period of time after the activity has taken place.
- It is **long**, when the effect of the impact is felt at a given moment and for a period of time equal to or greater than the lifetime of the project.

- **Scope of the impact**

The extent is punctual, local, and regional; it expresses the spatial scope or radiance of the effects generated by an intervention on the environment. This concept refers to either a distance or area over which changes will be experienced by a component or the proportion of a population that will be affected by these changes:-

- It is **ad hoc** when the impacts are limited to any point of the project site.
- The extent **is local** when it extends over the entire extent of the site.
- It is **regional** when the impact extends outside the site.

- **Intensity**

The intensity or the degree of disruption corresponds to the magnitude of the changes that affect the internal dynamics and the function of the environmental component affected. Generally, it distinguishes three degrees: High, Medium and Low.

The following settings are to consider:

- The disturbance is **high** when the impact deeply undermines the integrity of the element touched, alters very strongly its quality or limited its use of important way or cancels any possibility of its use.
- It is **medium** when the impact undermines somewhat the use, the quality or the integrity of the element touched.
- It is **low** when the impact does not change perceptibly the integrity, the quality or the use of the element touched.

- **Value of the component affected**

The value associated with an impact relates to the social importance, economic and/or cultural as the population attaches to a resource as well as the ecological importance of this

resource in the dynamics of the ecosystem assigned to local plans, regional or national. This value will be considered as low, medium and strong.

- The value is **low** if the impact affects an abundant resource seasonally or in any season, but not threatened with extinction.
- It is **medium** if the impact affects a resource which the regeneration time and mutation is relatively long (approximately five years).
- The value is only **strong** if it affects a resource which the regeneration time and mutation is long, greater than five years, a sensitive area or if it is of a resource threatened with extinction final.

Table 3 : Determination of the absolute importance

Intensity	Scope	Duration	Absolute importance
Strong	Regional	Long	Major
		Average	Major
		Short	Major
	Locale	Long	Major
		Average	Average
		Short	Average
	Ad hoc basis	Long	Major
		Average	Average
		Short	Minor
Average	Regional	Long	Majeure
		Average	Average
		Short	Average
	Locale	Long	Average
		Average	Average
		Short	Average
	Ad hoc basis	Long	Average
		Average	Average
		Short	Minor
Low	Regional	Long	Major
		Average	Average
		Short	Minor
	Locale	Long	Average
		Average	Average
		Short	Minor
	Ad hoc basis	Long	Minor
		Average	Minor
		Short	Minor

Source: Fecteau, 1997

Table 4 : Determination of the relative importance of an impact

Absolute importance of the impact	Relative value of the affected component	The relative importance of the impact
Strong	Strong	Strong
	Average	Strong
	Low	Average
Average	Strong	Strong
	Average	Average
	Low	Average
Low	Strong	Average

	Average	Average
	Low	Low

The combination of the absolute importance with that of the value of the affected component gives the relative importance or the severity of the impact.

2.3.3 Identification of risks and dangers

A risk identification matrix, through the cross-referencing of risks and the different stages and activities of the project, enabled the interactions of each activity with each risk to be highlighted.

Activities identified as potentially hazardous and posing risks to the health and safety of producers and populations are identified.
Finally, the risks of technological accidents likely to occur during project activities are identified on the basis of knowledge in the field.

2.4 Consultation of the population

Participatory consultation was essential and consisted of interviews with all sections of the population of Mandouri through focus group meetings to inform them about the project, to gather information on the human aspects of their environment and their opinions on the project and their grievances.

This consultation concerned all the social strata of the area with particular emphasis on opinion leaders (local authorities, Chief Canton, Producers, NGOs, etc.). It was designed and conducted in such a way as to gather information about the environment through the sharing of knowledge.

Site visits and discussions with project beneficiaries have taken place since 2014. The last targeted discussions with project beneficiaries and stakeholders took place during the course of 2017.


Photo 1 : Meeting with the beneficiaries in the presence of the township chief of Mandouri and the Director of Environment, the Prefect's office

Analysis of the public consultation in May 2017

In total, 41 beneficiaries of the project (34 men and 7 women) and 9 key informants were interviewed (List of Interviewees - Annex 1 and completed Questionnaire of Samples - Annex 2). Each interviewee was also the head of the household.

Land tenure consists mostly of customary / communal ownership with a few rentals (tenancies). Some interviewed did not know their land tenure type. Land parcel size ranges from 1ha to 8ha.

Key religious beliefs in the community are Islam, Animism and Christianity.

Main occupation is farming, and key source of income is agriculture. Crops mentioned in decreasing order were rice, maize, cowpeas, sesame, sorghum, soy bean, millet, tomatoes, peanuts, and okra. Missing in the list of mentioned crops is vegetables and fruits. Livestock mentioned in order of decreasing importance included goats, poultry, sheep, cattle, donkeys, and even pigs and pigeons.

Diseases mentioned in decreasing order included - malaria, eye infection (conjunctivitis), ulcers, toothaches, pneumonia, anaemia, typhoid, cholera, skin rashes, HIV AIDS, bilharzia, coughing, fatigue and ear pain.

Most of the households sampled have 6-20 members per household. There are available infrastructure and social services (primary and secondary school, hospital, electricity, police station, etc.) in Mandouri. But for serious illness, other hospitals accessed include, Dapaong - 100km, Tandjieta 75km, and Benin - 75km. There are no tertiary institutions (colleges, universities) in Mandouri.

Awareness on the Project

Of the community members interviewed, 56% are aware of the project, while the rest are not. This is an indication, that there is need for more detailed information dissemination on the project, especially given the low education levels, and the considerable exodus of community members. The following key issues were raised (Table 1).

Table 1: Key issues from public participation

Key Issue	Description
Local economy	Interviewees hoped the Project would bring many benefits to the area, including the following:- • Increased production, end of famine. • Irrigation will allow all-season cultivation, even horticulture Irrigation, solar power. • Reduction of famine and poverty, improved schooling and medical care. • Increase of the production; increased pasture; improved health and schooling • Increased production and income will increase construction, and also develop trade • A food self-sufficiency, reduction of exodus of especially the youth. • More wealth for farmers, reduced rural exodus, and less occurrences of famine in the village. • Reduction of misery, poverty and hunger and generally decreased and livelihood improvement among the inhabitants. • Local Development, decreased rural exodus of the youth, reduction of poverty, hunger, and idleness.

Land use	Concerns raised concerning land use included the following:- • Possibility that land leased to producers will be sold after project development. • Possibility of change of land tenure and a possible increase in the price of land.
What they like about the project	• Irrigation that will enable production in all seasons (rainy and dry seasons). • Support for livestock production. • Support the beneficiaries in necessary tools. • Solar energy being important not for lighting alone but also for some of the accomplishments of the active. • Support in the agricultural production. • Multifaceted nature of the project i.e. support for livestock production, supply of drinking water, as well as crop production using irrigation.
Aspects to include in project design	• Reforest parcels of land surrounding project site. • Promote the use of organic fertilizers instead of chemical ones. • Promote the careful use of toxic phytosanitary products away from dwelling places. • Enclose or fence off project site to avoid accidents like poisoning of livestock. • Reforestation to replace the trees removed when clearing for agriculture • Flood control. • Project to buy the rice produced.

3.0 POLITICAL, LEGAL, NORMATIVE AND INSTITUTIONAL FRAMEWORKS

Environmental and social impact assessments of projects such as an irrigation project are a legal requirement in Togo. This chapter examines the strategic, legal, normative and institutional framework of ESIA for the Agricultural Resilience Project in Mandouri.

3.1 Policy Framework

Togo has developed several policy instruments in order to ensure better management of its natural resources and to promote economic and social development that ensures the well-being of the population. Some policies have experienced an effectiveness of implementation but others have remained to the project phase because of difficulties of mobilization of financial resources.

3.1.1 General policy documents in Togo

3.1.1.1 Accelerated Growth Strategy and Promotion of Employment (SCAPE)

Developed in 2012 by the Government, Togo's Accelerated Growth and Employment Promotion Strategy (SCAPE) provides a medium-term development framework for achieving the Government's General Policy Statement (DPG), the Millennium Development Goals Development (MDG / ODD) and the authorities' vision to make Togo an emerging country within 15 to 20 years, respectful of human rights and promoting the rule of law. This document reviews the national poverty index from 2006 to 2011, with particular emphasis on the growing rise in unemployment and underemployment in Togo, which particularly affects young people and women, Employment and socio-economic integration of young people has become a major concern of the authorities. It refers to priority actions such as: (i) supporting the training of young people in apprenticeship; (ii) developing and implementing a pre-employment program for young people; (iii) supporting the spirit of Enterprise, self-employment of young people and the creation of professional activities in all sectors of the national economy; (iv) establishment of a Fund to facilitate the access of young job developers to credit And (v) promoting local employment for youth and vulnerable groups; To be implemented in order to solve the employment problem with a view to reducing poverty.

The SCAPE encompasses a number of cross-cutting themes, including access to safe drinking water and sanitation, sustainable natural resources management, climate change and disaster reduction, population and gender.

3.1.1.2 National Strategy for Sustainable Development (SNDD)

The Togo National Strategy for Sustainable Development (SNDD) document is validated in September 2011 in Lomé and is a valuable tool for planning our country's development. Its Vision of a Sustainable Togo is to build a society on the basis of harmonious economic and social development, with cultural respect and support for the environment by 2030. A society in which economic, ecological and social sustainability, Solidarity, human rights, democracy, good governance are the barometers of its development. The general objective that the actors have set out in this document is to ensure economic, ecological, cultural and social development in Togo. In other words, to work for an ecologically viable economic system that guarantees acceptable conditions and living conditions for present and future generations.

This document is based on four strategic axes:

- Consolidation of the economic recovery and promotion of sustainable production and consumption patterns;

- Revitalization of the development of the social sectors and promotion of the principles of social equity;
- Improved environmental governance and sustainable management of natural resources;
- Education and skills for sustainable development.

3.1.1.3 Profile of Poverty

The poverty profile drawn up in April 2016 is a report that analyses poverty in Togo over the period 2011-2015 through data from QUIBB 2015. It aims to analyse both the evolution of poverty over this period and its decomposition according to the different social, demographic characteristics and the different layers within the population by domain.

The budget-consumption surveys and the Unified Questionnaire of Basic Indicators of Well-being (QUIBB) are important data sources to assess the situation of poverty in a country and measure inequality in the redistribution of the growth generated in population.

Indeed, when evaluating the implementation of the Millennium Development Goals (MDGs) and government actions, including the Strategy for Accelerated Growth and Employment Promotion (SCAPE), it is important to Have reliable data and respond to concerns such as:

- What is the situation of poverty in Togo at the end of the OM?
- To what extent have Togolese households benefited from this economic growth?
- Which social groups benefited most from this growth?
- Are these results reliable?
- Have the poorest Togolese benefited from this growth (pro-poor growth)?

The poverty profile focuses on:

- the methodology used to calculate expenditure aggregates, as well as the development of poverty thresholds;
- an analysis of the main results of monetary poverty;
- the possession of certain durable goods as an alternative measure of household consumption in order to apprehend the living conditions of households;
- the assessment of poverty in terms of access to basic social services as a measure of human capital.

3.1.2 The policy documents in connection with the environment sector in Togo

Since the 1980s, the Government of Togo has initiated actions to take the environment into account in the development policy of the country. Thus, with the involvement of the various professional social actors in the country, it developed, validated and adopted, in December 1998, a comprehensive policy framework for the management of the environment and natural resources on the basis of which a number of documents and texts have been prepared. These include the following policy and strategic documents:

3.1.2.1 National Policy on the Environment

The National Environment Policy adopted by the Government of Togo on 23 December 1998 defines the overall policy framework for the promotion of sound management of the environment and natural resources with a view to sustainable development in all sectors activities. It focuses on:

(i) addressing environmental concerns in the national development plan;
(ii) (the mitigation, elimination and / or reduction of negative environmental impacts of public or private development projects and programs;

(iii) strengthening national capacities in environmental and natural resource management;
(iv) improving the conditions and living conditions of the population.

Accordingly, the National Environment Policy aims, among other things, to promote sanitation through the implementation of wastewater and storm water disposal systems in human settlements and the implementation of a policy of reducing domestic waste.

This project falls under the heading of atmospheric pollution, especially in its planning and construction phases. In terms of the applicable measures, these are those relating to the prevention and control of pollution and nuisances.

3.1.2.2 National Plan of Action for the Environment (NPAE)
The National Action Plan for the Environment, adopted in June 2001, constitutes a strategic framework that complements the National Environment Policy. It takes into account the concerns of the different actors in the national socio-economic life and helps to stimulate the ecological consciousness of the different categories of actors and decision-makers to make them take into account the environmental dimension in the planning and management of programs and projects Development.

The NPAE, in its foundations and strategic orientations, aims to reconcile, in a global participatory approach, the requirements of environmental quality with those of increased productivity and economic profitability in a national and international context fluctuating.

As a result, solving environmental problems related to activities such as this project will involve:
- assessment of the impact of the project on the environment;
- the development and implementation of performance indicators for environmental monitoring;
- the application of environmental standards;
- the taking into account of safety measures to minimize adverse effects on populations, employees of the service station and the environment;
- encouraging the use of technologies to ensure safe evacuation of harmful waste;
- the development, implementation, monitoring and rigorous monitoring of environmental management plans;
- Periodic environmental audits of ongoing activities likely to have a negative impact on the environment and / or the living environment.

For the NPEA, the general principles that should guide the development and use of medium- and long-term economic instruments are the polluter-pays principles. The NEAP also provides for the progressive establishment of a system of national accounts integrating environmental aspects. By following the principle of integration of the environment and development, the PNAE recommends that environmental expenditure should be allocated mainly to the resources of companies and companies and to the budgets of the State and local Develop projects with an impact on the environment.

3.1.2.3 National Environment Management Program (NEMP)
This National Environment Management Program document is a programming of actions identified for the implementation of the policy and of the National Plan of Action for the environment over the next fifteen years. This document has the same objectives and the foundations that NWSEP and disclaims five strategic directions:

- Strengthening national capacities in the management of the environment;
- Promote an ecological conscience nation based on the mastery of knowledge and the development of positive attitudes in the face of the environment;
- Effectively take into account environmental concerns in the planning and management of development;
- Promote sound and sustainable management of natural resources and the environment;
- Strengthen sub regional and international cooperation for a concerted management of environmental problems.

The NSFP is divided into three successive phases of five years (NSFP 1, NSFP 2 and NSFP 3) over a period of 15 years. The different actors of development concerned to participate in the execution of this program.

3.1.2.4 National Program of investment for the environment and the Natural Resources (PNIERN)

The Government of Togo, with the support of technical and financial partners, has embarked on a planning process leading to the definition of national environmental policy and the development of a National Action Plan for (PNAE), which constitute an overall strategic framework in the perspective of sustainable development. This planning framework is reinforced in 2010 by the National Program for Investments for the Environment and Natural Resources (PNIERN). PNIERN aims to sustainably manage the environment and natural resources in order to contribute to the improvement of food security and the country's economic growth and poverty reduction.

Development objectives are grouped into institutional objectives, socio-economic objectives and environmental objectives.

- Institutional objective: to promote the proper functioning of State institutions and to strengthen the technical and financial capacities of the actors concerned with a view to integrating the ERM into the country's development policies.
- Socio-economic objective: Creating conditions conducive to food security and economic growth.
- Environmental objective: to combat the effects of climate change and disaster risks, rural land degradation, loss of biodiversity and pollution in urban and rural areas.

PNIERN has six specific objectives, each of which corresponds to a sub-programme for which investment priorities have been defined on the basis of diagnostic studies and in consultation with all stakeholders. The six sub-programmes are:

- strengthening institutional, legal, financial and technical capacities for sustainable management of the environment and natural resources;
- support for the implementation and amplification of good practices in rural environmental and natural resource management and the strengthening of research, advisory and commercial services;
- climate change mitigation, disaster management and risk prevention;
- reducing emissions from deforestation and forest degradation;
- improving the living environment in urban and rural areas;
- development and implementation of a knowledge acquisition and management system, monitoring and evaluation and development of a communication strategy to support the enhancement of environmental and natural resource management.

3.1.2.5 National Forestry Action Plan (NFAP), Phase 1: 2011-2019

Togo's National Forestry Action Plan, drawn up in November 2011, aims to achieve a forest cover of 20%, to fully cover national wood-energy needs, to conserve biodiversity and to ensure sustainable protection of risk areas As well as the inhabitants of fauna.

The aim of this document is to promote the accountability of all actors, state and non-state, in the management of the natural environment for a notable increase in national forest cover. Specifically, they are:

- Strengthening the legal and regulatory framework in the forest sector to formalize the interventions of the various actors;
- Reinforcement of the forest service's intervention resources for optimal forest policy management;
- Revitalization of the participatory approach and the process of decentralization in the forest sector;
- Restructuring and protection of the forest estate;
- Development of forestry sectors;
- Development of forestry research to adapt the forest sector to climate change;
- Strengthened partnership and communication in the forest sector.

To achieve these objectives, five strategic axes are chosen, namely:

- Promoting sustained forest production;
- Restoration of degraded stands and conservation of biodiversity;
- The development of an effective partnership around forest management
- Improving the institutional, legal and legislative frameworks of the forest sector;
- Development of forestry research.

3.1.2.6 Energy policy

Togo has an energy policy in 2011 to guide interventions in the sector. The main orientations of the energy policy are organized around the reduction of energy dependency, the reduction of the energy bill, a better matching of energy supplies to the needs of the population.

Togo's energy policy is based on the following axes:

- Secure energy supply and control costs;
- Increase access to electricity;
- Improve the supply of electricity for industrial consumers;
- Fostering energy efficiency on supply and demand;
- Developing national renewable energy sources;
- To enable the Directorate-General for Energy to play its central role in the sector.

In its decline in objectives and major strategic axes, it addressed the potential energy resources of the country (oil, natural gas, coal, wood energy, solar, wind, hydroelectricity ...). The developer has already opted for a renewable energy source that meets one of the axes that is "developing the national renewable energy sources" of this policy.

3.1.2.7 Climate change policy papers

- ***Strategy for the implementation of the United Nations Framework Convention on Climate Change (2001)***

The development of the strategy has complemented the work of the Initial National Communication on Climate Change. The national UNFCCC implementation strategy has defined priority actions including sustainable natural resource management in the Land Use

and Forestry sector, improvement of agricultural and livestock production systems, management Household and industrial waste, communication and education for behavioural change.

The preparation of national communications (CNI in 2001, DCN in 2010 and TCN in 2015) is aimed at improving the quality of the activity data, i.e. greater participation of the various actors and taking into account National priorities defined in the following sectors: policy, geo-climate, water and socio-economic resources.

The third communication describes the progress made and all the actions initiated by Togo to contribute to the overall effort to address climate change. One of the objectives is to carry out studies on current programs and actions and to consider, in the context of adaptation and mitigation of climate change.

- ***National Plan for Adaptation to Climate Change (NPA)***

The National Adaptation Plan for Climate Change was developed in December 2016 and aims to ensure the socio-economic development of Togo and to strengthen the resilience of vulnerable populations through the implementation of adaptation measures to climate change, Horizon 2030. This vision takes into account major challenges and challenges such as: (i) food and nutrition security; (Ii) the reduction of poverty and social inequalities; (Iii) public health and living environment; And (iv) protecting the livelihoods of the vulnerable.

The overall objective of the NPACC is to contribute to improving the lives of people and enhancing resilience to climate change for inclusive and sustainable growth.

Specifically, the implementation of the NPACC aims to: (i) ensure the systematic integration of the CCA into planning and budgeting; (Ii) building the capacity of stakeholders; (Iii) sensitizing decision-makers on the need to take CCA into account in planning documents; (Iv) sensitizing people to prepare them to build their resilience to climate change; (V) improve local knowledge and best practices and endogenous practices related to climate change; And (vi) strengthen the framework for consultation among all national stakeholders for coordinated action against climate change.

It is a development planning tool integrating adaptation to CC, covering a period of 5 years (2017-2021) and will be implemented by all the national stakeholders: Republic institutions, Government, National Commission of Sustainable development, ministerial departments and deconcentrated structures, local and regional authorities, civil society, private sector actors, universities, research and systematic observation institutions, grass-roots organizations and technical and financial partners.

3.1.2.8 Strategic documents in connection with the conservation and use of biological diversity

- ***National monograph on Biological Diversity (2002).***

The national monograph on biological diversity, developed in 2002, is a scientific document that makes an inventory of the specific richness of the various components of Togolese biodiversity.

Indeed, biological diversity is the unique capital that maintains life on earth through these ecological roles and the provision of subsistence products for living things. It also contributes

to the regulation and harmonization of social, national and international relations through its scientific, technological, sociological, cultural and educational uses.

This document collects and analyses ecological, biological, economic and social data to define the framework for the development of the national strategy for conservation and sustainable use.

- ***National Strategy and Plan of Action for biodiversity in Togo***

The National Strategy and Plan of Action for Biodiversity in Togo (NSPAB 2011-2020) is above all an accession by Togo to the general framework set up not only by the biodiversity-related conventions, but also by the United Nations system. The aim of this framework is to "live in harmony with nature", with a world vision by 2050 that by that time "biodiversity is valued, conserved, restored and used wisely, ensuring the maintenance of services provided by Ecosystems, maintaining the planet in good health and providing essential benefits to all peoples ". The conservation, restoration and enhancement of biological diversity at the project site in order to maintain the long-term functioning of ecosystems and their resilience to climate change should be taken into account in the implementation of the project in creating green areas and planting seedlings all around and within the enclosure of the site.

- ***National Wildland Fire Management Strategy***

The national wildland fire management strategy developed in 2010 is part of an overall vision of sectoral strategies to combat desertification and climate change and is part of the strategic directions contained in the Poverty Reduction Strategy Paper Focusing on the MDGs. The strategy is also part of the guidelines of the National Forestry Action Plan. It will promote wide-ranging openness towards all actors, be they ministerial departments, local authorities or non-governmental actors, with a view to their participation in the implementation of future actions.

The overall objective of this national strategy is to optimize the beneficial side of fires in order to mitigate their catastrophic impact. The approach adopted assumes that the individual in his or her social, cultural and territorial realities must be at the centre of this strategy, hence the question of how to integrate the human factor and the local context into fire prevention strategies Forestry or utility light control. Thus, in a specific way, this strategy targets three (03) priority objectives by 2020 in particular:

- to develop the safety culture in Togo by targeting and encouraging behaviours and practices that reduce the risk of wildfires;
- propose guidelines for the understanding, prevention and management of vegetation fires in their social and ecological context;
- orient land-use planning not only towards the sustainability of ecosystem goods and functions, but also towards civil security.
- To achieve the strategic objectives, the strategy is based on three areas of intervention, with the possibility of replicating them on the scale of the five economic regions of Togo. These strategic axes are:
- management and recovery of the fuel causing wildfires
- the development of safety and security awareness among stakeholders and capacity building.
- the development of an effective monitoring and early warning system and the operational capacity of actors to react in real time in the event of wildfire.

- **National Biosafety Framework**

The national biosafety framework developed in December 2004,aims to define guidelines for: (i) a national policy on Biosafety, (ii) a legislative system, (iii) an administrative system, (iv) a system for the assessment and management of risks, and (v) Mechanisms for the participation of the public and for the sharing of information.

- **A National Program of Action to Combat Desertification (NPACD)**

Togo has ratified the United Nations Convention on the fight against desertification on 04 October 1995 and published its National Program of Action to Combat Desertification (NPACD) in March 2002.

The NAP aims to strengthen national capacities for the management of natural resources for the promotion of a sustainable development. It advocates through its sub-program IV, the sustainable management of natural resources by the promotion of a management of wetlands and protected areas, the protection of fragile ecosystems and the fight against the bush fires.

3.1.2.9 National Profile of chemicals (developed in 2008 and updated in June 2013)

The development of the national profile is thus a fundamental step in the search for ways and means to enable the country to make more efficient the government's actions in the environmentally sound management of chemicals to guarantee the safety of human health and the protection of the environment. These actions consist of:

- provide practical information on programs and activities related to the management of chemicals in the country;
- Establish a process to facilitate dialogue and exchange of information between national agencies and other (sub-regional, regional and international) institutions involved in chemicals management;
- strengthen the capacity of national institutions involved in chemicals management;
- facilitate dialogue and exchange of information between government and other actors such as industries, workers' organizations, local communities and NGOs;
- make available to all actors in the sector a reference document facilitating the environmentally sound management of chemicals.
- The paper highlights in Chapter 3 the priority issues related to the production, import and use of chemicals including:
- Non-compliance with protective, hygienic and other measures increases the risk of exposure to users and consumers.
- pollution of air by chemical pollutants: SO2, CO, NOx, fixed particles (Pox), Clinker dust (cement), Residues, hydrocarbons, Airborne particles of pesticides, dioxins, furans
- sulphur, nitrates, phosphates, pesticides, NO, hydrocarbons, heavy metals (Pb, Cd, Hg, etc.).
- Pollution of surface water and groundwater by chemical pollutants: Heavy metals, hydrocarbons, nitrates, nitrates by reduction in the groundwater, phosphates, POPs sulphides, pesticides and other chemicals.

This project, with a plan for the management of pests and pesticides, enters to the right of the Stockholm Convention.

3.1.2.10 National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants and pollutants

It has been ratified by Togo on 22 July 2004. The implementation of the Convention on Persistent Organic Pollutants (POPs) is based on their substitution and the prevention of their releases in the environment. This Convention has the objective to ensure a better management of POPs for the purposes of protection of the health of people and the environment against their adverse effects in accordance with the provisions of the Convention.

This document is of concern for the project since it has a management plan for pest and pesticides.

3.1.3 Policy documents on the agriculture sector in Togo

3.1.3.1 National Program of Agricultural Investment and Food Security (PNIASA)

Togo has developed the National Program for Agricultural Investment and Food Security (PNIASA). The Program has set itself the objective of "increasing farm incomes and contributing to the improvement of the trade balance and living conditions of rural people under conditions of sustainable development with particular attention to the populations Poor and most vulnerable ". To achieve this objective, five priority axes have been defined. They cover the following orientations:

a. Intensification and sustainable development of agricultural production systems so as to increase the income of farmers and improve the living conditions of rural people;
b. Promotion of diversification channels and development of agribusiness;
c. Structuring of the rural world and professionalization of agricultural producers;
d. Institutional capacity building for services (public and private); and
e. Promoting the right to food and good governance around food and nutrition security.

The National Agricultural Investment and Food Security Program (PNIASA) is the roadmap for agricultural actions in Togo. The project for the development of a hundred hectares of agroforestry land is within this framework. The project is funded by UEMOA, which is one of the TFPs that have endowed Togo with this program.

3.1.3.2 Profile of Agriculture

The profile of the Togolese agriculture developed in June 2013 is articulated as follows:

- The structure of households, of the rural population and agricultural community;
- The situation on the agricultural labour force;
- Agricultural activities;
- The bankarisation of the farming population;
- Agricultural expenditure.

3.1.3.3 Strategy for the Revitalization of Agricultural Production (SRAP)

Adopted by the Council of Ministers on 30 July 2008, the strategy aims to tackle the food crisis and tackle immediately the vulnerability and food insecurity that occurred during the 2008 crises. 2008-2010, is mainly based on supporting producers in the following food sectors: cereals, market gardening, poultry farming, fish farming and micro-fisheries, as well as strengthening epidemiological surveillance of animal diseases. The objective is to increase production to the extent necessary to cover national needs and to generate food security stocks.

If the project for the development of one hundred (100) ha of agroforestry area is a multi-sectoral project, it is still an agricultural project. The project is in line with this strategy in that its implementation will potentially produce production for agricultural and fish production and this will undoubtedly contribute to the improvement of food security.

3.1.3.4 ECOWAS Agricultural Policy

Since the early 2000s, West Africa has initiated a policy dialogue to design a regional agricultural policy framework in a context where many sub-regional institutions coexist. This process, which forms part of the revised ECOWAS Treaty, led to the adoption by ECOWAS Heads of State and Government regional agricultural policy on 19 January 2005. This adoption follows a thorough process of diagnosis of regional agriculture, its potential for development, the strengths and weaknesses of national agriculture and a reading of the challenges and stakes of the region in term Agriculture and food security.

The regional agricultural policy adopted by ECOWAS affirms this vision: "modern and sustainable agriculture, based on the efficiency and efficiency of family farms and the promotion of agricultural enterprises through the involvement of the private sector. Productive and competitive on the intra-Community and international markets, it must ensure food security and provide decent incomes to its assets ". It has a general objective of "contributing in a sustainable manner to meeting the food needs of the population, economic and social development and poverty reduction in the Member States, as well as inequalities between territories, Countries ". ECOWAS affirms in its objectives the principle of food sovereignty of the West African populations.

The proposed Mandouri project, by equipping communities with climate change resilience skills will undoubtedly increase agricultural, pastoral and fisheries production, which will be considerable contributions to the realization of sovereignty and to combat poverty effectively.

3.1.3.5 Agricultural Policy of the UEMOA

In 2000, the Commission of the West African Economic and Monetary Union (WAEMU) embarked on a process of formulating the broad guidelines of the Union's Agricultural Policy (PAU).

This participatory process, based on a close consultation between the Commission and the various national and regional actors, made it possible to define the objectives, guiding principles, axes and instruments for intervention of this policy, which were adopted by the Decision of the Union, in December 2001, through the Additional Act N° 03/2001. Implementation of the PAU was initiated in 2002. This is a long-term approach, based on all the conclusions of the formulation process, and in particular on the explicit orientations detailed in the Additional Act. In particular, it provides for the prior establishment of a number of instruments (institutional, steering, financing, etc.) which will serve as a framework for the implementation of the PAU.

The overall objective of the PAU is to contribute to the sustainable fulfilment of the food needs of the population, the economic and social development of the Member States and the reduction of poverty in rural areas.

The goal of the 100-hectare development project is to equip people with the adverse effects of climate change on production sectors. As a result, it will have the effect of increasing agricultural, pastoral and fisheries production: this increase in production will contribute to achieving food security and improving the living conditions of the population, which is the overall objective Of the PAU. This is in the sense that WAEMU is funding the implementation of this project.

3.1.3.6 Comprehensive Africa Agriculture Development Program (CAADP)

The Comprehensive Africa Agriculture Development Program (CAADP) was developed as part of the New Partnership for Africa's Development (NEPAD), with a focus on investing on three interrelated "pillars" Make a difference in Africa:

a. Extending areas under sustainable land management and reliable water control systems;
b. Strengthening rural infrastructure and trade capacity to improve market access; and
c. Increase food supply and reduce hunger. In addition to the three pillars mentioned above, providing scientific support for production and long-term competitiveness, there is a fourth pillar, (iv) research, agricultural extension and technology adoption.

CAADP is an interaction of the three major production sectors of agriculture, fisheries and livestock. The project to develop one hundred (100) perimeter agrosylvopastoral, through the creation of perimeter with sustainable management of water and land is right part of CAADP actions. The project, by providing tools and strategies for adapting populations to climate change, will contribute to increasing agro-pastoral production and effectively reducing hunger, which is the overall goal of CAADP.

3.1.4 Strategic documents in connection with the development of the territory

In 2009, Togo adopted the National Policy for Land Use Planning. This policy seeks to find adequate solutions to the problems of the territory, to promote a comprehensive and rational spatial management with a view to improving the framework and living conditions of the populations with a view to a balanced socio-economic development and Sustainable development of the country.

Specifically, this policy aims to:

- Ensure better organization and management of the national space by promoting the creation of regional development hubs, equipping and opening up regions and localities;
- ensure better distribution and use of physical and human resources and a judicious location of equipment and economic activities;
- ensure better protection of the urban and rural environment by taking appropriate measures to safeguard the ecological balance of the country;
- reduce regional disparities to ensure the socio-economic development of the regions in order to curb the rural exodus and strengthen solidarity;
- improve the conditions of women and promote their integration into the economic circuit;
- foster the development of inter and intra-regional complementarities;
- give greater visibility to sectoral policies through a territorial coherence framework at the national and regional levels;
- reduce poverty by increasing the incomes of the population, especially those of the most disadvantaged groups;
- secure land tenure;
- Ensuring the adequacy between the economic system and the natural potential;

- to adjust rural development policies on the regional territory by identifying spaces for vocation;
- identify and better locate investment programs in areas where they will have the greatest impact.

3.1.5 The policy documents in connection with the water sector in Togo

3.1.5.1 National Water Policy

The general objective of the national water policy adopted by the Togolese government on August 4, 2010, is to contribute to the fight against poverty and to sustainable development by providing appropriate solutions to the problems related to water, so that it becomes a limiting factor in socio-economic development. In relation to integrated water resources management, the achievement of the objectives of the national water policy according to the principles of equity and solidarity towards the poorest sections of the population, economic efficiency and environmental sustainability, Requires the development of an integrated, transversal and participatory approach to resource management. This approach takes into account the fact that water appears as both a limited resource, a factor of production and a common heritage. All relevant factors in the water cycle and all relevant stakeholders are integrated into this process for the optimal and ecologically sustainable use of water resources.

The question of taking into account the environment in relation to the exploitation and management of water resources in the national water policy document is of particular interest:

- impacts of human behaviour and practices on water quality and availability. This concerns in particular the impacts that agricultural, industrial and demographic and urbanization activities can have on the availability of water resources (increase in the level of water withdrawal, diversion of watercourses, etc.). ..) and on the quality of the water (pollution of the resource, change of water temperature, etc.); and
- environmental problems arising from the way water resources are used by the sectors and users to whom the resource is allocated.

3.1.5.2 National Action Plan for the Water and Sanitation Sector

Togo has adopted a National Action Plan for the Water and Sanitation Sector (PANSEA). Water is seen as one of the bases of the growth and poverty reduction strategy and an integrating factor. Therefore, PANSEA advocates:

- guaranteeing the availability of water in quantity and quality for all economic activities,
- ensuring equitable and sustainable access to drinking water and sanitation for the population;
- health insurance, public safety and the conservation of ecosystems and biodiversity; and
- Promoting a framework favourable to good water governance under the Integrated Water Resources Management (IWRM) approach.

Faced with the problems inherent in the water sector, the Government set up an Integrated Water Resources Management (IWRM) policy in 2002. The aim of IWRM is to promote an integrated and rational management of national water resources in a coherent management system proposed to all stakeholders in the water sector. This policy specifically targets the sustainable improvement of people's equitable access to drinking water and modern sanitation. It defines the measures and the appropriate framework for the qualitative and quantitative management of water resources. It is based on three core values: fairness, sustainability and improved quality service.

3.1.5.3 Water Resources Policy for West Africa

In 1998-1999, led by the GWP West Africa Technical Advisory Committee (GWP-WATAC), the region has prepared a regional vision for water by 2025, through consultation with key stakeholders. The vision was presented and discussed at the World Water Forum in The Hague in 2000. In March 2000 the ECOWAS Council of Ministers of Water and Environment adopted the "West African Vision for Water" Water, life and the environment for 2025 ". It states: "By 2025, water resources are managed efficiently and practically, in a sustainable manner for the environment so that every person in the region can have access to safe drinking water for the Waste disposal structures, food security; That poverty be reduced, that human health be protected, and that the biodiversity of terrestrial and aquatic systems be protected.

The project takes account of the rational use of water through the introduction of an irrigation system integrating this concern and by equipping the producers on the production and use of organic fertilizer and fertilizer use and biological pesticides.

3.2 Legal framework

Togo has acceded to a number of international conventions, treaties and agreements and, from 1988 onwards, drafted laws and regulations on the environment and forest resources that are binding on any project promoter. The legal framework for the management of the environment in Togo consists of the provisions of international conventions, treaties or agreements to which Togo is party, as well as legislative and regulatory texts. The Environmental and Social Impact Assessment (ESIA) is one of the major tools for the implementation of the Government's policy on the management and protection of the environment and natural resources. Some of these provisions that fall within the scope of this project should be listed.

3.2.1 International Legal Framework

This section highlights conventions and international and regional treaties to which Togo is a party.

3.2.1.1 United Nations Framework Convention on Climate Change

Article 4 (1) (f) of the United Nations Framework Convention on Climate Change provides that "all parties shall take into account their common but differentiated responsibilities and the specificity of their national and regional development priorities, And their situations take into account, as far as possible, climate change considerations in their social, economic and ecological policies and actions and use appropriate methods, such as impact assessments, formulated and defined at the national level to minimize adverse effects on the economy, public health and the quality of the environment ... ". It is in the spirit of this convention that the Mandouri irrigation project is subject to an environmental impact assessment, as its implementation will result in deforestation, soil disturbances, of vehicle movements that will be responsible for greenhouse gas emissions.

3.2.1.2 United Nations Convention on Biological Diversity

Adopted in Paris on 17 June 1994, Togo signed the Convention and ratified it on 4 October 1995. It enshrines the commitment of States to conserve biological diversity, to use biological

resources in a sustainable manner and to share equitably the benefits arising from the use of genetic resources.

In line with the principle of anticipation and precaution, it is underlined in point 8 of the Preamble to the 1992 Rio Convention on Biological Diversity that "It is of the utmost importance to anticipate and prevent the causes of Reduction or loss of biodiversity and addressing it ". The same Convention states in Principle 15 that: "To protect the environment, precautionary measures must be widely applied by States according to their capacity. In the case of risk, serious and irreversible damage, the absence of absolute scientific certainty should not be used as a pretext for delaying the adoption of effective measures to prevent environmental degradation ". In order to do so, Article 14, paragraph 1a, invites each Contracting Party to "adopt procedures to require the assessment of the impacts on projects which it has proposed and which are likely to cause significant harm to biological diversity With a view to avoiding and minimizing such effects ".

The Environmental and Social Impact Assessment undertaken addresses this concern as the agro-sylvo-pastoral development project in Togo will lead to the destruction of the vegetation cover, the habitats of aquatic animals and consequently the loss of biological diversity

3.2.1.3 United Nations Convention on the Fight against Desertification

Adopted in Paris on 17 June 1994, the United Nations Convention to Combat Desertification entered into force on 26 December 1996 for Togo. It was ratified by Togo on 4 October 1995. This Convention recognizes the priority status of African countries affected by the phenomenon of desertification. It stresses the need for cross-cutting and integrated approaches to the fight against desertification through development projects in order to take account of the multiple causes of the phenomenon. Indeed, the affected countries must draw up National Action Plans (NAPs), which must draw up an inventory of desertification and suggest a control strategy. Togo published its NAP in 2001.

The project site is in a humid rural area and the project will undoubtedly lead to the destruction of the vegetation that may cause desertification. The project is therefore covered by this Convention.

3.2.1.4 Ramsar Convention on Wetlands of International Importance, 1971

Togo has signed the Ramsar Convention, which entered into force for this country on 4 November 1995. This Convention recognizes the need to protect wetlands. It is therefore the main international commitment to the promotion of international cooperation in the field of wetland conservation. The signatory states undertake to take into account their wetlands in the formulation of their management policies and to provide the International Union for Conservation of Nature (IUCN), which provides the Secretariat, with a list of their wetlands of international importance. Taking this Convention into account in the implementation of this project would be beneficial for the preservation of these fragile ecosystems, such as wetlands.

3.2.1.5 African Convention for the Conservation of Nature and Natural Resources

In July 2003, the African Convention on the Conservation of Nature and Natural Resources adopted in 1968 was revised. This Convention, which originally did not explicitly address

environmental impact assessment or sustainable development, has, at the time of its revision, devoted, on the one hand, its Article 13 to the processes and Activities with an impact on the environment and natural resources, and Article 14 on sustainable development issues. Article 14 (2) (b) clearly obliges Parties to "ensure that policies, plans, programs, strategies, projects and activities that may affect natural resources, ecosystems And the environment in general should be adequately assessed at the earliest possible stage and that ongoing monitoring and control of environmental effects should be carried out regularly. It is in this sense that the present project is the subject of an environmental impact study.

3.2.1.6 The international code of conduct for the distribution and use of pesticides

The revised version was adopted during the one-hundred-and-twenty-third session of the FAO Council in November 2002. The Code was one of the first voluntary instruments in support of food security, which also aims to protect human health and the environment. Adopted in 1985 by the FAO Conference at its twenty-third session, it was amended at its twenty-fifth session in 1989 to take into account the prior informed consent procedure. The Code established voluntary standards of conduct for all public and private bodies involved in, or involved in, the distribution and use of pesticides. Thus, since its adoption, it is the globally accepted pesticide management standard. The experience of the past 15 years shows that the Code, together with its technical guidelines, has genuinely helped countries to establish or strengthen their pesticide management system.

The Code advocates the integration of pesticide management into the broader framework of chemicals management and sustainable agricultural development. The essential function of the Code is to serve as a framework and reference for the wise use of pesticides by all concerned, in particular until countries develop appropriate and effective regulatory infrastructures for effective pesticide management.

The code is of interest for the Mandouri project because the area is potentially affected by fertilizers, pesticides, and unregistered chemical herbicides from neighbouring Benin and Ghana. The application of this code of conduct is essential for the preservation of ecosystem health. Moreover, we are in a context of valorisation of organic production, and such chemical will impair the quality of products; and might restrict access to certain international markets.

3.2.2 National Legal Framework

In implementing this SEIT, the Proponent will comply with the national provisions governing the areas affected by the project.

3.2.2.1 Legislative Framework

- **Constitution of Togo**

The constitution of the Togolese Republic, adopted by constitutional referendum on 27.09.1992 and promulgated on 14.10.1992, provides in its article 41 that "Everyone has the right to a healthy environment". This right, which is recognized to every person and to the people, imposes obligations on the State, for under the terms of art. 41 stipulates that "the State shall ensure the protection of the environment".

The management of the environment has therefore been brought to the rank of a constitutional value, which imposes particular constraints on the State in this field. But the ordinary citizen is also concerned because, although he is the beneficiary of the right to the

environment, he is not free of all environmental obligations because "rights and obligations" always go hand in hand. The State can only protect the environment by imposing prohibitions, regulations (approvals, permits, authorizations) that impose constraints on the individual's actions, including irrigation projects Image of the project of raising the level of resilience of the communities of the agricultural sector in Mandouri. The individual, in this case the peasant, must at his level, through citizen behaviour, respect the regulations and take responsible actions in terms of protection and management of the environment. This environmental and social impact assessment is carried out in order to comply with this constitutional provision.

- ***Act No. 2008-005 of 30 May 2008 – Law on the Environment***

The Framework Law on the Environment constitutes the basic text on management and environmental protection in Togo. Article 1 of the said law states that it "establishes the general legal framework for the management of the environment in Togo" and "aims to:
Preserve and sustainably manage the environment;
Guarantee an environmentally sound and balanced living environment for all citizens;
Create conditions for the rational and sustainable management of natural resources for present and future generations;
Establish the fundamental principles to manage, preserve the environment against all forms of degradation in order to develop natural resources, to fight against all kinds of pollution and nuisances;
Sustainably improve the living conditions of populations, while respecting the balance with the surrounding environment. "

The Framework Law requires the environmental impact assessment, in particular in paragraph 1, sections 38 to 40 of the said Act for a category of activities. Thus, Article 38 provides that " activities, projects, programs and development plans which, because of their size or their impact on the natural and human environment, are likely to harm the environment, are subject to prior authorization from the Minister for the Environment . Such authorization shall be granted on the basis of an impact assessment assessing the negative or positive environmental consequences of the proposed activities, projects, programs and plans ". The same article states in paragraph 3 that "the impact study report shall be prepared by the proponent taking into account the cumulative short, medium and long-term effects in the environment before any decision or commitment is made Important ".

- **Act No. 2008-009 of 19 June 2008 concerning the Forestry Code**

Adopted on 19 June 2008, the purpose of the Forest Code is to "define and harmonize rules for the management of forest resources for the purpose of achieving a balance of ecosystems and the sustainability of forest heritage". As regards the protection of forest resources, Article 55 provides that "any action aimed at the preservation or limitation of activities liable to degrade them" is one of the acts to be undertaken for the conservation and protection of sites.

This irrigated perimeter project will be implemented in accordance with the provisions of the Forest Code as it will have negative impacts on forest resources.

- **Act No. 2007-011 of 13 March 2007 on decentralization and local freedom**

Law No. 2007-011 of 13 March 2007 on decentralization and local freedom, in Article 2, organizes Togolese territory into local and regional authorities, which are: the region, the prefecture and the municipality. Article 34 stipulates that the municipality is urban or rural and that the rural municipality has as a territorial base the canton. Article 40 declares that the State transfers to the territorial collectivities, within their respective territorial jurisdictions, competences in, inter alia, the management of natural resources and protection of the environment.

As regards natural resource management and environmental protection, Article 53 states in paragraph 5 that the municipalities shall have competence in the areas of the protection of areas reserved for market gardening and livestock, management and Maintenance of standpipes, wells, boreholes and reservoirs; The distribution of drinking water and the rational management of the forest and fishery resources of the municipal territory.

- **Act No. 2010 - 004 establishing the Water Code**

Law No. 2007-011 of 13 March 2007 on decentralization and local freedom, in Article 2, organizes Togolese territory into local and regional authorities, which are: the region, the prefecture and the municipality. Article 34 stipulates that the municipality is urban or rural and that the rural municipality has as a territorial base the canton. Article 40 declares that the State transfers to the territorial collectivities, within their respective territorial jurisdictions, competences in, inter alia, the management of natural resources and protection of the environment.

As regards natural resource management and environmental protection, Article 53 states in paragraph 5 that the municipalities shall have competence in the areas of the protection of areas reserved for market gardening and livestock, management and Maintenance of standpipes, wells, boreholes and reservoirs; The distribution of drinking water and the rational management of the forest and fishery resources of the municipal territory.

- **Order No. 12 of 6 February 1974 on the Agro-land reform**

Ordinance No. 12 of 6 February 1974 is a tool for achieving an economic and social objective linked to land. It proceeds to the classification of the lands of the whole national territory into three (3) categories: lands held by the communities and individuals, the lands constituting the public and private domains of the State and the local communities and finally the national land area. This Ordinance also establishes a complex land tenure system in which customary law and modern law coexist. Under the terms of the ordinance, the structure of land ownership is based both on land custom and on written law.

The public and private domains of the state and local communities. The public domain comprises all buildings which by their nature or by destination are at the disposal of the public and which belong either to the State or to public establishments, secondary territorial public authorities and public services (Article 13 of Ordinance No. 12 Of 6 February 1974). This domain may be natural or artificial. In our study, only the natural public domain is analysed. Indeed, the natural public domain comprises the public maritime domain and the public domain of the river.

According to the terms of Article 15 of Ordinance No. 12 of 6 February 1974 on agro-land reform, the river domain comprises:

(A) Watercourses, their beds and their free edges within the limits determined by the heights of the waters flowing at full length before overflow, and an area thirty (30) meters wide from these boundaries;
(B) Non-navigable or floatable watercourses within the boundaries determined by waters flowing at full margin before overflow.

The residents of these watercourses are subject to an easement of passage over a zone broad of ten (10) meters on each bank; Lakes, lagoons, lagoons within the limits determined by the highest levels of water before overflow with a protection zone of one hundred meters in length from these boundaries on each anterior bank and on each of the edges of the islands.

The project site lands are land that is the land held by communities and individuals.

3.2.2.3 Regulatory Framework

- **Decree No. 2006-058/PR of 05 July 2006 05.07.2006 on EIA study rules**

This decree lays down in Article 1 the list of works, activities and planning documents which, under penalty of nullity, must be submitted to an environmental impact assessment in order to assess their impact on the environment.

According to Article 6, it is stated that "detailed environmental impact assessment (EIA) shall include major public, private or community projects, including:

Establishments or modifications of installations, structures and works located in sensitive areas or at risk, as defined in article 2 of this decree or which will be specified by decree of the minister in charge of the environment, in consultation with the ministers Sectors;
All types of investment projects listed in the Annex to the Decree;
Implantation or modification of structures, structures and works which, due to their technical nature, contiguity, size or the sensitivity of the site, may have harmful effects on the environment, and which are not covered by the present article and the annex to this decree and for which the realization is subject to authorization;
Any project of which the ministry in charge of the environment and the ministry responsible for the activity in question decide by regulation, the necessity of an EIA ".

With regard to Article 7, it provides that: "Any authorization, approval or approval for the implementation of the projects referred to in Article 6 of this Decree by a public authority shall be subject to the prior Certificate of environmental compliance issued by the Minister of the Environment after a favourable evaluation of the environmental impact assessment report submitted by the promoter ".

Section 2 of the decree defines the projects submitted for the summary environmental impact assessment. According to Article 8: "public, private or community projects, planning activities and documents whose negative effects on the environment are limited or can be easily limited or avoided by the application of an Environmental Commitment Promoter (EEP) are subject to a simplified environmental impact assessment. The same article adds in its paragraph 2 that "However, in the event of a modification of an activity provided for in the preceding paragraph, which tends to increase the harmful effects on the environment, an in-depth EIA may be required in accordance with the provisions of Article 6.3 above, before the execution of the modified works ".

Article 9 provides that: "Any authorization, approval or approval of public, private or community projects of the planning activities and documents referred to in Article 8 of this Decree shall be subject to the submission by the promoter of a certificate Approval of the environmental commitment of the project, issued by the Minister for the Environment after a favourable evaluation of the simplified impact assessment ".

- **Order No. 013/MERF of 09.09. 2006 on EIA procedure and content**

Article 1 of the Order "lays down the content, methodology and procedure of environmental impact assessment (EIA), pursuant to Decree No. 2006-058 / PR of 05 July 2006 establishing the list of Works, activities and planning documents subject to environmental impact assessment and the main rules of this study ".
From a procedural point of view, Article 2 lists the different phases of environmental impact assessment which are:

- Implementation of the environmental impact assessment,
- Review and evaluation of the environmental impact assessment report;
- Issuance of the Environmental Compliance Certificate;
- Monitoring the implementation of the environmental management plan;
- Issuance of environmental discharge.

Article 4 states that "The Environment Directorate shall manage with the competent institutions the process of carrying out environmental impact assessment and the issuance of the certificate of environmental compliance pursuant to the provisions of Article 17.3 of the Decree No 2005-095 / PR of 4 October 2005 on the allocation and organization of the Ministry of the Environment and Forestry Resources ".

The proposed development is an irrigated perimeter of one hundred (100) hectares. The impact assessment corresponding to this category is an environmental impact statement in accordance with the order n ° 013 / MERF of 1 September 2006 regulating the procedure, the methodology and the content of the environmental studies, environmental impact.

- **Order No. 018/MERF of 09 October 2006 laying down the conditions and procedures for public information and public participation in the process of study of the impact on the environment**

It defines the modalities and organization of information and awareness meetings for local populations, public hearings and public inquiries that ensure public participation in decision-making regarding a project that will take place in their locality. The appropriateness of this procedure arises from the assessment of the social, economic, cultural and environmental implications of the populations in the project area.

All these texts constitute the legal basis for carrying out the environmental impact assessment of this project.

3.2.3 Normative Framework

The Togolese Republic does not at present have environmental standards. The standards for the project will therefore be those drawn from the WHO, European Union or IFC guidelines, which are presented in the following tables.

Table 5 : Table 6: Guidelines of discharge of sewage WHO and IFC

Pollutant	Unit	Recommended value
PH	-	6 - 9
Bod	Mg/L	30
DCO	Mg/L	125
Total nitrogen	Mg/L	10
Total phosphorus	Mg/L	2
Oils and Fats	Mg/L	10
Total Suspended Solids	Mg/L	50
Total Coliforms	*NPP6 / 100 ml	400

*Mpn = most probable number

Source: - World Health Organization (WHO). Water Quality Guidelines Global, Update, 2005

- EHS Guidelines General of the IFC relating to the environment, wastewater and the quality of the ambient waters, April 2007

Table 6 : Guidelines selected in the list of WHO on drinking water

Parameter	Unit	Recommended value
Total Coliforms	By 100 ml	Zero in the treated water
Cadmium	Mg/L	0.003
Cyanide	Mg/L	0.5
Mercury	Mg/L	0.006
Selenium	Mg/L	0.04
Arsenic	Mg/L	0.01
Fluoride	Mg/L	1.5
Nitrate (in the form of NO3-)	Mg/L	50

Source: Guidelines of the World Health Organization (WHO) for the quality of drinking water 4TH EDITION, 2011

Table 7 : EU Standards of discharge of gases and particles

Polluting products	Average value limit (EU)
Ozone (03)	0.08 ppm
Carbon monoxide (CO)	40 micrograms/m3
Sulphur dioxide (SO2)	80 micrograms/m3
Nitrogen dioxide (NO2)	200 micrograms/m3
Lead (Pb)	2 micrograms/m3
Particles in suspension (< 10 microns)	80 micrograms/m3

Source: GUIGO Mr. et al: Management of the environment and impact studies

Table 8 : Guidelines of the WHO regarding the quality of the air

Polluting products	Average duration of exposure	Value in □g/m3
Sulphur dioxide (SO2)	24 hours	125 (1st intermediate target) 50 (2e intermediate target) 20 (Guidelines)
	10 minutes	500 (Guidelines)
Nitrogen dioxide (NO2)	1 year	40 (Guidelines)
	1 hour	200 (Guidelines)

Particulate matter (PM10)	1 year	70 (1st intermediate target) 50 (2e intermediate target) 30 (3e intermediate target) 20 (Guidelines)
	24 hours	150 (1st intermediate target) 100 (2e intermediate target) 75 (3e intermediate target) 50 (Guidelines)
Particulate matter (PM2.5)	1 year	35 (1st intermediate target) 25 (2e intermediate target) 15 (3e intermediate target) 10 (Guidelines)
	24 hours	75 (1st intermediate target) 50 (2e intermediate target) 37.5 (3e intermediate target) 25 (Guidelines)
Ozone	8 hours per day Maximum	160 (1st intermediate target) 100 (Guidelines)

Source: World Health Organization (WHO). Air Quality Guidelines Global Update, 2005

Table 9 : Guidelines of the WHO on the noise level

Receiver	An hour LAeq (dBA)	
	Of Day (07h.00 - 22h.00)	At night (22h.00 - 07h.00)
Residential; institutional education;	55	45
Industrial Commercial;	70	70

Source: Guidelines for Community Noise, World Health Organization (WHO), 1999.

3.2 Institutional framework

The main institutions involved in the implementation of the relevant laws and legislation are the Ministry of Environment and Forest Resources and the Ministry of Agriculture, Livestock and Water Resources. This section highlights the two key departments and all other relevant government institutions.

3.3.1 Department of the Environment and Forest Resources (MERF)

It ensures the implementation of the national environmental policy in collaboration with the other ministries and institutions concerned. Specifically, it is through the Environment Directorate (DE) that MERF coordinates the implementation of the government's policy on environmental management and protection. It ensures the integration into national legislation of the international environmental commitments to which Togo is a party.

3.3.1.1 National Environment Management Agency (NEMA)

NEMA is the structure on which the Framework Law on the environment entrusts the implementation of the national system on environmental assessments including the impact assessment studies, strategic environmental assessments and environmental audits.

Thus, the whole process of realization of the studies of impacts, the evaluation of the report and of the issuance of the certificate of environmental compliance is of the competence of the NEMA.

3.3.1.2 Directorate of the Environment (DE)

The Environment Directorate (DE) is responsible for the implementation of strategies, plans, programs and projects for the preservation and management of the environment; To propose the elements of national policy in the field of environmental preservation; To ensure the effective implementation of existing environmental laws and regulations, including ratified international legal instruments; And to work for the effective integration into the programs / projects of other ministries and development actions in general, of concerns related to the preservation of the environment.

3.3.2 Ministry of Agriculture, Livestock and Fisheries (MALF)

The Ministry of Agriculture, Livestock and Fisheries (MALF) is responsible for the implementation of government policy in the field of agriculture. Its current institutional mechanism is set by the decrees signed on 23 July 1997 establishing three main bodies. These include: (i) the General Secretariat (Decree No. 97-108 / PR), the Institute for Technical Advice and Support: ICAT (Decree No. 97-106 / PR) and the Institute Togolese Agricultural Research Institute: ITRA (Decree No. 97-105 / PR). These decrees were amended following Decree No. 2008-09, adopted on 29 July 2008, concerning the organization of the ministerial departments in Togo.

3.3.4 Ministry of Economy and Finance (MEF)

According to Decree No. 2012-006 / PR on the organization of the ministerial departments, the central administration of the MEF comprises ten (10) General Directorates, including the Directorate General of Taxes (DGI) Domains and cadastral authorities which is responsible for land activities and for State missions and functions.

- ***The Inter-Ministerial Compensation Committee (ICC)***

The Inter-Ministerial Compensation Committee comprises the representatives of the Ministries of Economy and Finance, the Ministry of Public Works, the Ministry of Environment and Forest Resources, the Ministry of Development and Town and Country Planning, the Ministry the Territorial Administration, Decentralization and Local Authorities, the Ministry of Social Action, Child Protection, Promotion of Women and the Elderly.

3.3.5 Department of Mines and Energy

This ministry is responsible for the implementation and monitoring of the National Policy on Mineral and Energy Resources. According to Decree No. 2012-006 / PR on the organization of the ministerial departments, the central administration of this Ministry comprises two (02) General Directorates, including the Directorate General of Mines and Geology, which is in charge of track research and means to ensure the revival of mining activities and which intervenes in the issuance of licenses to authorize borrowing quarries.

3.3.6 Department of Water, Sanitation and the Village Hydraulics

This ministry is responsible for the management and implementation of the Water Policy and the regulation of water resources and sanitation activities. In rural areas, it is responsible for the supply of drinking water to the population through the installation of village drilling.

3.3.7 Other Departments

To departments mentioned previously, it is necessary to add the following departments:

- Department of Health;
- Ministry of Social Action and National Solidarity;
- Ministry of Planning, the development and the development of the territory
- The Ministry of Territorial Administration, decentralization and the local communities;
- Department of Development at the base, crafts, Youth and the employment of young people;

- The Ministry for the Advancement of Women.

3.3.8 AGETUR Togo

AGETUR-Togo is a non-governmental organization with the status of a non-profit association, governed by the 1901 Law on Associations.

The objectives of the Agency are listed in its statutes:

- be the instrument for the execution of programs of urban works of general interest emanating either from the Togolese State or from local authorities and from any natural or legal persons;
- Encourage, through the implementation of urban works programs of general interest in the field of civil engineering, construction and public works, the creation of employment for the workforce of all qualifications;
- have priority work carried out by local small and medium-sized enterprises to promote the development of their technical and management capacities;
- Improve the know-how of the local labour force employed and the competitiveness of the companies responsible for carrying out construction projects through the implementation of general interest work programs:
- carry out the work, the result of which will be economically and socially useful and improve the urban environment.

4.0 DESCRIPTION OF THE ENVIRONMENT receiver of the project

This chapter describes the natural and human environment in which the project will be implemented.

4.1 Delimitation of the zone of influence of the project

The direct area of influence for biophysical aspects is defined as the area of direct environmental impacts related to the implementation of the project. This area of direct influence is roughly the place where biophysical and human aspects could be disrupted by project-related work. Outside the direct zone of influence there is an indirect or diffuse zone of influence covering the socio-economic and biophysical aspects which can go hundreds of kilometres due to the flow of waters of the river Oti. The project area thus covers:

- direct: the town of Mandouri, the perimeter of 144 ha, the water supply channel, the pumping station, the tributary Oualé. ;
- Indirect: Kpendjal Prefecture, Savannah Region, Oti North Watershed.

4.2. Physical and biological environment

4.2.1. Geology, soils and geomorphology

4.2.1.1. Geology

The geological formation corresponding to the entire project area includes the diverse crystalline formations of the eastern edge of the West African craton. In comparison with similar formations widespread in Burkina Faso, they are considered Archean (or ante-Birrimian) to Upper Proterozoic (Precambrian C or Birrimian). There are gneisses, migmatites, amphibolites, granites and granodiorites.

4.2.1.2. Soils

Soils in the Project area are divided into three groups:

- Tropical ferruginous soils on granite;
- Soils relatively sophisticated;
- Soils tropical ferruginous on sandstone, in the area is.

All of these types of earthquakes are considered to be the most effective means of preventing and treating the disease. Tropical ferruginous gravillionnaires on granite.

4.2.1.3. Geomorphology

The relief of the Savannah region presents two geomorphological sets: (i) the flat surfaces of the Oti valley (Oti plain, Precambrian peneplain); (Ii) contrasting reliefs (Bombouaka plateau, Dapaong plateau).

The plain of Oti, a vast gutter with relatively flat low valleys (120 to 200m), is traversed by the river Oti and its tributaries.

As far as the relief of the prefecture of Kpendjal is concerned, it can be summarized as mountains and isolated hills, notably in Namoudjoga, Naki-Est and Borgou, Mandouri plain, valleys and basins.

Mandouri is located on a geomorphological set with the configuration of a large expanse of almost undulating undulating terrains of low elevation relative to the surrounding terrain consisting of cuesta trays characterized by a highly altered upper indurated layer giving the appearance of a rocky chaotic. This peneplain is the result of the penetration and coalescence of the watersheds of the Oti and its tributaries Kpendjal, Oualé, Moilibouanga,

Naabouanga and Kambouanga. The morphological evolution of the peneplain gives it the appearance of a flattened butte whose top is occupied by the locality of Mandouri.

4.2.2. Climate

The recipient locality of the project, like the rest of the Savannah Region, enjoys a Sudanian climate marked by two distinct seasons:

- Dry from November to April characterized by the north-eastern continental trade wind (Harmattan);
- A rainy season from May to October marked by the rainy monsoon winds.

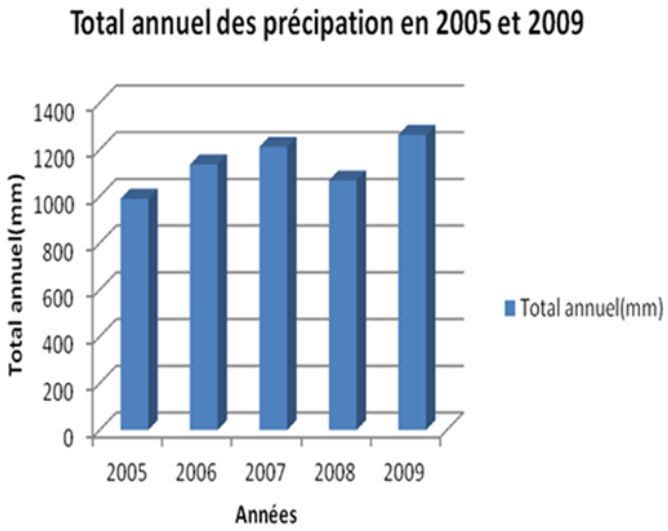
The annual rainfall totals between 1000 and 1100 mm of water with an irregular distribution over time and in the regional space. There is very little rain in the first few months, and a concentration of heavy showers during a period of 2 to 3 months from July to September.
The average number of rainy days is between 55 and 65 days. The table below shows the evolution of the year to date rainfall in the Savannah Region between 2005 and 2009.

Table 10 : The evolution of annual precipitation in the region of Savannah, 2005 to 2009

Years	2005	2006	2007	2008	2009
Annual total (mm)	989.7	1,136.5	1212	1,068.2	1,263.2

Source: Weather of Dapaong, December 2012

The graph corresponding to this evolution of annual precipitation is indicated below.



Source: grouping CINTECH/AGECET, December 2012

Figure 2 : Precipitation in the region of Savannah, 2005 to 2009

There is a variation in the annual rainfall between 2004 and 2008. This variation may be related to the phenomenon of climate change in the West African sub region.

Temperatures are high with small annual fluctuations. The average monthly temperature passes through two maxima: 33° C and 38° C in March and November and two minima: 15° C and 17° C in January and August. Like precipitation, temperatures in the project area varies widely. Overall, the temperatures are warm. The average annual temperature is around 33° C. The minimum temperatures are recorded in the month of January while the maximums are recorded in the month of April. The temperature fluctuations are high (about 5 to 7° C). The table below shows the evolution of the monthly average temperature in 2008.

The table below shows the evolution of the monthly average of the temperature in 2008.

Table 11 : Evolution of the monthly average of the temperature in 2008

Months	Jan	Feb.	March	April	May	June	Jul.	August	Sept.	Oct.	Nov.	Dec.
Monthly average (°C)	30.8	35.1	37.4	36.8	33.3	30.9	29	28.8	29.40	32.50	35.10	34.70

Source: Weather of Dapaong, December 2012

Analysis of the data in the table shows a monthly change in the average monthly temperature in 2008. The average temperature for 2008 is 32.81° C. The relative humidity in the project area varies greatly according to the season: it is high in the rainy season (86% in August) and very low in the dry season (less than 15% in January). The phenomenon of sunstroke is greater in the dry season and reaches an average of 2,555 hours or more with a maximum generally reached between October and April. Theoretical evaporation is 2,000 mm on average.
The average wind speed is estimated at 1.93m/ s in the area (harmattan and monsoon winds not included).

4.2.3 Hydrology

The Savanes Region is located in the watershed of the two tributaries of the Oti. The project area belongs to the Volta basin. The Oti River (167 km long) is the major hydrographic axis flowing from the north-east to the south-west in the Mandouri-Mango plain.

The project area is crossed to the east by a river in the name of Kpendjal and in the centre by a river called Sansargou. The water supply to the irrigated perimeter of Mandouri will be from the Oti River which flows in the northeast part of the perimeter.

4.2.4 Vegetation

From an ecofloristic point of view, Mandouri's irrigated perimeter is located in Zone I, Plains Zone (MERF, 2003). It is an area of grassy savannas with trees species that include - Parkia biglobosa, Vitellaria paradoxa and Isoberlinia spp.

The vegetation formation characteristic of the prefecture of Kpendjal is savanna. The site of the project is a grassy savannah in which we distinguish two strata of plants:

- A shrub layer: it is very scanty and very poor in plant species. The few species encountered are: Lophina lanceolata, Piliostigma thonningii.
- A herbaceous layer: very abundant and dominated mainly by three species: Panicum maximum, Cyperus sp, Sporobolus pyramidalis..

From the analysis of the results of the table, one notices the area of the perimeter is entirely colonized by one species - Lophira lanceolate the other species are very poorly represented on the Project area.

The maximum height of the species varies between 3m and 5m while the average diameter at sight of eye is estimated at 50cm.

Table 12 : Summary Table of surveys

Number of patch of 400m2	**1**	**2**	**3**	**4**	**5**	**6**	**Average**
Species encountered							
Lophira lanceolata	4	6	5	3	1	8	**5**
Piliostigma thoningii	0	1	1	0	2	0	**1**
Accacia albida	1	0		0	1	0	**0**
Accacia auriculiformis	0	0	1	1	0	1	**0**
Tamarindus indica	0	0		1	0	0	**0**
Ficus gnaphalocarpa	0	0	1	1	0	0	**0**

Of all the species encountered in the perimeter area, only Tamarindus indica enjoys a systematic protection status. The herbaceous stratum is dominated by two species, Panicum maximum and Sporobolus pyramidalis, which have completely colonized the entire perimeter area.

The main causes of vegetation degradation in the project area are:
- Destructive agricultural practices,
- Illicit cutting of trees for firwood - the main source of energy for more than 80% of the population,
- The annual practice of bush fires, and
- Overgrazing.

4.2.5 Wildlife

The site was once an area rich in wildlife with the in what is now the nature reserve. But thanks to the socio-political disturbances that the country had in the 1990s, this reserve was invaded by the neighbouring populations. The intrusion of anthropogenic activities into the reserve resulted in its loss.

,

Nevertheless, there are some wildlife species in the area. These are: Kobus kobkob, Azelaste meleagrides, Phacochorus aethiopicus, teals, wild ducks. Constraints to animal population growth include:
- Poaching - a serious threat to wildlife
- The use of firearms,
- Population invasion of the reserve, and
- Degradation of vegetation.

Some interventions have been instituted to restore wildlife in the Mandouri Reserve. One such intervention is the financing by the European Union (EU) for the reserve to be part of the WAP (W-Arli-Pendjari) complex, a cross-border reserve in Benin, Niger and Burkina Faso.

4.3 Socio-economic baseline

This section describes the natural and human environment in which the project will be implemented.

4.3.1 Demography

The population of Kpendjal prefecture in 2010 was estimated at 155,091 inhabitants with a density of 76 inhabitants per km². This population is composed of 52% women, 62% under 15 years, 33% between 15 and 60 years, and 5% more than 60 years. The annual population growth rate is 3.18%. There are large disparities in the cantons.

The population of the canton of Mandouri in 2010 was estimated at 10,589 habitants, in an area of 238 km², to give an average density of 44 inhabitants per km². This population is made up of 76.6% of rural and 3.4% of urban dwellers.

If the average rate of increase of 3.18% is maintained until 2030, the population of Mandouri Township, estimated at 12,800 in 2016, will increase from 15,400 in 2022 to 17,500 in 2026 to nearly 20,000 inhabitants by 2030.

The locality of Mandouri is characterised by the exodus of the youth to urban areas. Due to climate anomalies throughout the Savannah region, rural youth have migrated to neighbouring countries mainly Nigeria, Ghana and Burkina Faso in search of well-being and income to support the rest of the family.

4.3.2 Landuse – Socio-economic activities

Has the image of the rest of the country, more than 90% of the populations of the project area are engaged in agriculture. It is an agriculture of the traditional type and family. The main crops produced are: sorghum, maize, the paddy rice, the yam, the peanuts, cotton, and soybeans. Vegetable crops are grown around the few water points in the canton. They include cultivation of okra, tomato, adémè, chili pepper, onions, lettuce, and cabbage.

4.3.3. Social infrastructure

Access to basic social services to Mandouri is a glaring need. Electricity is provided by a generator between 7 hours and 22 hours. In this situation, the administrative services are privileged and very few households have access. The lighting of a few the arteries is done from the solar streetlights. The network is reduced to the city centre; which does not allow the other parties of the Locality mainly those which are remote to be supplied.

Access to drinking water is a concern of the most important to Mandouri. The drinking water usually comes from wells that predominantly dry up in the dry season. It must raise all of even the existence of a drill fitted with a pump for the public supply. However, according to the users, the water dried up when the drought is severe. The only source of drinking-water supply is permanently the Oti.

With respect to the Access to health services, it is fairly satisfactory thanks to the construction of a health centre. However, because of the lack of high-performance equipment and some services such as surgery, difficult cases are evacuated to the CHR of Dapaong.

The access to safe drinking water is provided in large part by 6 drilling and by 8 wells to large diameter at Mandouri. However, these drillings frequently falling in failure and the wells dry up at certain times of the year so that the problem of access to drinking water in the village remains always posed. There is therefore need to achieve in the village of additional wells to ensure access to a drinking water to populations.

4.3.4. Education

There are three orders of instruction in the prefecture of Kpendjal, Preschool, Primary and Secondary.

a. Preschool: this is the least developed and is found only in urban areas.
b. Primary education: it forms the basis of the entire education system. It is managed by the 1st degree inspectorates. This order of education is in full bloom as a consequence of the increase in population.
c. Secondary education: as in the case of primary education, there has been a dramatic increase in class size.

There is a stagnation of initial and complementary literacy activities in the prefecture. This literacy is nevertheless essential to increase the capacities of the populations in the vital sectors of production.

Adult literacy is essential for the improvement of the living conditions of the populations, and it is therefore urgent to initiate actions for its intensification. However, there are enormous difficulties in the education sector, such as:

- Inadequate material and financial resources (school infrastructure (rooms, table-benches, laboratories, etc.);
- Insufficient human resources (teachers, supervisors, number and quality);
- Rapid increase in enrolment in the various levels of teachers.

4.3.5. Health

At the health level, in 2007, the Kpendjal prefecture had eleven (11) Peripheral Health Units and one (1) Prefectural Hospital for an estimated population of 133,000 at the same time. Compared to the WHO standard of 1 health centre per 10,000 inhabitants, the health supply is deemed unsatisfactory in the prefecture.

In addition, there are spatial disparities in access to health care in certain localities in the prefecture. Health facilities suffer from inadequate work equipment, skilled personnel, medicines, etc. Some infrastructures are dilapidated or inadequate and pose a problem of reception and hospitalization.

The main causes of morbidity and mortality are malaria, intestinal parasitic infections and respiratory infections. Endemic diseases such as leprosy and tuberculosis are still prevalent in the prefecture. There is also the emergence of a new disease - Burili ulcer. The HIV/AIDS pandemic is also on the rise in the region.

5.0 Analysis of options, variations and of the project

The consideration of Project alternatives is one of the more proactive sides of environmental assessments. It enhances the project design through examination of options, in addition to focusing on the core task of reducing potential adverse impacts of a single design. This calls for the comparison of feasible alternatives for the proposed project site, technology, and/or operational alternatives. Alternatives may be compared in terms of their potential environmental impacts, capital and recurrent costs, suitability under local conditions, and acceptability by neighbouring land users. The project alternatives considered in the course of formulating the proposed Project include the following.

5.1 The "No Project" alternative

The site of Mandouri is located an area where flooding problems, access to drinking water, soil erosion, and drought are the major constraints to development. This region also records the highest poverty rate in the country (90.5%) and thus remains highly vulnerable to adverse effects of climate change and variability.

Indeed, the local economy is mainly based on agriculture, as practised by 96% of the population of Kpendjal prefecture. The agriculture depends largely on very variable weather conditions. Moreover, the mode of production has accommodated a very sensitive type of subsistence farming to climate. This situation, combined with a total lack of diversification of livelihood activities is manifested by the high degree of community vulnerability with no control of the crop calendar.

A management paradigm shift will be required to change this outlook for Mandouri Canton. Not implementing the Agriculture resilience project would mean that potential benefits, including improved crop production for both seasons of the year due to use of solar water pumping and the associated economic benefits including support to livestock production would not transpire. While any potential negative impacts associated with the Project would not materialize, the 'No Project' alternative is not feasible for the project area.

5.2 Other design and technology

The proponent has already got technical studies and designs conducted – for a combined furrow and basin irrigation system. Hence there is no need to adopt alternative designs as the ones proposed suffice for the project as it were. The proponent can opt to change the farming technology from irrigation to rain fed production, however, the erratic rainfall patterns make this alternative an unsuitable one, thus the proposed alternative of irrigated agricultural production remains the best option.

5.3 Alternative project site

At the moment, the proponent has no alternative sites for relocation. The current site is land donated by the Mandouri community after the culmination of lengthy negotiations. This site is about 3 kilometres to the west of River Oti, 2 kilometres to the north of Mandouri Town and is bounded to the east by the Oti-Keran nature reserve. Looking for land to accommodate the scale, type and size of the project and going over similar site selection and community negotiations may take a long period.

5.4. Comparison of Alternatives

a. **Under the design and the technology alternatives**, the sponsor would be required to plant other types of cultures. The proponent has considered this option depending on the adequacy of the area and of the factors in the request and adjusted for the growth

of fruit and vegetables. The proponent could however consider it in the future to develop flowers for export.

b. **In the framework of the alternative of moving**, the proponent should seek another field in an area favourable. This would not be a preferred option since the proponent
c. **Already purchased this land after negotiations with the Community**. The site is not far from the town of Mandouri and the River Oti which will provide water for irrigation in dry season.
d. **Current Action: - after having assessed all the options, the proponent has set the action in progress**. However, there will be environmental issues associated with the implementation of the project. The latter will be mitigated in the implementation of the environmental and social management plan.

5.5. Description of the project

The project to increase agricultural resilience of vulnerable actors to climate change in the agricultural sector in Mandouri, Togo, aims at reducing the vulnerability of producers affected by a very high spatial and temporal variability of rainfall, through water diversification, diversification of production activities, and strengthening of local governance to better address climate change issues. Thus, concrete adaptation actions will cover the following activities:

Component 1: Support to the mastery of the water resource and to the production

Expected Results: *Development Agricultural hydro and improved tillage practices*

The poverty reduction strategy paper indicates that the rate of vulnerability is stronger in rural areas (87.4%) with the savannah region (where is the site of the project) which remains by far the poorest region of the country with an incidence of poverty estimated at more than 90%. The vulnerability of populations is accentuated by the weakness of their capabilities to deal with external climate shocks.

During the consultation at the local level, populations of Mandouri had noted a strong concern related to the difficulty of the cultural practice in the face of the strong climate variability (drought-floods). The mastery of the water would therefore be a considerable asset to enable people to better manage the fluctuations and impacts related to climate variability on the activities of production.

Expected Effect 1: *144 ha of agricultural land will be developed and equipped with an irrigation system powered solar energy.*

Work will focus on:

(i) construction of irrigation networks, drainage networks, runway networks;
(ii) the acquisition and installation of pumps and accessories;
(iii) the acquisition and installation of solar equipment; and
(iv) additional work consisting of ploughing, clearing, levelling and delineation of driving tracks.

Expected Effect 2: *Improvement of the yields of the products through the mechanization of the means of production and the improvement of cropping practices*

Acquisition of four (4) agricultural equipment kits consisting of (a tractor , 3-disc plow, sub-soiler, 10x10 drive sprayer, trailer, harvester, rotavator, and a huller).

In addition, the project will support beneficiaries in the selection of rice varieties and other crops to be produced. Support for production will also include agro-sylvo-pastoral and fish-farming production techniques.

Component 2: Support for the diversification of the means of subsistence

Expected Results: *diversification of the means of existence of local communities by the practice of through horticulture, poultry and the support to the marketing*.

Expected Effect 1*: the diversification activities are practiced and the products are valued*
This component aims to strengthen the means of subsistence of the recipients by the development of the horticulture and poultry farming. In addition, the project will support the beneficiaries on conservation of produce (construction of stores, drying areas for the rice), value addition to horticultural produce, and marketing.

In relation to transformation and conservation, NGOs at the local level could be involved in strengthening the communities' capacities and thus bringing them together for better control of production activities.

Expected Effect 2: *Access to micro credit is facilitated*
The project will establish a micro-credit facility to support agricultural and income generating activities, in conjunction with microfinance institutions located in the project area.

Component 3: institutional support, capacity building and knowledge generation
Expected results*: Strengthening of the capacity of local institutions and communities to better support for issues relating to climate change.*

Expected effects 1*: local institutions and communities are more aware and climate change are better understood and taken into account in the development policies at the local level.*

The capacities of the different actors and stakeholders will be strengthened. In addition, this component will also focus on strengthening the technical capacity, organizational and environmental actors in the field, i.e.

a. Environmental Competencies (ESIA, fight against bush fires, sanitation, etc.);
b. Concerted management of water resources and conflict management, and
c. Environmental monitoring.

With regard to the environmental and social actions, the actions envisaged are:

- Implementation of environmental measures of the ESMP,
- Implementation of the Resettlement Action Plan,
- Establishment of a Restoration Plan (temporary),
- Establishment of the Plan of commitment of stakeholders to strengthen the ownership of the project;
- Establishment of a Stakeholder Engagement Plan to enhance ownership
- Establishment of Grievance Resolution Plan, and;
- Implementation of a pollution management plan.

Expected effects 2: *Reinforcement of beneficiaries in financial management of cooperatives and equipment maintenance techniques*
This will strengthen the capacities of beneficiary communities in terms of:

(i) simplified financial and accounting management;
(ii) cooperative organization;

(iii) training of local technicians in the installation and repair of irrigation and solar equipment.

Expected effects 3: *The lessons learned from ongoing projects at the national level are capitalized and a system for disseminating knowledge gained through the project is implemented at the local level*

The lessons learned from ongoing projects at the national level are capitalized and a system for disseminating knowledge gained through the project is implemented at the local level

This will involve creating synergies between the projects and existing projects at national level, in particular:

- PGCIT project partially funded by the GEF5 for the operationalization of the early warning system;
- ADAPT funded by the GEF and IFAD to reduce the impact of climate change on vulnerable rural groups and essential natural resources to support agricultural production and increase food security.

For the dissemination of knowledge, the good agricultural practices that are adopted will be disseminated through training / sensitization sessions; broadcasts on local radios and documentary films. Information on the project will be produced and disseminated at the level of the authorities, technical and financial partners and beneficiaries.

In addition, a database at the local level will be created with a view to collecting and processing, safeguarding and disseminating technical sheets, awareness-raising tools and other training materials with a view to their replication.

6.0 IDENTIFICATION, description and assessment of the impacts of the project

This chapter identifies both the positive and negative impacts associated with the proposed project of agricultural resilience of Mandouri, in the township of Mandouri, the prefecture of Kpendjal, Togo.

6.1 Possible interactions between the activities and the affected environments

This section presents the affected environments and the activities of the project to the main phases of development, construction and operation before showing the possible interactions between the activities and these environments.

6.1.1 The environments affected by the activities of the project

The potential impacts of the project could affect the biophysical and human environment, including soils, water, air, flora and fauna, the socio-economic conditions, health and safety, the landscape as indicated in the Table 14.

Table 13: List of affected environments

Mid	Components	Elements of the component
Biophysical Environment	Ground	Stability of the soil (structure and texture)
		Congestion on the ground
		Chemical composition of the soil
	Water	Surface waters (runoff and water course)
		Groundwater
	Air	Air quality
		Noises and vibrations
		Smell
	Flora and Fauna	Plant species
		Animal Species
		Ecosystems and Biodiversity
Human environment	Socio-economy	Demography, travel and migration
		Access to goods and services
		Means of subsistence
		Economic activities and/or income-generating
		Custom, tradition and social relations
	Health and Safety	Health of workers and populations
		The health and safety of workers and populations
	Use of the soil and landscape structure	Habitat
		Agricultural space
		Pastoral space
		Vegetative space
		Composition of the visual field

6.1.2 Project activities as potential sources of impacts

The sources of potential impacts are the activities planned during the periods of preparation of construction, of the work, withdrawal of the site, construction and operation which will have impacts or negative, either positive on the environment of the area of the project. The

different phases of the work and their activities sources of impacts are as follows in the following table.

Table 14 : Activities of the different phases of the Mandouri project

Phases	The activities
Preparation of the project site	Installation of the site
	Led Construction Machinery
	Release of the right-of-way
	Preparation of the site
	Development of the bases-life
Construction	Release of the right-of-way
	Exploitation of borrowings of materials
	Construction of the pipeline primary and secondary education
	Storage of materials and parking of gear
	The movements of the vehicles (trucks, heavy vehicles, etc.)
	Solid and liquid waste management of the Shipyards
	Construction of the Pumping Station
	Installation of the solar park
	Achievement of a drilling
	Construction of a mini castle of water
	Construction of the pipeline for 3 fountains
	Construction of stores and drying areas
Operating System	Existence of facilities
	Pipeline Maintenance
	Maintenance of the solar farm
	Uses of inputs and pesticides
The end of the project	Rehabilitation and strengthening of degraded works
	Construction of new structures

6.1.3 Identification of impacts of the project

Of adequate aspects of the management of the environment will be integrated throughout the planning and design, implementation (construction) and the operational steps of the project in order to minimize the negative environmental impacts and to ensure a sustainable development of the area.

The checklist below (Table 16) gives an indication of potential impacts.

Table 15 : Impact identification matrix adapted to the project

				Preparatory phase			Execution phase of the work									Operating Phase		
Callout **+** Positive Impacts **-** Negative Impacts **+/-** Adverse and Positive Impacts **0** Zero Impacts			**Activities of the project**	Installation of the building site and base	Mobilization and transfer of earth-moving machinery and construction trucks	Brushing and felling of trees in the right-of-way	Earthworks	Borrowing of materials	Construction of different irrigation channels	Development of perimeters (planning, plots, etc.)	Development of related infrastructure	Storage of materials and parking of gear	Construction site solid waste management	Liquid waste management at construction sites	Presence of site staff	Existence of facilities	Intensification of production	Operation and maintenance of water and sewerage works
Environmental elements				**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
Biological environment		Terrestrial wildlife, aquatic, avian	**9**	-	-	-	-	-	-	-	-	-	-	-	-	+/-	+/-	+/-
		Flora and terrestrial and aquatic vegetation	**10**	-	-	-	-	-	-	-	-	-	-	-	-	+/-	+/-	+/-
Human environment	**Socio-economic framework**		**11**	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	0
			12	0	0	0	0	0	0	0	0	0	0	0	+/-	+/-	+	0
		Quality of Life / Health / Safety	**13**	-	-	-	-	-	-	-	-	-	-	-	-	+/-	+/-	+/-
		Immigration / displacement	**14**	+	+	+	+	+	+	+	0	-	0	0	+	+	+	0
		Custom / Tradition / social relations	**15**	+	+	+	+	+	+	+	+	+	+	+	+	+	+	0
	The Land	Habitat / Buildings	**16**	-	0	-	0	0	0	0	0	0	0	0	+	+	+	0
		Access to Land	**17**	0	0	-	-	-	-	-	-	-	-	-	0	+	+	0

Source: Leopold et al. 1971

The following is a brief description of the potential positive and negative impacts of the agricultural resilience project and the various aspects of the environment on which they could have an impact.

Impacts of the project have been assessed and are generally grouped into those that affect soil, water resources, air quality, flora and fauna, community and economic activities, land use problems, aesthetics, landscape and human health. These impacts have been taken into account for the various phases of the project (construction, operation and decommissioning), and appropriate mitigation measures are also discussed

6.2. Positive impacts of the project

Improvement of Food Security

The draft agricultural resilience project will use improved agricultural technologies. This, coupled with irrigation, will allow local communities to produce the following crop in the dry season (tomato, okra, watermelon, etc.) and rainy season (rice, corn, sorghum, etc.)

Job creation

The project will create employment opportunities for people living in the region, in the region and even in remote locations. A skilled and unskilled workforce will be required during project implementation and phases of operation. Some staff members include contractors, casual workers for the construction, rehabilitation and operation of the irrigation project, irrigation engineers, agronomists, food technologists, agricultural managers, accountants and others. This has the main advantage of increasing incomes for the inhabitants and therefore improving their livelihoods. In addition, the amount of money earned by wages will directly increase the exploitation of various economic activities and business development in the areas adjacent to the project area.

Improving the management of natural resources

The project area is currently covered with bushes, shrubs and acacias, all of which are adjusted to arid conditions. The conversion of this property to agricultural land with green hedges and solar panels will lead to improved land management and optimal land use.

Possibility of improved research and development

The Mandouri Agricultural Resiliency Project will serve as a model of intelligent engineering for agriculture. The project is strategically located in a region not far from Benin and Burkina Faso, and potentially constitutes a good site for the sharing of knowledge between the countries of West Africa.

National and international negotiating opportunities

The strategic location between Togo, Burkina Faso and Benin potentially provides a large market for agricultural products. By purchasing agricultural inputs and machinery, the sale of agricultural products will also improve market opportunities at both the local and international levels.

Improved water use / flood moderation

The project area is susceptible to flooding. Implementation of the proposed project will contribute to better use of water in both rainy and dry seasons. The use of water in irrigation and other activities in the area will be a way of controlling the flow of water downstream of the project area.

Environmental benefits related to the use of solar energy

Significant reductions in emissions will be achieved by the production of photovoltaic electricity (PVe) since PV does not generate noise or chemical pollutants during normal operation. In addition, PV cells help to increase soil moisture and improve flora formation in arid and dry areas.

PVe use means the project is effectively contributing towards a reduction in the consumption of fossil fuels. The designed power requirement for the irrigation project is 110 kW – 150 HP, to drive a pump of 600 m^3/hr with a total head of 40 meters. The PV power generation will require 848 260w solar panels.

Fuel (diesel) consumption estimates for a 100 kW generator / motor at full load is 7.4 gallons/hr (28.012 litre/hr).

Assuming a 6 hour operation per day, fuel use is estimated at 28.012 x 6 = 168.072 litres/day or 5,042.16 litres/month. Pumping will be done for at least 6 months in the dry season, with an estimated fuel consumption of 30,252.96 litres of diesel.

The project by reducing fossil fuel consumption reduces GHG emissions resulting from their combustion in diesel motor pumps. Considering that the burning of a litre of diesel emits 2.68 Kg of CO_2 into the atmosphere, the project, through the 30,252.96 litres of fuel not consumed, would have reduced emissions by about 81 tons of CO_2 in one year.

Social impacts related to the use of solar energy
Some direct benefits are related to direct use in the performance of community activities. The design of the project includes a solar community bakery. Therefore, PVe improves quality of life and reduces migration. During installation and maintenance, the creation of full-time and part-time jobs improves the local micro-economy and contributes to poverty reduction.

Solar energy, a non-polluting source of energy, will be used for irrigation.

6.3 Assessment of Negative Impacts - phases of preparation and construction

The environmental and social impacts expected during the construction phase of the proposed project include:

Air pollution
There will be some air pollution from equipment that will be used during construction work from dust and exhaust from vehicles and equipment used.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Short	Ad hoc basis	Average	**Average**	Certain and average	Irreversible	**Average**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

Noise pollution

The noise pollution in the short term is probably derived from construction activities on the spot, in particular machines and vehicles. This is likely to be of the Noise) for households living around the site of the project.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Short	Ad hoc basis	Average	**Average**	Certain and average	Irreversible	**Average**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

Pollution of water and soil

The waste of hydrocarbons, can become a source of pollution of soil and water resources if they are handled, stored or drained by vehicles and construction equipment. The Excavation linked to the project could result in a degradation of the quality of surface waters and groundwater. Spills of hazardous materials in the excavated areas during construction could introduce contaminants in the groundwater.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Short	Ad hoc basis	Average	**Average**	Certain and average	Irreversible	**Average**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

Loss of the coverage of the natural vegetation

The draft irrigation project is expected to transform the current site in an agricultural area irrigated, so it will require a clearance of natural vegetation. The cleaning of the vegetation during the construction of the infrastructure of the project will also result in a loss of vegetative cover.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Short	Ad hoc basis	Average	**Average**	Certain and average	Irreversible	**Average**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

Public Health

Public health

Construction, rehabilitation and traffic in operation will create dust, air and noise pollution, which may have an impact on public health. Petroleum waste from vehicles can also affect public health if they find their way into water sources. Lead compounds will accumulate on all planted vegetation for consumption. Sanitation and hygiene in the workers' camp are also of concern and, if left untreated, can lead to epidemics such as hepatitis, typhoid, intestinal worms, etc. Construction work is associated with an increase in sexually transmitted diseases such as STDs and HIV / AIDS due to the influx of workers interacting with local populations. Construction teams can also cause social upheaval among communities close to the project area.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Short	Ad hoc basis	Average	**Average**	Certain and average	Irreversible	**Average**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

Problems of Work

The project will stimulate some labour issues in the project area. Project activities will focus mainly on the workforce. Locals in the project area will be encouraged to take up the majority of available jobs. The project will likely attract immigrant labour.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Short	Ad hoc basis	Average	**Average**	Certain and average	Irreversible	**Average**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

6.4 Description and evaluation of negative impacts to the operating phase

The environmental and social impacts expected during the operational phase of the proposed agricultural resilience project include:

Soil erosion

The destruction of the natural vegetation will expose the soil to further erosion.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Short	Ad hoc basis	Average	**Average**	Certain and average	Irreversible	**Average**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

Loss of Biodiversity
The elimination of the natural vegetation will also result in a loss of biodiversity.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Short	Ad hoc basis	Average	**Average**	Certain and average	Irreversible	**Average**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

Modification of the structure of the ground
The use of water is irrigated could also change the structure of the soil.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Long	Ad hoc basis	Average	**Average**	Certain and strong	Irreversible	**Strong**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

Salinization
Irrigation projects are largely associated with salinization and elevation of the local water table (Water use). The low efficiency of irrigation is one of the main causes of the rise of the water table. Poor water distribution systems, poor management of the main system and old irrigation on the ground Practices are the main reason.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Short	Ad hoc basis	Average	**Average**	Certain and average	Irreversible	**Average**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

Effects of the ecosystem downstream of the river

The Irrigation Project has been designed to optimize the available water resources. The operation of the Irrigation Project will result in a reduction of water flows for downstream users.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Long	Local Level	Average	**Average**	Certain and average	Irreversible	**Average**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

Pollution by the chemical products

The use of agro-chemicals, including pesticides, fertilizers, herbicides, and insecticides can cause pollution of the water, the air and the soil. Some of these chemicals can also be hazardous in nature and may result in hazards to health.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Long	Regional	Average	**Average**	Certain and strong	Irreversible	**Strong**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

Seeds and invasive plant diseases

Eliminating the dry season gap and creating a wetter micro-climate can result in increased pests and plant diseases. The reversal of river water has the potential to cause environmental disturbances, resulting from changes in the hydrology and limnology of the river Oti.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Long	Ad hoc basis	Average	**Average**	Certain and average	Irreversible	**Average**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

Influx of population

At the present time, the area of the project is not an area of human settlement. The establishment and operation of project will result in an influx of population in the region. The

migration of people from neighbouring countries could lead to cultural changes and increased conflict on the resources and public and social services.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Long	Ad hoc basis	Average	**Average**	Certain and average	Irreversible	**Average**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

Management of solid waste

With businesses and the proposed operations of the irrigation project, coupled with the increase in the influx of population, a tremendous rate of production of solid waste is expected.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Long	Ad hoc basis	Average	**Average**	Certain and strong	Irreversible	**Strong**

The absolute importance of the impact is average and its gravity strong. It requires measures of specific mitigations.

Production of crops - Conflicts of rearing

During the operating phase, the livestock in the area of the project could damage the crops in the irrigated area, resulting in conflicts.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Long	Ad hoc basis	Average	**Average**	Certain and strong	Irreversible	**Strong**

The absolute importance of the impact is average and its gravity strong. It requires measures of specific mitigations.

Increased insecurity

The increase of the population which results in the project area is likely to lead to many commercial activities in the region, with a potential increase of cases of insecurity.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity

The negative	Directly	Long	Ad hoc basis	Average	**Average**	Certain and strong	Irreversible	**Strong**

The absolute importance of the impact is average and its gravity strong. It requires measures of specific mitigations.

Increase in poaching

Although the natural reserve of Oti-Keran near does not have a lot of wildlife currently, the anticipated increase in the population could increase the anthropogenic pressure on the reserve.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Long	Locale	Average	**Average**	Certain and average	Irreversible	**Average**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

Increase in communicable diseases

Malaria is already a concern in the area of the project. If not well managed, the irrigation project can increase waterborne diseases such as bilharzia and diarrhoea, among others. The increase in the growth of the population with the social change associate may also lead to communicable diseases such as STDs, HIV / AIDS, etc.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity
The negative	Directly	Long	Locale	Average	**Average**	Certain and strong	Irreversible	**Strong**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

6.3 Description and evaluation of negative impacts to the Decommissioning Phase

The environmental and social impacts expected during the operational phase of the project of agricultural resilience proposed include

Noise pollution

In the course of the work of dismantling, it is likely that there will be some noise for households living around the camps.

Evaluation of the impact

Nature	Interaction	Duration	Scope	Intensity	Absolute importance	Occurrence	Reversibility	Gravity

The negative	Directly	Short	Ad hoc basis	Average	**Average**	Certain and average	Irreversible	**Average**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

Air pollution

There will be of the pollution of the air from the equipment that will be used during the demolition work from dust. The exhaust gases of the vehicles and equipment used are also likely to pollute the soil, vegetation and water sources around the camp.

Evaluation of the impact

Nature	**Interaction**	**Duration**	**Scope**	**Intensity**	**Absolute importance**	**Occurrence**	**Reversibility**	**Gravity**
The negative	Directly	Short	Ad hoc basis	Average	**Average**	Certain and average	Irreversible	**Average**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

Production of solid waste

The demolition of the buildings of the project and related infrastructure will result in a large quantity of solid waste. The waste will contain materials used in the construction, including concrete, metal, drywall, wood and the fastening elements.

Evaluation of the impact

Nature	**Interaction**	**Duration**	**Scope**	**Intensity**	**Absolute importance**	**Occurrence**	**Reversibility**	**Gravity**
The negative	Directly	Short	Ad hoc basis	Average	**Average**	Certain and average	Irreversible	**Average**

The absolute importance of the impact is average and its medium severity. It requires measures of specific mitigations.

7.0 Environmental and Social Management Plan (ESMP)

The ESMP for development projects are intended to provide a logical framework in which the impacts related to the project are identified and a mitigation plan and monitoring of impacts environmental effects formulated. In addition, the ESMP assigns responsibilities to various actors and provides a timetable in which the mitigation measures and follow-up can be carried out.

The proponent recognizes that the draft agricultural resilience proposed has the potential impacts on the biophysical environment and on the health and safety of persons employed. In addition, it will affect the socio-economic well-being of local residents. Therefore, a concerted effort will be placed on the reduction of negative impacts and the strengthening of the positive impacts associated with the project.

7.1 Measures for the mitigation of negative impacts

7.1.1 Mitigation of negative impacts to the construction phase

The environmental and social impacts expected during the construction phase of the proposed project include:

Accidents at Work

The safety and security of workers may therefore be guaranteed thanks to the awareness of the dangers, the risks and to the security as well as to the training in first aid. The application of health and safety measures required by the Act and the internationally accepted standards must be guaranteed and be respected in order to minimize the impacts on the impacts on the health and safety, i.e. the life insurance and disease, the first aid kits, personal protective equipment (PPE), etc.

The pollution of the air

The following mitigation measures are recommended for the irrigation project;

- All the staff working on the project will be trained before starting the construction on the methods of minimization of impacts during construction
- The construction of heavy vehicle drivers to the earth will be under strict instructions to minimize unnecessary travel, reload the petrol tanks in the afternoon and to minimize the idle for the engines.
- A careful screening of the construction site will be conducted to contain and stop the dust related to the construction.
- The Exposed stocks such as the sand and dust will be included, covered and watered daily, or treated with binders of soil non-toxic.
- The contractor will ensure that all workers are of gear of protection each time that those are in service,
- The contractor will ensure that the machines and the construction equipment are well maintained to reduce exhaust gas emissions,
- The excavation work will be stopped if the threshold speed of the wind has been exceeded.

Noise pollution

The contractor will consider to minimize the noise during the construction work:

- Routing of trucks noise sensitive areas, where appropriate, on the construction site ;
- Reduction in the amount of engine idle time for trucks pick-up and other small equipment;
- Provide all workers who operate in noisy areas or to break the noisy equipment with EPI.

Pollution of water and soil

The contractor will ensure the proper disposal of all the construction debris in a reasonable manner and do not lay not in rivers / Courses of water.

Loss of the natural vegetation cover
The proposed irrigation project is expected to transform the current site in an agricultural area irrigated, so it will require a clearance of natural vegetation. The cleaning of the vegetation during the construction of the infrastructure of the project will also result in a loss of vegetative cover. We will endeavour to ensure as many trees as possible spared.

Public Health
Measures.

Labour Issues
Continuous awareness campaigns will be needed to sensitize local people to the different dimensions of the project so that they can embrace immigrants.

7.1.2 Mitigation of negative impacts in the operating phase

Soil erosion
Planting cover crops, the line of a hedge and shrubs. Other strategies of soil management will include -

- Use of techniques to control the erosion of soils that disperse the erosive energy and avoid concentrate in providing a good plant.
- A good maintenance of the canal and the irrigation infrastructure,
- Adoption of systems of conservation tillage and infiltration

Loss of Biodiversity
The project will integrate
Cultures of horticultural trees and green spaces and deforestation in the margins to ensure the maintenance of biodiversity.

Modification of the structure of the ground
The change in soil structure will be mitigated by the awareness of farmers / farm workers of appropriate soil conservation and management measures, including -

- good maintenance of the canal and irrigation infrastructure;
- adoption of conservation and tearing tillage systems to control hardening and improve infiltration and infiltration

Salinization
The use of improved irrigation technologies, specifically the combined basin and furrow techniques, will increase the effectiveness of the application of the water to mitigate the events related to the operation of the water and salinization.

Effects of the ecosystem downstream of the river
To increase the availability of water, a storage tank is proposed as an alternative source for the project of the water of the water during the high flows to use during low flows.

The pollution
A storage and a safe disposal of these chemicals must be observed.

The solar energy, a non-polluting source of energy, will be used for irrigation.

Seeds and Plant Diseases Invasive Species
Appropriate planning and management of project activities, such as reduction of inputs and release of nutrients (nitrogen and phosphorus) from cultivated fields and use of organic rather than chemical fertilizers to the extent possible.

Population flows
Administrative rules and regulations regarding movement within and outside the project area will need to be coordinated by the regional administration office. The development of infrastructure for domestic water supply, water treatment, sanitation, etc., will be important in the project to support population growth.

Solid waste management
It is proposed to use appropriate waste management strategies and to comply with solid waste management rules. Minimization of waste production will be the first priority. However, inevitable waste will be separated at source, recycled or disposed of in landfill sites.

Crop Production - Livestock Conflicts
The conflict between the farmer and the farmer will be mitigated by the closure of the project area and the support of breeders in the construction of cattle pens

Increased insecurity
Increased insecurity will be mitigated by integrating security measures into the project and applying the laws, regulations and regulations relating to security in the country.

Increased poaching
Although the nearby Oti-Keran Nature Reserve does not have much wildlife at present, enforcement of wildlife conservation and management laws must be applied to allow the reserve to recover its former glory despite the Expected increase in population.

Increase in communicable diseases
Malaria is already a concern in the project area. If not properly managed, irrigation projects can lead to water-borne diseases such as bilharzia and diarrhoea, among others. Increased population growth with associated social change can also lead to communicable diseases such as STDs, HIV / AIDS, etc. The proposed mitigation measure for these effects is to ensure the suffocation of stagnant water and possible mosquitoes, and that social and sexual health changes Campaigns are carried out in the project area.

7.1.3 Mitigation of negative impacts of the decommissioning phase

Noise pollution
During dismantling, it is likely that there will be noise for households around Camps. To mitigate these effects, the contractor should consider setting up the camps in less densely populated areas, installing portable barriers to protect compressors, conveying trucks used during demolition exercises from neighbourhood-sensitive areas,, minimize idle time for light trucks and other small equipment, limit the use of very noisy equipment throughout the day and ensure that all workers operating in noisy areas or using noisy equipment carry PPE against extreme noise.

Air pollution

There will be air pollution from the equipment that will be used during demolition work from dust. Exhaust gases from vehicles and equipment are also likely to pollute soils, vegetation and water sources around the camp. To mitigate this, the contractor will:

- The demolition exercise is limited to the day only:
- All personnel working in the project are trained before starting the demolition exercise on methods to minimize negative impacts on air quality.
- Construction vehicle operators are subject to strict instructions to minimize unnecessary travel, fill fuel tanks in the afternoon and minimize engine idling.
- All active demolition zones are watered at least twice a day to reduce dust.
- All trucks carrying debris / demolition waste are covered.
- Careful screening to contain and stop demolition dust is adopted
- Exposed demolition debris, e.g. dust and sand, are enclosed, covered and watered every day before transport to the disposal site.
- All workers on site are required to wear PPE in service.

Production of solid waste

Demolition of project buildings and related infrastructure will result in a large amount of solid waste. The waste will contain materials used in construction, including concrete, metal, drywall, wood and fasteners. He proposed that a licensed operator be hired to collect debris / waste from a demolition in order to avoid illegal final dumping at unauthorized sites. All debris / waste should also be collected regularly to control air pollution and injury.

7.2 Analysis of mitigation measures

Table 17 highlights the sources of potential impacts, potential impacts and their mitigation measures.

A comprehensive environmental and social management plan (ESMP) has been developed to assist the project proponent to mitigate these negative impacts and to monitor the project (Table 18). It should be noted that the project has its own dynamic. It is generally recommended that the implementation of the ESMP be subjected to regular reviews in the form of environmental audits after a period of one (1) year, depending on the threats noticed on the environment.

Table 16 : Synthesis of mitigation measures

SOURCE OF POTENTIAL IMPACT	POTENTIAL IMPACT	IMPACT INDEX	MITIGATION
1. IRRIGATION PROJECT			
a. Clearing for agriculture			
Habitat alteration	• Noise pollution	-1	• Maintain / service all equipment • Construction should be carried out only during daytime. 0800-1700hrs • Provide workers with PPE • Signage to alert neighbours on the development.
	• Air pollution / dust	-1	• Awareness on pollution reduction • Control speed and operation of construction vehicles • Spray water on excavated areas. • Provide workers with PPE (dust masks, work gloves) • Sensitize drivers to avoid off road driving. • Stockpiles of sand and soil should be covered, watered or surrounded with wind breaks
	• Biodiversity loss	-1	• Care will be taken to ensure as many trees as possible are spared. • Plant green hedges and tree wind breaks around project site
b. Development of irrigation infrastructure			
Transport of requisite materials	• Air pollution /	-1	• Awareness on pollution reduction • Control speed and operation of construction vehicles • Sensitize drivers to avoid off road driving.
	• Noise pollution,	-1	• Maintain / service equipment • Construction should be carried out only during daytime. 0800-1700hrs • Provide workers with PPE • Signage to alert neighbours on the development.
	• Biodiversity loss	-1	• Awareness on biodiversity conservation • Control speed and operation of construction vehicles • Sensitize drivers to avoid off road driving.
Construction activities	• Air pollution,	-1	• Excavation only at areas of construction • Control speed and operation of construction vehicles; reduce unnecessary idling • Spray water on excavated areas. • Provide workers with PPE (dust masks, work gloves) • Sensitize drivers to avoid off road driving. • Stockpiles of sand and soil should be covered, watered daily, or treated with non-toxic soil binders • Trucks hauling construction materials should be covered to reduce spillage • Stop excavation work if wind threshold velocity has been exceeded
	• Noise pollution,	-1	• Maintain / service equipment • Construction should be carried out only during daytime. 0800-1700hrs • Provide workers with PPE • Signage to alert neighbours on the development.

SOURCE OF POTENTIAL IMPACT	POTENTIAL IMPACT	IMPACT INDEX	MITIGATION
	• Biodiversity loss,	-1	• Replanting of trees along the edges of the project site. • Awareness on biodiversity conservation • Control speed and operation of construction vehicles • Sensitize drivers to avoid off road driving. • Incorporate horticultural tree crops in project area • Incorporate green areas and forestation within the edges to ensure maintenance of biodiversity.
	• Increased water use	-1	• Water conservation campaign for all workers • Time project construction to coincide with high water levels in River Oti / other sources
	• Soil pollution,	-1	• Set aside a particular area for parking all construction equipment • Service all construction equipment in one designated spot • Set aside a specific area for solid waste and re-use, recycle or dispose of in an environmentally sound way
	• Job creation	+1	• Local people will be hired to assist with construction work • Local vendors may be hired to supply food and water. • Local people will be hired to guard the pumping station / water treatment points
	• Accidents / injuries	-1	• Awareness creation on health and safety risks • First aid training / first aid kits on site • Provision of personal protective equipment (PPE) • Store hazardous phytosanitary chemicals in a central lockable store
	• Solid waste		• Waste management awareness campaign for all workers • Provide adequate waste collection facilities on site • Dispose of collected waste regularly
Operational stage	• Increased water use	-2	• Build a storage reservoir is proposed as an alternative source for the project to store water during high flows for use during low flow • Install water meters to monitor the use of water, • Put in place measures for water recycling where applicable. • harvest rainwater to supplement the proposed water supply
	• Air pollution / Methane emissions / C02 / N_20	-2	• Controlled water regime to lessen methane production • Practise low-input agriculture to reduce carbon footprint
	• Water pollution	-2	• Controlled input to and release of nutrients (nitrogen and phosphorous) from cropped fields • use of organic instead of chemical fertilizers where possible
	• Soil pollution	-2	• Store hazardous phytosanitary chemicals in a central lockable store • ensure controlled and efficient use of agricultural chemicals
	• Invasive plants, pest and diseases	-2	• Develop an integrated invasive species (pest & weeds) management plan ***(see Annex 7)** • Remove invasive species on detection
	• Soil compaction	-2	• Use of soil erosion control techniques which disperse erosive energy and avoid concentrating by providing good vegetative cover to disperse the energy of rain drops and contour drainage to slow down surface runoff, • Proper maintenance of canal and the irrigation infrastructures, • Adoption of conservation tillage systems and ripping to control hardpan and enhance infiltration and seepage • Proper maintenance of canal and the irrigation infrastructures,

SOURCE OF POTENTIAL IMPACT	POTENTIAL IMPACT	IMPACT INDEX	MITIGATION
			• Adoption of conservation tillage systems and ripping to control hardpan and enhance infiltration and seepage
Decommissioning	• Air pollution,	-1	• Control speed and operation of construction vehicles • Spray water on excavated areas. • Provide workers with PPE (dust masks, work gloves) • Sensitize drivers to avoid off road driving.
	• Noise pollution,	-1	• Maintain / service all equipment • Construction should be carried out only during daytime. 0800-1700hrs • Provide workers with PPE • Signage to alert neighbours on the development.
	• Job creation	+1	• Local people will be hired to assist with dismantling work • Local vendors may be hired to supply food and water.
	• Accidents / injuries	-1	• First aid training / first aid kits on site • Provision of personal protective equipment (PPE) • Enforce occupational health and safety standards
c. Water abstraction from River Oti			
Pipe through Oti-Keran nature park	• Biodiversity loss / disturbance	-2	• Leave as many trees intact as possible
Water use for irrigation	• Water balance / loss from evaporation	-2	• Water use awareness campaigns. • Full control of water regime through irrigation.
	• Socio-economic benefit to community	+2	
Ground water / aquifers	• Seepage / contamination	-2	• Water use awareness campaigns. • Full control of water regime through irrigation.
Downstream water levels	• Reduced flow	-2	• Water use awareness campaigns. • Full control of water regime through irrigation.
d. Improved agriculture (irrigation, livestock production)			
Crop production by irrigation	• Soil and water pollution by phytosanitary chemicals	-2	• Develop an integrated invasive species (pest & weeds) management plan ***(see Annex 6)**
	• Soil compaction	-2	• Use of soil erosion control techniques which disperse erosive energy and avoid concentrating by providing good vegetative cover to disperse the energy of rain drops and contour drainage to slow down surface runoff, • Proper maintenance of canal and the irrigation infrastructures, • Adoption of conservation tillage systems and ripping to control hardpan and enhance infiltration and seepage • Proper maintenance of canal and the irrigation infrastructures, • Adoption of conservation tillage systems and ripping to control hardpan and enhance infiltration and seepage
	• Increased pests by monoculture	-2	• Develop an integrated invasive species (pest & weeds) management plan ***(see Annex 6)**
	• Increased weeds	-2	• Develop an integrated invasive species (pest & weeds) management plan ***(see Annex 6)**
	• Waterlogging and salinization	-2	The use of improved irrigation technologies including the combined furrow and basin design will increase water application efficiency to mitigate water-logging and salinization occurrences

SOURCE OF POTENTIAL IMPACT	POTENTIAL IMPACT	IMPACT INDEX	MITIGATION
	• Improved food security / livelihoods	+2	
	• Bye-products can be used for livestock	+1	*Rice bye-products as hay
Livestock production	• Improved livestock production (water and hay)	+2	
	• Livelihood improvement	+2	
	• GHGs (methane) from rice fields	-2	• Control of the water regime through irrigation • Avoid dumping organic matter (e. rice straw) in rice fields before composting • Use agricultural bye-products (e.g. rice straw) as organic fertilizer after composting • Controlled fertilizer use
	• Harm from phytosanitary chemicals	-2	• Store hazardous phytosanitary chemicals in a central lockable store • Construction of animal pens?
e. Human-crop production- livestock production interactions			
Livestock improvement	• Livelihood improvement	+2	
Population influx / immigration	• Competition for resources i.e. housing, waste management, water, etc.	-1	• awareness campaigns by local administration to sensitize the local people on the various dimensions of the project to enable them embrace immigrants • Sensitize workers on local culture • Fill job opportunities with locals as much as possible • sensitize the immigrants to respect the culture of the local people • Increase economic activities which will also increase employment opportunities, income earnings and market capital stock formation
	• Disease transmission	-1	• Awareness campaigns on socio-cultural aspects • Provision of toilets & clean water for all workers
	• Culture erosion	-1	• Awareness campaigns on socio-cultural aspects
Crop production-Livestock conflicts	• Compensation for crop loss by livestock	0	• Encourage formation of community policing and neighbourhood associations • Strengthened Grievance Resolution mechanisms
	• Payments / Conflicts over pasture	0	• Encourage formation of community policing and neighbourhood associations • Strengthened Grievance Resolution mechanisms
2. SOLAR POWER			
a. clearing for solar farm			
Habitat alteration	• Noise pollution	-1	See 1. Irrigation project (above)
	• Air pollution	-1	See 1. Irrigation project (above)
	• Biodiversity loss	-1	See 1. Irrigation project (above)
b. Development of solar power infrastructure			
Transport of material (solar panels, etc.)	• Air pollution, dust	-1	See 1. Irrigation project (above)
	• Noise pollution,	-1	See 1. Irrigation project (above)
	• Biodiversity loss	-1	See 1. Irrigation project (above)
Construction	• Air pollution,	-1	See 1. Irrigation project (above)
	• Noise pollution,	-1	See 1. Irrigation project (above)

SOURCE OF POTENTIAL IMPACT	POTENTIAL IMPACT	IMPACT INDEX	MITIGATION
	• Biodiversity loss,	-1	See 1. Irrigation project (above)
	• Increased water use	-1	See 1. Irrigation project (above)
	• Soil pollution,	-1	See 1. Irrigation project (above)
	• Soil compaction,	-1	See 1. Irrigation project (above)
	• Job creation	+1	
Operational stage	• Solar power	+2	
Decommissioning	• Air pollution, dust	-1	See 1. Irrigation project (above)
	• Noise pollution,	-1	See 1. Irrigation project (above)
	• Soil compaction	-1	See 1. Irrigation project (above)
	• Job creation	+1	

Measure of the impact indicated as follows:

Impact Index	Description of the impact
-2	Very bad impact which might have long-term effect
-1	Small impact which is temporary or may be mitigated fully
0	No impact
+1	Good impact but will last for a short period or my change with other effects
+2	Long-term good impact

Table 17. Environmental and Social Management Plan (ESMP)

Activities SOURCES OF IMPACTS	IMPACTS	Mitigation Measures	Periods of implementation	Responsible for Execution	Responsible for monitoring and checking	Indicators for Monitoring	Means of Verification	Cost of implementation in FCFA
PREPARATION PHASE AND CONSTRUCTION								
Development of access paths Clearing and cleaning areas, Development of the perimeter, Construction of the Pumping Station Installation of solar equipment	Air pollution	Train all the staff assigned to the project before the start of the activities	During the execution of the work	Contractor / PMU	Contractor / PMU	Number of training session	Site visit Activity Report	300 000
		Educate drivers to avoid unnecessary travel	During the execution of the work	Contractor / PMU	Contractor / PMU	Number of awareness session	Site visit	PM
		Ensure the good condition of the gear	During the execution of the work	Contractor / PMU	Contractor / PMU	Technical visit to day	Activity Report	PM
		Scour only the useful surfaces	During the execution of the work	Contractor / PMU	Contractor / PMU	Stripped area	Site visit Activity Report	PM
	Noise pollution	Make a routing of trucks noise sensitive areas	During the execution of the work	Contractor / PMU	Contractor / PMU	Number of complaint	Site visit Activity Report	PM
		Reduce the amount of engine idle time for trucks pick-up or other small equipment	During the execution of the work	Contractor / PMU	Contractor / PMU	Number of complaint	Site visit Activity Report	PM
		Provide the worker the EPI and vigils to their actual port	During the execution of the work	Contractor / PMU	Contractor / PMU	Status of the areas of borrowing	Site visit Activity Report	1 000 000
	Pollution of soils	Educate drivers on the contamination linked to the leaks of motor oils and of fuel on the ground	During the execution of the work	Contractor / PMU	Contractor / PMU	Numbers of Awareness	PV of Awareness Activity Report	100 000
		Do the control and maintenance of mandatory gear used on the site	During the execution of the work	Contractor / PMU	Contractor / PMU	Status of gear used on the site	Thumbnail of technical visits to day	PM
		Develop an area for the cleaning and the draining of the gear.	During the execution of the work	Contractor / PMU	Contractor / PMU	The presence of developed area and waterproof	Site visit	1 000 000
Development of the perimeter,	Modification of the structure	Limit the clearing of the banks to the portion useful for the opening of the	During the execution of	Contractor / PMU	Contractor / PMU	The Band of the Riverbank	Site visit Activity Report	PM

Activities SOURCES OF IMPACTS	IMPACTS	Mitigation Measures	Periods of implementation	Responsible for Execution	Responsible for monitoring and checking	Indicators for Monitoring	Means of Verification	Cost of implementation in FCFA
Construction of the Pumping Station Installation of solar equipment	of the soil of banks	tracks of access	the work			cleared does not exceed 20 m long		
		Backfill and levelling the lower parts of the bank and then transplant the clumps of grasses on the embankments in order to allow the rapid regeneration of the vegetation	During the execution of the work	Contractor / PMU	Contractor / PMU	Bank State Transplanted surface of tufts	Site visit Activity Report	500,000
		Create gentle slopes at the level of the banks of the tracks of access at the perimeter and at the pumping station	During the execution of the work	Contractor / PMU	Contractor / PMU	State of banks	Site visit Activity Report	PM
	The destruction of the plant cover	Scour only the portion useful to develop the tracks	During the execution of the work	Contractor / PMU	Contractor / PMU	Stripped surface	Report of Activities Site Visits	PM
		Avoid putting the rubble on the areas not pickled and covered in vegetation	During the execution of the work	Contractor / PMU	Contractor / PMU	Status of the areas stripped	Site visit Activity Report	PM
		Make a compensatory reforestation of the vegetation destroyed (10 ha)	During the operation	Contractor / PMU	Contractor / PMU	Replanted area	Site visit Activity Report	6,000.000
	Destruction of wildlife habitats	Limit the stripping only to the portion useful	During the execution of the work	Contractor / PMU	Contractor / PMU	Status of the areas stripped	Site visit Activity Report	PM
		Raise the awareness of the population in the preservation of wildlife	During the execution of the work	Contractor / PMU	Contractor / PMU	Number of awareness session	Site visit Activity Report	PM
		Avoid putting the rubble on the areas not pickled and covered in vegetation	During the execution of the work	Contractor / PMU	Contractor / PMU	Status of the areas stripped	Site visit Activity Report	PM
Development of the perimeter, Construction of the Pumping Station Installation of solar equipment	Destruction of food crops	To compensate the owners of affected crops	Prior to the start of work	Contractor / PMU	Contractor / PMU	Number of people compensated Number of Complaints	Received of payment Field visits	PM
		Raise the awareness of the population on the timetable of work	Before starting and during the work	Contractor / PMU	Contractor / PMU	Number of awareness session	Site visit Activity Report	PM
		Carry out the work in dry season after the crops	During the work	Contractor / PMU	Contractor / PMU	Number of Complaints	Field visits	PM

Activities SOURCES OF IMPACTS	IMPACTS	Mitigation Measures	Periods of implementation	Responsible for Execution	Responsible for monitoring and checking	Indicators for Monitoring	Means of Verification	Cost of implementation in FCFA
Operating Phase								
Operation of the Perimeter Operation of machines and pumps	Insalubrity of the perimeter by solid waste	Recover solid waste and especially non-biodegradable plastics that will litter the ground	During the operation	Contractor / PMU	Contractor / PMU	State of the soil	Site visit Activity Report	240,000
		Awareness of producers on the need not to abandon or lay the solid waste and the plastic bags	During the operation	Contractor / PMU	Contractor / PMU	Number of awareness	Site visit Activity Report	100,000
		Put the garbage in the provision of the workers on the sites.	During the operation	Contractor / PMU	Contractor / PMU	The number of bins	Site visit Activity Report	100,000
	Pollution of the soil by the oils	Use the gear in good condition to avoid leaks of motor oil	During the operation	Contractor / PMU	Contractor / PMU	Absence of engine oil to the ground	Report of Activities Site Visits	PM
		Educate drivers on the contamination linked to the leaks of motor oils and of fuel on the ground	During the operation	Contractor / PMU	Contractor / PMU	Numbers of Awareness	PV of Awareness Activity Report	100,000
Operation of the Perimeter		Do the control and maintenance of mandatory gear used on the site	During the operation	Contractor / PMU	Contractor / PMU	Status of gear used on the site	Thumbnail of technical visits to day	PM
Operation of machines and pumps		Develop an area for the cleaning and emptying of gear	During the operation	Contractor / PMU	Contractor / PMU	The presence of developed area and waterproof to drain	Site visit Activity Report	PM
	Soil Erosion	Educate drivers of trucks so that they limit the speed of vehicles to 40 km/h at the village level	During the operation	Contractor / PMU	Contractor / PMU	Numbers of Awareness	PV of Awareness Activity Report	PM
		Use of equipment in good condition	During the operation	Contractor / PMU	Contractor / PMU	Status of gear used on the site	Thumbnail of technical visits to day	PM
Operation of the Perimeter		Tilt the materials transported by trucks	During the operation	Contractor / PMU	Contractor / PMU	Number of Trucks sheeted	Site visit Activity Report	PM

Activities SOURCES OF IMPACTS	IMPACTS	Mitigation Measures	Periods of implementation	Responsible for Execution	Responsible for monitoring and checking	Indicators for Monitoring	Means of Verification	Cost of implementation in FCFA
Operation of machines and pumps	Loss of Biodiversity	Scour only The useful portions	During the operation	Contractor / PMU	Contractor / PMU	Stripped surface	Report of Activities Site Visits	PM
		Make a compensatory reforestation	During the operation	Contractor / PMU	Contractor / PMU	Replanted area	Site visit Activity Report	PM
Operation of the Perimeter Operation of machines and pumps	Modification of the structure of the ground	Make a regular maintenance of the pipes	During the operation	Contractor / PMU	Contractor / PMU	State of water ponds	Site visit Activity Report	PM
		Adopt a system of conservation tillage and tear to check the hardening and improve the infiltration	During the operation	Contractor / PMU	Contractor / PMU	State of banks	Site visit Activity Report	PM
Operation of the Perimeter Operation of machines and pumps	Registration of water and salinization	Use of irrigation technologies improved	During the operation	Contractor / PMU	Contractor / PMU	Number of worker equipped	Site visit Activity Report	PM
		Apply an alternation of culture on the perimeter	During the operation	Contractor / PMU	Contractor / PMU	Cultural practice used	Site visit Activity Report	PM
	Emission of methane in the atmosphere	Use of irrigation technologies improved	During the operation	Contractor / PMU	Contractor / PMU	Technology used	Site visit Activity Report	PM
		Awareness of producers to the strict observance of the requirements	During the operation	Contractor / PMU	Contractor / PMU	Number of awareness session	Site visit Activity Report	PM
		Apply an alternation of culture on the perimeter	During the operation	Contractor / PMU	Contractor / PMU	Cultural practice used	Site visit Activity Report	PM
	Effect on the ecosystem downstream	Build a withholding of water	During the operation	Contractor / PMU	Contractor / PMU	Existence of a withholding of water	Site visit Activity Report	
		Awareness of producers on good practices	During the operation	Contractor / PMU	Contractor / PMU	Number of awareness	Site Visits PV awareness raising meetings	PM
	Development of plant	Make appropriate planning and management of activities	During the operation	Contractor / PMU	Contractor / PMU	Number of Complaints	Report of Activities Site visit	PM

Activities SOURCES OF IMPACTS	IMPACTS	Mitigation Measures	Periods of implementation	Responsible for Execution	Responsible for monitoring and checking	Indicators for Monitoring	Means of Verification	Cost of implementation in FCFA
	diseases Invasive Species							
		Awareness of producers to the strict observance of the requirements	During the operation	Contractor / PMU	Contractor / PMU	Number of awareness	Site Visits PV awareness raising meetings	PM
		Use of Chemicals biological	During the operation	Contractor / PMU	Contractor / PMU	Number of sensitization meeting Moist soil	PV of outreach meetings Site Visits	200,000
Operation of the Perimeter Operation of machines and pumps	Production of crops and conflicts of rearing	Develop and put in place a mechanism for the resolution of conflicts producers and breeders	During the operation	Contractor / PMU	Contractor / PMU	State of the soil	Site visit	PM
		Training producers and ranchers in the peaceful cohabitation	During the operation	Contractor / PMU	Contractor / PMU	During the operation	Site visit Activity Report	PM
		Support the farmers by the construction of pens of cattle	During the operation	Contractor / PMU	Contractor / PMU	The presence of pens of cattle	Site visit Activity Report	PM
	Increase in poaching	Ensure compliance with the Regulation on the conservation of wildlife	During the operation	Contractor / PMU	Contractor / PMU	Number of complaint	Site visit Activity Report	PM
End phase of Project (decommissioning)								
Demolition of the facilities	Loss of Employment	Subscribe producers to an insurance policy	During the operating phase	Proponent	NEMA	Insurance Policy		
	Air pollution	Train all the staff assigned to the project before the start of the activities	Before the start of the dismantling	Proponent	NEMA	Number of training session	Site visit Activity Report	300,000
		Educate drivers to avoid unnecessary travel	During demolition	Proponent	NEMA	Number of awareness session	Site visit	PM
		Ensure the good condition of the gear	During demolition	Proponent	NEMA	Technical visit to day	Activity Report	PM

Activities SOURCES OF IMPACTS	IMPACTS	Mitigation Measures	Periods of implementation	Responsible for Execution	Responsible for monitoring and checking	Indicators for Monitoring	Means of Verification	Cost of implementation in FCFA
Demolition of the facilities	Noise pollution	Make a routing of trucks noise sensitive areas	During demolition	Proponent	NEMA	Number of complaint	Site visit Activity Report	PM
		Reduce the amount of engine idle time for trucks pick-up or other small equipment	During demolition	Proponent	NEMA	Number of complaint	Site visit Activity Report	PM
		Provide the worker the EPI and vigils to their actual port	During demolition	Proponent	NEMA	Status of the areas of borrowing	Site visit Activity Report	1,000,000

7.3 Summary of the environmental and social management plan

This project's ESIA identified both positive and negative impacts. The significant negative impacts associated with the various phases of the project and the associated mitigation measures are summarized in the synoptic table of the ESMP.

NEMA is in charge of the monitoring of the implementation of the ESMP, a process that is estimated to cost:-

- CFA 10 940 000 for the reduction of impacts;
- CFA 10 000 000 for ANGE monitoring.
- CFA 20 000 000 for the purchase of a pickup truck double cabin 4x4 tropicalized for NEMA follow-up missions.

The total cost of implementation of the project ESMP is F CFA 40,940,000, not including the retained costs (PM).

8.0 Risk Analysis and Management

The implementation of the project to increase the level of resilience of agricultural producers in Mandouri involves risks that should be described, assessed and mitigation measures proposed for them.

8.1 Description of the risks of the project

Risk of traffic accidents

The transport of materials to the construction site of the structures constitutes a major risk of a traffic accident. This situation can lead to traffic accidents by crossing the towns and the town of Mandouri. The populations of these localities and the road users will be exposed to the risk of traffic accidents because of the frequency of material transport activities and the movement of other construction equipment during the construction phase.

Risks of work accidents for workers

During the work, workers will be exposed to the many hazards associated with the movement of construction equipment, the use of construction equipment (bulldozers, tractors, hydraulic shovels) to noise and dust. These risks can lead to lung disease, misunderstanding, disability or even death.

Fire hazard related to on-site storage and fuel use

The works will have fuel on site to power the generator and heavy equipment. He will build a fuel storage bin on the site that will be refuelled by a tanker. It is a flammable product which will constitute a danger on the site.

Risks of prostitution, STDs and HIV/AIDS infections

The presence of workers in the work phase is a factor in the development of prostitution and a risk of STI / HIV / AIDS infection in the project area.

Risk of drowning

Foreign workers who do not know how to swim and who are not used to the waters of the Oualé and Oti rivers are at risk of drowning during the construction of the pumping station or if they want to wash themselves in the water. In addition, the releases of water from the Kompienga dam are all sources of risk of flooding.

Risk of contamination of water by faecal matter

In the course of the works, workers may be tempted to relieve themselves in the water or on the banks.

Risk of contamination of waterborne diseases

The irrigation perimeter and the site of the pumping station are remote from the dwellings. During work, workers and mobilized personnel may be tempted to drink river water or bathe in it. This situation can lead to contamination of waterborne diseases such as intestinal worms, lymphatic bilharzias is and so on.

8.2 Risks specific to the operation of the project

Risk of migration of persons

Once the project has been completed, exploitation of the perimeter may lead to migration of populations towards Mandouri. Increased population growth with associated social change can also lead to communicable diseases

Risk of development of water-borne diseases
Malaria is already a concern in the project area. If not properly managed, irrigation projects can lead to water-borne diseases such as bilharzia and diarrhoea, among others.

Risk of theft of solar equipment
The use of solar as an energy source for irrigation requires the installation of a field of solar panels and the use of modern and sophisticated equipment in the area. This can cause malicious people to want to steal the facilities.

Risk of mismanagement of solar installations
The use of solar power for irrigation of this magnitude has not yet been achieved in Togo. As a result, there is a problem of availability of local expertise for equipment management and maintenance.

Risk of flooding of project facilities
The project perimeter is an alluvial plain area of the Oti. In rainy or rainy season, frequent flooding of the plain makes the area inaccessible for several days. This situation is exacerbated by the overflowing of water from the Kompienga dam. This can cause flooding of the perimeter, the pumping station and the solar park.

Risk of conflicts between producers
During the exploitation of the perimeter, conflicts may arise between the producers, especially during the distribution of the plots, the installation of the crops for the respect of the prescriptions and in the event of breakdown of the installations of a block or a sector.

Risk of land insecurity in the exploitation of the perimeter
Although the perimeter has a deed of donation of 500 ha of land by the owners, donated for the execution of the project, claims may arise later when the perimeter will be serviced.

Risk of occurrence of pests and invasive vegetation
The permanent presence of water on the perimeter, the development of crops during the dry season and the use of agricultural inputs can cause the appearance of pests (insects) and invasive plants.

Project Risk Assessment
The criteria used for the risk assessment of the project are:
- the occurrence of the risk, that is, the probability of occurrence of the risk;
- the perception of the risk associated with phobia (fear) that the local population is at risk, and
- the consequences (damage or damage) if the risk arises.

The combination of these criteria makes it possible to identify the importance of the risk. Table 6 presents the results of the project risk assessment.

Table 18 : Result of the assessment of the risks of the project

The criteria / Risks	Occurrence	Perception	Consequences	Importance
Risk of traffic accident	Low	Strong	Strong	Strong
Risk of accident at work	Low	Strong	Strong	Strong

Risk of fire	Low	Low	Average	Average
Risk of drowning	Low	Average	Strong	Strong
Risk of contracting STDs, HIV/AIDS	Low	Strong	Strong	Strong
Risk of water contamination by faeces	Low	Average	Average	Average
The risk of contamination of water-borne diseases	Low	Average	Average	Average
Risk of migration of people	Low	Average	Average	Average
Risk of development of waterborne diseases	Average	Average	Average	Average
Risk of theft of solar installations	Average	Strong	Strong	Strong
Risk of poor management of solar installations	Average	Strong	Strong	Strong
Risk of Flooding of facilities	Strong	Strong	Strong	Strong
Risk of conflicts between producers	Low	Average	Average	Average
Risk of insecurity of land tenure to the exploitation of the Perimeter	Low	Average	Strong	Average
Risk of Apparitions of pests and invasive vegetation	Low	Average	Average	Average

8.3 Proposed Preventive Risk Measures

Preventive measures are:

- Risk of accidents at work
  - Communicating risk codes;
  - Place copies of the hazard coding system outside the facility, at the location of fire doors and connecting systems for fire emergencies;
  - Share proactively with emergency and security services personnel about the types of hazardous materials stored, processed or used in the facility
  - Periodically (quarterly) involve representatives of the local emergency and security services in orientation visits and inspections of the installation in order to familiarize themselves with the potential risks present.

- Risk of a traffic accident:
  - Sensitize drivers on the caution, limiting speed to 40 km / h when crossing villages and Mandouri town especially at the time of students' exit and the inadvertent use of the horn;
  - Implement truck exit signs at the crossroads of access roads;
  - Maintain regular runways;
  - To sensitize above all the taxi-motorcycle drivers to the respect of the signs and to the caution on the tracks
  - Sensitize drivers on the wandering of animals and the passage of transhumant herds;
  - Sensitize women to take care of children;
  - Put the donkey backs;
  - Take charge of the wounded;
  - Insist on the vigilance of gear and truck drivers
  - Always circulate lighted lights for gear and trucks, even in daylight
  - Keep away any unnecessary person on the job site
  - Warn the gendarmerie in the event of an accident.

- Fire hazard:
  - Prohibit any incandescent object during the supply of fuel;
  - Have adequate fire-fighting equipment on site;

- Risk of drowning
  - Sensitize employees on the risk of drowning;
  - Avoid carrying out work in water and rain;
  - Intensify work during the dry season (January to May) in order to be safe from flooding which accentuates the risk of drowning;
  - Train the workers in swimming and first aid;
  - Train members of the SSHE committee to swim;
  - Monitor the water releases of the Kompiengua dam;
  - Warn the gendarmerie in case of drowning.

- Risk of STI / HIV / AIDS contamination:
  - Raise employee awareness of respect for local customs;
  - Take appropriate measures to sensitize workers on STIs and HIV / AIDS and comply with the provisions of the Labour Code when recruiting workers to avoid child labour.

- Risk of contamination of water by faecal matter.
  - Prohibit the workers from making their needs in the water and on the banks;
  - Make available to the workers a mobile toilet on site and empty it under appropriate conditions.

- Risk of contamination of waterborne diseases
  - Prohibit workers from using river water as drinking water;
  - Prohibit workers and personnel from swimming in river water;
  - Provide drinking water to staff and workers;
  - Permanently have a lifeguard on site if work is carried out in the watercourse.

- Risk of migration of persons
  - Sensitize the populations and the producers on the respect of the local customs;
  - Take appropriate measures to sensitize people and producers on STIs and HIV / AIDS and comply with the provisions of the Labour Code when recruiting workers to avoid child labour.

- Risk of development of water-borne diseases
  - Sensitize the populations and the producers on the respect of the diseases related to the water;
  - Strengthen the Mandouri health centre in equipment and pharmaceuticals;
  - Establish a monitoring program for epidemiological and water-borne diseases;

- Risk of theft of solar installations
  - Sensitize the populations and the producers on the respect and the monitoring of the installations;
  - Recruit a local workforce for the 24-hour guarding of the installations;
  - Build a solid fence around solar installations.

- Risk of mismanagement of solar installations

- Sensitize the populations and the producers on the respect and the monitoring of the installations;
- Train local labour for the maintenance of facilities.

➢ Risk of flooding of facilities
- Construct the pumping station at a level that allows the equipment to be sheltered;
- Build the solar park in a non-floodable area.

➢ Risk of conflicts between producers
- Develop and implement a dispute management program related to the operation of the perimeter and facilities;
- Develop a perimeter and facility management manual.

➢ Risk of land insecurity in the exploitation of the perimeter
- Make the administrative documents required to secure the land perimeter;
- Sign contracts of exploitation of the perimeter between the owners, the producers and the State.

➢ Risks of pests and invasive vegetation
- Maintains irrigation canals, banks, rational use of agricultural inputs

8.4 Summary of the costs of implementation of the RMP

The costs of the implementation of the risk management plan amounted to 18.900.000 CFA francs for the first 5 years and to 500,000 francs per years for the operating phase due to the guarding of the solar installations.

Table 20: Risk Management Plan

The ACTIVITIES	Risks	The measures	Period of implementation	Responsible For monitoring	Responsible for control and monitoring	The indicators	Cost
Installation of the site, construction of the works, Development of the Perimeter	Accidents at Work	• Communicate the codes of risk; • Place copies of the system of codification of the risks to the outside of the facility, to the location of the entrance doors and systems of connection for fire emergencies; • Share with the emergency services personnel and security, in a proactive manner the information regarding the types of hazardous materials stored, processed or used in the installation • Do participate periodically (all quarters) the representatives of the emergency services and local security to orientation visits and inspections of the installation, in order to familiarize themselves with the potential risks present	Before and during the construction	NEMA	Proponent/PMU	• Contract of Insurance Policy • Number and types-of panels • Percentage of sensitized persons • Existence of tags • Level of speed in crossing of agglomeration • Status of vehicles and gear • Number of meetings • State of the Headlights • Absence of strollers on the construction site • Number of accident	PM
Led construction machinery, borrowing, and transport of materials.	Traffic accidents and work	• Raise the awareness of drivers on the prudence, the limitation of the speed to 40 km/h at the crossing of the villages and the City of Mandouri especially to the HOURS output of students and the inappropriate use of the horn; • Implement the signage of the output of the trucks at the crossroads of the tracks of access; • Regularly maintain the tracks; • Educate especially taxi drivers-bike to the respect of the signs and the caution on the tracks • Educate drivers on the divagation of animals and the passage of the transhumant herds; • Raising the awareness of women to take care of the children; • Put the back of an ass; • Take charge of the wounded;	During the preparation and construction	NEMA	Proponent/PMU	• State of soils • Quantity of recyclable materials • Amount of recycled material • Quantity of green waste on site • Amount of dredged material used • The number of bins • Effective use of waste bins • Amount of non-hazardous waste collected • Sorting of waste	200 000

The ACTIVITIES	Risks	The measures	Period of implementation	Responsible For monitoring	Responsible for control and monitoring	The indicators	Cost
		• Insist on the Vigilance drivers of equipment and trucks • Always circulate headlights on for the equipment and trucks, even in full day • Away any person not required on the construction site • Warn the gendarmerie in case of accident					
Installation of the yard, storage of hydrocarbons	Risk of fire	• Prohibit any incandescent object when the supply of fuel; • Have on the site of equipment anti-fire adequate;	During the preparation and construction	NEMA	Proponent/PMU	• Number of panels of appropriate signage on the site • Existence of equipment anti-fire	P/M
Construction of the Pumping Station	Risk of drowning	• Educate employees on the risk of drowning; • Avoid to perform work in the water and under the rain; • Intensify work in dry season (January to May) in order to be immune to the floods which accentuate the risk of drowning; • Training workers to swimming and first aid; • Train the members of the Committee SSHE to the swimming; • Monitor the dropped water from the dam of Kompiengua; • Warn the gendarmerie in the case of drowning	During the preparation and construction	NEMA	Proponent/PMU	• Number of awareness • Number of Complaints • Schedule of Activities • Number of workers trained • Number of Trained Worker • Number of cases of drowning	200 000
Installation of the yard, development of the Perimeter	Risk of contamination to STI/HIV/AIDS	• Educate employees on the respect of local mores; • Take appropriate measures to raise the awareness of workers on STIS AND HIV/AIDS, and comply with the provisions of the Labour Code in the recruitment of workers to avoid the work of children.	During the preparation and construction	NEMA	Proponent/PMU		PM
Installation of the yard, development of the perimeter, construction of	Risk of water contamination by faeces.	• Prohibit the labourers to do their need in the water and on the banks; • To put at the disposal of the workers a toilet mobile construction and the empty in appropriate conditions. • To put at the disposal of the producers of the	During the preparation, construction And Exploitation	NEMA	Proponent/PMU	• The presence of a note of Prohibition • State of the water and banks • The presence of a toilet construction site	PM

The ACTIVITIES	Risks	The measures	Period of implementation	Responsible For monitoring	Responsible for control and monitoring	The indicators	Cost
the Pumping Station		Toilet				• The presence of toilet for producers	
Intensification of productions agro-sylvo-pastoral	Risk of Apparitions of pests and invasive vegetation	• Maintains the channels of irrigations, fixing of banks, rational use of agricultural inputs	During the operation	NEMA	Proponent/PMU	Linear of Channels maintained, hectares of banks set, quantity of agricultural inputs used	PM
Installation of the yard, development of the perimeter, construction of the Pumping Station	The risk of contamination of water-borne diseases	• Prohibit the workers to use the river water as drinking water; • Prohibit to the workers and to personal to swim in the river water; • To put at the disposal of the staff and workers of the drinking water; • Have permanently on a master-swimmer on the site in case of implementation of the work in the course of water.	During the preparation and construction	NEMA	Proponent/PMU	• The presence of posters of the prohibition on the construction site • The presence of posters of the prohibition on the construction site • Presence of a device for the supply of drinking water on the site	1 000 000
Operation of the Perimeter	Risk of migration of people	• Raise the awareness of the population and the producers on the respect of local mores; • Take appropriate measures to raise awareness among populations and the producers on STIS AND HIV/AIDS, and comply with the provisions of the Labour Code in the recruitment of workers to avoid the work of children.	During the operation	NEMA	Proponent/PMU	• Number of awareness session • Number of Complaints	PM
Operation of the Perimeter	Risk of development of waterborne diseases	• Raise the awareness of the population and the producers on the respect of water-related diseases; • Strengthen the Health Center of Mandouri in equipment and pharmaceutical products; • Put in place a program of monitoring of the epidemiological diseases and water.	During the operation	NEMA	Proponent/PMU	• Number of awareness session • Number of Complaints • State of facilities	5 000 000

The ACTIVITIES	Risks	The measures	Period of implementation	Responsible For monitoring	Responsible for control and monitoring	The indicators	Cost
Exploitation of solar installations	Risk of theft of solar installations	• Raise the awareness of the population and the producers on the compliance and monitoring of the facilities; • Recruit a local labour for the caretaking 24h/24 of facilities; • Build a strong fence around the solar facilities;	During the operation	NEMA	Proponent/PMU	• Number of awareness session • Number of Complaints	2 500 000
Exploitation of solar installations	Risk of poor management of solar installations	• Raise the awareness of the population and the producers on the compliance and monitoring of the facilities; • Form a local labour for the maintenance of facilities	During the operation	NEMA	Proponent/PMU	• Number of awareness session • Number of Complaints • State of facilities • Number of trained person	PM
Operation of the pumping station and solar installations	Risk of Flooding of facilities	• Build the pumping station to a dimension which allows to shelter equipment; • Build the solar park in a non-flood area.	During the operation	NEMA	Proponent/PMU	• Number of Complaints • Number of cases of flooding	PM
Operation of the Perimeter	Risk of conflicts between producers	• Develop and put in place a program for the management of conflicts related to the exploitation of the perimeter and facilities; • Develop a management manual the perimeter of the area and the facilities.	During the operation	NEMA	Proponent/PMU	• Existence of a program management of conflicts	5 000 000
Operation of the Perimeter	Risk of insecurity of land tenure to the exploitation of the Perimeter	• Make the administrative documents required to secure the tenure of the perimeter; • Sign contracts for the exploitation of the perimeter between owners, producers and the State.	During the operation	NEMA	Proponent/PMU	• Number of Complaints • Existence of administrative documents of the land	5 000 000

9.0 Monitoring and Follow-up programs

9.1 General principles

The Environmental and Social Impact Assessment described a number of impacts and risks on environmental components and phenomena. For this reason, it is necessary to develop an environmental monitoring and control program covering all phases of the project.

The monitoring and follow-up program is designed to ensure that the enhancement and mitigation measures are implemented, that they produce the desired results, or that they are modified or discontinued if they do not produce convincing results.

The purpose of environmental monitoring is to ensure compliance by the proponent as concerns:-

- proposed measures in the ESIA, ESMP and RMP, including mitigation and prevention measures;
- decrees and decrees relating to ESIA and texts relating to the preservation of natural resources and the environment in Togo;
- commitments by the developer in relation to the laws, regulations on safety, health and public health, managing the living environment of the population, protecting the environment and natural resources.

Environmental monitoring will verify on the ground the regularity of the assessment of certain impacts and the effectiveness of certain mitigation measures provided for by the ESIA. In addition, the monitoring will concern the analysis of the evolution of certain receptors of impacts (natural and human environment) affected by this exploitation project. It will mainly consist of:

- the evolution of the phenomena of destruction and soil erosion;
- the evolution of the reconstitution of the vegetation cover and the reconstitution of deforested areas;
- career development;
- changes in biodiversity;
- the development of diseases or other diseases related to irrigation, sexually transmitted diseases, etc.

Surveillance, monitoring and control should include the effectiveness of the implementation of the mitigation measures identified in the ESMP and the preventive measures of the RMP.

9.2 Modality and frequency

The proponent must submit all of the months, the preparatory phases and construction, a report on the Environmental Management of the project, including the implementation of the ESMP and the RMP. This report of environmental management should include the following elements:

- Appearance of the impact (yes/no);
- If yes, nature (positive/negative);
- Place of the appearance of the impact;
- Intensity;
- Scope;
- Duration / occurrence;
- Importance;
- Reversibility;
- Mitigation Measure Environmental Management Plan Implementation (Yes/No);
- If yes specify the effectiveness of the measure (Yes/No);
- If the measure is ineffective, give the reasons for the ineffectiveness of the measure;

- Corrective solution made;
- If no measure of mitigation or compensation is implementation, give the reasons.

The control of the implementation of the ESMP will essentially be carried out by the Construction Coordination and Programming Unit (CCPU) including the environmentalist from the control office during the work and from the regional administration (public health, water and forestry, agriculture and livestock, police).

9.3 Monitoring and Follow-up

The purpose of monitoring is to ensure that the recommended enhancement and mitigation measures are effectively implemented during all phases of the project.

For the most part, the implementation of the environmental and social management of the works will be carried out by the company. Classical environmental measures (personnel safety, quarrying, waste management, etc.) to be included in the specifications of the work will be carried out by the company holding the contract.

Monitoring will be carried out by the Project Management Unit (daily monitoring) and the Environmental Monitoring Officer (regular and unannounced site visits), as well as by regional and prefectural environmental services.

The Project Management Unit shall communicate to the NEMA and the Environment Directorate the final program of monitoring and environmental monitoring and control before the start of the various project activities. A quarterly monitoring report will be sent to the NEMA during the various phases of the project.

Control is a task that is primarily the responsibility of the National Agency for Environmental Management (NEMA) in collaboration with the Employer or its delegate and the other competent administrations. The choice of sampling sites, the conditions for analysing samples and the use of their results, the frequency of analyses, the definition of standards and thresholds that will trigger the needs for the implementation of corrective actions are Of ANGE's responsibility.

NEMA monitors the Environmental and Social Management Plan. It ensures that the company complies with the commitments made and proposes sanctions against the company in the event of a breach by the company of its commitments and obligations.

Unannounced visits will be made by the competent services to ensure compliance with the measures and to propose recommendations to improve the measures recommended to mitigate or reduce major impacts. In order to effectively implement the measures, the company must be assisted by a consultant or an environmental management consulting firm.

Following the monthly monitoring and supervision of the work presented by the Proponent on the environmental management of the project, a monitoring commission will be set up by ANGE to carry out the field verification. However, unannounced site visits may also be undertaken by ANGE. In the event of an unforeseen serious environmental problem, an extraordinary visit to the site would be essential.

9.3.1 Criteria for monitoring and control

The main criteria for monitoring and control are:

- Hygiene and sanitation at the level of the ground level;
- The level of maintenance of equipment and trucks (sheet of maintenance);
- The use of gloves, helmets, fluorescent jackets and safety shoes for the protection of the staff;
- The realisation of the works of water and soil conservation, in particular at the level of the sensitive points to the collapse of the slopes;
- The level of watering areas sources of dust;
- The level of implementation of the other measures of bonus and mitigation of negative impacts.

9.3.2 Indicators for Monitoring

The main indicators for monitoring are:

- the number of erosion claws and troughs around the base-life, borrowing and quarrying and storage sites;
- turbidity and changes in colour of watercourses;
- the number of consultations for waterborne illness in neighbouring health centres per quarter;
- changes in the number of visits for respiratory illness, cough, bronchitis in these health centres;
- the number of jobs created for local workers;
- changes in the number of accidents related to the disruption of traffic during construction;
- the number of complaints registered in the register of grievances set up at the local council level;
- the number of consultations with the political, administrative and local authorities.

The analysis of these indicators is the main input to the monitoring reports and the basis for suggestions for cancellation or replacement of ineffective measures.

9.4 Objects of surveillance, monitoring and control

- Objects for surveillance, monitoring and control
- As an indication, the environmental and social follow-up activities of the project could be as follows:
- monitoring the turbidity of the waters of the main rivers in the project area during dry seasons and rainy seasons. The analysis of the samples must first concern the turbidity of the waters. In the absence of national standards, WHO standards will be used. Protection measures will be taken whenever the situation so requires;
- Monitoring of soil erosion will take place in areas deemed sensitive. It will be necessary to take samples on the profile in order to evaluate the resistance to the collapse under the effect of the water runoff. This analysis will be annual. It will enable timely response to consolidate the embankments;
- Vegetation monitoring will be carried out on the plantations carried out. This monitoring will be permanent. It will be carried out by the local water and forest services and will concern the survival of the plants, the predation of animals and insects in particular;
- Monitoring the health of the population in health centres. It will be done in six months and will concern the evolution of the prevalence of STI / AIDS, water and respiratory diseases. Control of this development should allow for timely responses from all authorities;
- Monitoring of traffic accidents by the road safety authorities.

CONCLUSION

The environmental and social impact assessment carried out within the framework of this project made it possible to identify both positive and negative impacts. Negative impacts are inherent in the various phases of the project, the most significant of which have been the subject of proposals for mitigation and / or compensation measures.

In addition, risk analysis identified hazards and preventive measures were proposed in the Risk Management Plan (RMP).

The ESMP and RMP are proposed to minimize, reduce, compensate, avoid or prevent the adverse impacts and risks of this project. It is therefore incumbent on the proponents to implement the proposed plans in order to reconcile economic, social and environmental objectives. If the proposed environmental management measures are effectively implemented, the significant impacts and risks assessed will be significantly minimized, reduced or offset.

Given the positive socio-economic and environmental benefits to be generated from the development of the Mandouri Agricultural Resiliency Project, and the Environmental Impact Assessment Study Team having found no major negative impacts, we recommend that the project be authorized to be implemented, expects the proponent to adhere to the mitigation measures recommended here and the full implementation of the proposed Environmental and Social Management Plan (ESMP).

Annex 1: ESIA Term of Reference

Term of Reference of the study of the impacts of environmental and social

1. Context and justification of the project

Agriculture in Togo is mainly rainfed agriculture and dominated by small productions which depends essentially of the very variable climatic conditions. This high variability of climate conditions is characterized very often by a late start or an early end of the rainy season in relation to the timetable cultural usual, the appearance of the breaks in rainfall and a bad spatio-temporal distribution of rains. This disrupts cropping patterns of farmers, affects very often the cultures in full vegetative phase, causing this fact of losses of yields often substantial.

The northern regions of the country are the most affected by the consequences of climatic anomalies which greatly reduce the agricultural productions and increase the vulnerability of populations.

The site of Mandouri is located in the savannah region where the problems of flooding, access to drinking water, soil erosion, and drought are major constraints to development. This region very vulnerable to the adverse effects of climate change and variability saves the poverty index of the highest in the country (90.5%).

In effect, the local economy is based primarily on agriculture which occupies 96% of the population of Kpenjal. It depends largely on the climatic conditions very variables that are not mastered by producers.

As regards the activities of production, 56.4% of assets are women who play an important role and are the engine of the development of agriculture. Despite this importance in the development of agricultural activities in the community, they are marginalized and have a low access to a land of quality because only men are owners. Young people are also without employment and are often tempted by the rural exodus.

The site of Mandouri is also an area of pastoral activities by excellence and the passage of the livestock that flows to the south in search of pasture and points of water during the dry season is at the origin of conflicts very often deadly between farmers and ranchers.

In the area of the project, the populations are supplied with drinking water from rivers, drilling and individual wells. Rural households have access to much more difficult than urban households in drinking water.

In general, the problem of drinking water supply arises in the prefecture of Kpendjal with a rate of access of 14.1% according to the data of the national mapping of Poverty (2011).

The women who, in the majority have the responsibility to collect water see their tasks increasingly multiplied and difficult. They are paying the consequences in terms of health, but also of education and income-generating activities. This situation contributes strongly to their vulnerability to climate change.

This project constitutes an appropriate response of adaptation to the strong climate variability by the mastery of the water for the securing of agricultural production activities of the communities, the promotion, the diversification of the means of existence, the valuation of agricultural products and the improvement of the local governance.

Also, in the desire to obtain more the accession of the public and key stakeholders, to compliance with the procedures in force for the achievement of the SEIT, to integrate the backup policy of the Fund for Adaptation to climate change, raise the impacts of the project on both the habitat that on ecosystems, an update of the study of environmental impact and social development of the project is essential.

2. Objectives of the project

The objective of this project is to increase the level of resilience of vulnerable actors of the agriculture sector in Togo, including Mandouri in the prefecture of Kpendjal.

More specifically, the project aims to:

a. Contribute to the securing of rice production and to the reduction of the national deficit in rice by an additional production of 9 900 tonnes of paddy rice;
b. Promote, improve and diversify the income of recipient families of the project through the construction of the works of mastery of water for irrigation; the mastery of irrigation techniques semi-California 144 hectares; the improvement of the availability of drinking water for the populations; and the promotion of diversification and the valorisation of the products.

3. Presentation of the project

The project is divided into three major components namely:

- Support to the mastery of the water resource and to the production
- Support for the diversification of the means of subsistence
- Institutional support and capacity building and knowledge generation

➢ **Component 1: Support to the mastery of the water resource and to the production**

Expected Results: Development Agricultural hydro and improved tillage practices
The expected effects are the following:

Expected Effect 1: *144 ha of agricultural land are arranged and equipped with an irrigation system Californian semi powered by a source of solar energy.*
The work will focus on: i) the construction of irrigation networks, drainage networks, networks of tracks; (ii) the acquisition and installation of pumps and accessories; (iii) the acquisition and installation of solar equipment and (iv) the complementary work consisting of ploughing, the clearing of the bush, the planning and the delimitation of the axes of conduit.

Expected Effect 2: *Improvement of the yields of the products through the mechanization of the means of production and the improvement of cropping practices.*
It will be the acquisition of kits of agricultural equipment (a tractor of 75 CV + a plow to 3 disks + a sprayer to disk 10x10 + a sub-soiler to 3 teeth + a Trailer + a combine + a rotavater + a huller).
In addition, the project will support the beneficiaries in the selection of varieties of rice and other speculation to produce. The support to the production will also focus on the accompaniment of producers on the techniques of production agro-sylvo-pastoral care and fish.

➢ **Component 2: Support for the diversification of the means of subsistence**

Expected Results: diversification of the means of existence of local communities by the practice of horticulture, poultry and the support to the marketing.
The expected effects of this component are the following:

***Expected Effect 1** : the diversification activities are practiced and the products are valued*
This component aims to strengthen the means of subsistence of the recipients by the development of the horticulture and poultry farming. In addition, the project will support the beneficiaries for the conservation (store construction of storage, drying areas for the rice), the processing of horticultural products and marketing.

In relation to the processing and conservation, NGOS at the local level could be involved for the strengthening of the capacities of communities and thus allow to consolidate them for a better control of production activities.

For the marketing, the project will seek to strengthen the capacities of populations on the information necessary for a decision beneficial and the enable better inter-act with the different actors of the chain for a mutual benefit.

The producers will be trained to the study of the market to ensure a match between the supply of the products and the request of the local market and national. They will learn to recognize, understand and put in place the elements that make up the supply chain. They will also be able to understand how to connect to consumers. At this level, the generation and knowledge management will play an important role.

The project will identify all key actors in order to involve them in a participatory process of assessment of the needs of the market and the identification of specific solutions.

Expected Effect 2: *Access to micro credit is facilitated*
The project will put in place a Guarantee Fund credits to farmers with a view to support the activities related to the diversification and marketing.

- **Component 3: institutional support, capacity building and knowledge generation**

Expected results: Strengthening of the capacity of local institutions and communities to better support for issues relating to climate change.
The expected effects of this component are the following:

***Expected Effect 1**: local institutions and communities are better sensitized and climate change are better understood and taken into account in the development policies at the local level.*
The capacities of the different actors and stakeholders will be strengthened in the aim to pass" of climate risk to Resilience", to the extent that the reduction of the risk may constitute a substantial contribution to the adaptation to climate change. Therefore, the strengthening of capacities is provided in the risk assessment, risk reduction, vulnerability assessment, and adaptation technologies.
In addition, this component will also focus on strengthening the technical capacity, organizational and environmental actors in the field:
a. Of Environmental Competencies (SEIA, fight against bush fires, sanitation, etc.);
b. Concerted management of water resources and the management of conflict and
c. Environmental monitoring.

With regard to the environmental and social actions, the actions envisaged are:
- Implementation of the measures of the Environmental and Social Management Plan (ESMP) (development of local conventions, reforestation compensatory, integrated management of resources, the establishment of a mini-AEP (a drilling equipped + a mini castle of water + 3 terminals fountains) in the city of Mandouri etc.);

- Implementation of the plan of actions and Resettlement (BY);
- Establishment of a plan for the restoration of the means of production (temporary);
- Establishment of the Plan of commitment of stakeholders to strengthen the ownership of the project;
- Establishment of the plan for the resolution of grievances in the aim to resolve the potential conflicts that could impede the operation of the project, and
- Implementation of a plan for the prevention and management of the pollution.

Expected Effect 2: *Strengthening of the beneficiaries in financial management of cooperatives and techniques of maintenance of equipment*
It will strengthen the capacity of recipient communities in terms of:
a. Financial and accounting management simplified;
b. Co-operative organization;
c. Training of local technicians in the installation and repair of irrigation facilities and solar.

Expected Effect 3: *lessons learned from the projects in progress at the national level are capitalized and a system of dissemination of the knowledge acquired in the framework of the project is put in place at the local level*

4. Presentation of the proponent
The master of the work of the project is the Ministry of the Environment and Forest Resources (MERF). The control of work delegated will be entrusted to the AGETUR and the Directorate of the environment will ensure the control of work.

5. Purpose and objectives of the study of the impact of environmental and social
It is a question here of the updating of the study of environmental impact and social development of the project. The present study was therefore intended to identify and assess the impacts of the project on the environment and the Human Environment in order to ensure its sustainability. In a specific manner, it is:
- To describe the methodology for the collection of data in general, to identify and assess the impacts, to propose measures for mitigation and compensation of negative impacts and to enhance positive impacts;
- To describe the receiving environment of the project through its different components;
- To present the activities of the project;
- Describe the various issues related to the project;
- To highlight the policy of safeguarding of the Fund for Adaptation to Climate Change (FA);
- To identify the positive and negative impacts of the project in the area, in this case the impacts of the project on the habitat and ecosystems;
- To analyse the severity of these impacts;
- To propose measures for mitigation and/or compensation for the negative impacts and measures to strengthen the positive impacts;
- To develop an environmental and social management plan;
- To develop a program of monitoring and environmental monitoring;
- To present the hazards and risks related to the project;
- To propose a plan for the management of the risks and dangers;
- Propose a plan of actions and Resettlement (BY);
- Establish a plan for resolution of grievances in the aim to resolve the potential conflicts that could impede the operation of the project, and
- Propose a plan for the prevention and management of the pollution.

6. Terms of Reference of the consultant

Task I: description and justification of the project

This part of the study will present the goal to achieve, the context and the justification of the project and indicate the bases of the study.

a. **Delimitation of the scope of the study and its content**

The Office of studies will determine the area of influence of the project, the activities and impacts that will need to be analysed.

The zone of influence will include the site of the project as well as the surrounding areas where the influence of the project and the environmental impacts and humans of direct and indirect jobs to conduct may be felt.

b. **Description of the project**

The study will include a detailed description of the project and its main components

Task II: Analysis of the political context, legal and institutional framework of the project

The Office of studies will describe the backup policy of the Fund for Adaptation to Climate Change (FA), the regulations and standards relevant to the management of the environment and natural resources, to the health and safety of persons and the requirements of the international conventions ratified by Togo in connection with the implementation of the project.

Task III: description of the initial state of the environment and the human environment

The study will establish the zone of influence of the project. On the basis of the available data, supplemented as necessary by the inventories both quantitative and qualitative, the study will describe the relevant components of the Environment, to plans biophysics, and human and socio-economic By report to the issues and impacts of the project.

The inventory will focus on the following aspects:

- Physical elements: climate, geology, geomorphology, topography, pedology; hydrogeology, air quality, water quality, etc.;
- Biological elements: flora, fauna, natural habitats and sensitive habitats, endangered species, etc.;
- Human elements: areas of habitats, human settlements, various networks, etc.;
- Socio-economic elements and cultural rights: sectors of activities, use and ownership of land, sources of income, means of production, characterization of the transportation, cultural heritage and of worship, etc.;

Task IV: Presentation and analysis of variants

The study will identify the different variants of the project. It will present the different options namely Project option and option not project. The variants identified will be analysed in terms of advantages and disadvantages and the optimal variant will be chosen.

Task V: potential impacts on the environment

The study should identify, analyse and evaluate the importance of all the impacts (positive, negative, short, medium and long terms; direct and indirect impacts; reversible and irreversible, cumulative impacts, etc.) on the biophysical environment, human and socio-economic.

The analysis of impacts will take into account their nature, intensity, scope and duration. It will have to determine the value of each impact for society and for species directly affected on the basis of criteria such as the sensitivity, uniqueness, rarity and the irreversibility.

The analysis of impacts will focus on:

- **The project site:** the identification and assessment of impacts must describe how the environment, its resources and its habitats will be modified by the project and how these changes will affect the patterns of human populations and the wildlife affected by the project.
- **The installation phase of the project**: the Bureau of Studies will examine the ecological changes and social that the installation of the infrastructures of the project will lead.
- **The operating phase of the project** :

The Office of studies will examine

- The impacts related to the health, safety and to pollution resulting from the exploitation of the works;
- The impacts on the natural landscape, the quality of the water, the air, the acoustic environment, the flora and fauna.

The end phase of the project:

The Office of studies will identify the impacts related to the health, safety, security and to pollution following the possible scenarios inherent in the end of the project.

Task 6: Environmental and Social Management Plan

1. Identification of mitigation and compensation measures

The study will specify the measures (actions and works) provided for different phases of the project, to prevent, eliminate, reduce or mitigate the negative impacts of the project.
If applicable, the study will describe the measures envisaged to compensate for the negative impacts of the project and maximize the positive impacts.
It should also raise the residual impacts.

2. Development of an environmental and social management plan

The management plan will include:

- The mitigation measures and/or compensation of negative impacts to absolute importance and Medium severity and strong;
- An environmental monitoring program, which will include:
  - The list of items requiring a surveillance;
  - The set of measures and means envisaged to protect the environment;
  - The characteristics of the monitoring program (completion schedule, human and financial resources allocated to the program);
  - The Proponent's commitments as to the deposit of monitoring reports (number, frequency, content) to the National Agency for the management of the environment;
- An emergency plan to respond to situations of possible accidents;
- An environmental monitoring program including:
  - The reasons for monitoring and the list of items requiring a follow-up;
  - The objectives of the follow-up program and the components covered by the program;
  - The number of follow-up studies planned as well as their characteristics (scientific methods, completion schedule);
  - The modalities of production of the monitoring reports (number, frequency) to the NEMA;
- An institutional framework for the implementation of the ESMP accompanied by a program of strengthening the capacity of the actors;
- The budget for the implementation of ESMP;
- A summary table of the environmental and social management plan following the canvas in force.

7. Participation of the public

The participation of the populations and the main institutions concerned by the project is a key element of the study. The provisions must be taken with a view to gather the opinions and concerns of various stakeholders.

In addition to the involvement of stakeholders in the workshop on the evaluation of the report of the study of environmental and social impact, the residents and users of a portion of the project site will be the subject of particular attention during the public information activities before and during the implementation of the project (the realisation of the works).

8. Expected Results

- A report of a study of environmental and social impact including detailed:
- The summary;
- The list of tables and figures;
- The list of acronyms used;
- The non-technical summary and understandable by all stakeholders;
- The implementation context of the project;
- The methodology for the preparation of the report of the study;
- The policy, legal and institutional framework of the project;
- The description of the initial state of the middle;
- The description of the variants of the project;
- The methodology for the identification and assessment of environmental and social impacts;
- The proposed measures;
- The management plan and environmental and social;
- The follow-up program and environmental monitoring;
- The communication plan and information;
- The documents, annexes and bibliographic references used in the realization of the study;
- The Hazards and risks of the project;
- The synthesis of the plan of action of resettlement of affected populations;
- The synthesis of the mechanism for the settlement of complaints or grievances;
- The risk management plan.

- A plan of action of resettlement (BY) which will amply deal of land;
- A mechanism for the settlement of grievances

9. Program for Environmental Monitoring and Follow-up

The Office of studies will need to develop a monitoring plan that describes the elements to follow, responsibilities, the follow-up period. This follow-up program aims to ensure that the mitigation measures are effectively implemented, they generate the expected results and that they are either modified, either cancelled in cases where they do not give the conclusive results.

10. Stakeholders

The Office of studies will focus on the involvement of the following actors: the proponent of the project; the owners of the land of the project site; the local authorities of the area (Prefect, mayor, heads, CVD, etc.); the other institutions and actors concerned by the project

11. Institutional responsibilities

The implementation of the mitigation measures as well as the completion of the follow-up program requires the establishment of responsibilities in the implementation of management plans and monitoring environmental. The Office of studies should define the needs for training and those relating to institutional aspects for the implementation of the mitigation measures.

12. Profile of the Bureau of Studies

The main consultants of the Bureau of Studies which will conduct this ESIA must be the level Bac+5 minimum and have an experience of at least five years in the matter. This team should be multidisciplinary and incorporated between other environmentalists, lawyers, sociologists, geologists, hydrologists, managers, planners, cartographers, specialists in civil engineering and public works, economists, etc.

These consultants must have a good knowledge of environmental problems and the legislative and regulatory framework of SEIA in Togo.

13. Assistance to the Bureau of Studies/ role of the sponsor

The proponent will have to put at the disposal of the Bureau of Studies all the relevant documentation and will facilitate the contacts with the technical services.

14. Criteria for the assessment of benefits

The report of the SEIT will be appreciated by:

- The project coordination team on compliance in relation to the terms of references;
- An ad hoc evaluation committee met in a workshop on the evaluation according to the criteria below:
  - Compliance of the report with the terms of reference;
  - Correct information and accurate on the technical plan:
    - The quality and the fidelity of the analysis of the initial state of the site;
    - The quality and the reliability of the data;
    - The relevance of the scientific methods used;
    - The quality of the analyses in the identification, description and assessment of the impacts of the project on the environment;
    - The conformity of the proposed measures with the standards and the legislation in force;
    - The relevance and adequacy of the proposed mitigation measures with the imperatives of the protection of the environment and sustainable development and their contribution to the implementation of the orientations and strategies of the national policy on the environment;
    - The content of the Environmental Management Program and its consistency with the mitigation measures envisaged;
    - The content of the Risk Management Plan and its consistency with the preventive measures proposed;
    - The program of monitoring and surveillance as well as corresponding institutional arrangements;
    - The terms of the financing of the plan for the management of the environment.
  - Taking into account the comments of the public;
  - Set out full and adequate of key conclusions;
  - Clear information; understandable and sufficient for a decision.

15. Organization and Duration of the mission

The study will be done through consultations with a view of the refocusing of the work and a support to the consultant in case of need. These consultations will take place according to the steps that will be defined by the consultant in conjunction with the team responsible for the appraisal of the project under the coordination of the management of the environment.

The Consultant will forward a preliminary report called "Progress Report" 45 days which will be evaluated on the occasion of the meetings of consultation.

The Consultant will transmit for validation, an interim report in accordance with the expected results, two and a half months (75 days) from the date of signature of the contract. This interim report will be provided in paper format in 5 copies in addition to an electronic version on a CD. Rom.

Fifteen (15) days after the validation of the interim report, the Consultant will remit, the final version of the report in paper format in 5 copies and in electronic format on CD. Rom in PDF and Word not protected.

The report of the study will be validated at a national workshop following the procedures in force at the level of the NEMA. The consultant will take in charge the expenses related to the validation process of the study report.

The duration of the study is to three (03) months.

However, the consultant may be requested at any time during the process of the instruction of the project to provide relevant information in the framework of the acceptance of the project document "Full Project" by the secretariat of the Adaptation Fund.

16. SUPERVISION OF THE MISSION

The Consultant will conduct the study under the supervision of the team responsible for the instruction of the project under the coordination of the Directorate of the Environment to ensure the achievement of the objectives and results of the study. To this effect the consultant's report will be submitted to the Coordination that will hold working sessions with the consultant for a good conduct of the study.

Annex 2: Public consultations – lists of respondents

A. **Public Consultation - 21-22 May 2017**

Office represented	**No cell / Contacts**
Key Informants	
1. GEVAPAF	Odane Kada, Program Manager, 20285278
2. Prefecture	KOLANI Yempabe, 90011797
3. Prefecture	Gnoithe DOUTI, Manager, 99291599 / 90346815
4. The local authority	DJAKPERE Tignoiti, Chief of Canton, 90312436
5. DPAEH / Kpendjal (Regional Directorate of Agriculture, livestock and the hydraulic savannas (DRAEH//S))	NADJAGOU Kanfieni Lalle, 90200945
6. Department Prefecture of the Environment and Forest Resources	GBENIN Kodjo Benjamin, Director
7. Committee of breeders	BARRY Arzouma, Vice-president, 98553444
8. Market of the rearing	AMADOU Amidou, Assistant Treasurer, 98555572
9. School	MAMA I Ababeni, teacher, 90843492

Name	**Sex**	**The cell No.**
Other stakeholders		
1. LAMBONI Yendou	M	No
2. Syli KOMBATE	M	No
3. Bogra TAMBIAGA	M	90759657 / 99507352
4. Badi KOMBATE	M	90001404 / 99003908
5. ARZOUMA Boukhari	M	97489166
6. GANGA Tango	M	97239757
7. Gnoithe DOUTI	M	No
8. YALO Boudandja	M	No
9. KOMBATE digaguibe	M	No
10. KOLANI Bayé	M	99877110
11. KOMBATE kolanbigua	M	No
12. SANWOGOU Marie	F	90367198 / 97657911
13. Sakina OMOROU	F	90589819
14. Awa KOMBATE	F	91989387
15. MAMOUDOU Issa	M	97465881
16. Mr. KOLANI Joseph	M	90147159 / 98634722
17. KOMBATE Bibate	M	93805963
18. ABDOULAYE Dramane	M	90346978
19. GNAGOU Nanfangue	M	99805179
20. TALATA Karimou	M	No
21. Achetou ARBILA	F	93575670
22. MOUSSA Adama	M	No
23. NATCHEMBATE Dapauguidi	M	99929909
24. KOUMONGUA Dramane	M	No
25. NATCHENDE Songuimpale	M	98519533
26. SAMBIANI goumpouguini	M	90981069 / 98049091
27. Idrissou ILIASSOU	M	99769885
28. SABIME slab	M	No

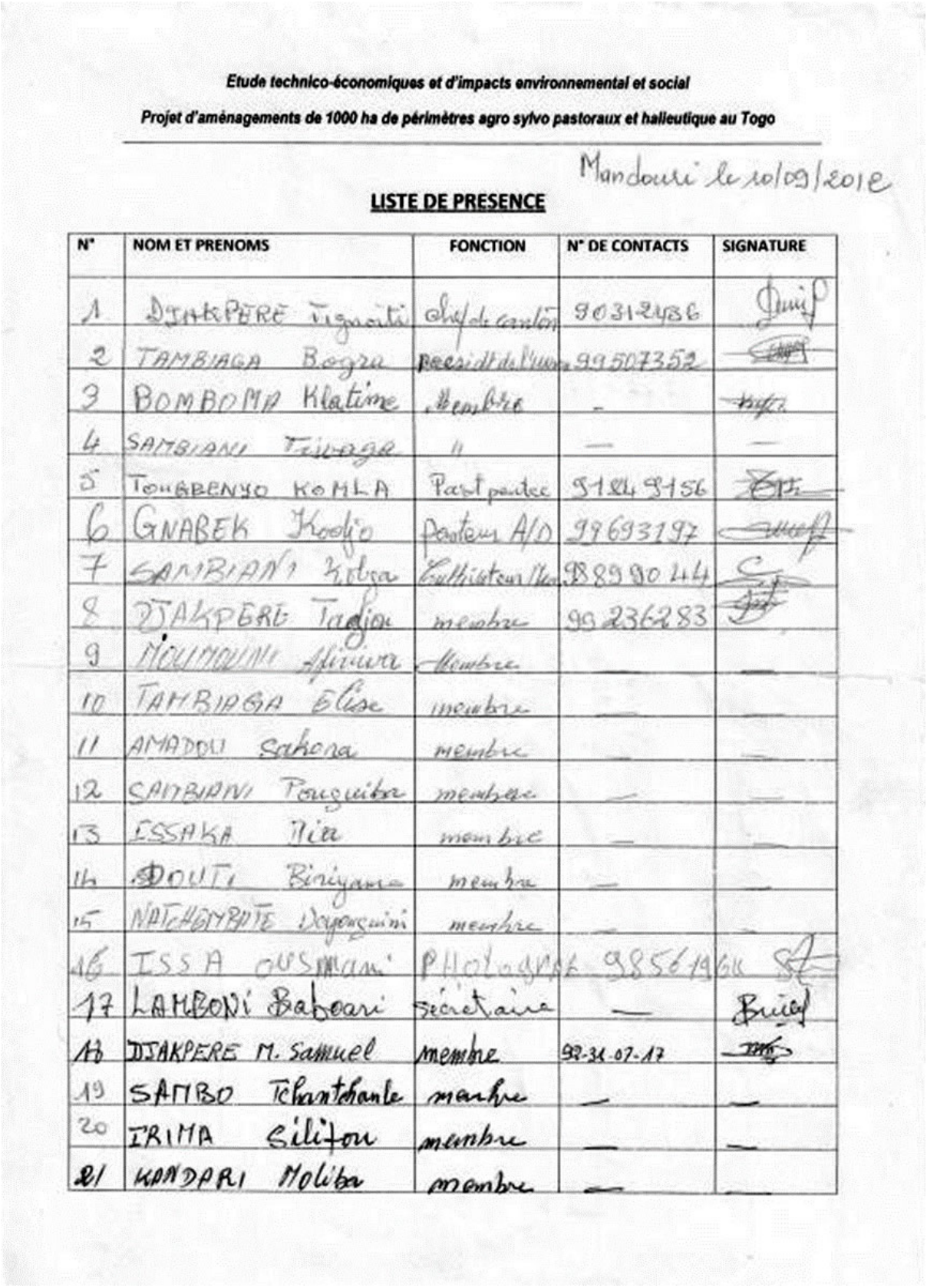
29. SANWOUGOU Dimounoba	M	99956638
30. KOUMONGUA Fataou	F	97245005
31. MAMAH abibah	M	91092027
32. ARZOUMA Soule	M	90724346 / 99997129
33. DRAMANI oumorou	M	No
34. SAMBIANI pouguimba	F	No
35. YEMBLIMA Souguetemba	M	98707480
36. ISSARBA Kambirba	M	99450079
37. NATCHEMBATI Djanle	M	96386352
38. KOMBATE kolitchieme	M	98224453
39. SAMBIANI boundandja	M	No
40. LAMBONI Nabonle Joseph	M	98019257
41. SAMBIANI Boulo	F	No

B. **Initial Public Consultation (2015)**

- List of people met (Mandouri) - 09/2012

Name	Structure	Quality	Contact
1. DIAKPERE Tignoiti	Canton/Mandouri	Head of the Canton	0022890912136
2. Bogra TAMBIAGA	Union of Producers	President	0022899507352
3. Kannatin DOUTI	MERF/DP Kpendjal	Assistant to the RFP	0022891934255
4. TORMANGUE Latchiribe	MERF/DP Kpendjal	Water and Forestry	0022890926921
5. Ms SANWOGOU	Network of women leaders in the area of natural disaster risk reduction	President	0022890367198
6. BATENGUE Alexandre	ICAT/Mandouri	TS/Vegetable Production	
7. KANFITINE Paul Y	The Communication for Sustainable Development/Dapaong	The coordinator	0022890010650
8. Ningbale KANKPIABE	The Agency to support the initiatives of base/Dapaong	The coordinator	0022890054836
9. TCHIAME Gountante	PNADE/Dapaong	A sociologist	0022891914099

- Participants List - Mandouri ESIA 10.09.2012



Etude technico-économiques et d'impacts environnemental et social

Projet d'aménagements de 1000 ha de périmètres agro sylvo pastoraux et halieutique au Togo

Mandouri le 10/09/2012

LISTE DE PRESENCE

N°	NOM ET PRENOMS	FONCTION	N° DE CONTACTS	SIGNATURE
1	DJAKPERE Tignaiti	chef de canton	90312486	
2	TAMBIAGA Bogzu	Président de l'Union	99507352	
3	BOMBOMA Klatime	Membre	—	
4	SAMBIANI Tiwaga	"	—	—
5	TOUGBENYO KOMLA	Participant	91849156	
6	GNABEK Kodjo	Pasteur A/D	99693197	
7	SAMBIANI Kolga	Cultivateur Ma	98990144	
8	DJAKPERE Tadjou	membre	99236283	
9	NOUMOUNI Aliwara	Membre	—	—
10	TAMBIAGA Elise	membre	—	—
11	AMADOU Sakona	membre	—	—
12	SAMBIANI Pouguiba	membre	—	—
13	ESSAKA Nier	membre	—	—
14	DOUTI Biniyawa	membre	—	—
15	NATCHOMBITE Dagongnini	membre	—	—
16	ISSA OUSMANI	Photographe	98561966	
17	LAMBONI Babaari	secrétaire	—	
18	DJAKPERE M. Samuel	membre	93-31-07-17	
19	SAMBO Tchantchanle	membre	—	—
20	IRIMA Silifou	membre	—	—
21	KANDARI Moliba	membre	—	—

Annex 3: Samples of filled questionnaires

A. Male respondent

Africa Sustainability Centre
ASCENT

Questionnaire d'évaluation d'impact environnemental et social [EIES]
AUGMENTER LA RÉSILIENCE DES COMMUNAUTÉS VULNÉRABLES DANS LE SECTEUR DE L'AGRICULTURE DE MANDOURI DANS LE NORD DU TOGO

À ÊTRE REMPLI PAR LA COMMUNAUTÉ VOISINE, ET TOUS LES D'AUTRES INTERVENANTS SUSCEPTIBLES D'ÊTRE TOUCHÉS PAR LE PROJET.

Description du projet :
La plupart des régions du nord du Togo (Kara et des Savanes) sont régulièrement touchés par la famine, les anomalies à la suite des changements climatiques qui réduisent considérablement la production agricole. Le projet proposé prévoit de traiter la vulnérabilité au changement climatique dans le secteur de l'agriculture dans une région de savane (Mandouri) par l'installation des infrastructures et l'amélioration de la sécurité alimentaire. Le projet prévoit **d'installer la technologie d'irrigation et de l'équipement, y compris la technologie solaire**, pour améliorer la qualité de l'eau et l'approvisionnement de la communauté dans la zone du projet. Le projet proposé comprendra également la diversification des moyens de subsistance en soutenant la production du bétail et en intégrant la gestion des connaissances dans le cadre du projet.

Ce questionnaire est administré à recueillir les avis de toutes les personnes susceptibles d'être touchés par le projet, afin de faciliter l'établissement d'une évaluation des impacts environnementaux et sociaux par rapport aux dispositions du décret n° 2008-005 portant sur le cadre de l'environnement et le décret No 013 _MERF aux règles d'intervention, la méthodologie et le contenu des études d'EIE. Tous les renseignements obtenus sont utilisés exclusivement pour l'étude proposée et sont traitées de manière confidentielle. Nous apprécions votre collaboration et vous remercie de votre volonté de participer à cet exercice.

L'INFORMATION DES PARTIES PRENANTES :
Nom du répondant : MAMAH Abiba
La cellule n° : 91-09-20-27
Son métier : Revendeuse de céréales
Village : Mandouri Canton / Préfecture : Kpendjal
Date : 20/05/2017 Signature :

A. Données démographiques
1. Chef de ménage : MAMAH Abdourameane
2. Âge : 47 ans
3. Sexe : Hommes : ☒ Femmes : ☐
4. Son métier : agriculteur
5. Religion : musulman
6. Total des membres du ménage : 12
7. Depuis combien de temps habitez-vous dans la région ? plus de 100
8. Comment avez-vous acquérir votre parcelle de terrain ? [**Cochez la case appropriée**]
   - ☐ Acheter
   - ☐ Héritage
   - ☒ Les terres communales
   - ☐ Attribution par le gouvernement
   - ☐ Autres (veuillez préciser) _____

1. La résilience de l'agriculture - Projet andouri

9. Taille du terrain : 3ha

10. Principale source de revenus : agriculture et commercialisation des produits agricoles et animal

B. Les données sur le projet résilience agricole

11. Le projet proposé a été mentionné pour vous avant ?
oui

12. Tout commentaire sur **l'irrigation** et **l'énergie solaire** aspects des projets ?
L'irrigation devrait permettre le cultures maraîchères
L'énergie devrait réduire les coupures électriques

13. **Qu'est-ce que** vous aimez sur le projet proposé ?
Accroître les surfaces cultivables et la diversifier les cultures vivrières et de rentes

14. Ce que vous n'aimez pas sur le projet proposé ? Veuillez expliquer.
Tout est bon pour moi sauf ce qui peut porter nuisance à toute la population

15. Pensez-vous que le projet proposé aura une incidence sur l'environnement ? Si oui, quel aspect de l'environnement ?
Pourrait réduire les espaces de pâturage aussi bien pour les peuh transhumants que locaux

16. Quelles améliorations devraient les développeurs du projet : pour réduire ou minimiser les effets sur les personnes et l'environnement si le projet est de continuer ?
Les développeurs devraient veiller à la pérennisation dudit projet afin de réduire la faim, le vol, l'exode rural

17. Quels avantages pensez-vous que le projet va apporter la région d'habitants ?
Amélioration des conditions de vie, réduction de la pauvreté, la délinquance juvenile

C. Les niveaux d'éducation des ménages

18. Le niveau d'éducation — Nombre de membres

☐ l'enseignement maternel	
☐ l'enseignement primaire	05
☐ L'enseignement secondaire	02
☐ éducation tertiaire	

19. Distance aux équipements éducatifs

☐ L'école maternelle	1 km
☐ L'école primaire	3 km
☐ L'école secondaire	322 km
☐ Collège / université	

D. Les SERVICES SOCIAUX ET LES INFRASTRUCTURES

20. Où allez-vous pour les services sociaux ? Dans quelle mesure est-il ?

Service social	Distance
☒ Marché Central	800m à pied
☒ Station de police	600 m à pied
☒ Mosquée	120 m à pied
☐ Church	
☐ Le réseau de téléphone cellulaire	✓
☐ Réseau d'électricité	
☒ Réseau d'eau potable	100m à pied
☐ Réseau d'assainissement	
☒ Service postal	
☐ Internet service	
☐ Voyage / service de crédit	
☐ Cafétéria	
☐ Les ONG/organisations communautaires	
☒ Pharmacie	400 m
☐ Bibliothèque publique	

Quelles sont vos préoccupations à partir de la proposition de projet dans le domaine de l'agriculture sur les services sociaux et de l'infrastructure ?

C. La santé publique

21. Le type d'état de maladies connu dans votre ménage et la fréquence d'occurrence.

Maladie	La fréquence d'occurrence		
	Tous les mois	En saison	Chaque année
Le paludisme	☐	☒ pluvieuse	☐
La bilharziose	☐	☐	☐
La typhoïde	☒	☐	☐
Le choléra	☐	☒ 1ères pluies	☐
Infection oculaire	☒	☐	☐
L'anémie	☒	☐	☐
Les maladies de la peau	☒	☐	☐

La rougeole	☐	☐	☐
Les ulcères	☒	☐	☐
Mal de dents	☐	☐	☐
La pneumonie	☐	☐	☐
HIV (SIDA)	☐	☐	☐
Autres (préciser)	l'ascaridiose, l'excès palustre		

22. Où allez-vous pour l'assistance médicale ? **Dans quelle mesure est-il ?**
- ☒ L'hôpital (préciser) : ~~10~~ à pied, moto, vélo.
- ☐ Dispensaire (préciser) :
- ☐ La clinique (préciser) :
- ☐ Des herbes traditionnelles (Source) :
- ☐ Autres (préciser) :

D. TYPE DE LOGEMENT

23. ☒ ~~Annonce~~ Permanente
- ☐ Semi-permanente,
- ☐ ~~Personnel~~ temporaire

Quelles sont vos inquiétudes sur le logement à partir de la proposition de projet dans le domaine de l'agriculture ?

~~La distance entre~~ La tombée de certaines cases en cas de ~~et~~ débordement du site en eau

E. La production agricole

24. En vertu de quel type d'occupation utilisez-vous / tenir cette terre ? sous quel regime utilisé-vous cette terre.
- ☐ En pleine propriété (propriété absolue)
- ☐ Améliorations locatives / Bail 10 à 99 ans
- ☐ Location : annuel
- ☒ Commune / coutumier : droit coutumier ou heritage
- ☐ Ne sais pas

Quelles sont vos préoccupations à partir de la proposition de projet dans le domaine de l'agriculture sur les régimes fonciers et les prix de la terre ?

25. Quelles plantes cultivez-vous ? Pour la **subsistance** ou la **vente** ? **[cocher selon le cas]**

Petit	Superficie	Production	Séjour	Vente	Prix unitaire (F CFA)
Le maïs	1 ha	10 à 12 sacs	☒	☒	134 F/kg
Millet			☐	☐	
Le sorgho			☐	☐	
Le manioc			☐	☐	

Haricots verts			☐	☐	
Le niébé			☐	☐	
Haricots de soja			☐	☐	
Les tomates			☐	☐	
Les oignons			☐	☐	
Pastèques			☐	☐	
L'Arachide			☐	☐	
L'okra			☐	☐	
Le chou			☐	☐	
Le poivre			☐	☐	
Oseille de Guinée			☐	☐	
Fruits (précisez)					
A.			☐	☐	
B.			☐	☐	
C.			☐	☐	
Les autres cultures (préciser)					
A. le riz	2 ha	20	☒	☒	117F/kg
B.			☐	☐	
C.			☐	☐	
D.			☐	☐	

Quelles sont vos inquiétudes sur le projet de projet agricole sur la production agricole ?

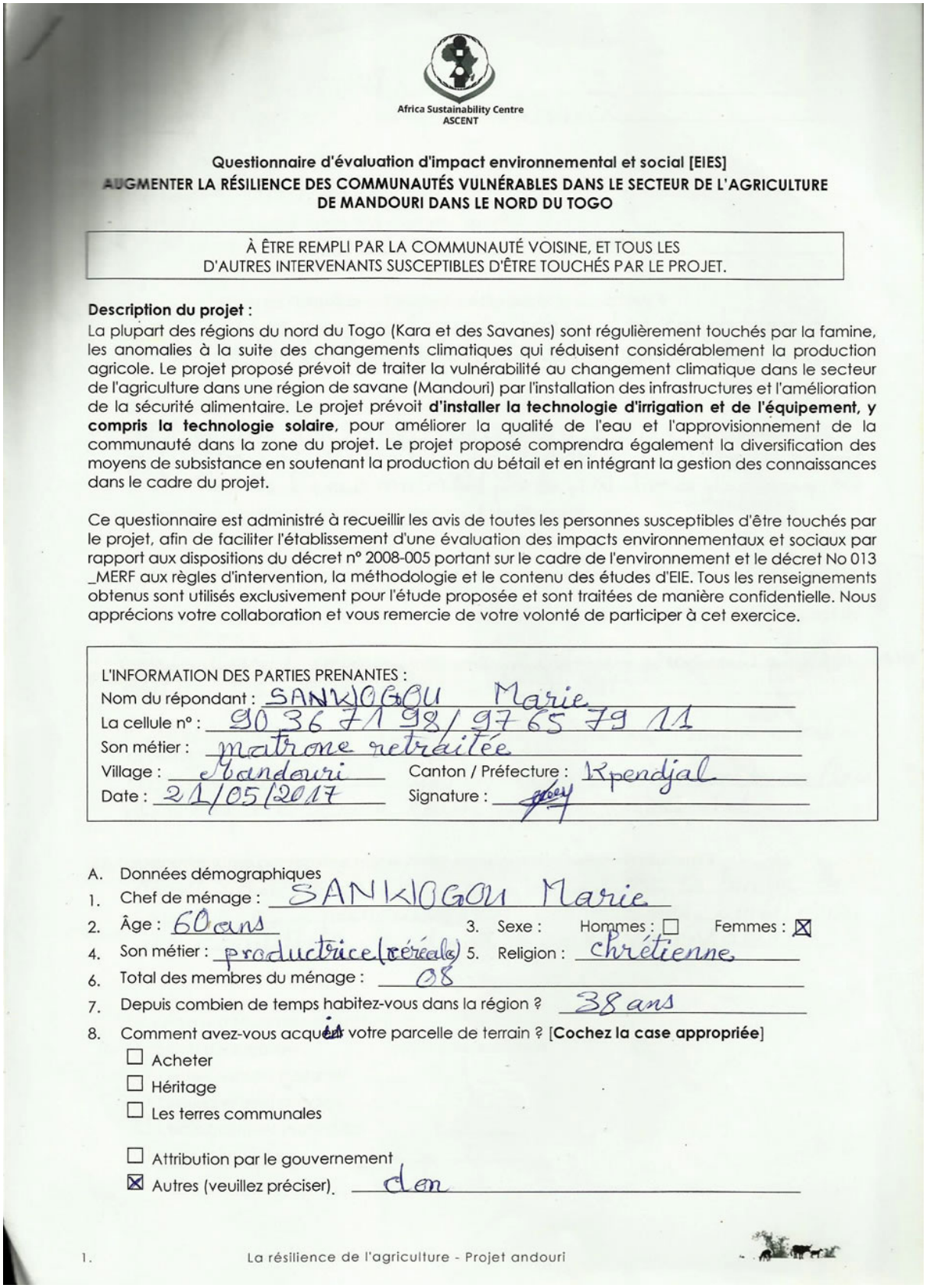
26. Quels animaux gardez-vous? Pour la **subsistance** ou la **vente** ? **[cocher selon le cas]**

Animal	**Nombre**	**Séjour**	**Vente**	**(F CFA/an.)**
Les bovins		☐	☐	
Les chèvres	10	☒	☒	10000 à 20000 F
Les moutons	10 à 25	☒	☒	15000 à 45000F
Les chameaux		☐	☐	
Des ânes	01	☐	☐	
Les Lapins		☐	☐	
La volaille	20 à 40	☒	☒	1000 à 3000F
Autres (préciser)				
		☐	☐	
		☐	☐	
		☐	☐	

Quelles répercussions croyez-vous que de la proposition de projet dans le domaine de l'agriculture sur l'élevage ?

Réduction de l'espace de pâture pour les éleveurs et discordes entre éleveur et agriculteur

B. Female respondent



Africa Sustainability Centre
ASCENT

Questionnaire d'évaluation d'impact environnemental et social [EIES]
AUGMENTER LA RÉSILIENCE DES COMMUNAUTÉS VULNÉRABLES DANS LE SECTEUR DE L'AGRICULTURE DE MANDOURI DANS LE NORD DU TOGO

À ÊTRE REMPLI PAR LA COMMUNAUTÉ VOISINE, ET TOUS LES D'AUTRES INTERVENANTS SUSCEPTIBLES D'ÊTRE TOUCHÉS PAR LE PROJET.

Description du projet :
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Ce questionnaire est administré à recueillir les avis de toutes les personnes susceptibles d'être touchés par le projet, afin de faciliter l'établissement d'une évaluation des impacts environnementaux et sociaux par rapport aux dispositions du décret n° 2008-005 portant sur le cadre de l'environnement et le décret No 013 _MERF aux règles d'intervention, la méthodologie et le contenu des études d'EIE. Tous les renseignements obtenus sont utilisés exclusivement pour l'étude proposée et sont traitées de manière confidentielle. Nous apprécions votre collaboration et vous remercie de votre volonté de participer à cet exercice.

L'INFORMATION DES PARTIES PRENANTES :
Nom du répondant : SANKOGOU Marie
La cellule n° : 90 36 71 98 / 97 65 79 11
Son métier : matrone retraitée
Village : Mandouri Canton / Préfecture : Kpendjal
Date : 21/05/2017 Signature :

A. Données démographiques
1. Chef de ménage : SANKOGOU Marie
2. Âge : 60 ans
3. Sexe : Hommes : ☐ Femmes : ☒
4. Son métier : productrice (céréale)
5. Religion : chrétienne
6. Total des membres du ménage : 08
7. Depuis combien de temps habitez-vous dans la région ? 38 ans
8. Comment avez-vous acquis votre parcelle de terrain ? [**Cochez la case appropriée**]
   - ☐ Acheter
   - ☐ Héritage
   - ☐ Les terres communales
   - ☐ Attribution par le gouvernement
   - ☒ Autres (veuillez préciser). don

1. La résilience de l'agriculture - Projet andouri

9. Taille du terrain : 7,25 ha

10. Principale source de revenus : Agriculture

B. Les données sur le projet résilience agricole

11. Le projet proposé a été mentionné pour vous avant ?

Non

12. Tout commentaire sur **l'irrigation** et **l'énergie solaire** aspects des projets ?

L'irrigation pourrait améliorer les conditions de vie et de travail des producteurs. ~~L'énergie solaire~~

13. **Qu'est-ce que** vous aimez sur le projet proposé ?

☒ Appuyer les bénéficiaires en outils nécessaires
Sollicitons le soutien du projet dans la production du bétail
Protection de l'environnement par la plantation de diverses espèces végétales.

14. Ce que vous n'aimez pas sur le projet proposé ? Veuillez expliquer.

15. Pensez-vous que le projet proposé aura une incidence sur l'environnement ? Si oui, quel aspect de l'environnement ?

Oui, car l'utilisation de certains produits phytosanitaires pollue les eaux, appauvrit les sols, ...

16. Quelles améliorations devraient les développeurs du projet : pour réduire ou minimiser les effets sur les personnes et l'environnement si le projet est de continuer ?

Promouvoir l'utilisation des engrais organiques en lieu et place de ceux chimiques, le reboisement.

17. Quels avantages pensez-vous que le projet va apporter la région d'habitants ?

Nous pensons que le projet va réduire la famine, la pauvreté, épanouissement des femmes, améliorer les conditions de vie et d'études des enfants.

C. Les niveaux d'éducation des ménages

18. Le niveau d'éducation — Nombre de membres

☐ l'enseignement maternel	01
☐ l'enseignement primaire	01
☐ L'enseignement secondaire	03
☐ éducation tertiaire	

19. Distance aux équipements éducatifs

☐ L'école maternelle	1,5 km
☐ L'école primaire	1 km
☐ L'école secondaire	105 km
☐ Collège / université	322 km

D. Les SERVICES SOCIAUX ET LES INFRASTRUCTURES

20. Où allez-vous pour les services sociaux ? Dans quelle mesure est-il ?

Service social	Distance
☒ Marché Central	500 m
☒ Station de police	400 m
☐ Mosquée	
☒ Church	1, 3 km
☒ Le réseau de téléphone cellulaire	1 km
☒ Réseau d'électricité	1, 2 km
☒ Réseau d'eau potable	15 300 m
☒ Réseau d'assainissement	5 m
☒ Service postal	1,2 km
☐ Internet service	—
☐ Voyage / service de crédit	—
☐ Cafétéria	—
☐ Les ONG/organisations communautaires	—
☒ Pharmacie	1km
☐ Bibliothèque publique	—

Quelles sont vos préoccupations à partir de la proposition de projet dans le domaine de l'agriculture sur les services sociaux et de l'infrastructure ?

Construction des magasins, appuyer en matériel, et financier

C. La santé publique

21. Le type d'état de maladies connu dans votre ménage et la fréquence d'occurrence.

Maladie	La fréquence d'occurrence		
	Tous les mois	En saison	Chaque année
Le paludisme	☒	☒	☒
La bilharziose	☐	☐	☐
La typhoïde	☒	☐	☒
Le choléra	☐	☐	☐
Infection oculaire	☒	☐	☒
L'anémie	☒	☒	☒
Les maladies de la peau	☒	☐	☒

La rougeole	☐	☐	☐
Les ulcères	☒	☐	☒
Mal de dents	☒	☐	☒
La pneumonie	☒	☐	☒
HIV (SIDA)	☒	☒	☒

Autres (préciser) parasitoses, la toux, les hépatites (A, B)

22. Où allez-vous pour l'assistance médicale ? **Dans quelle mesure est-il ?**

- ☒ L'hôpital (préciser) : 500 m
- ☐ Dispensaire (préciser) : _____
- ☐ La clinique (préciser) : _____
- ☐ Des herbes traditionnelles (Source) : _____
- ☐ Autres (préciser) : _____

D. TYPE DE LOGEMENT

23. ☒ ~~Annonce~~ permanente
- ☐ Semi-permanente,
- ☐ ~~Personnel~~ temporaire

Quelles sont vos inquiétudes sur le logement à partir de la proposition de projet dans le domaine de l'agriculture ?

Nos inquiétudes sont : si les promoteurs ne prévoient pas de magasin, certaines pièces seront prises pour des magasins

E. La production agricole

24. En vertu de quel type d'occupation utilisez-vous / tenir cette terre ?
- ☐ En pleine propriété (propriété absolue)
- ☐ Améliorations locatives
- ☐ Location
- ☐ Commune / coutumier
- ☒ ~~Ne sais pas~~ don

Quelles sont vos préoccupations à partir de la proposition de projet dans le domaine de l'agriculture sur les régimes fonciers et les prix de la terre ?

tentatives de retrait de certaines parcelles auprès des exploitants

25. Quelles plantes cultivez-vous ? Pour la **subsistance** ou la **vente** ? **[cocher selon le cas]**

Petit	**Superficie**	**Production**	**Séjour**	**Vente**	**Prix unitaire (F CFA)**
Le maïs	/		☐	☐	
Millet	/		☐	☐	
Le sorgho	/		☐	☐	
Le manioc	/		☐	☐	

Haricots verts	/		☐	☐	
Le niébé	/		☐	☐	
~~Haricots de~~ soja	1ha	1,04t	☒	☒	250F
Les tomates	/		☐	☐	
Les oignons	/		☐	☐	
Pastèques	/		☐	☐	
L'Arachide	/		☐	☐	
L'okra	/		☐	☐	
Le chou	/		☐	☐	
Le poivre	/		☐	☐	
Oseille de Guinée	/		☐	☐	
Fruits (précisez)					
A.	/		☐	☐	
B.	/		☐	☐	
C.	/		☐	☐	
Les autres cultures (préciser)					
A. le riz	5ha	23,52t	☒	☒	143 F/kg
B. césame	0,25h	0,52t	☐	☒	~~150~~ F/kg
C.			☐	☐	
D.			☐	☐	

Quelles sont vos inquiétudes sur le projet de projet agricole sur la production agricole ?
baisse de la production des autres cultures au détriments de celle du riz

26. Quels animaux gardez-vous? Pour la **subsistance** ou la **vente** ? **[cocher selon le cas]**

Animal	**Nombre**	**Séjour**	**Vente**	**(F CFA/an.)**
Les bovins		☐	☐	
Les chèvres	08	☐	☐	
Les moutons		☐	☐	
Les chameaux		☐	☐	
Des ânes		☐	☐	
Les Lapins		☐	☐	
La volaille	22	☒	☒	30000F
Autres (préciser)				
Les porcs	30	☒	☒	177500F
		☐	☐	
		☐	☐	

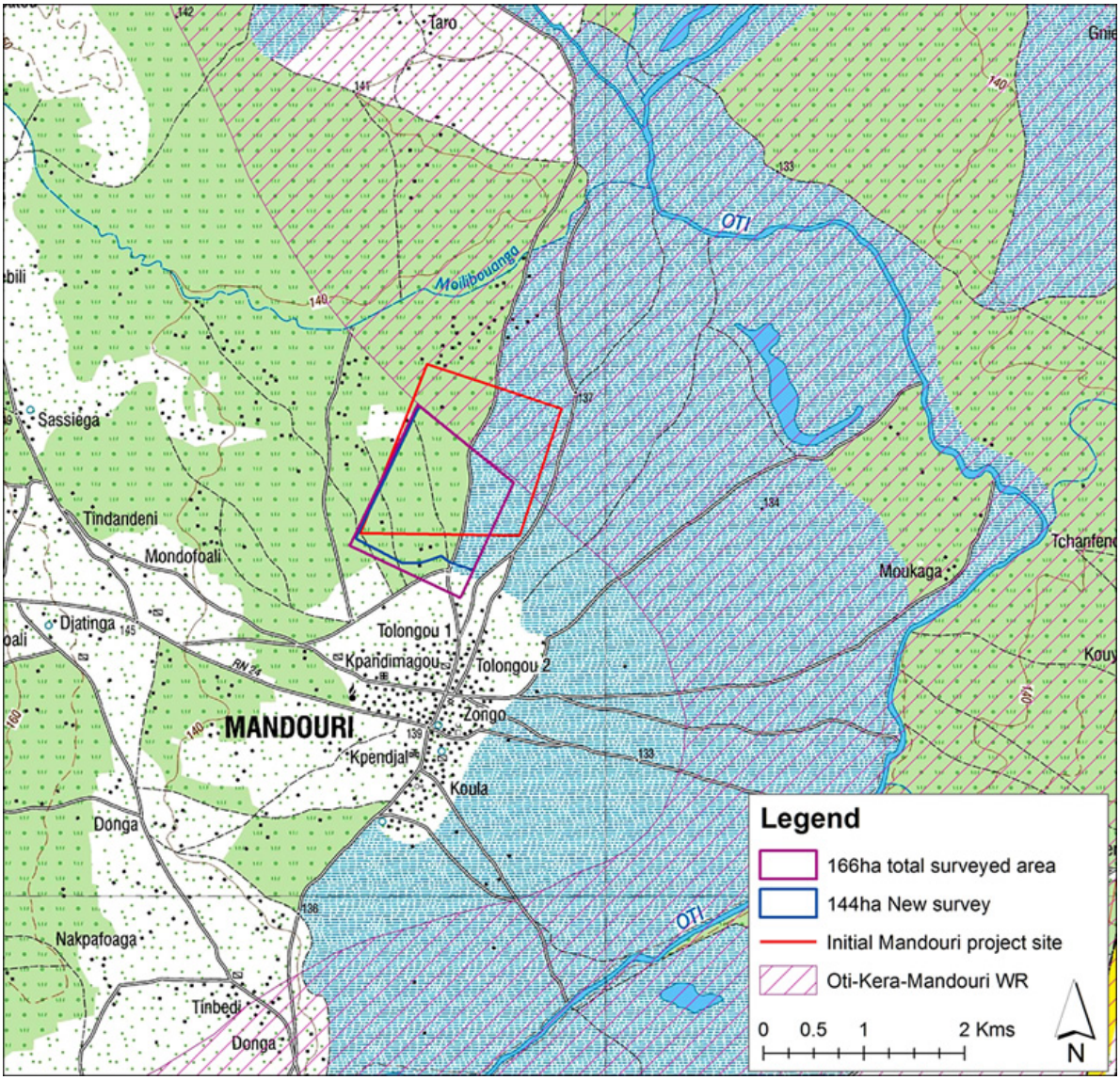
Quelles répercussions croyez-vous que de la proposition de projet dans le domaine de l'agriculture sur l'élevage ?
Contraintes de garder les animaux dans des enclos même en saison sèche, problèmes de dévastations, plus de terrain d'entente entre éleveurs et agriculteurs.

Annex 4: References

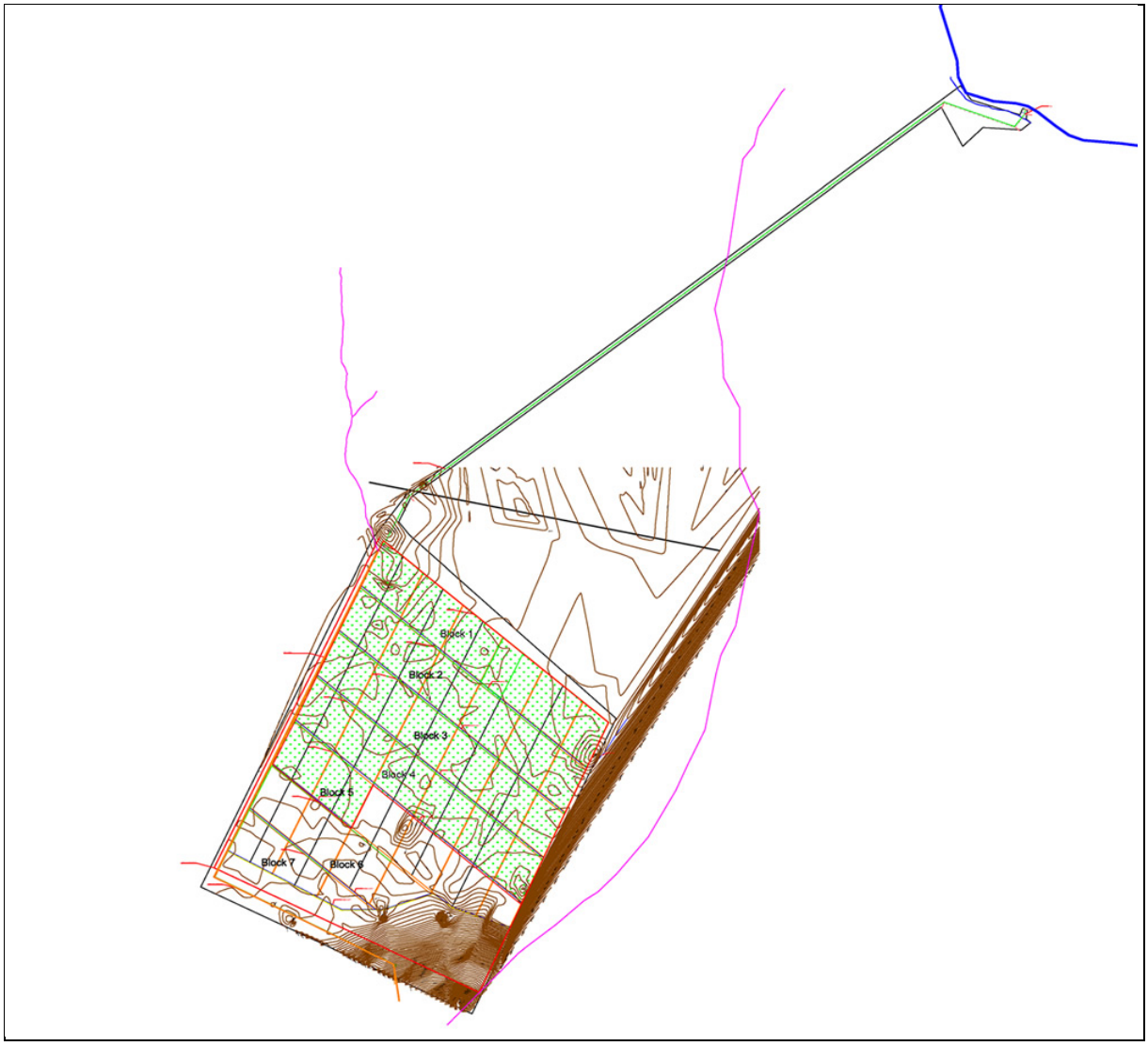
1. Togolese Constitution revised by Act n°2002/029 of 31 December 2002.
2. Decree No. 2006-058/PR of 05.07.2006 on the EIA study regulation
3. EHS Guidelines General of the IFC relating to the environment, wastewater and the quality of the ambient waters, April 2007
4. Gguigo Mr. et al: Management of the environment and impact studies
5. Guidelines for Community Noise, World Health Organization (WHO), 1999.
6. Act No. 2007-011 of 13 March 2007 on Decentralization and freedom
7. Act No. 2008-005 of 30 May 2008 - Framework-act on the environment
8. Act No. 2008-009 of 19 June 2008 on the Forest Code
9. The Law no. 2010 - 004 on the Water Code
10. The order No. 013/MERF of 09.09. 2006 on the EIS and the content
11. The order No. 018/MERF of 09.10.2006 on the participation of the public in the EIA process
12. Leopold et. al. A procedure for evaluating environmental impact. 1971
13. The environmental and social impact Mandouri evaluation report. CINTECH/AGECET. March 2014
14. The order No. 12 of 6 February 1974 on the reform of agricultural land
15. Monograph of the Savanna region. December 2009
16. World Health Organization (WHO). Air Quality Guidelines Global Update, 2005
17. Source: Guidelines of the World Health Organization (WHO) for the quality of drinking water 4th edition, 2011

Annex 5: Project design

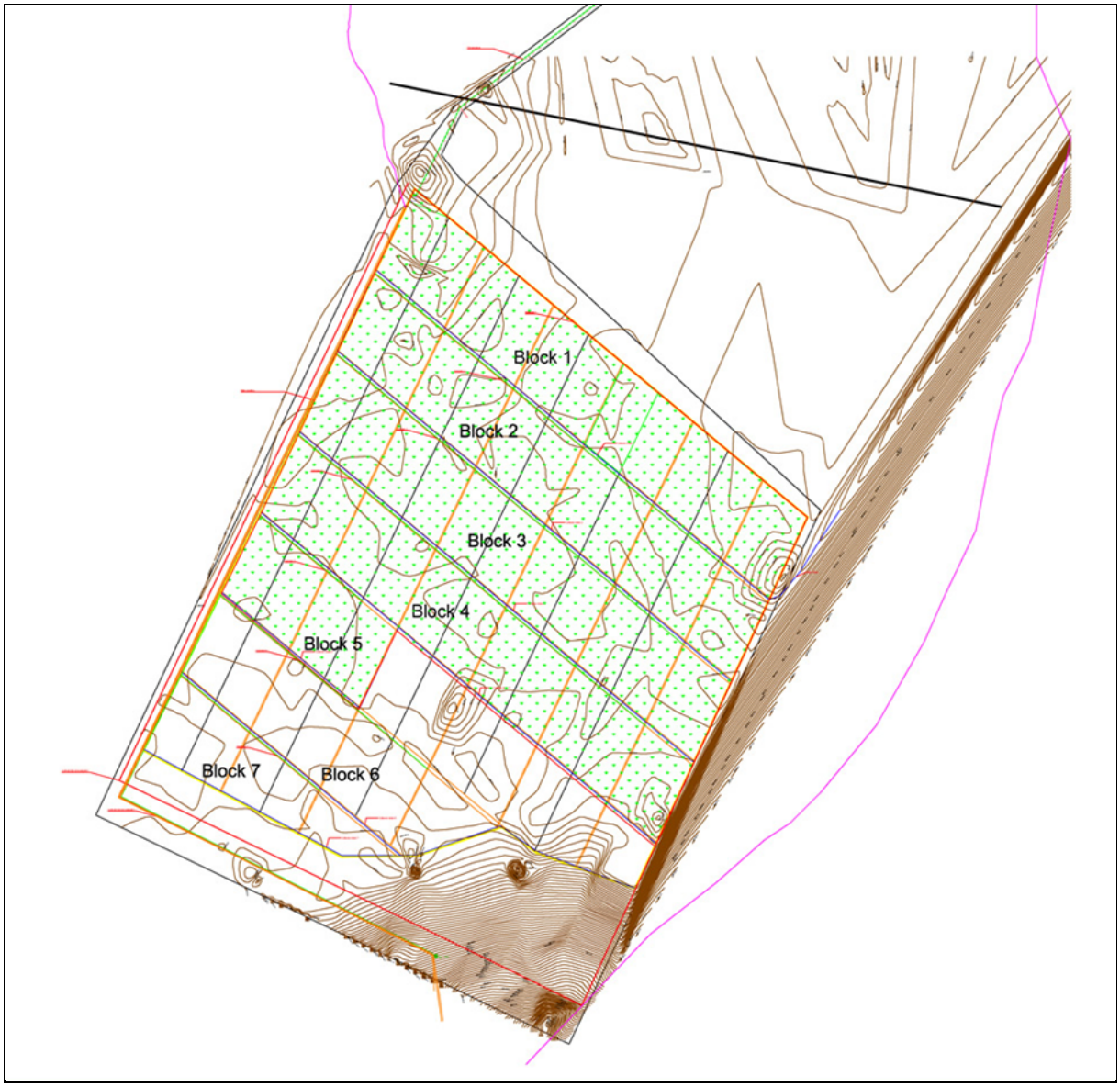
A. New blocks surveyed on the topomap of Mandouri



B. New Survey of June 2017 showing the water levies River Oti (blue line - do)



C. New Survey June 2017 showing the blocks of Irrigation of 144 ha 1 to 7,



The system designed for Mandouri will be a combined basin and furrow irrigation system.

The irrigation area is split into 5 blocks: 1, 2, 3, 4 and 5 as shown in **Fig. a**. Sub-division of the area was based on the following:

- Topography – blocking of areas with similar topographical features;
- Existing drainage system (natural waterways/depressions) – used to form boundary between blocks;
- Soil types – areas with similar soils grouped together as much as possible;
- Discussions and agreements with farmers' representatives on the boundaries.

Fig. a: Irrigation blocks

The project site will be divided into a number of irrigation blocks and a combination of the two techniques (basin and furrow) will be used. In basin irrigation, water is applied to levelled surface units (basins) which have complete perimeter dikes to prevent runoff and to allow infiltration after cut off (**Fig. b**). Basin size is limited by available water stream size, topography, soil factors, and degree of levelling required. Basin may be quite small or as large as 15 ha or so. Level basins simplify water management, since the irrigator need only supply a specified volume of water to the field. Suitable for close growing crops (e.g., paddy), though many other crops can also be grown in basins: e.g., maize, sorghum, trees.

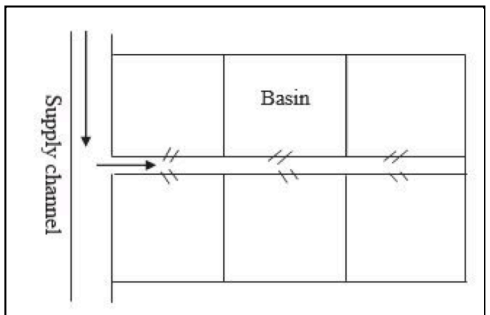
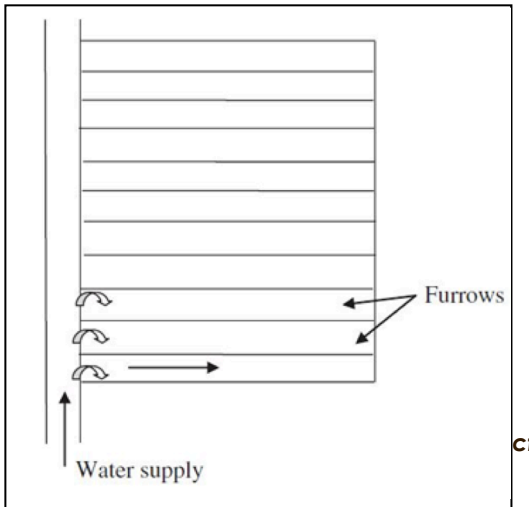


Fig. b: Basin irrigation



A furrow is a small, evenly spaced, shallow channel installed down or across the slope of the field to be irrigated parallel to row direction (**Fig. c**). In this method, water is applied to furrows using small discharges to favour water infiltration while advancing down the field. The furrow method is an efficient

ct

system if properly managed. For this method, fields must have a mild slope and inflow discharge must be such that advance is not too fast and produce excessive runoff losses, nor too slow to induce excessive infiltration in the upper part of the field. Alternatively, short blocked furrows with manually controlled water applications are practiced by traditional irrigators.

Furrow irrigation is best used for irrigating widely spaced row crops such as potato, maize, vegetables, and trees.

In implementing the combined basin and furrow irrigation systems, work will focus on:

1. irrigation network construction, drainage networks, trail networks;
2. the acquisition and installation of pumps and accessories;
3. the acquisition and installation of solar equipment, and
4. Additional works will consist of ploughing, clearing, planning and the delimitation of driving axes.

It is planned to install a basin and furrow type of irrigation system that is best suited to the context of the site because of the following considerations:

- rational use of water (reduction of losses through evaporation and infiltration);
- easy to use and require less maintenance.

Annex 6: Integrated Invasive Species Management Program concept

An IISMP aims to achieve effective, long-term invasive plant control and management that is compatible with legislation, societal values, and environmental resources.

In IISMP programs, all available information is considered in order to manage plant populations effectively in an environmentally sound manner. Generally the first step in an IISMP is to prevent organisms from becoming pests/invasive plants/noxious weeds, by stopping establishment of new pests/invasive plants/noxious weeds and keeping established pests/invasive plants/noxious weeds at an acceptable level that causes minimal damage. When applied appropriately, this process results in improved management, lower costs, ease of maintenance, and reduced environmental and economic impacts.

Successful implementation of an IPM program requires the following:

- Strategic, monitoring-based, prevention-oriented management;
- Extensive communication and cooperation among different administration levels, non-government organizations, local governments, private industry, and landowners;
- Public education and awareness programs implemented in cooperation with regional invasive species committees; and
- Continued resourcefulness and innovation by invasive species managers.

Fig. 1 summarizes the steps intended to describe and provide guidance for an Integrated Invasive Species Management approach.

Fig. 1: Steps for an Effective Invasive Plant Management Program

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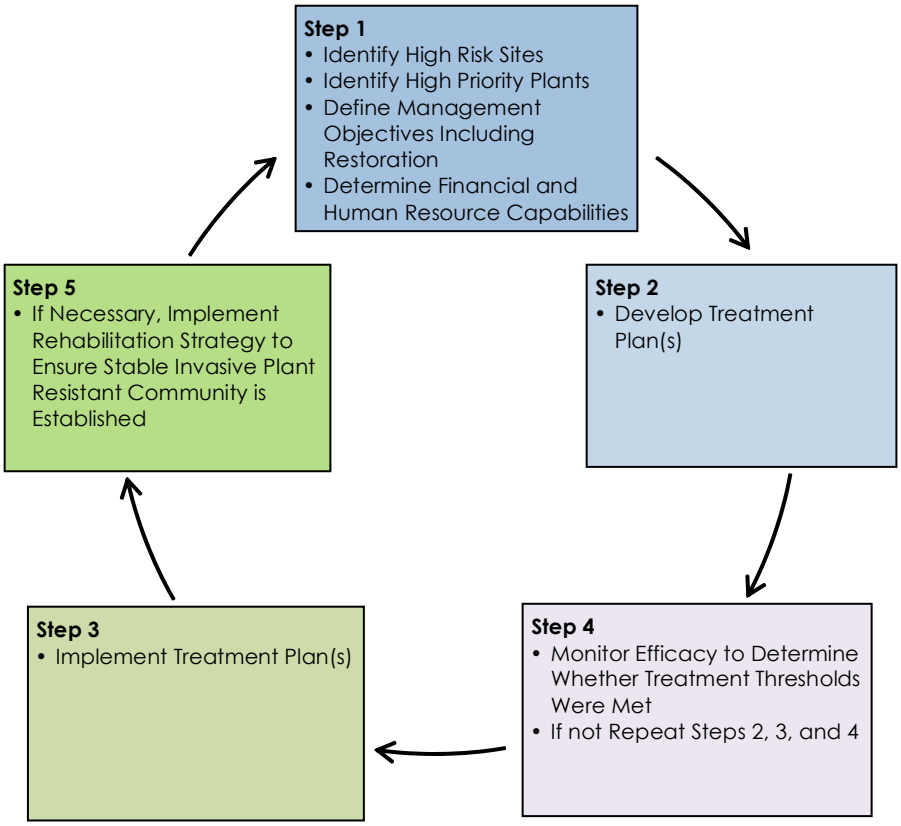

Adapted from Invasive Plant Pest Management Plan for Provincial Crown Lands in the Southern Interior of British Columbia. FLNR-PMP 738-0024-14/19. December, 2016

VULNERABILITY STUDY REPORT

Project to Increasing resilience of vulnerable communities in the agricultural sector of Mandouri in the north of the TogoJuin 2017analysis of the vulnerability

June 2017

Executive Summary

Acronyms and Abbreviations

AFAT	:	Agriculture, Forestry and Land Use
ANSAT		National Food Safety Agency
Ftes	:	Evapotranspiration
Ghgs	:	Greenhouse Gases
Ipcc	:	The Intergovernmental Group of Experts for the evaluation of the climate
GIFS	:	Integrated Management of Soil Fertility
NSCT	:	New Cotton Society of Togo
Gdp	:	Gross Domestic Product
Abip	:	Agricultural Gross Domestic Product
PROPTA	:	Project for the promotion of animal traction
QUIBB	:	Unified questionnaire of the Basic indicators of well-being
RCPs	:	Representative Concentration Pathways
SIE	:	System of energy information
SOTOCO	:	Togolese society of Cotton
ZAAP	:	Areas of Agricultural Development Planned

INTRODUCTION

The economy of Togo is based on the agriculture sector. This sector is confronted to the adverse effects of climate change, the consequences of which are expressed in terms of a reduction in the production, thus threatening to destabilize the food security and to dispossess the two-thirds of the active population of their means of subsistence. This threat is all the more serious in that the Togolese agriculture is a rainfed agriculture dominated by small producers. In effect, it depends essentially on the climatic conditions very variable which disrupt greatly the agricultural activities. This high variability is due to the worsening of the climate variability characterized by: (i) the false starts of the rainy season; (ii) the early stop of rains in relation to the timetable usual cultural ; (iii) the offset of the seasons; (iv) the bad spatio-temporal distribution of rainfall marked by the appearance of dry breaks and the concentration of rain on short periods; and (v) the elongation and/or the severity of the drought; (vi) floods; (vii) the high heat; and (viii) winds.

This strong climate variability disorienting effect the farmers in their habits culturales affects the cultures in full vegetative phase resulting in the loss of important yields and decimating the animals, dealing cruelly affect the food security of the country and its economy. Also, the northernmost regions of the country (Kara, savannas) enjoying unfavorable climatic conditions, are they regularly affected by famine, consequence of climatic anomalies which considerably reduce the agricultural productions. The region of savannas located at the lisère of the Sahel is according to the studies of vulnerability, the region most vulnerable to climate change in Togo.

However, with annual cumulations between 900 and 1100 mm of rain the savannah region receives between 7 and 8 billion cubic meters of water per year. This quantity of water can, thanks to the techniques of control and optimal exploitation of surface water, allow to reduce the vulnerability of the actors of the agriculture in the region. Unfortunately, the mastery of the water for irrigation is still in an embryonic state in Togo.

It is to this effect that the project for the rehabilitation of the level of resilience of vulnerable actors to climate change of the agriculture sector in Togo and more specifically to Mandouri (Savanna region) through the control of water constitutes an appropriate response of adaptation to the strong climate variability to secure the activities of agricultural productions. Beyond the securing of the production, this project intends to promote the diversification of means of subsistence, the valuation of agricultural products and the improvement of the local governance for a better taking into account of the adverse effects of climate change and the climate variabilities.

This study, carried out in the framework of this project, is to assess the vulnerability of the agriculture sector in the area of the project to the adverse effects of climate change , in order to establish a reference situation socio-economic and environmental, and to propose a strategy for appropriate adaptation.

1. STATE OF THE PLACES IN THE AREA OF THE PROJECT

1.1 Geophysical Context Of The Area Of The Project

1.1.1 Geographical Situation And Geomorphology

Mandouri is the chief place of the prefecture of Kpendjal, located in the savannah region in the extreme north-east of Togo. With an area of 2028 km², the prefecture of Kpendjal is limited in the north by Burkina Faso to the Is by Benin to the south by the prefecture of ITO and to the west by the prefecture of tone. The prefecture of Kpendjal consists of eleven (11) Cantons: Mandouri; Namondjoga; Pogno; Koundjoaré; Naki - Is; Borgou; Ogaro; Tambigou; Nayéga; Papri; Tambonga.

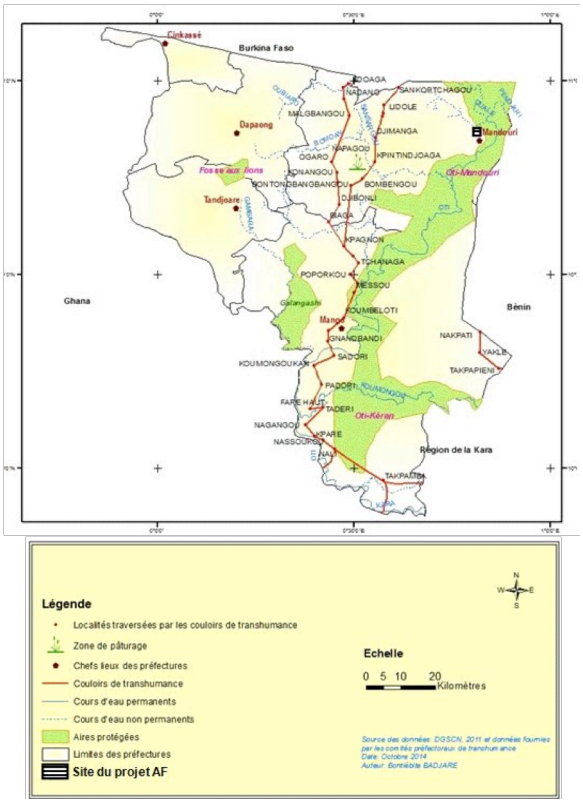

Figure 1 : Map of the Savanna region Showing the corridors of transhumance

The savanna region covers an area of approximately 8 386 km², or 14.8% of the surface area of the country.

From a geological point of view, the zone is characterized by the succession of crystal formations to diversified facies (cradle Birrimian); sedimentary weakly structure monoclinale based on the cradle Birrimian; and metamorphosed belonging to the structural unit external to the chain of Dahomeyides.

The terrain of the Savanna region presents two geomorphic sets: (I) the flat surfaces of the valley of the OTI (Plain of the Oti, Precambrian peneplain); (ii) the contrasting reliefs (plateau of Bombouaka, plateau of Dapaong).

The plain of the Oti, wide gutter to the Valleys relatively low and flat (120 to 200m), is travelled by the River Oti and its tributaries.

The monotonous relief of Glacis in a gentle slope is marked by alluvial strips insulation of the marshy areas and prone to flooding and by the Buttes (120 - 130 m) overlooking the plains exondées continuously. Of Dapaong to Gando to the Burkina Faso border, extends a wide peneplain, little rugged, characterized by large flat surfaces of 200-250M with weak slopes toward the axs of drainage. They are dominated by tabular buttes Reaching 300m. To the north of Mango to Barkoissi and up to Dapaong, the altitudes will fall and the terrain becomes more varied, more contrasted with two lines of ridges characteristics. The first line

((plateau of Bombouaka) is marked by a powerful escarpment continuous almost across the Northeast region in the southwest where it culminates in the Mont Bikoro - Panabako (515 - 520 m) and extends to the Ghana (Gambagascarp). The second ridge Line (plateau of Dapaong) less vigorous (345m), the slope blunt more passes by Warkambou Dapaong and Korbongou. These two lines of Heights dominate the depression of the pit to the Lions drained by the Koulogona.

Specifically with regard to the relief of the prefecture of Kpendjal, it boils down to the mountains and isolated hills in particular in the cantons of Namoudjoga, Naki-Est and Borgou, mainly, of the plain of Mandouri, valleys and cups.

Figure 2 : Satellite image of Mandouri

Source : Google Earth

Mandouri located on a geomorphological set with the configuration of a large expanse of land nearly flat wavy slightly, altitude little high in relation to the surrounding terrain consisting of plateaux of cuesta characterized by a higher layer observed to be indurated very altered giving the appearance of a Chao rocky. This peneplain is the result of a pénéplanation and the coalescence of the watersheds of the ITO and its tributaries Kpendjal, Oualé, Moilibouanga, Naabouanga and Kambouanga. The morphological evolution of the peneplain gives it the appearance of a flattened Butte whose summit is occupied by the locality of Mandouri.

1.1.2 Soil And Land Resources

The savanna region is a region whose space cultivable represents only to sentence the two-thirds of its total area and whose soils have a agricultural potential low.

Three main types of soil are observed: soils gravillonnaires dominant on the cradle Granito gneissic -; soils tropical ferruginous on the shales dominant siliteux; the lenses of ancient alluvium which bear deep soils, sandy surface and surrounded by a shell and the alluvium engorged current of water in the rainy season constitute humifères soils.

The underlying rocks (which do not appear in the plain) are sandstone and shales of the ITO. This slows the infiltration of rainwater and explains the rapid dehydration of soils and the rapid Saturation in water of the soils.

The soils of the plain of Mandouri present characters of hydromorphisme pronounced. The plain is covered of countless small mounds of 10 to 25 centimeters high built by worms.

The savanna region has the particularity to convene the highest percentage of land not degraded and land severely degraded. The lands of non-degraded cover vast areas of land in the Park Oti-Keran-Mandouri. The insignificantly degraded land are located to the east and to the south-east of Dapaong toward Ogaro, Borgou, Mandouri, where the population density is relatively low, as well as to the south-west of Tandjouaré. II is the same in the is of large areas in Reserves (toward Gando), to the West (toward Nagbeni), in the south-west (toward Barkoissi) and especially toward the south.

The mosaic of land little or moderately degraded occupies a large area in the south of Dapaong and totalled nearly 15% of the region. The land moderately degraded cover large areas in the north-east and to the west of Dapaong, and are beginning to extend to the east and south-west of Tandjouaré. Their degradation and their extension in the sector of Tandjouaré are likely in the short term, especially for those who are localized on the sandstone, whose soils are very sensitive to I erosion by water, to the physical and chemical degradation.

The area more degraded is the one that is located to the north of Dapaong in the sectors of Nanergou, Timbou, Biankouri and Gando and it covers 5.8% of the region. Some sectors are even extremely degraded.

The types of degradation are diverse in this region. This are I erosion in water and I erosion in gullies, locally in gullies, associated with the physical degradation and biological: compaction, crusts of surface, destabilization of the structure of the aggregates, aridification, decrease the rate of organic matter and quantitative decrease macrofauna on the ground.

The rains to high intensity, the configuration of the field and the nature of the soils promote I erosion by water and especially the gullies. It is the only area of Togo where currently observed many gullies which are progressing quickly enough. The runoff prevail the soil up to the underlying bedrock (granite Compact) or up to the armour, lateritic making the sterile land, unfit for agriculture.

The pressure in land in this area is already strong, because the rural population density exceeds 250 hab/km² in some sectors. The measures for the protection of land are therefore to be taken in the short term, if it wants to avoid a real desertification of this part of the country.

1.2 Vegetation

The savanna region belongs to the ecological zone I (DRU, 1979). This ecological zone corresponds to the Northern Plains and is covered with dry forests, dry savannas to thorny dominated by Acacia spp, from the prairies to Loudetia and Aristida and forests galleries.

The vegetation to Mandouri is predominantly dry savannas to thorny, shrubs, and trees which are added, the formations of the reserve of Mandouri (dry forests and forests galleries) contiguous to the large national parks of Burkina Faso and Benin. It notes the abundance of rônier as is the case in the entire region of the savannah.

A thin vegetation consisting of large expanses of grassy savannas, transforming themselves by place in Shrub savannah covers the plain of Mandouri.

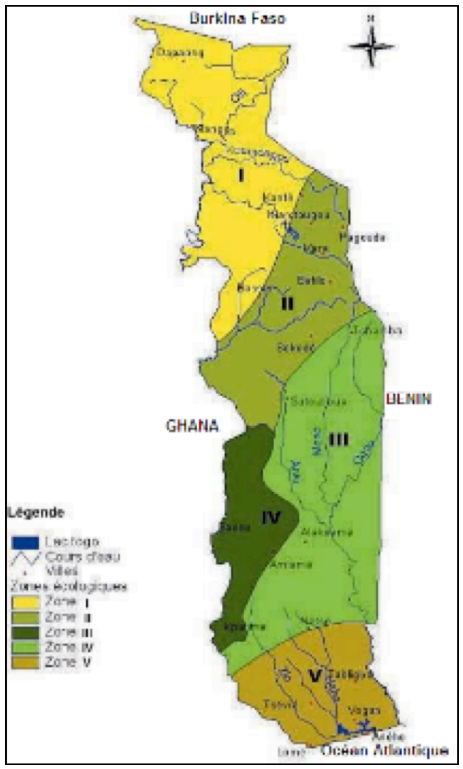

Figure 3 : Ecological Zones of

1.3 Climate Context

The climate of the Savanna region is characterized by a precipitation regime soudanien, with an annual rainfall of 900 to 1100 mm spread over 175 days. Temperatures vary between 17 and 41°C in the dry season and between 22 and 34°C in rainy season with a relative humidity between 15 and 86%. The single rainy season is spread between May/June and September/October. The dry season in which the Severity is typical of the transition zone Sahel lasts between 6 to 7 months with an annual evapotranspiration, of the Order of 2400 mm, superior to the annual cumulations of precipitation in the entire region of the savannah.

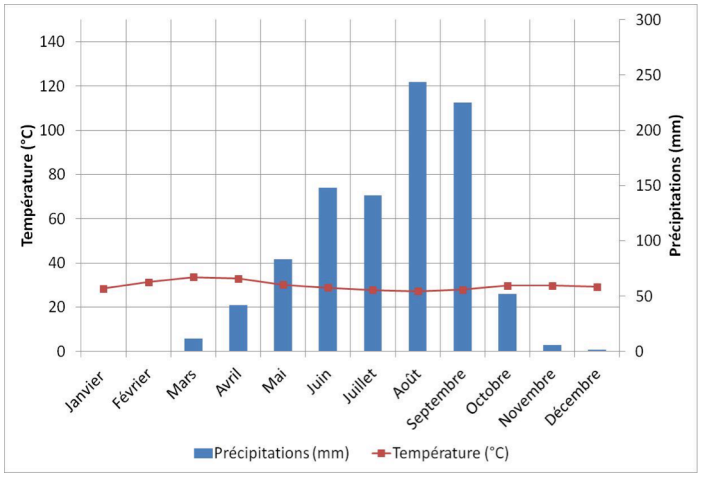

Figure 4 : Ombrothermique Diagram of Mandouri

Has Mandouri, the climate is of type Sudano-Guinea characterized by the severity of the dry season which constitutes a brake to agricultural activities and makes it more difficult to

supply of water to the population and livestock.

The mean monthly temperature passes through two maxima: 33°C and 38°C in March and November and two minima: 15°C and 17°C in January and August (Figure 2). However, it happens that Mandouri saves very strong Chaleur. The record of heat is 53°C, recorded on Monday, 5 August 1991 and the record cold of 2°C, recorded on Wednesday, 22 July 1981. Generally, the temperature is permanently high: in the day temperatures can exceed[1] 36°C, whereas in the night, they fall to achieve at 20°C.

The cumulation Annual average precipitation is of the order of 900 to 1 100 mm per year and the average number of days of rain is located between 55 and 65 days. With an average cumulation of precipitation of 6.7 mm, the month of February is the month the more dry while that of July is the wettest month with an average cumulation of rain of 155.2 mm (Figure 2).

The insolation is strong (7h 30 min per day) in the prefecture. The duration of the insolation is theoretically estimated at 2555 hours per year in average; which explains therefore the high temperatures recorded in the prefecture of Kpendjal. This strong insolation causes a theoretical evaporation average of 2000 mm. The evaporation is 2 400 mm for the Piche and 2390 mm for Tray Coloracio with monthly maxima ranging in february - march (More than 300 mm) and a minimum in September (60 mm).

The relative humidity in the prefecture of Kpendjal is very variable from one season to another and even during the course of a day of 24 hours. It is very strong in the rainy season (86%) in August. In the dry season, it lowers up to 15% in January of the fact of the harmattan, desiccant wind which blows from November and this during 3 to 4 months. In addition it decreases in the hottest hours of the day and increases in the darkness of the night.

The aridity index calculated according to the relationship of E. Of Martonne (I=P/(T+10)) is 16.1, a value which Mandouri class in the category of semi-arid regions.

1.4 Hydrography And Hydrogeology

1.4.1 Surface Water

Water resources are made up of the waters of rain, of surface waters that drain the Oti and its tributaries (Kpendjal, Oualé and Sansargou) and groundwater.

Estimated on average to 2 billion cubic meters of water on average per year in the prefecture of Kpendjal, the surface waters of Togo are relatively abundant. They are drained by the ITO and its tributaries Kpendjal, Oualé and Sansargou.

The prefecture of Kpendjal belongs to the basin of the Volta and the hydrographic system boils down to that of the ITO and its tributaries.

[1] Meteorological Station of Mango

The River Oti (167 km long) constitutes the axis major hydrographic flowing from the north-east to south-west in the plain of Mandouri-Mango with a slope very low (0.110 m per km) and an average flow exceeding 100 m3/second after Mandouri. The climate regime tropical to long dry season is reflected on the flows. For most of the stations, the flows recorded are low during three months (February to May) and are less than 5 m3/second in annual average.

To the east, the prefecture is crossed by the Rivers Oualé and Kpendjal and center by the river Sansargou.

The floods, phenomena generally localized and temporary, are in direct connection with the volume of precipitation. The locality of Mandouri knows a rather particular situation of the fact the morphology of its terrain.

In effect, since the community of Mandouri is located on the summit of a flattened Butte, during the rainy season, it is surrounded by water, giving it the appearance of an island. Mandouri is regularly exposed to flooding resulting from the flooding of the ITO and the Oualé, whose waters are spread until in the outlying districts of the locality.

1.4.2 Groundwater

The savanna region, in terms of groundwater has two aquifer systems distinct: (i) the aquifer of the weathered bedrock and the alluvial aquifers of low depth.

The main aquifer system, the aquifers of the weathered bedrock (granite gneiss / /migmatite) are overhung by a clay layer, a dozen meters. The static level is generally measured at 7 - 8 meters of depth and pumping tests recently conducted in the sector (during the construction of drilling) indicate specific flows variables, between 2 and 9 m3/h/m. This system of aquifer consists of two sub-systems: the aquifers related to fracturations and those related to the alteration. The grus over rock form of porous media whose permeability is generally low (1 to 9. 10 - 7 m/s) and the porosity of the order of 2 to 5%.

The alluvial aquifers of low depth. These aquifers are formed in formations recent detritic whose facies is heterogeneous, the Sandy clays constituting the dominant facies. The thickness of these formations does not generally exceed a dozen meters locally and their lateral extension remains limited to the right of the course of water not perennials. They therefore form of hydraulic systems quasi-autonomous, with low flow velocities and low capacity of storage.

However, the band Barkoissi - Mango toward the south and up to the north between Pognon Mandouri and does not contain a tablecloth provided enough. The success rate is very low and sometimes negative. A number of analyzes of the resistivity carried out shows that the groundwater relatively little mineralized is not a problem chemical. By against the surface waters and sometimes of the wells are not protected pose serious health problems.

1.5 Demographic Data

1.5.1 Structure And Evolution Of The Population

The population of the prefecture of Kpendjal in 2010 is estimated at 155 091 inhabitants is a density of 76 inhabitants/km². This population is composed of 52% women, 62% of less than 15 years, 33% between 15 and 60 years and 5% more than 60years; it grows at an annual average rate of 3.18%. Large disparities appear at the level of the cantons.

The population of the Township of Mandouri is estimated in 2010 at 10 589 hab repatie on an area of 238 km²; either a average density of 44 inhabitants/km². This population is composed of 76.6% of rural for 3.4% urban.

If the average rate of increase of 3.18% is maintained up to 2030, the population of the Township of Mandouri, estimated at 12 800 hab in 2016, will increase from 15 400 hab in 2022, to 17 500 hab in 2026, then to nearly 20 000 hab on the Horizon 2030.

1.5.2 Mobility Of The Population

The locality of Mandouri is a victim of the Exodus which particularly affects young people in rural areas. The fact of the climatic anomalies that knows all about the savannah region, rural youth have migrated to the neighboring countries mainly Nigeria, Ghana and Burkina Faso to the search for well-being and income in order to support the rest of the family.

1.6 Social Indicators Of Development

1.6.1 Incidence Of Poverty

According to the report of the investigation QUIBB-TOGO 2015[2] (unified questionnaire of the Basic indicators of well-being), poverty in Togo affects 55.1% of the population in 2015 against 58.7% in 2011, a decrease of more than 3 points in 4 years. Identified as one of the main causes of the degradation of natural resources and therefore anthropogenic source of emission of greenhouse gas (GHG) emissions, poverty will be exacerbated by climate change. This situation is explained by the fact that the fringe of population most affected by this phenomenon depends on the natural resources and a rainfed agriculture. Indeed, in 2015, 68.9% of the population living in rural areas is poor against 37.8% in urban areas.

If the incidence of poverty has declined in the Maritime region and the Grand Lomé, it has increased in the savannah region with more than 90% of the population lives below the threshold of poverty.

In fact, inequalities have increased and the extreme poverty has increased by 2 percentage points between 2006 and 2011. Farmers are the poorest group despite their strong contribution to economic growth. 47.9% of the Togolese population lives in a household or

[2] QUIBB report-TOGO 2015 published in April 2016.

the chief has for main activity agriculture. Therefore, the fight against poverty in Togo passes by the performance in the agriculture sector. Indeed, according to a scenario, the reduction by half the rate of poverty to the Horizon 2020 in Togo requires a agricultural growth of 6.9%, a growth rate of GDP per capita of 2.6%.

The surveys on the poverty of households reveals that on the national plan, households headed by women are less poor than those headed by men, however, the situation is reversed in rural areas.

The final results of the investigation emerge that the social indicators, the indicators of poverty and inequality in the country as a whole have improved between 2011 and 2015. Between 2011 and 2015, the rate of lighting to the electricity is increased from 39.2% to 48.3%, an improvement of 9.1 points, the proportion of households who had had difficulties to meet the food needs has decreased by 15.6 points from 49.5% to 33.9%, the proportion of individuals who had had a disease in the course of the four (4) recent weeks has increased by 3.3 points. The net school enrolment rates in the regions of savannas is the most low with a rate of 48% of children in school which only 46% among girls and 58% among boys. Over the same period, the unemployment rate has fallen from 6.5% to 3.4% while that of under-employment has increased by 2.1 points (22.8% to 24.9%). The incidence of poverty is, him, increased from 58.7% in 2011 to 55.1% in 2015. However, the Savanna region démeure the region the poor Plu of Togo.

From the point of view of the phenomenon of poverty the prefecture of Tône remains the least poor of the region with an incidence of 88.4%. The prefecture of Kpendjal is the area where poverty is most rampant, and affects 96.5% of the population. Follow in the order, the prefecture of Tandjoaré, with an incidence of 90.3% and the Prefecture of the ITO with an incidence of 89.3%.

1.6.2 Access To Water And Electricity And Health

Access to basic social services to Mandouri is a glaring need. Electricity is provided by a generator between 7 hours and 22 hours. In this situation, the administrative services are privileged and very few households have access. The lighting of a few the arteries is done from the solar streetlights. The network is reduced to the city center ; which does not allow the other parties of the Locality mainly those which are remote to be supplied.

Access to drinking water is a concern of the most important to Mandouri. The drinking water usually comes from wells that predominantly dry up in the dry season. It must raise all of even the existence of a drill fitted with a pump for the public supply. However, according to the users, the water dried up when the drought is severe. The only source of drinking-water supply is permanently the Oti.

With respect to the Access to health services, it is fairly satisfactory thanks to the construction of a health center. However, because of the lack of high-performance equipment and some services such as surgery, the difficult cases are evacuated to Dapaong.

1.7 Socio-Economic Activities

The main activities are agriculture and livestock.

1.7.1 Agriculture

Agriculture is the main economic activity of the prefecture of Kpendjal: 96% of jobs and 90% of revenues. The occupation of the soil is particularly high in the north of the Prefecture (+ 80%) sectors remain available to the south. The crops constitute the major activity and provide the bulk of the income. Cereals (millet and sorghum) provide the basis of the power supply, supplemented by the bean and yams to the south, whereas the peanut and cotton are cultures of annuity.

a. Speculation Main

The main crops are:

- Food crops: rice, cowpeas, corn, millet to 3 months, Mil 6 months, sorghum, soybean, yams; [3]
- The cash crops: cotton and peanuts; and
- The vegetable crops : onions, tomatoes, watermelons, carrots, okra, Guinea sorrel.

The locality of Mandouri is recognized for the importance of its production of rice. It is fort of this potential that the Ministry of Agriculture has organized the Producers Co-operatives in the perspective of the project for the establishment of the zones of Agricultural Development Planned (ZAAP). Has the favor of this project, the Ministry of Agriculture has introduced the variety IR 841 and provides technical support and advice to cooperatives which produce up to 2 tonnes of rice to the hectare. [4]

But the production of rice to Mandouri faces the problem of control of water (drought and flood), the problems of access to financing, storage, processing and marketing of rice and to the reluctance of producers vis-a-vis the variety of rice introduced by the Ministry of Agriculture (IR 841).

b. Cultivation techniques

- **Crop rotation**

The crop rotation is of current application in the locality. The cropping rotations are based on associations of cultures. The crops grown in pure are essentially the cotton. The observation of systems of cultures of the prefecture fact distinguish three types of fields which coexist:

[3] The Mil 3 months is used as culture of welding.
[4] The establishment of the ZAAP Mandouri to has not taken place because of the inadequacy of funding.

- Fields of check box located in the immediate vicinity of concessions. These fields are usually yellow corn very early, considered as culture of solder or associations of cereals and legumes or of local vegetables (okra, Guinea sorrel)
- The fields of low- funds are often close to the village, consisting mainly of rice, maize, sorghum and their associations as well as yams.
- Fields of bush (distant) relating essentially to the sorghum, the mil of 6 months, the yam and their associations with the cowpeas.

It is to be noted that the cotton and groundnuts, can be found in the three types of fields. The rotation is done differently by area of culture (example of crop rotation by prefecture). It is presented as follows:

- Parcel 1st : corn +cowpeas;
- Parcel 2: Mil 3e and 6e months;
- Parcel 3: cotton;
- Parcel 4: Sorghum + cowpeas;
- Parcel 5: fallow.

NB: parcel = sole.

- **Mechanized cultivation**

The mechanized practices and hitched are in the locality but the mechanized practice is more important. The costs of the mechanical operations per hectare are to:

- Labor: 25 000 to 28 000F CFA;
- Harrowing: 15 000F CFA;
- Sowing: 12 000F CFA.

The cost per hectare of the operation of labor / hilling by the culture attached is 10 000 to 12 000F CFA.

The action carried out to facilitate the work of the peasant is the introduction of adequate equipment and proper: culture hitched. This new technique takes more and more of the magnitude in the regional agricultural development. The mechanized tillage which are very sought especially for the heavy soils (bottom- funds), are far from satisfying the requests in light of some of the failures (shortage of spare parts, delay in the work ….).

The SOTOCO (replaced today by the NSCT), which provided the technical guidance in the field of the culture of cotton had done a lot for the promotion of agricultural mechanisation (culture hitched and motorised).

In the field of culture hitched, the applicants were trained and equipped. The equipment takes into account all the necessary equipment: complete omniculteur; plow complete; body of plow ; complete butteur; hoe triangle; Charrette PP 1 000; Charrette asine…

c. *Agricultural calendar*

Table 1 : Calendar Cultural

Culture / Op. Cult	Cotton	Corn	Sorghum	Mil	Cowpeas	Peanut
Choice of the parcels	Mars-Avril	March	March	March	Mars-Avril	Mars-Avril
Cleaning	Avril-Mai	Avril-Mai	Avril-Mai	Avril-Mai	Avril-Mai	Avril-Mai
Establishment of the Manure	-	Avril-Mai	Avril-Mai	Avril-Mai	-	-
Epandage of manure	-	Mai-Juin	May	May	May	May
Scarification	May	Mai-Juin	May	May	July	May
Labor	Mai-Juin	May- Juin-Juil	Mai-Juin	Mai-Juin	Juillet-Août	Mai-Juin
The seedlings	Mai-Juil	Mai-Juin-Jul	Mai-Juin	Mai-Juin	Juillet-Août	Mai-Juin
Weeding 1 and 2	June-july	June-july	June-july	June-july	August	June-july
Epandages 1 and 2	Juin-Août	June-july	June-july	June- July	August	June-july
Hilling	June-july	Juil-Août	July	July	-	-
Treatment	Juil-Nov	-	-	-	Sept-Nov	-
Crop	Sept-Nov	Oct-Nov	Sept-Oct	Sept-Oct	Nov-Déc	Sept-Oct
Transport	Sept-Nov	Oct-Nov	Sept-Oct	Sept-Oct	Nov-Déc	Sept-Oct
Dèspathage	-	Oct-Nov	-	-	-	-
Drying	-	Oct-Nov-Dec	Sept-Oct- Nov	Sept-Oct-Nov	Déc-Jan	Nov-Déc
Storage in panicle	-	-	Sept-Oct-Nov	Sept-Oct-Nov	-	-
Threshing and winnowing	-	Oct-Nov-Dec	Sept-Oct-Nov-Déc	Sept-Oct-Nov-Déc	Déc-Jan	-
Packaging	-	Oct-Nov-Dec	Oct-Nov-Dec	Oct-Nov-Dec	Déc-Jan	Sept-Oct

Source : DRAEP/RS

The above table shows the periods of the year where work is taking place for the main crops of the prefecture. The analysis of this agricultural calendar, it is clear that from April to December the farmer is occupied without judgment by its cultures (without prejudice of the times of the work which can be assigned to) with a peak period of May to July. By contrast, from January to March, it enjoys a period of lesser activity that it devotes to the rehabilitation of the boxes, feasts customary, to hunting …

The Calendar Cultural of cotton is identical to the agricultural calendar in general with the specificity that it takes into account the phytosanitary treatments and the collection of cotton. There are basically five (05) Periods:

- March - April: cleaning and preparation of the fields; and
- Mid May - end of June: installation of plots with the activities of labor and seedlings;
- Mid-june - september: Cropping Talks marked by the weeding, the manure, the buttages and phytosanitary treatments;
- September - January: harvesting and storage;

- October - April: collection of cotton.

The Calendar Cultural of cotton knows two peak periods. At the time of the seedlings because of the strict framework of the period of seedlings it should respect and during the harvest where several agricultural products reach maturity at the same time where the concurrency of harvesting activities which obliges producers to organize in mutual assistance or to resort to other to the outside labor.

d. Property and land and agrarian legislation

The populations that are currently found in the Hamlets exercise rights on the land to various titles, according that they descend from the first occupants of the soil, clans conquerors or of lineage from another clan to a recent time.

The first masters of the earth regard themselves as the only true "owners of the soil". They hold a genuine Fetish of the earth and therefore have a significant influence on the property structures.

The conquerors have captured of certain lands by removing their family fetishes in the lands which they have been able to have: the location not belonging to person, conquered more or less by force, or collected by succession.

Some lineages, foreigners can come to settle on the lands of a clan. This installation must be done with the permission of the master of the earth (authentic or conqueror). But it simply gives a right of use revocable.

The exercise of the rights to land done at four levels:

- At the level of the clan or sub clan, the exercise of the right belongs to the clan or the sub clan descendant of the first Master of the earth. The boundary between the lands of two clans is a function of the density of the population. It can be a natural accident of the ground, the bottom- funds, creeks, stones, or in default of a ridge that we student between the land;
- At the level of the lineage, the latter has a right of exclusive use on his land. The situation seems to be the same for the dependent lineages of the Clan master of the earth or for lineages foreigners who enjoy the hospitality of the Leader of earth;
- At the level of the soukhala, each soukhala for exclusive use of the lands that surround it;
- At the level of the persons, in addition to the family plantation or collective soukhala of men and women to cultivate an individual parcel. The men grow peanuts on the plots quite remote, women may benefit also loans land but for very little of time (one to two years). Up to now, it has given them the land of bottom-fund difficult to put in value.

The field returned by the populations in the framework of the ***project Strengthening the resilience of vulnerable communities in the agricultural sector of Mandouri in the north of Togo***, is the common property of all communities. To do this, all communities have signed a deed of donation putting at the disposal of the project, a perimeter of 500 ha with possibility to extend in case of need. In effect, the locality of Mandouri does for the moment not face a strong pressure on the land as it is the case in most of the Prefectures of the Savanna region. In addition, the Perimeter reconveyed is located in the flood part and belongs to the domain reserved for agriculture.

e. Access to Land

Access to the land for agricultural activities does not seem to be a strong constraint for the beneficiaries. The prefecture and particularly Mandouri is sparsely populated and access to the land has not been mentioned by the beneficiary community as being a problem. Women enjoy easy access to the land and are in the majority in the cooperatives.

1.7.2 Elevage

The prefecture of Kpendjal is an area traditionally turned to the livestock. It has certain advantages for the success of the animal production:

- Traditionally peasants owners of oxen (the agro-pastoralists);
- The presence of Peulh guardians of herds (internal transhumance);
- Areas of low human density where the herds can stay in the dry season.

However, it must not be forgotten in consideration:

- A health situation little favorable;
- The areas where the population density are very important and thus causes the migration of cattle;
- The scarcity of water points;
- The inadequacy of the food crops to allow for possibly a complement of food for animals.

The whole of these conditions suggests the problems which arise for the growth of the animal production. The practice of transhumance poses a number of problems (insecurity, theft of local animals, contagion of episodic diseases) as well as the divagation of animals.

a. Breeding of bovine animals

The bulk of the herd is to race Borgou (resistant to trypanosomiasis) more or less of mixed parentage of zebus in the north but which form in the South a relatively homogenous population well complied for traction (tools adapted) and for the slaughter. The animals are often left in divagation, which constitutes a source of conflict with the agricultural

producers. In the locality of Mandouri, this phenomenon added to the transhumance, explains why few producers engage in the culture of the yams since a few years.

Recognized as the second economic activity of the locality, the cattle also meets with problems. The first is that linked to the control of water particularly in period of drought and the second is linked to the absence of landscaped pastures. The fact of the lack of water and pasture during the dry season, the animals are exposed to the under-nutrition and malnutrition and lose weight. The fringe to risk of the animal population is comprised of the calves and suckler cows (photo 1).

Photo 1 : Oxen emaciated by the drought in the Mandouri

The prefecture and in particular Mandouri is crossed by the corridors of transhumance sub-regional. But the fact that these corridors are not arranged to maintain the transhumants in their corridors, the latter becomes with their herds in search of water and pasture causing damage in the fields of farmers.

b. Breeding of small ruminants

The small ruminants (sheep and goats) take an important place in the prefecture. On average, there is a 20 sheep and goats by farm; which seems considerable. However, the animals are often in divagation, which constitutes a source of conflict with the farmers. This sub-sector is also exposed to food problems related to the lack of water and pasture arranged particularly in dry periods. This activity is often associated with agriculture.

c. Pig Industry

The prefecture is favorable to the hog industry, the main problem is the power supply in the dry season. The rearing of pigs is an activity exclusively practiced by women. However, these animals are left in the divagation during the dry season; which can be a source of conflict in the case of development of cultures of against season.

d. Breeding of donkeys

The donkeys are high for the culture attached and the transport of wood and agricultural products.

e. Breeding of poultry

The prefecture produces a lot of poultry particularly guinea fowl. The hens are less adapted and outbreaks of avian influenza are there major devastation. The rearing of guinea fowl is very prosperous in the entire region of savannas to the point where we spoke of the "gray gold". The development of this activity has made of the Savanna region the source of supply a privileged position in guinea fowl in Togo.

1.7.3 The Fishery

The economy of the prefecture of Kpendjal is essentially based on farming and fishing activities. They constitute of Carrier Sectors if the actors are more organized and benefit from a technical support result and that of the circuits of appropriate marketing are well defined. However, Mandouri, fishing is weakly practiced and the main actors of this sub-sector, are of the Burkinabe and Benin. The fishermen are exercising their activity in the Oti and its tributaries which naturally constitute a real potential for the development of aquaculture.

Fish products are mainly consisting of fish of various species: carp, catfish, sardines, sea bream etc. of freshwater turtles (very sought for certain ceremonies of worship where its high cost), the monitor lizards, frogs.

2. CHANGES AND CLIMATE VARIABILITIES IN TOGO

Climate Projections have been carried out with the model SimClim2013. The scenarios of emissions and atmospheric concentrations of GHGS used to do this are the channels of representative concentration (*Representative Concentration pathways* (RCPs) of the IPCC, which describe the different trends of emissions and atmospheric concentrations in the twenty -first century GHG emissions.

The experts from the IPCC have designed scenarios of emissions and atmospheric concentrations of GHGS (possible trajectories) in order to provide guidance to policy makers in terms of GHG emission reductions to the Horizon 2100.

Table 2 : Projected Evolution of the average of the temperature of the air at the surface of the globe and the elevation of the average level of the seas by the end of the twenty-first century by report to the reference period 1986 through 2005.

		2046-2065		2081-2100	
	Scenario	**Average**	**Likely range**	**Average**	**Likely range**
Evolution of the average surface temperature of the globe (°C)	**RCP2.6**	**1.0**	**0.4 to 1.6**	**1.0**	**0.3 1.7**
	RCP4.5	1.4	0.9 A 2.0	1.8	1.1 A 2.6
	RCP6.0	1.3	0.8 to 1.8	2.2	1.4 A 3.1
	RCP8.5	**2.0**	**1.4 A 2.6**	**3.7**	**2.6 Has 4.8**

For the assessment of the vulnerability it was considered the two extreme scenarios the RCP2.6 and the RCP8.5. The **RCP2.6** is representative of a scenario that aims to maintain likely the global warming below 2°C compared to the pre-industrial period to the Horizon 2100. It corresponds to a level of atmospheric concentration of GHGS Less than 500ppmv CO2 equivalent. It involves strong reductions of GHG emissions by the international community to reach a critical threshold of 445 ppmv around 2050 and the threshold of 420 ppmv from 2055. The **RCP8.5 scenario** is representative of the present world trend of GHG emissions. The RCP8.5 is the most pessimistic, but it is a likely scenario because it corresponds to the extension of the current emissions.

2.1. The Reference Scenario

The reference scenario describes the average climate for the period 1986 through 2005. According to this scenario, the average annual temperature "TMean" vary from 21.2°C to 28.7°C with maxima "TMax" of about 35.2 °C in the extreme north and minimal ''TMin'' of 16.0°C to the west of the region of the trays. The annual precipitation averages are between 850 and 1715 mm with the lowest values in the Maritime Region (854 to 912 mm) and in the extreme north of the region of savannas (912 to 969 mm).

In the savannah region where the site is located in the project, the temperatures vary between 26.6 to 28.6 °C for the mean annual temperatures, between 33.4 and 35.2°C for maximum temperatures average annual and between 21.6 and 23.5 °C for minimum temperatures average annual. With respect to annual cumulations of precipitation, they vary between 854,4 mm to 1141,5 mm.

2.2. Scenarios Of Climate Change To The Horizons 2025; 2050; 2075 And 2100

2.2.1. Climate Scenarios According To The Optimistic Assumption (RCP2.6)

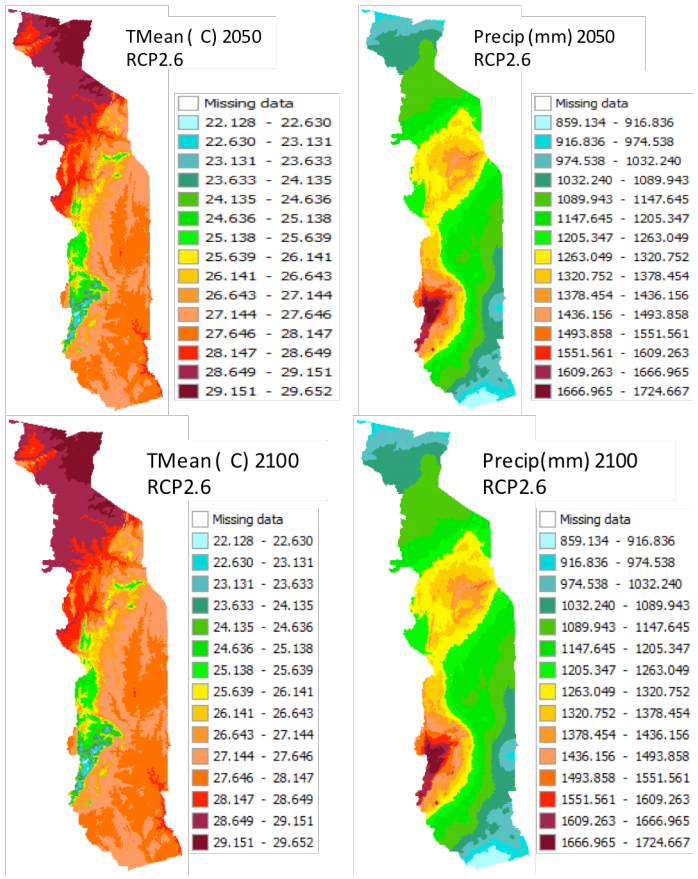

Figure 5 : Climate scenarios to the Horizons 2050 and 2100 according to the optimistic assumption RCP2.6

Source : Establishment of climate scenarios (TCN)

In the case where the human community would succeed to stabilize the concentration of GHGS in the atmosphere at a level lower than 500 ppm, the trend toward global warming would continue on the whole extent of the country but in a moderate way.

The average temperature at the national level would increase by 0.6°C to the Horizon 2025 and 0.9°C over the period 2050 to 2100 and will fluctuate between 22.0 and 29.5°C to the Horizon 2025 and between 22.1 and 29.7°C after 2025. Overall, the warming would be more low on the mountains of the Togo (West of the Plateaux region of recording the lowest global warming with average temperatures between 22.0 and 25.5°C) and increase, at times, to the north and to the south of the country.

With regard to precipitation, they would evolve in the range 857 - 1 722 mm on the Horizon 2025 and 859 to 1 725 to the Horizons 2050, 2075 and 2100 with increases of 3.3 to 6.2 mm (2025) and 4.7 to 9.0 mm (2050 - 2100) compared to the reference scenario (854 - 1716 mm), an average increase of between 0.37 (2025) to 0.54% (2100). The increase in precipitation would be stronger on the mountains of Togo and decrease to the time toward the north and the south of the country.

2.2.2. Climate Scenarios According To The Pessimistic Assumption (RCP8.5)

Unlike the optimistic assumption, if nothing is done to stabilize the concentration of GHGS in the atmosphere and that the current trend of emissions is maintained, the climate warming in Togo would be very strong with increases in average temperatures of 0.9 to 4.2°C to the Horizon 2100.

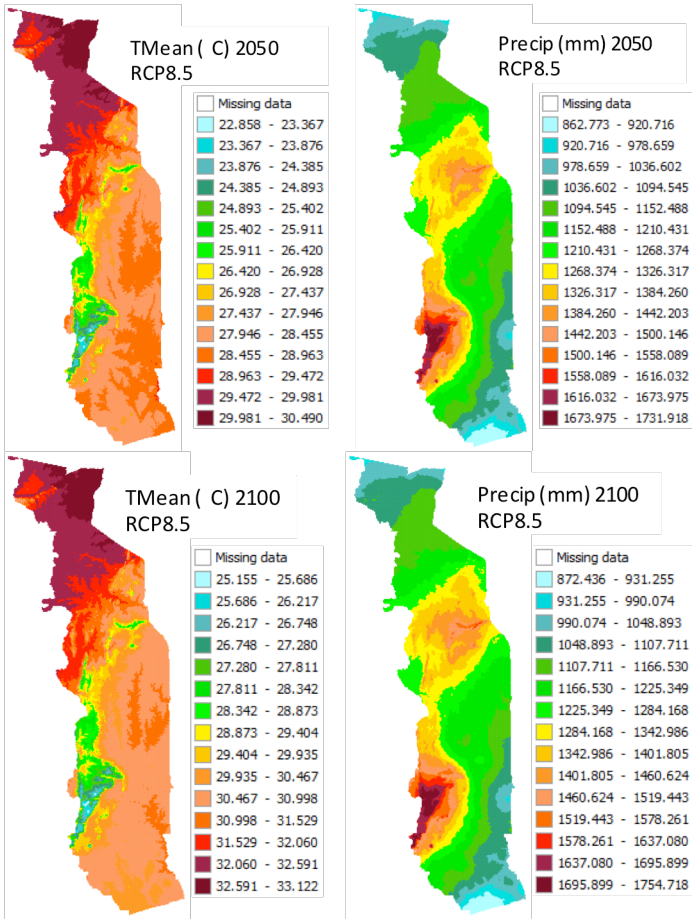

Figure 6 : Climate Projections to the Horizons 2050 and 2100 according to the pessimistic assumption RCP8.5

Source : Establishment of climate scenarios (TCN)

The average temperatures will fluctuate between 21.9°C and 29.5°C to the Horizon 2025 is a average warming of 0.8°C. But after 2025, the gaps between the scenario "optimistic" and that "pessimistic" dig themselves clearly. The climate in the case of the pessimistic scenario would be more hot with temperatures average maximum between 27 and 40°C and minimum temperatures medium sized oscillating between 17 and 27°C. The regions located north of the mountains of Togo (Kara and savannas) and the Maritime region would suffer the minimum temperatures the highest averages, while maximum temperatures the higher would not be recorded only in the regions located north of the mountains of Togo.

This warming trend has been accompanied by an increase in precipitation more important than in the case of the optimistic scenario. The annual cumulations of rain should increase on all the extent of the territory between 6 mm to the Horizon 2025 and 29 mm to the Horizon 2100 with records on the mountains of Togo. Compared to the average climate of the period 1986 through 2005, the annual cumulations of rain would increase of 0.7% to the Horizon 2025, 1.4% in 2050, 2.3% to the Horizon 2075 and 3.3% to the Horizon 2100.

2.2.3. Projections Of Climate Change In Togo

According to the observations of the climate in Togo on the period 1961-2012, the warming is unequivocal and large-scale changes in climate are already observed: a warming of 1°C in relation to the 1961-1985 period, with annual variances between 0.7 and 1.2°C; reductions in annual cumulations of rain included between 3 and 81 mm with however a resumption of precipitation found in some stations since 2005.

This trend to the increase of acid concomitantly with the climate warming seems to be confirmed in the climate projections to the Horizons 2025, 2050, 2075 and 2100 (Table 3).

Table 3 : Variations in climate parameters compared to the period 1961-1985

	RCP2.6 Scenario				RCP8.5 Scenario			
Horizon	**Temperature**		**Precipitation**		**Temperature**		**Precipitation**	
	ΔT(°C)	**ΔT(%)**	**ΔP(mm)**	**ΔP(%)**	**ΔT(°C)**	**ΔT(%)**	**ΔP(mm)**	**ΔP(%)**
2025	0.7	2.81	4.7	0.10	0.8	3.21	5.8	0.12
2050	1.0	4.02	6.9	0.14	1.8	7.23	12.3	0.24
2075	1.0	4.02	6.9	0.14	2.9	7.23	19.9	0.37
2100	1.0	4.02	6.9	0.14	4.2	16.87	28.5	0.55

Source : TCN, 2015

Indeed, it is clear from the scenarios developed (Table 3) that the warming of the climate in Togo will continue with the increases in average temperatures between +0.9 and +4.5°C according to the pessimistic assumption and between +0.6 and +0.9°C according to the optimistic assumption. Either of the variations between 3.21 and 16.87% according to the pessimistic assumption and between 2.81 and 4.02% depending on the optimistic assumption.

From the point of view of the rains, there would also increases between +6 and +29 mm according to the pessimistic scenario and between +5 and +7 mm according to the optimistic scenario. This corresponds to the variations between 0.12 and 0.55% depending on the pessimistic assumption and between 0.10 to 0.14% depending on the optimistic assumption.

The warming would be more low on the mountains of the Togo and increase gradually to the time toward the north and to the south of the country, while the annual cumulations of rain would be the most important and would decrease gradually to the time toward the peripheries. At the regional level, the Plateaux region of would register the lowest warming relative to the extreme north of the country encompassing the prefectures of tone, Tandjoaré, Kpendjal, and Gando where the increases in temperatures would be the strongest.

Unfortunately, these climate scenarios do not allow to understand the changes that can intervene at the level of the distribution of precipitation. However, compared to the data in Table 1, it appears that ***the climate in Togo should dry out more. This trend to the drying stems from the fact that the increases in precipitation will be too low to compensate for the increase in evapotranspiration resulting from strong increases in temperatures.***

3. EVALUATION OF THE VULNERABILITY AND IMPACTS OF CLIMATE CHANGE IN THE AREA OF THE PROJECT

3.1. Climate Change Currently Observed And Their Impacts

3.1.1. Recent Developments Of The Climate In The Savanna Region

The analysis of the trend in average temperatures between 1961 and 2010 in Togo demonstrates that the savannah region has experienced a average warming of more than 1°C compared to the average of 1961 - 1990 (+0.9°C in Dapaong and 1.6°C to the Mango); the months of the wet season being become much warmer than ordinary.

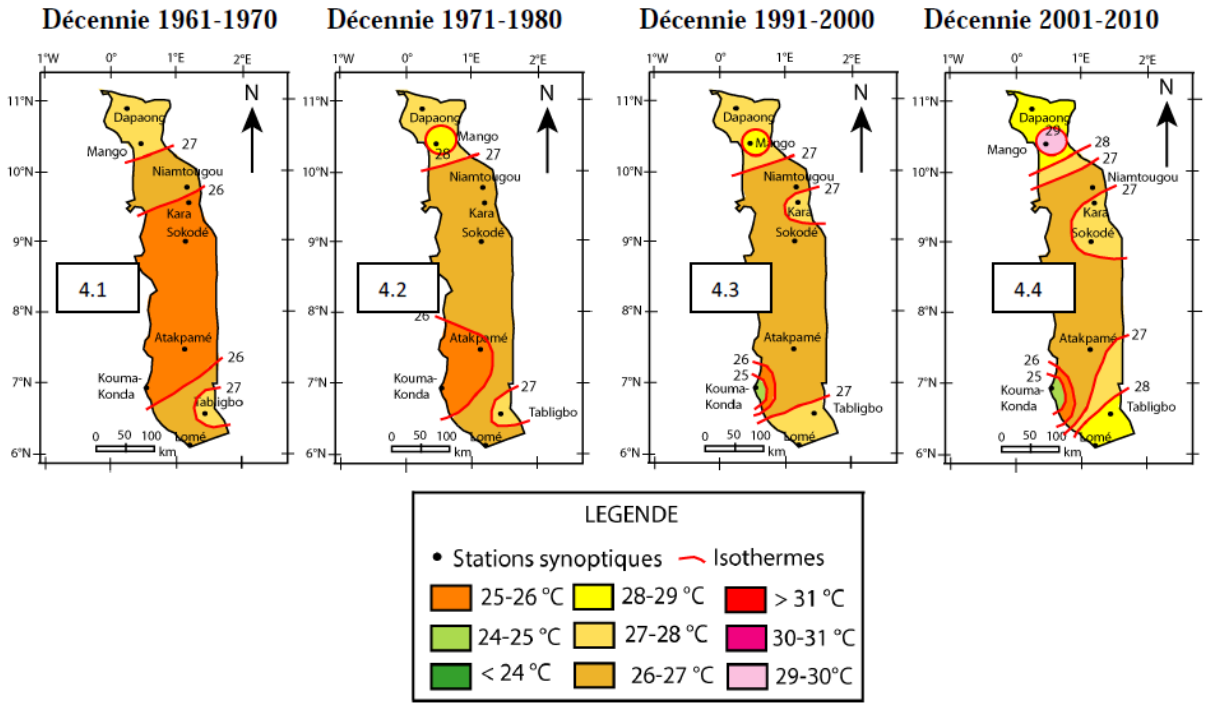

Figure 7: Decadal Evolution of the average annual temperature in Togo from 1961 to 2010.

Source : Badaméli, 2015

At the same time the analysis of the evolution of precipitation on the comparable period highlights a slight tendency to increase

The monthly distributions and intersaisonnières have evolved considerably: the dry months dry up more, especially February, March and April; while the months most watered the season (June, July, and August) have experienced a reduction in their cumulative monthly for the benefit of the months of September and October.

On the side of the insolation, it is observed a strong increase of approximately 170 hours compared to the standard 1960 - 1990. This is the origin of the increased evaporation and evapotranspiration already strong in the region. The trend of increased evapotranspiration translated the drying of the climate in the region despite the slight increase of the rain that is observed.

Outside of the three major droughts which have caused a severe famine between 1942 - 1943; 1976 -1977 and 1983 - 1987, the savannah region has recorded a period generally in deficit in rains of 1990 to 1999, a period rainy moderately marked by floods since 2000 but with years of deficits (2014 for example).

3.1.2. Climatic Hazards Identified

According to the producers and the weather services in the area of the project, the observed changes currently in the climate in Mandouri are: (i) the false starts of the rainy season (early or late); (ii) the poor distribution of rains marked by the appearance of dry breaks and the concentration of rain on short periods; and (iii) the offset of the seasons; (iv) the early stop of rains in relation to the timetable usual cultural ; (v) the drought (the worsening of the severity of the drought); (vi) floods; (vii) the high heat; and (viii) winds.

3.1.3. The Observed Impacts Of The Changing Climate

The observed changes in the climate of the region of the savannas and climatic vagaries identified have serious impacts on the agricultural sector.

The false starts of the rainy season and the offset of the seasons have plunged the producers in total confusion: the calendar cultural usual can no longer be respected.

The poor distribution of rains marked by the appearance of dry breaks and the concentration of rain on short periods of time, the early stop of the rains and floods, disrupt the cycle of vegetative crop with result in the decrease of the decline in agricultural yields. When the PAUSE hair appears during the phase of flowering plants, the training of the grain is highly disrupted, thus reducing crop yields. According to the testimony of producers of Mandouri, the fact of the deficit of rain recorded in 2014, the yield of rice was dropped to 200kg/ha against 900kg/ha in normal period; either a yield decrease of 78%. This situation is aggravated by the degradation of the land which obliges producers to resort to chemical fertilizers to improve crop yields.

In effect, according to the studies on the assessment of land degradation in Togo, the plain of Mandouri and the ITO is classified among the agricultural areas are the most exposed to the degradation of the land. This phenomenon is accelerating in the savannah region, because of the combined effect of the decrease in the rainfall and the increase of the temperature. The edaphic plan, the drying of the soil that follows, results in a decrease of the vegetative cover and the exacerbation of the phenomenon of erosion by runoff, which leads to the decline in the productivity of crops. Which leads to the decline of the incomes of producers, famine, malnutrition, the worsening of poverty in the locality and pushes young people to the Exodus/emigration toward the countries of the sub-region (Ghana, Nigeria, Burkina Faso and Côte d'Ivoire).

As regards the rearing, large and small ruminants are experiencing the impacts of global warming, the drying and evaporation increased more of surface waters, and watering

sources, particularly during the dry season which can last up to eight months (October - May). The water deficit, the elongation and the worsening of the severity of the dry season lead to the depletion of the points watering of animals, pasture degradation; which exposes the animals to the Sub-power and to the thirst and causes even the death of livestock and the decline in the production of milk. In effect, when drought, the carnage is stronger at the level of the suckler cows and their small; impacting as well the production of the milk and the rejuvenation of the herds. The result is a decline in revenue of pastors and agro-Pastors and in some cases, the abandonment of the livestock.

Photo 2 : Herd of oxen is refreshing in a puddle of water the first rain

For example, the fact of the drought of 2014, ranchers, to reduce the losses, had sold their animals emaciated at prices sacrificed (up to 5000 F CFA For a beef). Despite this, they have had difficulty to bounce back the following year.

With regard to floods, they have serious consequences on the productions of plant and animal species.

In effect, in a period of rain, the locality of Mandouri is often flooded, situation that aggravate the dropped of water dams in Burkina Faso. These floods caused wilting of plants of maize and sorghum, causing the decline of their yields. In the particular case of the rice, floods, when they cover the rice plants, these eventually be smothered and die. This is the situation with the introduction by the Department of Agriculture, of the variety IR 841.

The plant of the variety IR 841, according to the producers, although rated as a good performance, is too low in relation to the water level in a period of flooding. This is not the case of local varieties which, thanks to their height, are more resistant to floods. But given that the national food safety agency in Togo (ANSAT) only buys the IR Rice 841, producers have in their majority, abandoned the production of local varieties to adopt the IR 841. However, the investigations have revealed that the local population does not like to consume the IR RICE 841 because less soft and does not fragrant like the local rice. The fact is that, when the ANSAT does not buy the rice, the producers have the penalty to sell their production on the local market.

In effect, until May 2017, the producers had not yet expired their production of rice in the past campaign. This situation reduces the credit-worthiness of producers of rice of Mandouri vis-a-vis the financial institutions, thus reducing their resilience in the face of climate change.

The establishment of a farm insurance in Togo would have been able to reduce the financial losses induced by the climatic disasters in order to encourage the recovery of agricultural productions after the climate shocks. But in the absence of such an initiative, the producers are left to themselves, which fact weigh the impact of climatic shocks on the producers.

The absence of Ranger of trees around the fields exposes the cultures to the effects of winds that arise particularly toward the end of the rainy season.

From the point of view of the supply of water, the locality of Mandouri undergoes all years, the effects resulting from the drying up of wells, boreholes and water points. In the face of this situation, the households as the breeders use water from the streams mainly the Oti. Also, in the dry season, sees one of the convoys of donkeys loaded cans of 25 liters making several trips to the ITO to draw water for domestic uses. For the laundry (washing clothes and linen) in dry season, women and children are moving toward the ITO, which constitutes an additional source of water pollution of the water course.

From the point of view of health, the inhabitants and the health services of Mandouri underline the occurrence of more and more cases of respiratory diseases (cough, cold, asthma), the multiplication of cases of malnutrition and dehydration specifically among children and the elderly, the occurrence of conjunctivitis often in the form of epidemic, the regular occurrence of outbreaks of meningitis, in the dry season. During the rainy season, the inhabitants and the health services of this locality mention the occurrence of diarrheal diseases and malaria. In fact, because of the increase in the ambient heat, the people prefer to sleep in the open air S Exponent then to the bites of mosquitoes; which explains the increase in malaria cases in the middle.

The animal and plant health is also facing the intensification of certain diseases such as avian influenza and the rinderpest.

As to the supply of wood for fires and charcoal, the situation at Mandouri is not different from the generalized deficit which is rampant in the savannah region. This scarcity of wood energy in the area of the project explains the high consumption of agricultural residues in the households. The scarcity of wood energy coupled with the Land degradation is the main reason for the invasion of the reserve as found during the field visit. The trees that are beyond the deforestation in the locality are the useful species as the shea butter, the rônier, *Terminalia macroptera* and a thorny Petrol. This deficit of wood energy has intensified the drudgery of women and of the girl.

The result of all of these consequences is the precarious nature of the means of subsistence of households and the accentuation of their poverty.

3.2. Climate Projections To Mandouri

3.2.1. Scenarios Of Climate Change To Mandouri Between 2025 And 2100 According To The Hypothesis RCP2.6

In the case where the global efforts of stabilization of concentrations of GHGS in the atmosphere to less than 500 ppmv, allows you to limit the global warming means below 2°C, Madouri will experience a mean warming likely between 0.7°C and 1.1°C (Table 4).

Table 4 : Scenarios of climate change to Mandouri according the RCP2.6

Climate Parameters	Reference Scenario	Optimistic scenario (RCP2.6)	
		2025	2100 horizon.
TMax (°C)	34.6 - 35.2	35.3 - 36.0	35.6 - 36.3
TMin (°C)	21.6 - 22.1	22.2 - 23.2	23.0 - 23.5
TMean (°C)	28.1 - 28.6	28.8 - 29.3	29.1 - 29.7
P (mm)	- 1026,7 1084,1	- 1030,5 1088,1	- 1032,2 1089,9

As well, average maximum temperatures would be between 35.3°C and 36.3°C, minimum temperatures averages between 22.2°C and 23.5°C and the average temperatures between 28.8°C and 29.7°C (Table 3).

With respect to the annual accumulation of precipitation, it would increase in relation to the reference value between 3.8 mm and 5.9 mm (table 5) Either values between 1030,5 mm and 1089,9 mm.

3.2.2. Scenario of climate change to Mandouri between 2025 and 2100 according to the hypothesis RCP8.5

In the case where the present world trend of GHG emissions is maintained, Madouri will experience a intense warming with an average increase of temperature between 0.8 °C and 4.6 °C (Table 5).

Average maximum temperatures would be between 35.5 °C and 39.7 °C, minimum temperatures averages between 23.8°C and 27.3°C while the average temperatures vary between 28.9°C and 33.2°C (Table 4).

Table 5 : Scenarios of climate change to Mandouri according the RCP8.5

Climate Parameters	Reference Scenario	Optimistic scenario (RCP8.5)	
		2025	2100 horizon.
TMax (°C)	34.6 - 35.2	35.5 - 36.1	39.0 - 39.7
TMin (°C)	21.6 - 22.1	23.8 - 24.3	26.8 - 27.3
TMean (°C)	28.1 - 28.6	29.0 - 29.5	32.6 - 33.2
P (mm)	- 1026,7 1084,1	- 1031,4 1089,1	- 1048,9 1107,7

With respect to the annual accumulation of precipitation, it would increase between 4.7 mm and 23.6 mm compared to the situation of reference (Table 5) with values between 1031,4 mm and 1107,7 mm.

3.2.3. Synthesis of climate projections to Mandouri

Whatever the scenario, it appears clearly that Mandouri will, unequivocally, a warming of its climate, accompanied by a slight increase in precipitation.

According to the scenario RCP8.5 which, in accordance with the current level of global efforts to reduce GHG emissions, is the most likely scenario, Mandouri will experience an increase in mean temperatures of approximately 1°C to the Horizon 2025 and up to 4.6°C to the Horizon 2100 for dramatic increases in minimum temperatures averages of 2.2°C to the Horizon 2025 and 5.2 °C to the horizon 2100 (Table 6). At the same time, the combination of precipitation will increase of 5 mm in 2025 to 23 mm to the Horizon 2100.

Table 6 : Climate anomalies in relation to the situation in reference to Mandouri

	Optimistic scenario (RCP2.6)		The pessimistic scenario (RCP8.5)	
	Deviations in 2025	**Deviations in 2100**	**Deviations in 2025**	**Deviations in 2100**
ΔTMax (°C)	0.7 - 0.8	1.0 - 1.1	0.9 - 0.9	4.4 - 4.5
ΔTMin (°C)	0.6 - 1.1	1.4 - 1.4	2.2 - 2.2	5.2 - 5.2
ΔTMean (°C)	0.7 - 0.7	1.0 - 1.1	0.9 - 1.0	4.5 - 4.6
ΔP (mm)	3.8 - 4.0	5.6 - 5.9	4.7 - 5.0	22.2 - 23.6

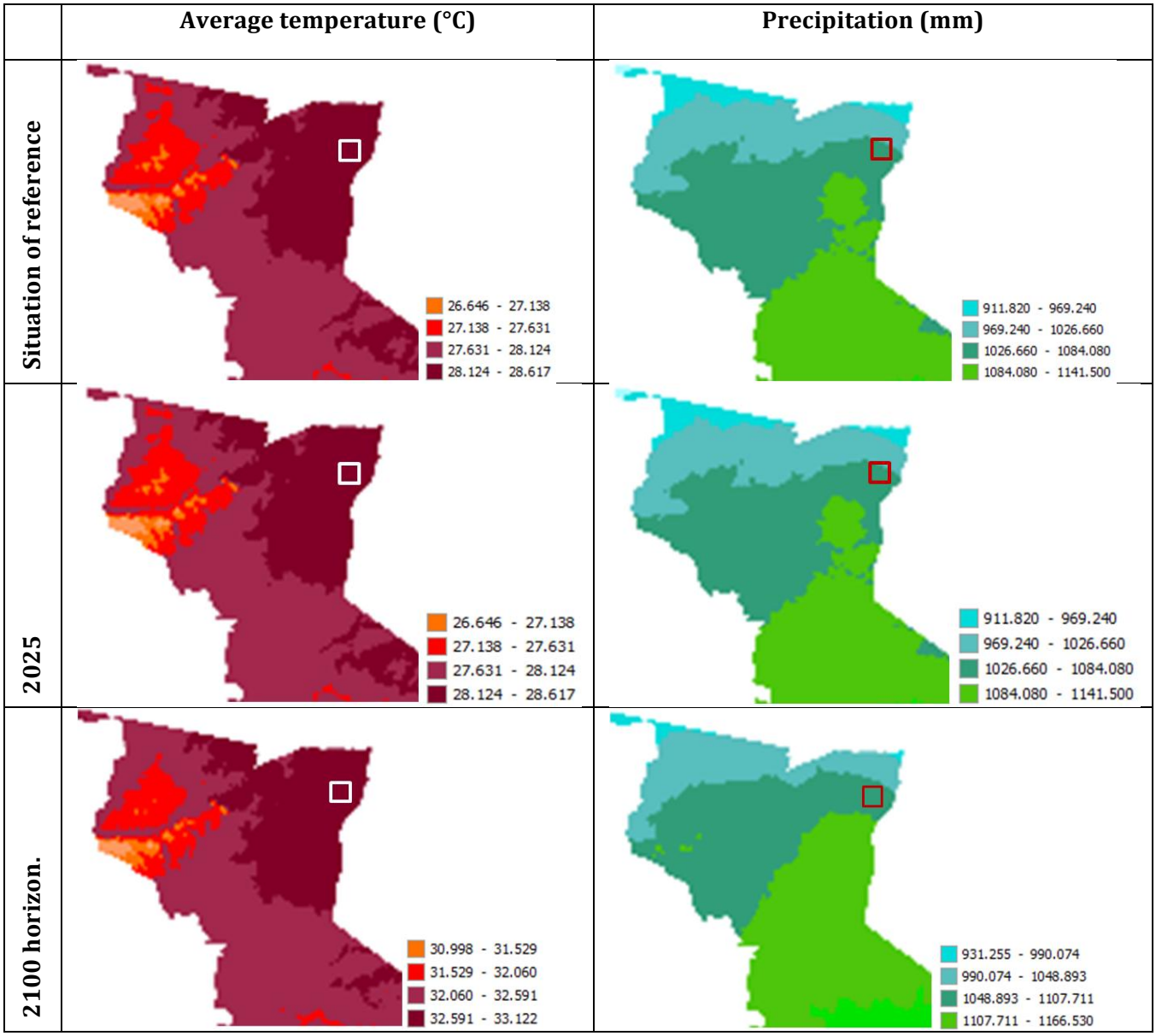

Figure 8 : Climate Projections to the Horizons 2025 and 2100 in the area of the project according to the pessimistic assumption RCP8.5 (the square represents the area of the project)

The overall average temperature will grow at rates of between 3.0% (in 2025) and 16.1% (to the Horizon 2100) against 0.46% and 2.2% for the cumulation of precipitation to the same horizons. This warming will be most intense at the level of the minimum temperatures that will increase at an average rate between 10.1% to the Horizon 2025 and 23.8% to the horizon 2100 (Table 6); this reflects the reduction in the number of days of freshness or the duration of moments of freshness and the installation of a permanent heat.

Table 7 : Mean changes in climate parameters compared to the period 1961-1985 (reference situation) in percentage (%)

	RCP2.6 Scenario				RCP8.5 Scenario			
Horizon	Temperature		Precipitation		Temperature		Precipitation	
	ΔT(°C)	ΔT(%)	ΔP(mm)	ΔP(%)	ΔT(°C)	ΔT(%)	ΔP(mm)	ΔP(%)
2025	0.7	2.5	3.9	0.4	0.8	3.0	4.9	0.5
2100	1.1	3.7	5.7	0.5	4.6	16.1	22.9	2.2

With the faster increase of the temperatures (Table 7), evapotranspiration is going to intensify. At the same time, precipitation will experience low increases. By analogy to the climatic context present, the rapid increase in evapotranspiration against too low increase in precipitation, will result in the accentuation of the drying up of the climate with worsening of climate risks currently observed. [5]

3.3. Evaluation Of The Vulnerability And Impacts Of Future Climate Change In The Area Of The Project

3.3.1. Factors Of Vulnerability Not Climate Change In The Area Of The Project

Outside of climate anomalies, some constraints non-climate constitute factors of a worsening of the vulnerability of populations in the face of the adverse effects of climate change. These factors are often environmental constraints, technological and socio-economic. In the case of this project, the major factors of a worsening of the vulnerability in the agriculture sector to Mandouri are:

a. Environmental factors worsening of the vulnerability

The factors of order major environmental likely to amplify the vulnerability of populations to climate change are:

(i) The degradation of the land

The lands are the support of crops and pastures. Consequently, their degradation (manifested by the loss of their quality) acts on the performance of cultures, and pastures, on the capacity of the relocation of plant formations and their biological wealth. Also, the Land degradation is-t-it a factor of a worsening of the vulnerability of populations to climate change.

(ii) The pollution by the inputs, including pesticides and chemical fertilizers

[5] Currently, the evapotranspiration Annual Average (FTE = 2000 mm/year) is far greater than the annual cumulations of precipitation at Mandouri between 1026,7 and 1084,1 mm according to the climatic situation of reference, approximately half of the evapotranspiration annual average.

The pollution of water and soil by the use of pesticides, herbicides and chemical fertilizers constitutes a threat to the microfauna of soils whose activities determine the quality of the soil. The use of these chemicals also threatens the biological diversity floral and animal.

(iii) Deforestation and the loss of biodiversity

The services rendered by the ecosystems to the man are multiple. Forests create microclimates, promote the infiltration of water in the soil, mitigate the erosion of soil and the effect of wind on human settlements, fertilize the soil, reduce the evaporation of the water from the sun, provide food supplements to men, absorb and sequester carbon, et. To this effect, deforestation and the loss of biodiversity will amplify the vulnerability of populations to climate change. In the area of the project, the degradation of ecosystems is advanced and there is virtually no forest outside the forest formations secondary to the reserve.

b. Technological factors worsening of the vulnerability

The main factors of technological order of amplification of the vulnerability of populations are:

(i) The type of agriculture practiced

The togolese agriculture is a essentially agriculture rainfed and of subsistence, dominated by small producers (the family producers). On the whole extent of the territory, it is the itinerant agriculture on the burn which is the mode; agricultural campaigns are open by the rainy season exposing the agriculture to the whims and climatic anomalies while the agribusiness is still in its infancy.

Elsewhere in the area of the project the production of rice is dominant, relegating the other speculation in the second plan. The fact of the matter is that if the production of rice fails during a crop year, the producers will be in a situation of poverty and households exposed to famine.

(ii) The techniques of production and conservation of products.

According to the results of the National Census of Agriculture of Togo is very weakly mechanized. The production techniques are still largely traditional: use of physical force and tillage tools (hoes, cut-cut and machetes), land clearing in the hand followed or preceded of wildfires. Outside the cooperatives of producers, the use of agricultural equipment is motorised very low. The modernization affects only the production of rice and, according to the producers of the locality, cooperatives rent themselves the tractors for the plows and the harvest which means that individually, it is difficult for them to resort to means motorized.

The hitch is by against a specificity for the Savanna region. This region has the highest proportion of hitch (89.4%) of the country. Also to Mandouri, the most common technique after the human force, is it the hitch under traction oxen and donkeys.

Moreover, the system of intensive rice whose profitability is proved, is not practiced by the producers of Mandouri, preferring emblaver hilldrop or sometimes by sprinkling of seed.

(iii) The control of water for agricultural purposes: the practice of irrigation

If one refers to the definition of the concept of "irrigation" according to FAO: *deliberate intake of water on the land to improve the production of pasture or crops*, the practice of irrigation in Togo is very low. According to the Census of Agriculture, 2012, this practice was practiced by only 16.7%, of agricultural households at the national level and 3.7% in the savannah region.

This technique which involves the presence of infrastructure and machines (that irrigation canals, pumps, sprinklers or systems of localized irrigation) to bring the water up to the cultures, allows to produce in against the season regardless of the conduct of the rainy season. However, it is expensive and therefore is not in the scope of the rural households. This which consolidates the alienation of their activity to the climate, thereby amplifying the vulnerability of the producers to the variabilities and to climate change.

Has Mandouri, irrigated agriculture is not practiced which aggravates the vulnerability of producers and limit the level of resilience in the actors of the sector of agriculture. Indeed, during the rainy season, producers benefit of the waters of the floods of water courses; but in the dry season, c is the total shutdown of agricultural activities and the absence of irrigation systems does not allow to practice of the cultures of against season or the market gardening which constitutes an important source of income in some prefectures of the Savanna region.

c. Socio-economic factors of worsening of the vulnerability

In this category of factors amplifiers in the vulnerability, the growing poverty of farmers, is the main factor.

(i) Poverty

In accordance with the studies on poverty in Togo, the rural areas are the home of poverty with a percentage of 68.9%; poor households representing about 74% of rural households. The increase in the poverty of rural households is a real brake on the investment own producers for the modernization of the techniques of production, access to inputs of quality, the maintenance of the cultivated areas, animal care and the promotion of an agriculture case. It is the main reason for the maintenance of subsistence agriculture.

The savanna region is one of the poorest regions of the Togo of the fact of its precariousness pédoclimatique and recent ecological disasters related to climate change. And the prefecture of Kpendjal is the area where poverty is most rampant in Togo, with an incidence of 96.5%.

(ii) The level of education of producers

The results of the National Census of Agriculture indicate that the farm population is predominantly illiterate: the proportion of the agricultural population having reached at least 1 degree is 38.5% (2012). This low level of study determines the degree of intellectual openness toward the modernization of agriculture, in particular the investment in technological innovations. It is, before the poverty, the reason for the commitment to the ancestral techniques of production and the traditional seed (85.1% of the farm population), as well as to the reluctance of producers vis-à-vis the technical framework deployed by the services of the Ministry of Agriculture. This low level of schooling of producers is a predisposition to vegetate in traditional agriculture, which aggravates the vulnerability not only of plant production systems and animal, but also and especially the vulnerability of the actors themselves. Has Mandouri, the level of education of young people is low. The young prefer abandon very early in the school to migrate to the neighboring countries and the Nigeria. The schooling of the young girl is low often overtaken by the early marriage.

(iii) The pressure on the perimeter built

The problem of access to the land constitutes, in the greater part of the time a blockage to the development of the territory and particularly for the facilities agro pastoral and forestry.

In Togo, the earth belongs to the local communities and access to land by succession is done to the detriment of the wife, even if women represent 50.6% of the farm population of the entire country (4th national Census of Agriculture 2011 - 2014; August 2014). Between other problem related to the Access to the earth, the demographic pressure: in some parts of the country in particular in the area of Kara, the West, the North and the south of the Savanna region and the Maritime region, the increase in the population compared to the narrowness of the space has lead to the fragmentation of plots and overexploitation of agricultural land.

Has Mandouri, the land pressure is still low compared to the rest of the Savanna region particularly in the Prefectures of Cinkansé and tone.

According to the blueprint of the prefecture of Kpendjal, the extension of the city of Mandouri does not pose a threat to the perimeter of the 500 ha available for the facilities hydroagricoles.

However, with the establishment of irrigation schemes in the framework of the "project of strengthening the resilience of vulnerable communities in the agricultural sector of Mandouri in northern Togo ," this locality can quickly be faced with a strong land pressure because of the influx of allochthonous producers. Conflicts may arise between the Aboriginal producers and the allochthonous. From this point of view, access to the perimeter built may be an aggravating factor the vulnerability in the medium and long terms especially for women.

d. The factors of a worsening of the vulnerability related to the Agricultural Policy of the country

The Agricultural Policy implementation in Togo is focused on the mechanization and modernization of the sector. However, even if the climate change are cited in the agricultural policy of Togo as a major risk which it must take into account, the control of water as a response to climate anomalies is not at the heart of the actions on the ground. In addition, the low level of development of the chain of values (conservation-processing-marketing of products) that aggravates the inability of producers to find by themselves, other opportunities outside of the national agency of the food security (ANSAT), the absence of a policy of insurance of producers face the vagaries of the weather and the rates too high of loans granted to producers (up to 18%), strengthens the vulnerability of agricultural producers. In addition, there are no mechanisms to facilitate the access of farmers to finance. All these factors combined to low coaching of producers predispose producers to a high vulnerability to the adverse effects of climate change.

In the particular case of Mandouri, of the problem of conservation-processing-marketing, producers have noted the variety of rice IR 841 promoted by the Department of Agriculture because of its high performance. According to the producers, this variety is inappropriate. Because, by report to the local variety, the plants of the ir rice 841 are small in size and therefore little resistant to floods. In addition, this variety would be less profitable than the local variety (paddy rice) today Dethroned. In addition, the taste less interesting of the ir Rice 841 does not favor the flow of the production at the local level.

e. The factors of a worsening of the vulnerability related to the social status of women

Women are very active and even constitute majority of agricultural producers to Mandouri. They have organized cooperatives and in organizations for the promotion of women influential.

However, the weight of tradition still maintains practices of discrimination of the woman as well among her husband that among its parents. To this effect, the women do not have right of succession. Early marriage and forced marriage are still practiced in the name of tradition and poverty. In addition, women are little educated and illiterate in their majority. A few paralegals have been trained but are not operational.

3.3.2. Analysis of the impacts of climate change to Mandouri

a. Vulnerability of forest ecosystems

The increase of rainfall and temperature, would entail an increase of the production potential of wood. But this potential would be affected by the increase in evapotranspiration, the growing demand for wood energy and the resurgence of vegetation fires attributable to the drying of the herbaceous stratum. Similarly, the floods which will

result from the increase in rainfall could reduce the productivity of wood in the forest formations of flood areas precisely in the alluvial plain.

At the national level, the third national communication on climate change, indicates that at the Horizon 2025, the natural formations and plantations will suffer a significant decline in their productivity may vary between 18.3% and 27% in the worst-case scenario. The deficits in timber could vary between 8.99 million m3 to the Horizon 2025 and 85,36 million m3 to the Horizon 2100 if nothing is done; and the classification of regions on the basis of the vulnerability indices place the savannah region among the most vulnerable in the country.

Knowing that the savannah region is a region pseudo Sahel, forest ecosystems are of a very high sensitivity to climate variability. Thus, with the increase of the temperature and evapotranspiration, ecosystems will experience disturbances that will result in the reduction of the productivity of woody formations and the loss of biological diversity (with total disappearance of some species demanding in humidity) that will exacerbate the intensification of vegetation fires.

Knowing the biomass-energy (fuelwood, charcoal, agricultural residues) constitutes the main source of energy of the household to Mandouri, where it represents almost 100% of the final energy consumption of households, they will be exposed to crises of wood energy; this which would intensify deforestation, the invasion of the protected area and the drudgery of women. If nothing is done in terms of reforestation, the deficits in wood-energy can increase the consumption of agricultural residues (stalks of corn, millet and sorghum, etc.) thereby depriving the agricultural land of an important organic fertilizer. This can lead to the total abandonment of mulching of the fields that are currently practiced in the fields.

In the field of renewable energies, the increase in the amount of sunshine would imply an increase in the performance of photovoltaic installations, which constitutes a de facto positive impact on the potential for solar energy. However, a significant increase in the level of temperatures could lead to a decrease in the performance of solar equipment.

b. Vulnerability of water resources

Has Mandouri, climate change will result in a decline in surface water of the fact of the increased evaporation, and the level of groundwater recharge. However, it may happen that the flows of water courses increase consecutively to the increase in precipitation; which will lead to serious flooding particularly in the alluvial plain of the system Oti, Kpendjal, Oualé Sansargou and. These floods could affect agricultural production including that of the rice to Mandouri. The damage will be more important if the variety of rice grown is not adapted.

Floods and the severity of low flow of streams can be amplified by the dropped or not water dams of Bagré and landscaped Kompienga upstream on the territory of Burkina Faso, which is likely to aggravate the impacts on the availability and the quality of the water.

The drying of water points will cause conflicts between the different users particularly during the long dry season.

From the point of view of drinking-water supply, Mandouri is already facing a low access to drinking water. In the dry season, the wells dry up as well as some drilling (according to the inhabitants). This situation will turn the populations to water courses including the poor quality of the water would be aggravated by pollution by chemical inputs (chemical fertilizers, pesticides, fungicides and herbicides). It will result in a worsening of the chore of water for the woman and the girl. Even for the laundry, the women will be in the obligation to go to the River Oti what will constitute an additional risk of an alteration of the quality of drinking water.

With the increase in the evaporation of surface water quality will be altered, exposing consumers to diseases related to the water. Combined with the massive use of chemical inputs, the evaporation of surface waters will expose consumers to the health risks associated with chemical products: poisoning, skin diseases, respiratory problems, sterility, cancers, asthma, attacks the nervous system and the reproductive system.

c. Vulnerability of soils

The soil to form under the action of several processes including: (i) the disaggregation and the alteration of the Roche-mother by the water and the thermal variations; (ii) the formation of humus in function of the present vegetation and conditions of temperature and humidity; and (iii) the migration of minerals. These processes are therefore highly dependent on climate conditions in the middle. However, the warming and the climate change to Mandouri should translate in the future by the increase of the temperatures and the disruption of the water cycle. This will result in the level of the soil by:

- The decline of the moisture (consecutive to the increase of the evaporation), and therefore the slowdown of the degradation of organic matter and transfers of minerals;
- The modification of the type of organic matter made by the vegetation because of the abundance of CO2 in the atmosphere;
- The modification of the mechanisms of erosion and sedimentation.

All this will modify the conditions chemical and biological characteristics of soils and therefore their evolution, with the result the intensification of land degradation and desertification which are currently an important environmental problem at Mandouri. This transformation of soils impactera in his turn the vegetation, the terroirs and agriculture.

d. Vulnerability in the sector human settlements and health

In the project areas, floods and strong winds will have serious impacts on housing and on the road infrastructure and equipment socio-economic. The fact of its configuration morphological, Madouri in the rainy season is surrounded by water giving the impression of an island. This situation may worsen and lead to the total isolation of the locality on more or less long periods.

On the plan of the health, the increase in precipitation would result in the proliferation of vector-borne diseases such as malaria and diarrheal diseases such as cholera.

Droughts and high heats will exacerbate the prevalence of diseases such as respiratory diseases (bronchitis, pneumonia, asthma, etc.), the cardio-vascular disorders and cerebrovascular disease. It would be the same for the cerebro-spinal meningitis in the instance whose the epidemic is almost all years in the savannah region.

e. Vulnerability in the agriculture sector

In the plant sector, cereals (maize, rice and sorghum), which constitute the basis of the power supply, are particularly vulnerable because of their high sensitivity to water stress, especially at the flowering stage. Thus, the moisture deficit will cause a decrease in productivity while the Proliferation of insect pests can inflict great losses of crops to producers. With the drying of the climate in the area of the project, the risk of occurrence of vegetation fires will be higher inducing serious crop losses.

In the case where one would attend the concentration of rain on short periods of time, the excess moisture in the soil will result in the proliferation of micro-organisms parasites of plants and pests (fungi and bacteria) that will attack the root system of plants, resulting in wilting of speculation flooded.

In addition, the increase of the concentration of CO2 in the atmosphere will be a fertilizing effect for C4 plants, group to which belong the weeds with the proliferation of weeds.

Accordingly, the changes of climate to Mandouri will result in a reduction of yields of crops. These losses, according to the second national communication on climate change, would be included between 5% to 10% accompanied by huge losses in farm cash receipts particularly for small producers structure, thus undermining food security in the country.

The decline of plant production will be even more important due to the intensification of the phenomenon of land degradation due to the worsening of the gully and erosion as well as to the use of herbicides and chemical fertilizers, deforestation and to the Lights of vegetation. The fact of the decline in the production of food, the risk of occurrence of food shortages and famine and multiplication of cases of malnutrition in the savannah region in general is high. In addition, the alteration of the quality of certain cereals and legumes constituting the food base in Togo, such as corn, sorghum rice and soya, will increase the cases of malnutrition, especially among children.

In the sub-sector animal, a decline in livestock production resulting from the depletion of water points, the degradation of pasture, the resurgence of certain diseases, including the under-supply and trypanosomiasis in cattle in particular the zebus, the death of livestock and the avian plague which deplete the poultry.

While the abundance of rain will foster the resurgence of certain diseases, including avian influenza, trypanosomiasis in cattle in particular the zebus. Could attend an outbreak of the price of the meat and eggs.

f. Impacts of climate change on the producers and their households

With the reduction of animal and vegetable, the households will see a drop in their income. This situation will worsen with the increase in operating costs associated with the impacts of climate change (floods, droughts, proliferation of pests and weeds) and the increase of crop losses.

The proliferation of diseases will be of social and economic impacts on the life of households who will have to invest more in health. During this time, floods and strong winds will cause economic losses and in human lives and increase the rural exodus and the number of displaced persons in climate.

The decline in household incomes, combined with the increased expenditure of households for the health of their members and to the costs of the damage and injury caused by the climatic disasters will reduce the capacity of producers to invest in their activities. And if the access to inputs and to basic services, mainly to access to drinking water and to health services of quality, are not improved, the populations of Mandouri risk s further impoverish.

The result of these impacts is the emergence of a new category of unemployed, of which the rural exodus can create additional problems in terms of climate refugees, employment (conversion), installation, housing, food and sanitation. This would add, because of the increase of the population, to increase the dependence of the countries in rice vis-a-vis the outside. Knowing that the Togo annually imports 100,000 tons of rice which is equivalent to approximately 4 billion FCFA, it is possible that the invoice to import rice become too heavy to cause serious disruptions of stock of rice resulting, by snowball effect, the outbreak of the price of foodstuffs.

The fact of the decline in agricultural yields and the worsening of the degradation of the land the actors of the sector will be brought to launch into the wild exploitation of protected areas with risk of triggering of popular uprising against the mode of management of protected areas.

In addition, taking into account the configuration of geomorphological locality, it is likely that floods spectacular destroy the road infrastructure or make them impassable, thereby cutting Mandouri of the rest of the prefecture. This destruction of infrastructure corsera the difficulty of flow of agricultural products, reducing the incomes of producers and then falling within their insolvency vis-à-vis financial institutions.

3.3.3. Analysis Of The Capacity Of Producers To Deal With The Adverse Effects Of Climate Change

In a first time, it should be noted that traditionally, practice the Association of cultures that is to cultivate on the same parcel at the same time, cereals and legumes. This ancestral technique allows to improve the fertility to obtain better yields.

The producers also associate, crop production and animal production. The association of these two activities constitutes an advantage not only in terms of availability of manure to improve the yield of crops, but also and especially in terms of the income of households.

From the point of view of techniques of production, it is essential to stress that in the favor of the awareness of the occurrence of climate anomalies, some producers practicing the mulching, putting manure and struggling against the erosion of land by the establishment of stony cords. In addition, the proximity of water courses in the Oti and the Oualé constitutes a natural advantage that can strengthen the capacity of adaptation of the producers.

The fact that the producers would be organized in cooperatives is a factor of strengthening their capacity for adaptation and resilience. In effect, through the co-operatives, producers can have access to financial support which they would not have individually access, easily pay the operating costs, to face competition on the markets, create a savings account common to cope with contingencies and invest in income-generating activities, etc. However, these co-operatives are for the time young people and many of them lack dynamism.

These factors indicate a low capacity of producers to face up to climate shocks. To build the capacity of adaptation and resilience sustainable, it seems essential to develop income-generating activities associated with the different components of the project.

4. PROPOSAL FOR A STRATEGY OF ADAPTATION OF AGRICULTURAL PRODUCERS OF MANDOURI TO FUTURE CLIMATE CHANGE

The strategy for the reduction of the vulnerability and raise the resilience of agricultural producers must have the objective to ***increase the sustainable productivity and farm incomes through the promotion of solutions and intelligent approaches to climate and adapted to the context.***

This strategy is built around three pillars: (i) the Food and Nutritional Security; (ii) the reduction of poverty and social inequalities; (iii) the protection of livelihoods of vulnerable layers.

Specifically, the strategy for the reduction of the vulnerability and raise the resilience of agricultural producers in the Togo comprises the following axs:

Strategic axis 1 : Strengthening the Resilience of production systems to climate change

The actions to be carried out are:

a) Production and provision of seed producers improved in terms of earliness and productivity

The fluctuations in rainfall interannual hardly predictable usually manifest by rains poorly distributed. They are challenging the varieties of seed hitherto used by the peasants of the Sahel and whose cycle is more or less long. This factor combined with the degradation of

soils is that the seeds are no longer able to maturation of the fact of the change of the seasons. This can impact on the food security of the community. Thus, the initiatives of adaptation on the production and provision of producers of improved seeds constitute a relevant answer.

The use of short-cycle varieties, associated with initiatives for restoration of degraded lands, allows to coincide, at best, the cycle of culture with the rainy season and thus to reduce the period of water stress in the end of the cycle. These seeds are on the speculation essential for the supply of the Populations: millet, maize, sorghum, cowpeas, rice and peanut.

To do this, it is important to identify the local varieties adapted and resilient to constitute a genetic basis.

b) Restoration of vegetation cover, soils, and the adoption of new agricultural practices

The reforestation and the protection of plant species will allow for the reconstitution of woody formations, kind of hedges limiting wind erosion which led to the loss of the soil and its nutrients, other consequences of climate change. The reforestation increases the plant diversity, the organic matter and the moisture of the soil. It reduces the surface runoff. These effects will have positive impacts in significant impacts on the increase of agricultural production and the diversification of sources of income that will reduce the vulnerability of peasants to poverty and the vagaries of the climate. These developments are therefore effective ways to adapt to drought or to torrential rains more frequent, while cushioning the effect of climatic shocks on the Productions grain and forage crops.

Climate Change and Variability accelerate the degradation of plant cover and make vulnerable soils to the erosive effects of the wind and the water. These soils have been cultivated for decades often with an inappropriate use of mineral and organic fertilizer without a correct restoration of their fertility. This has led to a strong mineralization and a rapid loss of their organic matter content. If the current trend of global warming continues, the performance of the agriculture in the savannah region will be more affected.

The actions aimed at restoring degraded soils and to develop sustainable agricultural practices are a good option for adaptation to climate change. Actions identified for Mandouri are:

- The installation of stony cords;
- The reforestation, the protection of plant species: promotion of reforestation to energy purpose, creation of a green belts around Mandouri and around the landscaped perimeters, etc.
- The promotion of the natural regeneration assisted;
- The promotion of the integrated management of the fertility of the soils;
- The promotion of agroforestry (for example with the *federbia albida*);

- The Association and the intelligent rotation of crops;
- The promotion of the intensive rice cultivation;
- The development of the beekeeping associated to reforestation ;
- The promotion of the farmed and not conventional to the satisfaction of the needs in food containing meat;
- The qualitative and quantitative increase in the supply feed, allowing to build up a stock of hay or a reserve on foot;
- Support for the establishment of practices agro-forestry;
- The fight against the degradation of the land by the strengthening of the integrated management of the fertility of the soils (gifs).

c) Protection and follow-up and assessment of water resources

The permanent availability of the water for the irrigation of crops constitute the sure way to mitigate the impacts related to the poor distribution of rain, the false starts of the rainy season and the early end of the rainy season and to produce against season. In doing this, producers will increase their income in intensifying their activities and diversifying their activities. The activities to lead to this effect are:

- The improvement of the knowledge of water resources;
- The construction and/or rehabilitation of the deductions of water for micro-irrigation and livestock watering in rural areas in all regions;
- The strengthening of the awareness on the management of water resources in the agricultural sector;
- The promotion of the actions that can reduce chemical pollution of water resources;
- The rehabilitation and restoration of the forests Gallery.

Strategic axis 2 : Information and awareness on climate change

The communities as producers need to be better informed and better equipped to cope with the consequences of climate change. Saw the need and the importance to inform and raise the awareness of the population on the phenomenon, the United Nations Framework Convention on Climate Change have registrant" information and awareness" as strategic axis in its article 6.

The awareness and the sharing of information are essential for the implementation of adaptation strategies to climate change effective. This action has the advantage, not only to inform and raise the awareness of peasants and local decision-makers, but also to disseminate, some initiatives of adaptations to climate change which are in the process of being carried out in the areas of intervention of the project. The issue being to stimulate reflection, to forge an informed opinion, inspire local innovations and strengthen

opportunities for collaboration around activities that reduce the vulnerability changes and to climate variability.

To this effect, the actions to lead to Mandouri are:

- The deepening of the knowledge on the climate and the provision of climate information reliable;
- Raising the awareness of the Community on the adaptation to climate change;
- The electrification of the young weather station;
- The provision of qualified staff;
- The staffing in additional equipment to produce climate forecasts reliable and training of technicians in the field;
- Establishment of a warning system to inform in real time the Community and the producers in the event of flooding.

Strategic axis 3 : Promotion of new technologies for energy saving and renewable energies

The irrational exploitation of timber resources, combined with rainfall deficits recurring, lead to the scarcity of fuelwood, the main source of energy of the rural populations of the Sahel. Such a phenomenon is considerably accentuating their vulnerability to climate change. To continue to survive in this unfavorable environment where the issue of the energy becomes more and more problematic, the community of Mandouri, must resort to practices and technologies that are less consumers of wood.

The actions envisaged are the following:

- The promotion of improved homes in the clays;
- The training and the promotion of techniques for the carbonization at high yields;
- The promotion of the manufacture of charcoal briquettes from debris of coal and plants;
- The training of groups of women in manufacturing of improved homes in clay and dissemination of improved homes ;
- Staffing of cooperatives in Solar kit for the irrigation and husking rice;
- The training of producers in artisanal production of biogas from waste to animals.

Strategic axis 4 : Diversification of the sources of income of producers

a) Development of practices to improve the supply of livestock in the dry season

The reduction of the pasture areas, the scarcity of water points, the emergence of new animal diseases, the reduction of the cycle of droughts are all indicators that attest to the vulnerability of animal resources to climate change. The forage resources begin to know a degradation in quantitative and qualitative terms due to the deficit of the water supply

which limit the primary productivity of pastures and of the fertilizing effect of the deposit of atmospheric CO2. The performance of the operations of embouches and dairy production of livestock are negatively affected.

In order to assist the pastoralists and agro-pastoralists to reduce the vulnerability of their animals in the face of climate change, it is urgent to find an alternative for small family farms holding cattle in order to enable them to fill the food deficit of their animals and to maintain or even develop a dairy production source of income and food.

These initiatives focus on:

- The development of forage crops (cowpeas feed, maize and sorghum feed), mowing, the silage and the conservation of the green grass for livestock feed in the dry season;
- The development of the marketing of fodder;
- The development of grazing and water point for the abrèvement of animals in the corridors of transhumance.

b) Development of cultures of against season and the market gardening

Agriculture and livestock which essentially depend on the populations of the Savanna region, are dependent on climate variations. A good rainfall allows farmers and ranchers to increase their incomes and improve their living conditions. Unfortunately, the rainfall deficits important disrupt, for decades, the productions of plant and animal, experiencing economically producers and households.

In the face of this situation, the diversification of income-generating activities (AGR) constitutes a strategy to fill the decline in financial resources. The AGR envisaged deal on:

- The development of the farming of poultry (including the breeding of guinea fowl) by the improvement of the local breed;
- The development of the market gardening and cultures of against season in dead period;
- The development of horticulture and the production of fruit;
- The development of fish farming and the production of freshwater turtles.

Strategic axis 5: Institutional support, capacity-building, the capitalization and dissemination of good practices and knowledge generated

It is the actions on all fronts that can sustain the actions of strategic axs more top presented. It is of priority actions:

- The improvement of the access of small producers to credit and other factors of production essential.
- The awareness of the actors on the rational management of natural resources in connection with the fight against climate change;
- The strengthening of the beneficiaries in financial management of cooperatives and techniques of maintenance of equipment;
- The formation of producer co-operatives in entrepreneurship;
- The strengthening of the technical supervision of the producers (Council on the techniques of production intelligent in the face of climate and restoration of degraded lands);

- The training of producers on the techniques of production intelligent in the face of climate and restoration of degraded lands;
- The strengthening of the capacity of the institutions responsible for agriculture and water on the integration of climate change;
- The establishment of a financial mechanism and insurance for producers;
- The construction of modern stores of storage of the products in particular the rice;
- The promotion of the packaging and the transformation of vegetable products and fruit;
- The development of the commercial stream of agricultural products;
- The establishment of a system/mechanism of capitalisation and dissemination of good practices and knowledge acquired in the framework of the projects at local and national level.

CONCLUSION

This analysis highlights the level of vulnerability of the community of basis of Mandouri to climate change. It is clear from this analysis that the proven risks related to climate change threaten the livelihoods of agricultural producers, of Pastors and their households. Impacts related to climatic vagaries are unfortunately reinforced by the state of degradation of natural resources and the environment, poverty and inequalities to the detriment of the wife.

In order to secure, on the medium and the long term, the means of subsistence, to sustainably reduce poverty and allow producers to the locality to support sustainable food security and the economic growth of the country, it is important to promote production techniques intelligent in the face of climate change and to strengthen the involvement of women.

To this effect, the implementation of the ***"Project for the rehabilitation of the level of resilience of vulnerable actors of the agriculture sector to Mandouri, in the north of Togo"*** constitutes an opportunity to raise the challenges of climate change in the locality of Mandouri.

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GENDER REPORT

INTRODUCTION

Women and young people play a leading role in the development of the country in general, and the agricultural sector in particular. Unfortunately, despite this significant contribution of women and youth as subsistence pillars of the economies and food security, they continue in practical life to face certain inequality, despite efforts by the Government of Togo and the many development partners. The inclusion of gender considerations is nowadays a must for ensuring lasting impacts of development projects. Also, it is important to explicitly recognize the contribution of men and women in the development of rural areas.

I. GENDER ISSUES IN AGRICULTURE A Mandouri

In the field of agriculture Mandouri, gender analysis shows that women and youth are faced with obstacles that they are often specific. these categoriesexperimenting more gender-related issues. Their name limited access to land, agricultural inputs, financing, processing and markets.

1.1. Low access to property and land use

Investigations in the project area have shown that women and young people have no right to land ownership. Whether enquired from women, men, landowners and canton chiefs, all have said that women have no right to land ownership. That is why in case of land dispute, the woman always comes out the loser. This is especially true in instances of resolution of conflicts related to land and especially those related to the illegal expropriation of women, women are not represented. Generally, women and young people do not participate in decision making within traditional management bodies of land disputes.

The fieldwork for this study showed that women have a right of use. Women do not control the land or other natural resources or even control the benefits arising from their development.

Indeed, Mandouri women collect non-timber forest products such as locust bean, shea fines, collect firewood, but with the permission of the landowners. In this respect it should be noted that men and women cultivate an individual plot. Men cultivate groundnut on relatively remote plots, women can also benefit from land loans but for a very short time (one to two years). Until now, they have been given lowland lands that are difficult to develop.

1.2. Access to agricultural inputs

Agricultural inputs refer to seeds, fertilizers and mechanical equipment. The access of women and young people to inputs is very limited and difficult. The wife is totally dependent on the husband or the head of the household who controls the management of household resources (land, crops, money, livestock, etc.). The woman has no guarantee that she will have access to credit to access by purchase / lease to the factors of production, even the efforts made by the government in recent times to make available credit to women with inclusive finance. The problem remains rampant, which explains the departure of young people to the rural exodus and the condemnation of women to their alarming state of poverty.

1.3. Gender report in community decision-making bodies is unfavorable to women

In Mandouri the agricultural decision-making process promotes the ideas of men than of women. As a result, women are often subject to decisions taken by men. In community-based structures such as Village Development Committees (CVD), women are certainly present, but do not occupy strategic positions. They control the positions of Treasurer and Consultant. The field work carried out did not reveal cases where women are heavily represented in community economic decision-making bodies.

Only in their groupings do women grow their ideas and decisions. In specialized producer organizations such as groupings of Cotton Producers, women are absent because of not practicing cultivation of cotton and other cash crops.

It should be noted that there is a prefectural federation of groups of Kpendjal that facilitates the flow of grain products from the farmlands to link members with wholesale buyers such as the National Agency for Food Security in Togo (ANSAT).

1.4. The economic activities of women Mandouri.

In Mandouri, women have organized themselves into groups. They are active in agricultural production activities for growing such main crops as cowpeas, rice, soybeans, corn etc. Vegetable crop production are also practiced by women in often undeveloped lowlands. The women of Mandouri are also active in the grain trade. In the case of animal husbandry, women are more aggressive in raising pigs, and also poultry and, to a lesser extent, goats.

1.5. Gender Report in Supply Chains.

The modern or semi-modern pig farming, the processing of agricultural products including shea butter, rice growing, fruit and vegetable crops and cotton growing are considered the most promising sectors for women in Mandouri. It should be noted, however, that women are almost absent from cotton growing and fruit trees. On the other hand, they are very present in subsistence vegetable crop farming and in rice growing where they are dominant. And this has produced some changes in organizational dynamics, literacy, increased agricultural production, reduced famine, the development of cereal trade with the increase in group turnover and so on.

Overall, gender analysis shows that women and young people are the least favored compared to men and adults.

1.6. The Gender situation in Mandouri compared to other parts of Togo

According to the 2010 census, the Savannah region of Mandouri has the lowest proportions of rural households and female-headed households. The average age of household heads by women in the Savannah region of which Mandouri is a member is 45 years and for men 47 years. The illiteracy rate of heads of household is higher in the Savannah region and it is higher among women at 85%

against 64% for men.

Moreover, women in the Savannah region are more dependent on agriculture than men, as 44.2% of male heads of households engage in non-agricultural activities, compared to 41.6% of women.

On the other hand, there are more female heads of household engaged exclusively in livestock, 3.2% against 1% for men.

In the Savannah region, 24.3% of male households practice irrigation, while for female heads of households only 10.2%.

More than 80% of male heads of households practice temporary crops, compared with less than 20% of female heads of household.

The proportion of farm households headed by men practicing vegetable crops is 93.9% as against 6.1% for women.

In Mandouri, very few female-headed households use cash crops. This situation can be explained by women's difficult access to land, linked to obligations or restrictions imposed by customary law. Generally in households, the allocation of land is not equitable, especially when it comes to establishing perennial crops. In the case of leasing or leasing of land, for example, only the practice of food crops or temporary crops is permitted on land.

As cash crops in the Savannah region, there are mainly cotton and cashew nuts. And it is in the cashew production that women are more active compared to cotton.

In terms of fruit crops, the Savannah region has the smallest proportion of heads of both male and female households who grow fruit, irrespective of the fruit. However, it should be noted that 27.5% of heads of female households in this region grow mango trees.

II. THE FACTORS BLOCKING WOMEN'S ACCESS TO PRODUCTION FACTORS

2.1. Political factors

The political orientation of women's access to land is difficult for rural women. There is no policy transmission link at the rural level. Similarly, the legal, legislative and regulatory arrangements that govern land tenure management in Togo are largely ignored by rural communities.

Social organization in Mandouri and other rural areas is based on phallocratic management. Indeed, usually the woman is not associated with making decisions, especially when it is to handle serious business. Even in the organization of agricultural planning, women do not participate in the choice of the crops to be harvested, nor in the distribution of plots by fields, nor even in disposing of a land which they will have the right to control.

2.2. Socio-cultural factors

The analysis of women's access to land and other natural resources in Mandouri shows that sociocultural factors are the major impediments to women's access to and control over land and other natural resources.

Traditionally, women in all Mandouri clan and ethnic groups have only indirect access to land. They generally benefit from plots of land acquired through a third party (usually a man: husband, head of lineage, other relative with the consent of the spouse, etc.) for their production, but have no control over the resource. In some cases, some landowners take away the land already sold to women after they have been developed for a few years and allocated to them poor land that they are forced to amend with the fertilizer.

Traditional and customary practices, the misinterpretation of the provisions of the Muslim religion and the level of education of rural women are real obstacles to the access of Manduri's wife to the land. Other sociocultural factors such as ethnicity, the place of women in family food strategies, the geographical location and history of

each area, the socioeconomic status of the spouse, religion, the importance of the network of social relations Of a woman, residence status also constitute constraints on access to land for women. These women do not dare to attack fathers, husbands, brothers or cousins before the conflict resolution authorities.

2.3. Traditional religion

In Mandouri, it has been reported that women have no access to land due partly to the fact that only men can take some religious roles such as making offerings to fetishes and those providing this role are those who manage the land.

2.4. Poverty

Mandouri is part of the area where poverty is most severe in Togo and affects 96.5% of the population. This situation does not facilitate the lease or purchase land rich and geographically close to residential areas by women.

III. INITIATIVES FOR WOMEN

Women's groups such as Songuimame Kanfiaguine and are supported to sometimes have loans for income-generating activities (donated materials and seeds to Lando group for market gardening), for the storage and resale at a profit, for the relief of housework with the mill offers (for Songuipale group). The groups Songuimame, Songuipale, Souglimane, Kanfiaguine, Lando also received support Azato in funding, training, donation of equipment, construction of enclosures. Women's groups that received support better operate in comparison to those who did not receive support.

Several organizations have undertaken to support women shares. For example, RAFIA supported in fertilizers, gardening, building warehouses, while ICAT helped in setting up groups, technical support and agricultural equipment. The DRAEP provided training, built enclosures, while Christian and Muslim organizations have helped constructon stores, multipurpose meeting rooms, digging wells and boreholes. Others like 2AE, OCDI and SIRAIB also provided significant support to women Mandouri.

IV. RECOMMENDATIONS ON THE STATUS OF WOMEN AND YOUTH

For more profitable economic activities of women and women's groups, the project in Mandouri should develop strategies to annihilate constraints and propose the following:

- Improving women's access to land,
- Improving the conditions of access to microcredit,
- The organizational capacity and operational capability groupings,
- Networking groups to give their agricultural cooperative skills,
- The promotion of Village Associations of Savings and Credit etc.
- Strengthen organizational and technical capacity of beneficiaries for the development of slums.
- Sign a development contract between land owners and groups for an assignment of the slums of land for a period of at least five years.
- Mean a contract between Group and support structure so that crop planning can be done well and followed.
- Train farmers on the technical route used by different cultures groups
- Train farmers on marketing and organization of marketing channels of their garden produce.
- Capitalize and disseminate successful experiences

Project of « Increasing resilience of communities of teh agricultural sector of Mandouri in the north Togo

Report on stakeholders mapping

Final version

June 2017

Executive Summary

Introduction

The agriculture sector in Togo is confronted to the adverse effects of climate change. These adverse effects are likely to disrupt the food security and to dispossess the two-thirds of the active population of their means of subsistence. To cope with this situation, the Togolese Government has initiated a global project of rehabilitation of the level of resiliency of actors in the agricultural sector in Togo. In the framework of the implementation of this project, it is developed a sub project for the development of 144 ha of perimeter agro-sylvo and pastoral and fish Mandouri in the region of the savannah.

This sub-project will contribute to the control of water under appropriate response of adaptation to the strong climate variability to secure the activities of agricultural productions on the one hand and on the other to promote the diversification of means of subsistence, the valuation of agricultural products and the improvement of the local governance for a better taking into account of the adverse effects of climate change and the climate variabilities.

It is in this context that were initiated several studies, some of which require the identification of stakeholders.

I. Methodology

- ***Documentary analysis***

The process of identification of stakeholders was based on the provisions of Decree No. 2012-006/PR of 07 March 2012 concerning the organization of the ministerial departments on the one hand and on the other hand on the activities covered by the Sub-project through the available documentation.

At the level of activities, have been identified the development hydroagricole, plant production, fisheries production, the use of solar energy, etc.

- ***Field visit.***

The field visit has consisted in:

- On Monday, 15 May 2017, the team of the mission had however to meet before the Regional Director of the Environment to the Mango.
- On Tuesday 16 May 2017, the team visited Mandouri where she met with the Director of the Prefect of the environment. A working meeting was held in the presence of the President of the ZAAP and his adviser, of a representative of a co-operative (scoops SONGUIMAME) and of a representative of a local organization, the Association GEVAPAF (management of the Environment and the valorisation of the products agro pastoral and forest). It has been briefed the participants on the grounds of the mission. The discussions have led to the organization of another meeting for Wednesday 17 May 217 at the home of the Leader canton in order to bring together the largest number of the population.

Photo1 : Interview with the President of the coope-ZAAP, his adviser, the facilitator of the Association GEVAPAF and the representative of the SCOOPS SONGUIMAME

- It was proceeded to the visit of the site for the project before the return on Dapaong. Has Dapaong in the afternoon, a meeting with the Regional Director of the Plan took place. At the end of this meeting, it was decided to invite the regional actors to a meeting on Wednesday afternoon.

Photo 2: Visit of the area of the Project, Audit of theboundary and limits with the Reserve of Fauna

- On 17 May 2017, the meeting at the Chief township of Mandouri took place and experienced a strong participation of members of groups of producers of rice forming

the cooperative of the ZAAP coope (ZAAP-). However, it has experienced the presence of only two (02) co-operatives are not members of the coope-ZAAP, the Cooperative SONGUIMPALE II and the scoops SONGUIMAME.

Photo 3: Meeting with the beneficiaries in the presence of the Chief township of Mandouri and the Director of the Prefect of the Environment

The meeting with the Regional Directorate of the plan in Dapaong, was held at 16h and has experienced the presence of a dozen regional actors.

- On 18 May 2017, a final meeting consisted of an interview with the Regional Director of the hydraulic unit.

Photo 4: Interview with the Regional Director of the hydraulics/Savannas

Some actors have not been able to be encountered for various reasons but due diligence has been made for their contacts.

In the course of these sessions have been administered questionnaires to a part of the actors encountered (cooperatives and producer groups, associations, NGOS). Interviews were also conducted with some actors (decentralised services regional and local).

II. Data collection from the recipient populations and of local actors

It is clear from the meetings with the Director of the Prefect of the environment, the Chief canton, the various cooperatives, the members of the different groups and local NGOS, the following elements :

- The ZAAP who will make the object of this project, is operated by a cooperative named coope ZAAP-formed by six (06) Groupings (Momba, Lampouguini, Timondiba, Timombiguini, Talkitandi and Timonde);
- That cooperative grown mainly of rice and exploits only 50 ha of the total plot dedicated to the project;
- The operation of the site is collective but individual since each has its plot;
- On the ZAAP c is the ir rice 841 which is product;
- The Coope ZAAP-remains open to the accession of other cooperatives or groups who will demonstrate the willingness, subject to compliance with the rules that govern the ZAAP, for the sustainability of the project;
- The local farmers are in the same time ranchers to where the lack of a community of ranchers in hand ;
- There are however of breeders transhumants who borrow a informal corridor and prohibited by the authorities, which passes in the project area;
- These farmers are often foreigners, very aggressive and evil which the beasts rioted the cultures of local producers;
- The co-operatives have difficulties in access to loans from institutions of microfinances which, practice of interest rates a little high, sometimes reached 18%;
- The local populations do not preserve the plants from the nursery foreseen by the project that, if they have an interest, where the proposal to join the beekeeping.
- The local populations want it either the project assistant a market gardening component;
- It should be the prohibition of the passage of the ranchers transhumants ;
- It must be proceeded to dessouchement of the trees of the site which prevent the passage of the tractors;
- Make a closing of the site with trees and strengthen the side where the wind is more violent;
- Establish a belt of trees around the entire community of Mandouri ;
- See the possibility of draining the water of the river, the treat and distribute it to the populations;
- Equip the population of Mandouri of drinking water;
- Train the young people for raising the awareness of populations on the bush fires, deforestation and its consequences;
- See if it is possible to close the site with the roasting and divert water for the grazing animals in order to prevent their ravaging of cultures;
- Restrict the 500 ha previously given before identifying the party to arrange for the project and the grazing;

- Equip the coope ZAAP-of a trailer, a combine and a planter;
- Assist the producers in seed and fertilizer with option for reimbursement after the crops;
- Adjust the problem of outlet for the flow of rice produced.

III. Data collection from the governmental technical services and NGOS

The interviews with the deconcentrated services of the State, associations and NGOS at the regional level have highlighted the different points:

- The major difficulty that meets the agro pastoral projects is the divagation of animals;
- In relation to the forestry, it should be the preferred local species with high added value;
- The beekeeping values the agroforestry and prevents the populations of clearing;
- Make a awareness in depth to involve enough of the populations in the project to conduct;
- The region is very prone to bush fires and to siltation of the facilities;
- The water can be difficult to access in the area of the project, and the water dried up quickly in the wells ;
- The beneficiaries of similar projects have had difficulty in repaying their loans from financial institutions;
- The emphasis must be on the appropriation of the project by the local populations which is a pledge of its sustainability;
- It must be taken into account in the post project;
- There is a need to depoliticize the projects since the political problems often mix to the failure of the latter;
- If it is necessary to put in place a project management unit, it is slight ;
- The choice of culture of the populations must be taken into account and not be imposed on them;
- The control of water for purposes agropastoralists must be taken into account in the projects to implement in the savannah region;
- It should adopt a holistic approach with a coordination involving various actors;
- The taking into account of the Development of "The gray gold" (breeding of guinea fowl), by putting in place at least a modern farm production of gray gold by prefecture in the savannah region;
- Put an emphasis on the land, on the plan of the definition of the modalities for sharing of managed lands;
- It must take into account the specificities of each area;
- Put the emphasis on the individuality in the collective;
- Also put the emphasis on the fields of demonstration;
- See if the important puncture of the water of the river would not be a source of low water that can provoke conflicts;
- Ensure the security of land since a few times the donor expects a counterparty;
- The communication around the Project is fundamental;

- Conduct a thorough study on the land question.

IV. Key stakeholders

No.	Category of actors
I-	**Technical structures (direct influence on the project)**
	Key structure
1.1	Department of the Environment and Forest Resources The direction of the Environment The direction of Forest Resources *Regional Directorate of the Environment and Forest Resources* *Prefectorial Direction of the Environment /Kpendjal* *National Agency for the management of the Environment*
	Technical structures concerned
1.2	Department of Agriculture, breeding and the Hydraulics Directorate of Plant Channels The direction of the Agricultural Development The direction of the equipment and of Agricultural Mechanization The direction of agricultural statistics The direction of the Elevage Directorate of Fisheries and Aquaculture Water Resources Branch Directorate of Training and of organizations of Agricultural Producers *Regional Directorate of Agriculture* *Prefectorial Direction of Agriculture*
1.3	The direction of the Hydraulics *Regional Directorate of the Hydraulics*
	Ministry of Development Planning Directorate General of Development Planning Directorate General of the mobilization of assistance and the Partnership *Regional Directorate of the planning*
1.4	Directorate General of the Institute of Council and of technical support (ICAT) *Regional Directorate of the ICAT* *Antenna of the ICAT*
1.5	Directorate General of the Institute of Togo to agronomic research (ITRA) *The Regional Center of the ICAT* *Antenna of the ICAT*
1.6	Ministry of Economy and Finance The direction of the cadastre CASIMEC APIM Microfinance institutions
1.7	Department of Mines and Energy The direction of the ENERGIE
1.8	AGETUR
	Implementation Agency
1.9	BOAD
II-	**The communities of basis BENEFICIARIES OF THE PROJECT (interested by the project in the first degree)**

2.1	COOPE zaap-
2.2	LAMPOUGUINI grouping (Member Coope-ZAAP)
2.3	TIMONDE grouping (Member Coope-ZAAP)
2.4	MOMBA grouping (Member Coope-ZAAP)
2.5	TIMOMBIGUINI grouping (Member Coope-ZAAP)
2.6	TALKITANDE grouping (Member Coope-ZAAP)
2.7	TIMONDIBA grouping (Member Coope-ZAAP)
2.8	SCOOPS SONGUIMAME
2.9	SONGUIPAL cooperative II
2.10	ALETAGNEMOU cooperative
2.11	Federation of Women's Organizations of Kpendjal (FOFK)
III-	**Local authorities and administrative policies (concerned by the project in the first degree)**
3.1	Prefecture of Kpendjal
3.2	Special Delegation of Kpendjal
3.3	Township of Mandouri
3.4	Chief of the village
IV-	**Organizations HAS THE BASIS AT THE LEVEL OF THE COMMUNITIES THAT BENEFICIARIES OF THE PROJECT (interested by the project in the first degree)**
4.1	CVD Mandouri
4.2	CDQ tantimagou I
4.3	CDQ tantimagou II
4.4	CDQ tolongou I
4.5	CDQ tolongou II
4.6	Village Association for the Management of Protected Areas
4.7	Prefectural Commission of Sustainable Development
4.8	Commune of Kpendjal 1
V-	**Ngos-ASSOCIATIONS AND STRUCTURES OF ACCOMPANIMENT (interested by the project in the second degree)**
5.1	Association Management of the Environment and the valorisation of the products agro pastoral and forestry (GEVAPAF)
5.2.	Ngos Ecole Africa
5.3	Research, and support and training to the initiatives of self-development (RAFIA)
5.4	Together for a inclusive development and sustainable (EDID)
5.5	Union des Caisses mutual savings and credit of savannas (U-CMECS)
5.6	Federation of Organizations for the development of savannas (FODES)
5.7	Regional Association of Animation and Training for Social Development and Participatory (ARAF/DLP)
5.8	AGAIB
5.9	Village of New Communication Technologies (IT-Village)
5.10	Center of Rural animation Tambimong Ogaro (Carto)
VI-	**Other structures concerned by the project in the second degree**

6.1	Department of Trade and Commerce
6.2.	Central Purchasing and Supply of agricultural inputs
6.3	Superior School of Agronomy/University of Lomé
6.4	The direction of the CADATRE
6.5	Ministry of Health and Population
6.6	Regional Health Directorate
6.7	Prefectural Directorate of Health
6.8	Regional Directorate of Public Works
6.9	Breeders transhumants
6.10	Department of Development at the base, crafts and Youth
6.11	National Agency of Development at the base
6.12	Ministry of Social Action and Literacy
6.13	ANSAT
6.14	Consumers
6.15	Business territory and Development (ETD)
6.16	Business Services and Producer Organizations (ESOP)

V. The technical and financial partners in the area of climate change

No.	**Technical and financial partners**		
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2	FAO	Mr. Oyétoundé DJIWA	Program Officer in the *FAO-Togo* 1307 Avenue of Duisburg Administrative district - Kodzoviakopé, Lome 01 BP 4388 Lomé Tel: +228-22 210411 E-mail: FAO-TG@fao.org
3	World Bank	Dr HOUNKPE Koffi	Responsible of the project to the World Bank Email: Khounkpe@worldbank.org

VI. Areas of intervention of the organizations/structures consulted

No.	The Structures	The interventions	Detailed rules
1.	RAFIA	- Organization of communities at the base and social mobilization; - Promotion of sustainable agriculture; - Promotion of Agricultural Sectors carriers; - Environment and the management of natural resources; - Gender and Development.	- Partnership Agreement; - No prerequisites.
2.	GEVAPAF	- Valuation of forest products (transformation of the shea butter, seeds of locust in mustard, beekeeping); - Social engineering and environment. On the Project: - Organization and structuring of cooperatives of the ZAAP; - Reforestation; - Training of nurserymen; - Training on the beekeeping; - Strengthening of the awareness-raising on the project.	- Partnership Agreement; - No prerequisites.
3.	EDID	- Management of natural resources (water conservation and soil, wooded lots); - Remarkable ecosystems and biodiversity; - Agroforestry and establishment of woodlots. On the Project: - Contribution of its experience in the field of agroforestry, management of natural resources especially the improvement of the fertility of the land; - The AGR relating to agroforestry and beekeeping.	- Contract of partnership; - Prior involvement of the beneficiary actors especially organized groups, NGOS…
4.	U-CMECS	- Collection of savings and granting of credit. On the Project:	- A better organization of the beneficiaries in a grouping;

		- Financial support of the beneficiaries in the strengthening of their AGR.	- Guarantees of repayment; - Involve the UCMECS in the structuring of groupings; - The groups must accept to follow training courses on the management of the appropriations.
5.	ARAF/DLP	- Strengthening of the capacities of the organizations at the base; - Restoration of natural resources; - Agroforestry and reforestation. On the Project: - Organization of the community; - Mobilization of actors; - Preparation of the beneficiaries for the ownership and the sustainability of the project.	- Partnership Agreement; - No prerequisites.
6.	IT-Village	- Agro-ecology; - Beekeeping; - Vocational training; - School canteen; - Construction of school buildings and drilling to the communities. On the Project: - Training of peasant organizations in agro-ecology; - Accompaniment of beekeeping groupings and purchase of their honey; - Strengthening of the capacity of market gardeners and farmers.	- Partnership with the NGOS and the training center.
7.	FODES	- Organization and strengthening of capacities of CSOS; - Representation and defense of the interests of CSOS.	- Partnership Agreement; - No prerequisites.

		On the Project: - Contribute to the mobilization of actors; - Strengthen the capacity of the actors; - Identify the real needs of the community; - Integrate the news.	

Annex 1 : List of persons encountered

No.	Name and Surname	Title/Occupation	CONTACT
1.	LARE Palmague	Regional Director Environment Savannas	98 48 41 47 larepalmague@gmail.com
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7.	KADANSAOU Kossi	Focal point PGICT to AGAIB/S	90 01 56 50
8.	NAWATE Kolani Lorimpo	Service Chief monitoring evaluation ICAT - Savannas	90 06 82 54
9.	ATTISSO Kodjo	INSEED/Savannas	90 02 97 63
10.	FETOUL Gnagnassincoul	Leader development section DRAEH/S	90 91 11 42
11.	DJAKPERE Tignoiti	Chief township of Mandouri	90 31 24 36
12.	Bogra TAMBIAGA	President of the coope ZAAP-	90 75 96 57/ 99 50 73 52
13.	Badi KOMBATE	Advisor to the coope ZAAP-	90 00 14 04/ 99 00 39 08
14.	MAMA Abdoufatao	Secretary scoops-SONGUIMAME	90 35 50 20/ 99 50 79 10
15.	NATCHAMBATE Dapouguidi	President TIMONDE grouping (Member Coope-ZAAP)	99 92 99 09
16.	DOUTI Bigmam	President MOMBA grouping (Member Coope-ZAAP)	S/C 97 23 97 57
17.	GANGA Tango	Secretary MOMBA Grouping	97 23 97 57
18.	TAMBIAGA Teibane	President LAMPOUGUINI grouping (Member Coope-ZAAP)	90 18 30 85
19.	LAMBONI Kanlaféi	President TALKITANDE grouping (Member Coope-ZAAP)	98 39 61 89
20.	LAMBONI liked	President TIMOMBIGUINI grouping (Member Coope-ZAAP)	98 64 01 95
21.	KPALA Tadja	President TIMONDIBA grouping (Member Coope-ZAAP)	99 31 68 42
22.	SANWOGOU Marie	The President of the Federation of Women's Organizations of Kpendjal (FOFK)/cooperative Secretary SONGUIPALE II	97 65 79 11/ 90 36 71 98
23.	Idrissou ILASSOU	A member of the groupement TIMONDE	-
24.	Sabime slab	A member of the groupement MOMBA	-
25.	DJAMONE Tignoati	A member of the groupement TIMONDE	98 63 83 49
26.	PAMPANDJA Gouligou	A member of the groupement MOMBA	-
27.	NATCHEMBATE Diéyabte	A member of the groupement TALKITANDE	-
28.	IDANI Yénibo	A member of the groupement TIMONDE	97 21 28 65
29.	MAMA Alassani	A member of the groupement TIMONDE	-
30.	SANWOGOU Tampandi	A member of the groupement TIMOMBIGUINI	91 45 74 16
31.	KOMBATE Koumboudi	A member of the groupement TIMONDIBA	99 10 95 61
32.	SAMBIANI Pouguimba	A member of the groupement MOMBA	-

33.	DOUTI Lamatou	A member of the groupement MOMBA	-
34.	SOULE Aïchatou	A member of the groupement MOMBA	-
35.	ALASSANI Afia	A member of the co-operative SONGUIMPALE II	-
36.	DAOUDA Assala	Member SONGUIMAME scoops	-
37.	Djonlipoa Bigou	A member of the groupement MOMBA	-
38.	YEMBLIMA Fatouma	A member of the groupement MOMBA	-
39.	TAMBIUGA Kpampoa	A member of the groupement MOMBA	-
40.	KOMBATE Gnoati	A member of the groupement LAMPOUGUINI	-
41.	Kongo DJAKPERI	A member of the groupement TALKITANDE	-
42.	Komi SAMBIANI	A member of the groupement LAMPOUGUINI	-
43.	DJAKPERI Kane	A member of the groupement TIMOMBIGUINI	-
44.	KANGBENI Monique	A member of the groupement TIMOMBIGUINI	91 12 60 26
45.	BOUREIMA Awa	A member of the groupement TIMONDE	-
46.	KOLANI Kangandiba	A member of the groupement TIMOMBIGUINI	-
47.	MINTOAMA Sabriga	A member of the groupement TIMOMBIGUINI	-
48.	DJAKPERE Kpentimpoa	A member of the groupement TIMOMBIGUINI	-
49.	Baboa DJAKPERE	A member of the groupement TIMOMBIGUINI	-
50.	ISSARMA Tindampoa	A member of the groupement TIMOMBIGUINI	-
51.	KOUMONGA Lanoaba	A member of the groupement TIMOMBIGUINI	-
52.	DOUTI Boagni	A member of the groupement TIMONDE	-
53.	SAMBIANI Nandoundi	A member of the groupement TIMOMBIGUINI	-
54.	ABDOULAYE Sénabou	Member SONGUIMAME scoops	-
55.	KERI Mémouna	A member of the groupement LAMPOUGUINI	-
56.	SAMBIANI Bonwa	A member of the groupement MOMBA	-
57.	DERMANE Fatouma	A member of the groupement LAMPOUGUINI	-
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62.	YENTOUGLI Wankas	The Coordinator ARAF/DLP	90 36 64 52/ 98 64 55 24
63.	PAMASSI Mr. Toussaint	Instructor at the Training Center Bonita Haus (NGOS IT-Village)	91 54 24 90/ 98 28 10 36
64.	KOLANI Lardjengue D. Damien	Service Chief Operating the Network U-CMECS	90 12 81 47

65.	BIEGNIEBE Gaëtan	Executive Director NGOS RAFIA	90 32 99 83
66.	Lengue DJANAME	Executive Director EDID	90 11 59 40/ 99 95 53 59

Togolese Republic **West African Development Bank**

DEPARTMENT OF THE ENVIRONMENT AND FOREST RESOURCES

REPORT

Validation Workshop of basic documents made in the framework of the preparation of the project document, organized on 29 June 2017.

Project of increasing of the level of resilience of vulnerable actors of the agricultural sector to Mandouri, in the north of Togo.

By: BAMALI Tahontan Direction
of the environnement, Lomé

1. Context

Climate change is a real threat to the development of countries, in particular for the least developed countries. Even a limitation of the global warming below 2°C will not be able to avoid the adverse effects of climate change.

Togo is already facing high heats, the poor distribution of rainfall, flooding, droughts, to violent winds and the sea level rise which exacerbates the phenomenon of

coastal erosion. By the damage1 that they cause, these climatic vagaries alter the framework of life and the well-being of populations, have a strong influence on the development of the country and threaten to annihilate the efforts of economic growth of the country. To this effect, the Togolese State is committed to carry out concrete actions in order to reduce the vulnerability of communities to the adverse effects of climate drifts.

To this effect, the Togolese State launched the process of preparation of the project document of the ***" Project for the rehabilitation of the level of resilience of vulnerable actors of the agriculture sector to Mandouri, in the north of Togo"*** which will be submitted to the Adaptation Fund.

Initiated by the Ministry of the environment and forest resources (MERF), the process of preparation of the document of the project benefits from the financial support of the West African Development Bank (BOAD), and the technical support of the Cabinet of study "Africa Sustainability Center (Ascent) ".

2. Objectives of the workshop

The main objective of this workshop is to improve, to validate and finalize the reports of studies of bases and the results should be used in the development of the project document.

It is acts more specifically:

(i) To present the general aspects of the project to the national stakeholders;

(ii) To present, discuss, amend and improve the reports of basic studies:

a. The report on the vulnerability;

b. The report on the kind;

c. The report on the identification of stakeholders ;

d. The report of detailed design of the irrigation ; and

(iii) To present the state of progress of the preparation of the project document.

3. Conduct of the workshop

The methodological approach of the workshop highly participatory, is based on the method "Courcelles" which was to divide the participants into small groups the transhumants who have made the tour of the presenters. At the level of each presenter, groups of participants, after a presentation of the report to put the participants in the context, pays its observations in an iterative discussion.

The workshop was held in three major segments: the official opening, the analysis of the project documents and the closing ceremony.

[1] For example in 2008, the floods have caused the collapse of several bridges which the bridge of Amakpapé; in 2010, the floods have caused damage estimated at 15 410 810 000 FCFA, or 34 246 244 $US.

The analysis of the project document is made in plenary.

4. Opening of the workshop

The official opening ceremony was marked by the word of welcome from the Director of the environment; Ballast interventions of the Prefect of Kpendjal, the Director Environment and climate changes of the BOAD and of the President of ascent ; and the opening speech by the Secretary General of the Ministry of the environment.

In his word of welcome, the Director of the Environment has made the genesis of the project. Taking the floor, the Prefect of Kpendjal (prefecture to which belongs Mandouri) has indicated the relevance and importance of the project for Mandouri in particular and the prefecture of Kpendjal. Has this effect; it is committed to implement all that is in its power for purposes of the success of the project. The following stakeholders will also follow in his footsteps, manifesting each the availability of its structure and their commitment to successfully lead, not only the process of preparation of the project document, but also and especially of the implementation phase.

5. Conduct and results of the workshop

After the opening ceremony, the authorities and the participants attended the general presentation on the project.

This presentation has allowed all participants to understand the objectives and the major components of the project.

The overall objective of the project is to reduce the vulnerability of producers by the mastery of the water for the production and raise their level of resilience through the diversification of crops and other income-generating activities.

More specifically, the project aims to: (i) build book of mastery of water for the irrigation of 144 hectares; ii) master the techniques for irrigation; (iii) improve the availability of water for the populations; (iv) promote the valorisation of the products and (v) improving income and diversify the sources of income of beneficiary families.

Components	The activities
1. Improvement of the planning and management of water resources and the production (agricultural)	1.1 Develop 144 ha for agricultural production, equipped with an irrigation system semi-Californian, powered by a solar powered pumping system 1.2 To improve the techniques and the means of production is irrigated 1.3 Design and implement training programs for the actors responsible for the operation, maintenance and repair of equipment acquired for the beneficiaries.

Components	The activities
2. Diversification of the means of subsistence and improvement of living conditions of the Beneficiaries	2.1 Promote the development of income-generating activities 2.2 Put in place a funding mechanism simplified for the producers (microcredit) 2.3 Build latrines for sanitation
3 Capacity-building, environmental and social actions and Knowledge Management	3.1 Design and provide capacity-building programs 3.2 Implement measures of the Environmental and Social Management Plan 3.3 Establish a system of knowledge management (production, capitalization, extension, etc.)

After having taken knowledge of the objectives, of the components of the project and the activities identified, participants are passed to the examination of the reports of baseline studies. To this effect the ten-seven participants were divided into four groups to analyze, in turn, the content of the reports.

The observations recorded are divided into two categories: observations specific to each report and recommendations on the project document.

At the end of the analysis of the reports of the baseline studies, the participants have followed a presentation on the state of progress of the preparation of the project document. To this effect, the first draft of the document, placed under the format of the Adaptation Fund, has been presented. As a result of the discussions the participants made recommendations in respect of what:

- Make reference to the diagram Director of the prefecture of Kpendjal as a guarantee that the extension of the city of Mandouri will not impinge on the perimeter of the 500ha;
- Secure the perimeter and put in place a mechanism which ensures access to producers not being of Mandouri;
- Provide an internal regulation for cooperatives mainly on the access mode to the perimeter built in order to avoid conflicts in the future and the maintenance of equipment and infrastructure;
- Divide, provided that it is possible, the perimeter in two: one for Aboriginal people and the other for foreign;
- To link the project to the policy of the authority of the basin of the Volta, saw that the project area is located in the Volta basin ;
- Integrate the conservation of biological diversity (ecotourism, eco Safari) at the project mainly;
- Improve the access to electricity in the locality to foster the development of the chain of value;

- Consider the construction of buffer pools in order to alleviate the problem of availability of water for the Pumping if it happens that the flow of the ITO is not favorable;
- In the framework of the accompaniment of producers, facilitate their access to financing (loans to affordable rates).

6. Participants

The workshop brought together the technical structures key whose the Prefecture of Kpendjal, the Delegation of the prefecture of Kpendjal, the Ministries of the environment and forest resources; the Ministry of Agriculture, animal husbandry and hydraulics; the Ministry of development planning; the Ministry of Economy and Finance; the University of Lomé; and the Office of study "ADA Consulting".

7. Deliberation of the workshop

At the end of the workshop, the participants, subject to the taking into account of the comments made, validated the reports of basic studies; which determines in advance the strength and the robustness of the project. Because as was said in the beginning of the workshop the President of ascent, only the strength of the Foundation determines the stability of a home.

8. List of Participants

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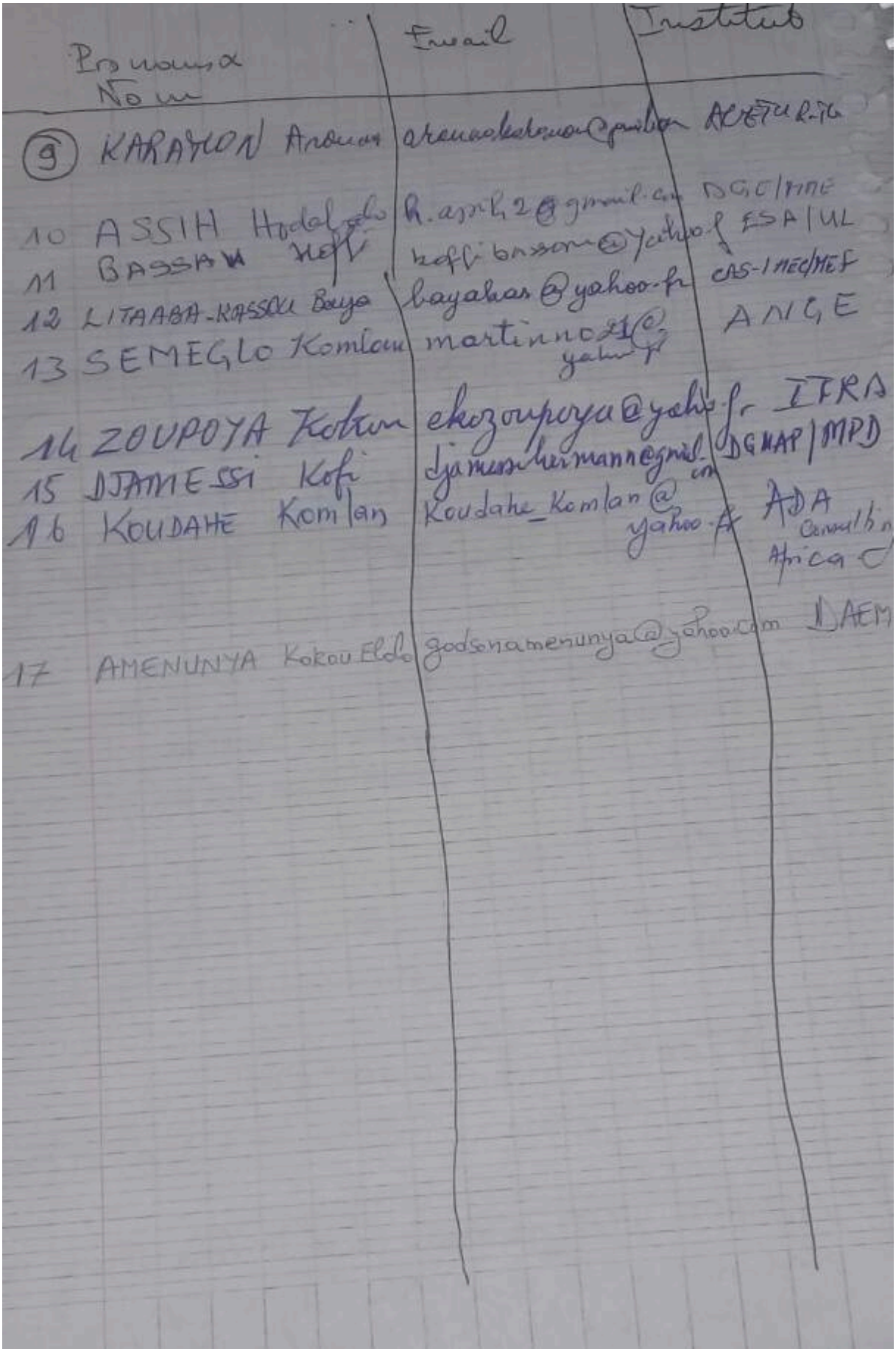

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Done on 30 June 2017, the Rapporteur

INCREASING THE RESILIENCE OF VULNERABLE COMMUNITIES IN THE AGRICULTURE SECTOR OF MANDOURI IN NORTHERN TOGO

Banque Ouest Africaine de Développement (BOAD)
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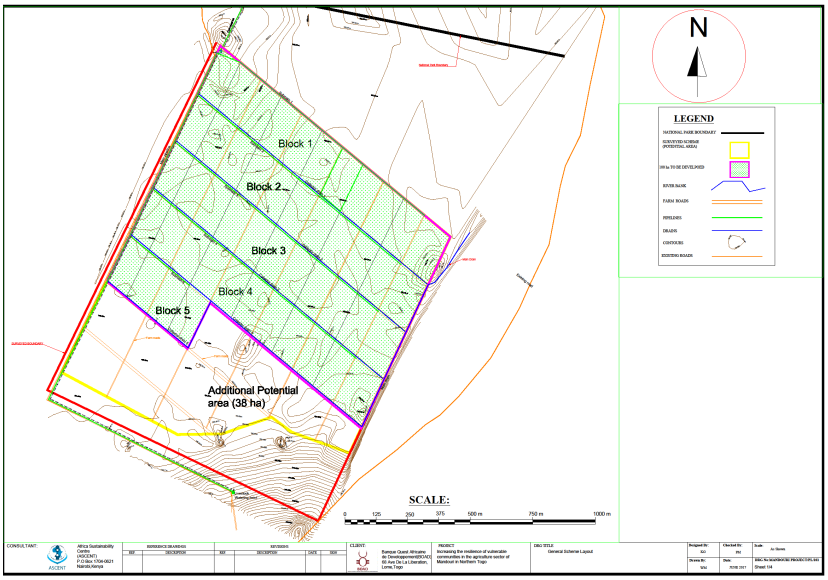


DRAFT FINAL DESIGN REPORT

VOLUME I: MAIN REPORT

JULY 2017

Africa Sustainability Centre (ASCENT)
PO BOX 1704-0621
Nairobi, Kenya

Table of Contents

List of Tables

1. INTRODUCTION

The economy of Togo is based on the agriculture sector. This sector is confronted by the adverse effects of climate change, the consequences of which are expressed in terms of a reduction in the production, thus threatening to destabilize the food security and to dispossess the two-thirds of the active population of their means of subsistence. This threat is all the more serious in that the Togolese agriculture is dominated by rainfed agriculture and small-scale producers. In effect, it depends essentially on the very variable climatic conditions which disrupt greatly the agricultural activities. This high variability is due to the worsening of the climate variability characterized by: (i) the false starts of the rainy season; (ii) the early stop of rains in relation to the cropping seasons; (iii) the offset of the seasons; (iv) the bad spatial-temporal distribution of rainfall marked by the appearance of dry breaks and the concentration of rain in short periods; (v) the elongation and/or the severity of the drought; (vi) floods; (vii) the high temperatures; and (viii) strong winds.

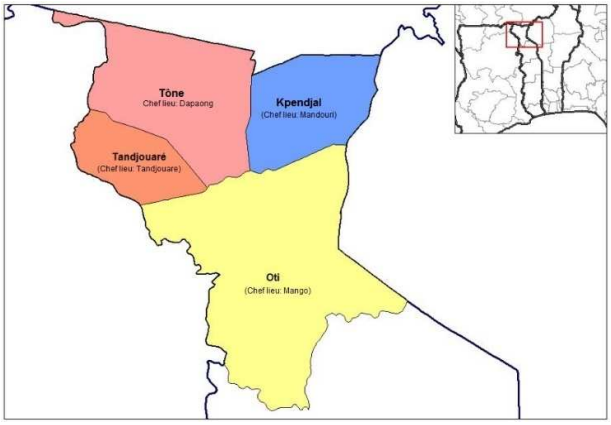
The high variations in climatic conditions affect farming by disorienting farmers, inhibiting crop growth and in most cases resulting in loss of crop yield and causing poor health of livestock. The net effect has been on food security and the general economy of the Country and especially the Northern Savanna region. This region is regularly affected by famine which has worsened over the years mainly due to climate change.

The northern region receives between 900 and 1100 mm of rain which translates to between 7 and 8 billion cubic meters of water per year in the savannah region from rains. This quantity of water can be used to reduce the effects of climate change and mitigate resulting vulnerability of the population in the region.

This proposed project, “Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri (Savanna region)” provides appropriate response of adaptation to the strong climate variability to secure the activities of agricultural productions. Apart from securing main rice crop production by allowing it to reach optimal growth and yield level the project will as well allow diversification to other crops that will be possible to grown during the dry period using irrigation. To improve economic situation of the beneficiary community value addition of the locally produced tomatoes and expanding economic activities of the beneficiary group to include small scale cottage industry whose power source will be provided from solar energy is also proposed. The use of solar energy for irrigation water pumping, providing power to the bakery and tomato paste production facilities instead of power generated from fossil fuel contributes to reduced carbon emissions.

1 DESCRIPTION OF THE PROJECT AREA

1.1 Location and area



Mandouri is the headquarters of the prefecture of Kpendjal, located in the savannah region in the extreme north-east of Togo. The prefecture of Kpendjal has an area of 2,028 km², boarders Burkina Faso to the North Benin to the East, the prefecture of Oti to the South and to the prefecture of Tone to the west. The prefecture of Kpendjal consists of eleven (11) Cantons, namely Mandouri, Namondjoga, Pogno, Koundjoaré, Naki – Is, Borgou, Ogaro, Tambigou, Nayéga, Papri, Tambonga.

Figure 1-1 : Project Area Location Map

1.2 Climate context

Mandouri has the climate of type Sudano-Guinea characterized by the severity of the dry season which results in a break to agricultural activities. The mean monthly temperature has two maxima, 33°C and 38°C in March and November and two minima, 15°C and 17°C in January and August. The figure below shows the average monthly temperature and rainfall for Mandouri.

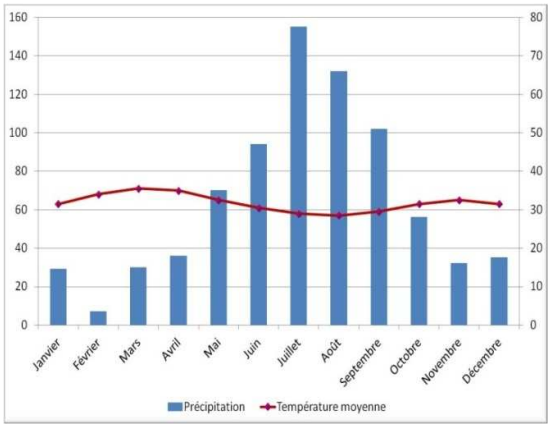


Figure 1-2: Ombrothermique Diagram of Mandouri
Data Source: Meteorological Station of Mango

1.3 Hydrography

1.3.1 Surface water

Kpendjal prefecture is traversed by the Oti river and its tributaries the Kpendjal and Oualé as well as the Sansargou in the central parts of Kpendjal. Mandouri has a shallow water table from which domestic water is drawn using shallow wells. River Oti is part of the Volta river basin.

During the rainy season, large areas are flooded from incident precipitation while for the months of August and September the Mandouri agricultural areas to the North of Mandouri town are flooded by Oti river waters as it flows over the banks. Mandouri town which is located on a high ground does not flood and takes the form of an island during the period when the surrounding areas are flooded.

During the dry period, the Oti river flow emulates the dry season with the river sometimes drying up or having extremely low flows during the months of April and May.

1.3.2 Groundwater

The savanna region, in terms of groundwater has two aquifer systems distinct: (i) the aquifer of the weathered bedrock and the alluvial aquifers of low depth.

The main aquifer system, the aquifers of the weathered bedrock (granite gneiss / /migmatite) are overhung by a clay layer, a dozen meters. The static level is generally measured at 7 - 8 meters of depth and pumping tests recently conducted in the sector (during the construction of drilling) indicate specific flows variables, between 2 and 9 m3/h/m. This system of aquifer consists of two sub-systems: the aquifers related to fracture and those related to the alteration. The grus over rock form of porous media whose permeability is generally low (1 to 9. 10 - 7 m/s) and the porosity of the order of 2 to 5%.

The alluvial aquifers of low depth. These aquifers are formed in formations recent detritic whose facies is heterogeneous, the Sandy clays constituting the dominant facies. The thickness of these formations does not generally exceed a dozen meters locally and their lateral extension remains limited to the right of the course of water not perennials. They therefore form of hydraulic systems quasi-autonomous, with low flow velocities and low capacity of storage.

1.3.3 Access to water and electricity

Access to domestic and livestock water is a concern for Mandouri community. Drinking water usually comes from wells that dry up in the dry season. The only permanent source of drinking-water supply is the Oti river which is some 3 to 5 km from Mandouri town depending on the point from which it is drawn.

Electricity is provided by a generator from 3 pm to 11 pm and from am to 11 am each day. Not all redidential or business premises are connected to the power supply. The lighting of a few the streets is by solar streetlights and mainly in Mandouri town centre.

1.4 Socio-economic activities

The main activities are agriculture and livestock.

1.4.1 Agriculture

Agriculture is the main economic activity of the prefecture of Kpendjal accounting for 96% of jobs and 90% of revenues. Crops constitute the major activity and provide the bulk of the income. Cereals (millet and sorghum) provide the bulk of the carbohydrates while beans provide the source for protein.

The main crops grown in the prefecture include:

- Food crops: rice, cowpeas, corn, millet, sorghum, soybean, yams
- The cash crops: cotton and peanuts;
- The vegetable crops: onions, tomatoes, watermelons, carrots, okra, Guinea sorrel.

Mandouri area dominated by production of rice during the rainy season in the flooded areas and maize in the generally higher ground that are not susceptible to prolonged flooding. The Ministry of Agriculture has organized the farmers in Producers Co-operatives for the establishment of the Planned Zones of Agricultural Development. The proposed project area is within the Mandouri Planned Zones of Agricultural Development. The Ministry of Agriculture has introduced the variety IR 841 and provides technical support and advice to cooperatives which produce up to 2 tonnes of rice per hectare

Production of rice in Mandouri faces the problems of water control during flood period and water availability during the dry period.

This project aims to provide a solution to the water availability problem encountered during the dry period while at the same time providing support to flood water management in order to maximise benefits from flood based rice production.

1.4.2 Livestock

Livestock kept by Mandouri community include in order of importance, guinea fowls, cattle, sheep, goat, pigs and donkeys.

a. Guinea Fowls

The prefecture produces a lot of poultry particularly guinea fowl. The chicken are less adapted and outbreaks of avian influenza are there major threat. The rearing of guinea fowl is very profitable in the entire region of savannas to the point where it is referred to as "gray gold ". The Savanna region is the leading producer of guinea fowls in Togo. In Mandouri guinea fowls are owned by men further emphasising their importance as economic commodity.

b. Cattle

The bulk of the herd is to race Borgou (resistant to trypanosomiasis) more or less of mixed parentage of zebus. The animals are often left to graze freely which then becomes a source of conflict with the crop producers. In Mandouri, this phenomenon added to the transhumance, explains why farmers have not been growing yams and crops that can survive during the dry season or even use the banks of the river Oti for limited irrigation. Cattle rearing is the second most important livestock economic activity in Mandouri. Cattle keepers face problems including lack of pasture and water during the dry period and limited pasture during the flood period.

To limit conflict between cattle keepers and the pastoralists the proposed irrigated area will require fencing, to keep off animals during the dry period crop production that will be introduced.

c. Small ruminants

The small ruminants (sheep and goats) take an important place in the prefecture. The animals are often left to graze freely which then becomes a source of conflict with the crop producers. Like cattle rearing small ruminant rearing faces problems related to the lack of water and pasture particularly in dry periods.

d. Donkeys

The donkeys are important for transport of wood and agricultural products in Mandouri.

e. Pigs

The prefecture is favourable to the pig rearing, the main problem is the food supply in the dry season. The rearing of pigs is an activity exclusively practiced by women. The pigs are left free to search for food in the town and its environs which becomes a source of conflict with the crop owners.

2 PROJECT DESIGN CONSIDERATIONS

2.1 Project Area Climate

Based on the climatic conditions of Mandouri and taking into account the local growing season and length of growing period as determined based on the LocClim Ver 1.1 for the Mandouri area, as presented below, it is clear that irrigation would be necessary to grow any crop to maturity for the period November to April.

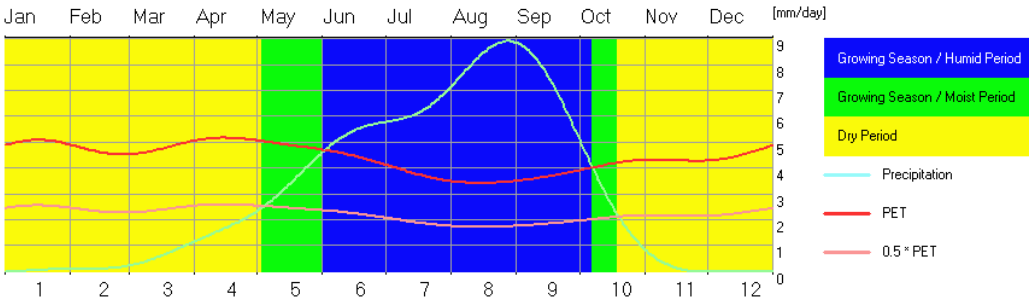


Figure 2-1: Precipitation, PET and seasons MAndouri Project Area, Source; New LocClim Ver 1.1

It is for the period November to April that proposed irrigation system is expected to contribute significantly to food security and economic empowerment of the Mandouri project area farmers. Table 3-3 gives the climatic data for Mandouri and table 3-4 shows the mean monthly rainfall and effective rainfall for the area.

Table 2-1 Climatic Data for Mandouri

Month	*Min Temp* *°C*	*Max Temp* *°C*	*Humidity* *%*	*Wind* *km/day*	*Sun* *hours*	*Rad* *MJ/m²/day*	*ETo* *mm/day*
January	19	34.2	21	173	8.2	19.2	5.9
February	20.7	36.5	22	173	7.9	20.1	6.39
March	22.7	37.2	40	173	7.8	21.2	6.4
April	23.2	35.7	60	173	7.2	20.6	5.7
May	22.5	33.7	69	86	6.9	19.8	4.6
June	21.3	31.3	81	86	7.1	19.8	4.21
July	20.7	29.3	88	86	4.9	16.6	3.42
August	20.7	29.1	92	86	4	15.5	3.13
September	20.3	30.2	92	86	5.4	17.5	3.48
October	20.2	32.5	76	86	7.4	19.6	4.13
November	18.5	34.4	44	86	8.2	19.4	4.39
December	18.5	34.2	27	86	6.8	16.8	4.1
Average	**20.7**	**33.2**	**59**	**115**	**6.8**	**18.8**	**4.65**

Table 2-2 The mean monthly rainfall and effective rainfall of the command area

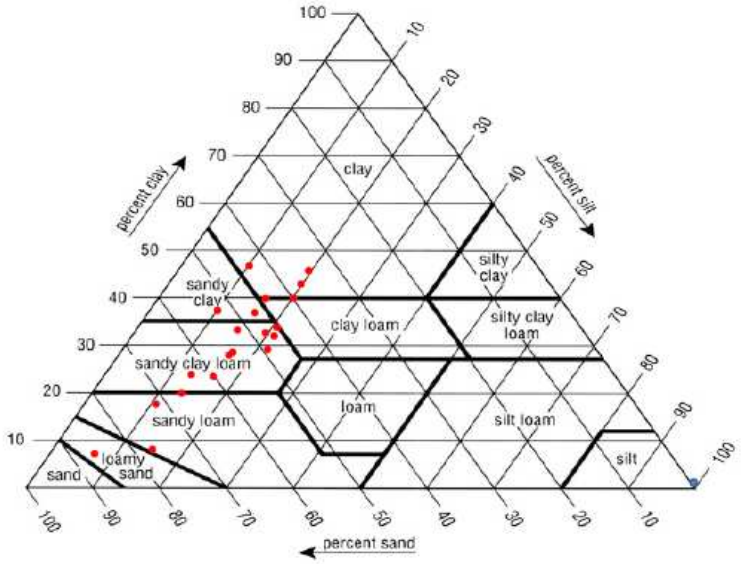
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Rain (mm)	3	4	16	56	102	180	167	271	236	62	6	2	**1105**
Eff rain (mm)	3	4	15.6	51	85.4	128.2	122.4	152.1	146.9	55.8	5.9	2	**772.2**

Effective rainfall has been determined using the FAO/AGLW formula

2.2 Project area soils

Soil samples were taken during the time of survey and delivered to laboratory for analysis.

The soil triangle below shows the distribution of the soils based on the laboratory analysis results. The red dots represent each of the samples that were analyzed.



The figure below shows the soil distribution for the Mandouri project area based on the soil text analysis results.

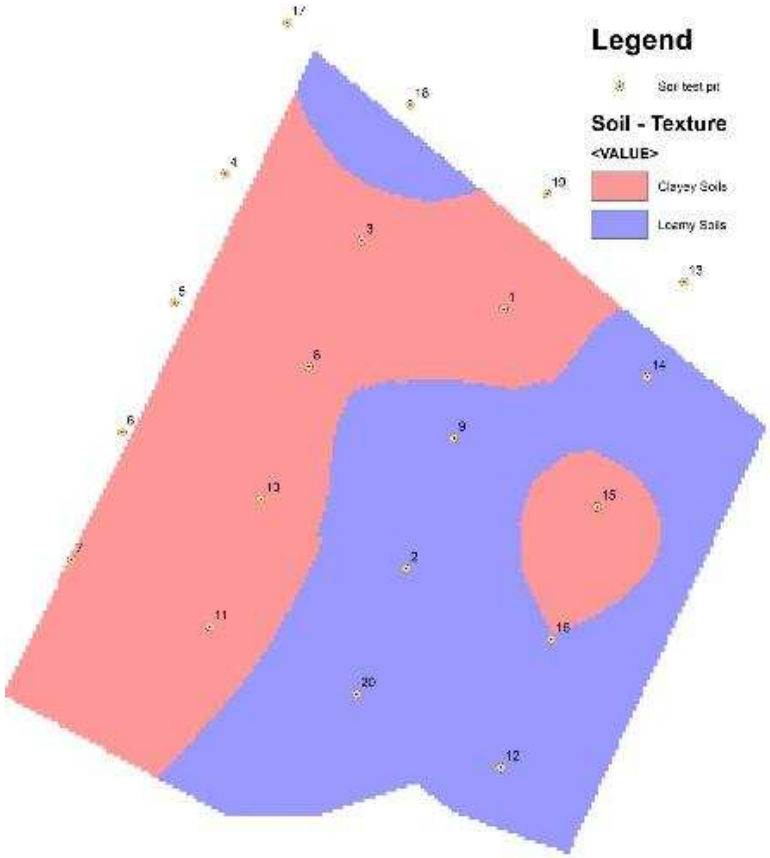


Figure 2-2: Soil Disribution for Mandouri project area

The following figures show the composition of the soil in the project area.

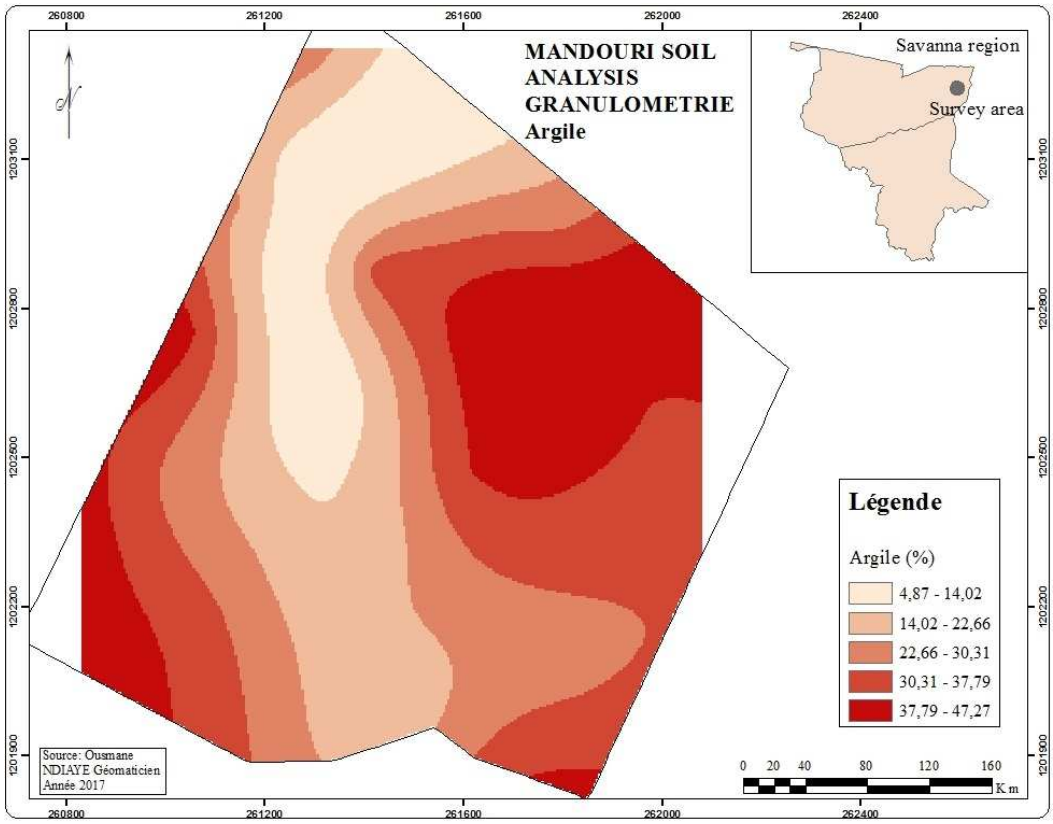
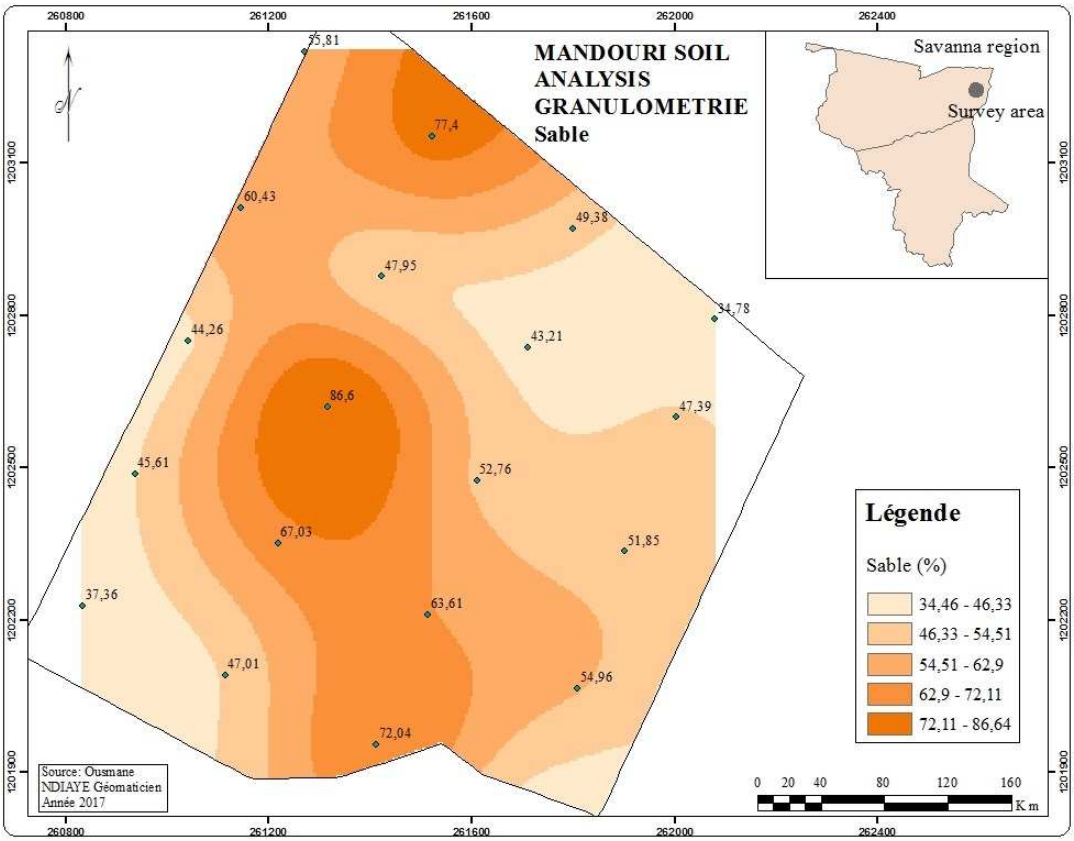


Figure 2-3: Soil compositon in Mandouri project area



The results of soil texture analysis show that the Mandouri are soils are mainly clayey and loamy soils. The soils are good for irrigated agriculture production as they can retain moisture. However due to the high clay content the soils are difficult to work if not wet.

Figure 2-4: Soil texture in Mandouri project area

2.3 Soil Chemical Analysis

Soil chemical analysis was undertaken on all the samples and results received. The analysis of the soils chemical analysis results will indicate which fertilizers need to be applied for the proposed cropping pattern.

2.4 Proposed Agricultural development

The proposed irrigation scheme is designed for a net area of 100 Ha of land that is flooded 4-5 months every year during the rainy season that falls between Mid-April/Early May and Mid-September/Early October. During this period, farmers in Mandouri plant paddy rice which is harvested November/December. The land then is left fallow until the start of the rains the following year. Livestock graze on the crop residues in the fields. It is on the basis of this background that the proposed agricultural development aimed at improving food security and providing secure and sustainable livelihoods for the beneficiaries has been made. It is proposed that during the dry season high value crops that are early maturing be grown under full irrigation for the entire period as there will be no rains. It is also proposed that during this period of cropping the livestock should be kept off the fields to avoid crop destruction. Rain/flood fed rice production should continue and benefit from better husbandry practices to be introduced by the project.

The following crops are considered potential for irrigation during the dry period and have been guided by the market information gathered e.g. Onions, tomatoes and water melons find their way to the region from outside of Togo i.e. Burkina Faso and other areas. The choice is further guided by their high prices offered by the buyers which is a good thing for the farmers and the economy of the area and the country at large.

Maize and Cowpeas (Le'Niebe') are preferred to address food security for the community in Mandouri and have been grown for a long time amidst the many challenges that need to be addressed. Green maize is a short maturing crop as it ise harvested after attaining physiological or horticultural maturity and will be sold green to bring quick cash to the farmers. Introduction of green maize in the crop mix will release land for other crops like short cycle vegetables and among other things provide fodder for the livestock. Peanuts also referred to as ground nuts are good source of protein and oil production through value addition. Leafy vegetables that are short maturing with continuous harvesting will provide a good source of vitamins and essential minerals and amino acids for a balanced diet to the community and income generation to the farmers/irrigators. Value addition of the leafy vegetables would increase their shelf life through drying and preservation.

The choice of the most promising crops is also guided by other factors such as: -

- Crop maturity periods, e.g. short cycle vegetables;
- Potential for value addition; -tomatoes, peanuts/ground nuts
- macro-economic and political factors of development;
- technical and agro-ecological factors linked to the potential increase in yields by applying irrigation, to the cropping cycle, and crop rotation practices;

- Social factors linked to the food security status of the beneficiaries, their employment and livelihoods.

2.4.1 Selected Crops and areas (Crop Structure)

The crop structure presented below is a guide of the crop mix and the anticipated areas to be under each crop for only the dry period.

Table 2-3 Proposed crop structure of the promising crops

Crop mix	% of project area to be covered by the crop mix	Proposed area (Ha) under selected crop mix
Short cycle crops- (Black nightshade, kales, spinach, Cowpeas (Leafy vegetables)	**10%**	**10**
Onions-	**15%**	**15**
Tomatoes-	**20%**	**20**
Maize (Green)	**10%**	**10**
Maize (Dry)	**10%**	**10**
Peanuts/Groundnuts	**15%**	**15**
Watermelons	**10%**	**10**
Cowpeas	**10%**	**10**

2.4.2 Proposed cropping patterns and intensities

Cropping pattern is defined as the proportion of land under various crops at a point (Hussain, M. 1996). It is a dynamic concept because no cropping pattern is ideal for all times to a particular region. It changes in space and time with a view to meet requirements, and is governed largely by the physical, cultural and technological factors. The cropping patterns of a region are closely influenced by the geo-climatic, socio-economic, historical and political factors (Hussain, M. 1996). Patterns of crop land use of a region are influenced by the physical and human environment).

The cropping patterns of the 100 Ha proposed for agricultural development will be in two sections; one that will cover the entire rainy season April- September and the other covering the dry season from October- March. The table below gives the proposed cropping pattern.

Table 2-4 Proposed cropping pattern for Mandouri project

	Crop	*Planting and harvesting dates*	*Season-1*	*Season-2*
			(%) Net Irrigation Area	*(%) Net Irrigation Area*
1	Rice	E-June/L-October	100.0	0.0
2	Leafy vegetables, black shade, kales, spinach, leafy cowpeas	M-November / L-January	0.0	10.0
3	Onions	E-December/ L-March	0.0	15.0
4	Tomatoes	M-January/M-April	0.0	20.0
5	Maize (Green)	E-December/L-February	0.0	10.0
6	Maize (Dry)	M-November/M-March	0.0	10.0
7	Peanuts/Groundnuts	E-December/ L-February	0.0	15.0
8	Water melons	E-November/L-February	0.0	10.0
9	Cowpeas	M-November /E-March	0.0	10.0
	Total		100.0	100.0

2.4.3 Growth duration for selected crops

The table presented below represents the identified growth developmental stages of each of the crops selected. This is critical for any proposed irrigation development because each of these stages of the crop growth demand different amount of water for their optimal development. It guides the determination of crop water requirements so that the design takes into consideration the amount of water demanded by the proposed crops for their entire growth period.

Table 2-5 Crop growth development stages

Crop Name	***Seed development -***	***Vegetative development***	***Reproductive development***		**Maturity period (Days)**
	Initial stage-Germination: seed to seedling	Crop development stage	Mid-season Flowering, pollination and	Late season Development of the seed	
Peanuts/Groundnuts	25	35	45	20	**130**
Onion	15	25	70	40	**150**
Maize (Dry)	20	35	40	30	**125**
Maize (Green)	20	35	40	15	**110**
Tomatoes	30	35	40	20	**135**
Leafy vegetable *(Traditional amaranths, Black night shade, Leafy Cowpea)*	30	45	-	-	**75**
Water melons	10	20	30	30	**90**
Cowpea	20	35	35	20	**110**

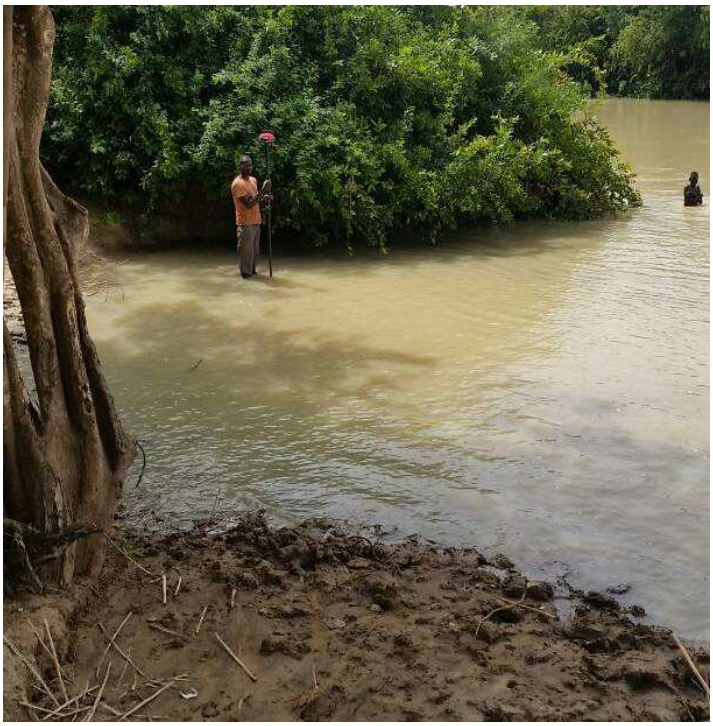
2.4.4 Proposed farming practices

The proposed scheme will have rice grown during the rainy season as it has always been grown due to the flooding nature of the area and will occupy the entire 100 ha for a period of 5 months. The rice will be planted and appropriate agronomic measures observed and harvesting done when it reaches physiologically mature as will be guided by the technical project technical team. This will ensure that rice will be dried out of the field to reduce the enormous losses witnessed when the crop dries in the field and the heads crack (dehisce) and grains drop on the ground making picking impossible. By doing so with cooperation of the farmers there will be enough time to prepare land for the proposed irrigated crops. Some of the proposed irrigated crops will have to be germinated and raised in the nursery preferably on germination trays and near the livestock water point.

3 WATER REQUIREMENTS AND DESIGN DISCHARGES

3.1 Delineation of Area

Topographical survey and subsequent mapping of the area enabled delineation of a gross Mandouri project area of 167 hectares. During survey, the farmer group through their chairman Mr. Moses indicated that the community had agreed to provide 100 ha for the irrigation project. The area provided by the community had further been demarcated with concrete beacon which upon survey was exactly 100 ha. Due to likely conflict with National Park it was agreed with the farmers that survey for irrigation development would start from the old National Park boundary to the South and be limited to South East by the alignment provided by the beacons to the North West it was agreed to expand the area from the beacon alignment by 150 m. it was agreed that after survey an area of 100 ha will be delineated for irrigated agriculture development. From the 167 ha area surveyed two areas one of 144 ha and the second of 100 ha have been delineated. Irrigation layout has been provided for both cases. The irrigation design has been carried out for a net irrigable area of 100 ha.



A farmer assists during the survey of the river at the proposed intake point

The net irrigable area of 100 ha within the gross area of 106.38 hectares. Pipeline and roads take up the 6.38 ha which will not be utilized for crop production, however the area is necessary as it gives access to the farms ad t the pipe infrastructure. The irrigation development will be carried out in selected 100 ha, foe each block the table below gives the net and gross irrigation areas.

Table 3-1 : Delineated area, gross and net area for Mandouri project

Block	Gross Areas(Ha)	Potential Net Irrigable Areas (Ha)
1	25.10	23.6
2	24.15	22.7
3	24.15	22.7
4	24.15	22.7
5	8.83	8.30
Total	**106.38**	**100**

3.2 Determination of Irrigation Water Requirements

The following factors/parameters have been considered in determination of the irrigation water requirements:

- Selected irrigation development option (closed pipeline for conveyance and distribution, and furrow and basin for application)
- Selected crops and cropping patterns
- Evapo-transpiration (ETo) and effective rainfall
- Irrigation areas
- Monthly Kc values
- Irrigation efficiencies (conveyance, distribution and application);
- 24 hours Irrigation duration per day for 7 days per week.
- Assumption that there is no contribution from ground water and no residual soil moisture is present.

The table 3-2 below shows the selected crops and the cropping pattern.

Table 3-2 Selected crops and cropping patterns

		Proposed Crops and Respective Areas			
			Total Area (ha)	**100.00**	
	CROP	**SEASON 1 (100%)**		**SEASON 2 (100%)**	
		Area (Ha)	**Proportion (%)**	**Area (Ha)**	**Proportion (%)**
1	Rice	**100**	**100**		
2	Leafy vegetables, black shade, kales, spinach, leafy cowpeas	0.0	0.00	10.0	10.00
3	Onions	0.0	0.00	15.0	15.00
4	Tomatoes	0.0	0.00	20.0	*20.00*
5	Maize(Green)	0.0	0.00	*10.0*	*10.00*
6	Maize(Dry)	0.0	0.00	*10.0*	*10.00*
7	Peanuts/Groundnuts	0.0	0.00	**15.0**	**15.00**
8	Water melons	0.0	0.00	**10.0**	**10.00**
9	Cowpeas	0.0	0.00	**10.0**	**10.00**
	TOTAL	**100.0**	**100.0**	**100.0**	**100.0**

3.3 Crops Water Requirement

The crop water requirement has been determined using the following relationship:

ETc = Kc x ETo

Where, Kc = crop factor and ETo = the Reference crop evapo-transpiration (mm/day). The Kc-values were obtained from FAO: Irrigation Water Needs (Chapter 4) for all the proposed crops. The table below gives the growth stage, stage Kc-values and the resultant monthly Kc for the proposed crops.

Table 3-3 Growth Stage, Kc per stage for selected crops

Crop Name	***Seed development -***	***Vegetative development***	***Reproductive development***		**Maturity period (Days)**
	Initial stage-Germination: seed to seedling	Crop development stage	Mid-season Flowering, pollination and fertilization	Late season Development of the seed - embryogenesis	
Peanuts/Ground nuts (growth period) in days	25	35	45	20	**130**
Kc per stage	0.67		1.05	0.86	
Onion (growth period) in days	15	25	70	40	**150**
Kc per stage	1.03	1.05	1.03	0.85	
Maize (Dry) (growth period) in days	20	35	40	30	**125**
Kc per stage	0.31	0.78	1.19	1.20	
Maize (Green) (growth period) in days	20	35	40	15	**110**
Kc per stage	0.31	0.78	1.19	1.20	
Tomatoes (growth period) in days	30	35	40	20	**135**
Kc per stage	0.79	1.15	1.06	0.94	
Leafy vegetables *(Traditional amaranths, Black night shade, Leafy Cowpea)* (growth period) in days	30	45	-	-	**75**
Kc per stage	0.7	0.93			
Water melons (growth period) in days	10	20	30	30	**90**
Kc per stage	0.48		0.94	0.96	
Cowpea (growth period) in days	20	35	35	20	**110**
Kc per stage	0.4	0.67	1.05	0.61	

3.3.1 Net irrigation requirement, NIR

The Net Irrigation Requirement (NIR) for upland crops has been determined as follows:

$$NIR = ETcrop - Pe - Ge - Wb \quad (mm/day)$$

Where,

NIR	=	Net Irrigation Water Requirements [mm/day];
ET_{Crop}	=	Crop Water Requirement [mm/day];
Pe	=	Effective rainfall (mm)
Ge	=	Ground water contribution (mm)
Wb	=	Stored water contribution (mm)

Ge and Wb are assumed to be negligible. Upland crops do not require water for saturation, percolation and maintenance of water layer above the soil.

Assumptions:

- Land preparation for each season set for 1 month;
- All farmers plant at the time proposed in the cropping calendar;
- The areas allocated for each crop during the dry season are not exceeded.

3.3.2 Gross irrigation requirement

The Gross Irrigation Requirement, GIR = NIR / (overall irrigation efficiency, Eff).

Where;

Eff : Ec x Ed x Ea

Where;

Ec	=	conveyance efficiency;
Ed	=	distribution efficiency;
Ea	=	application efficiency.

The table below show the irrigation efficiencies adopted in line with the FAO Guidelines for unlined and concrete Lined canals.

Table 3-4 Irrigation Efficiencies

Irrigation Efficiency	**Closed pipeline (Conveyance and distribution) and furrow for application**
Conveyance	95%
Distribution	80%
Application	50%
Overall	**38%**

The adopted overall irrigation efficiency is 38%. It is worth noting that with experience farmers will be able to improve water application efficiency and limit water losses meaning that there would be more water available for crop production.

3.4 Scheme Water Requirements and Availability

The calculated monthly Scheme Water Requirements (SWR) based on the proposed crops, cropped area and cropping calendar is presented in table below

Table 3-5 Estimated Scheme Water Requirements (SWR)

Months	Scheme Water Requirements (m^3/s)
Jan	**0.168**
Feb	0.159
Mar	0.098
Apr	0.034
May	0.000
Jun	0.000
Jul	0.000
Aug	0.000
Sep	0.000
Oct	0.096
Nov	0.018
Dec	0.066

From the Table above, the peak water requirements is experienced in the month of January and this is the flow that has been used to design for the proposed 100 ha net project area.

3.4.1 Irrigation scheduling

The irrigation scheduling /budgeting indicates how much water is to be applied and when to be applied. It is a planning tool for the irrigation water. Irrigation water scheduling depends on the type of the soil, the crops under cultivation and the application methods among other factors. The dominant soil in the project area is clayey and loamy soils while there is a wide range of crops that are grown.

Maximum Irrigation Interval(MII)

The maximum irrigation interval (M.I.I) is given by total readily available Moisture (TRAM)/ETcrop. TRAM is a function of the effective crop rooting depth and the soil available moisture and the allowable soil moisture depletion rate. The highest value of ETcrop for the project is 6.92mm/day. The minimum root zone depth among the selected crops is 0.4m. The available moisture content for predominant soil (clay loam) is 150mm/m depth of soil. The TRAM given by

(AW*allowable depletion rate) = 150*50%=75mm.

MII=TRAM * RZD/ETcrop

= (75*0.4)/6.92mm/day

= 4 days

3.5 Irrigation pipeline discharges

The irrigation pipelines have been designed to carry the peak demand in the respective areas as summarized in table 2-8 below.

Table 3-6 Pipeline design discharges

PIPELINE	LENGTH (m)	PIPE DETAILS		DIAMETER (mm)	BLOCK	DESIGN AREA (ha)	FLOW, Q(m^3/s)
		Length (m)	**Type/ class**				
Conveyance	3,341.00	36.00	GI PIPE Medium	400	All	100.00	0.1667
			UPvc pipes	400			
		3,305.00	B				
Mainline	2,363.50	24.00	GI PIPE Medium	550	All	100.00	0.1667
			UPvc pipes				
		2,339.50	B	560			
Submain 1	1,058.30	1,058.30	B	250	Block 1	23.60	0.0392
Submain 2	1,061.00	1,061.00	B	250	Block 2	22.70	0.0377
Submain 3	1,060.00	1,060.00	B	250	Block 3	22.70	0.0377
Submain 4	1,060.00	1,060.00	B	250	Block 4	22.70	0.0377
Submain 5	311.70	311.70	B	140	Block 5	8.30	0.0138

In total, the main and sub mains will carry a discharge of 0.1667 m^3/s to meet the crop water requirements.

4 IRRIGATION AND DRAINAGE DESIGN

4.1 Introduction

In line with TOR, the consultant was required to identify at irrigation development plans in the project area on the basis of water supply intake location, land coverage and selected crops to provide basis for discussion with the stakeholders and subsequent implementation of the proposed development.

The following sections present the irrigation development option for the proposed Mandouri irrigation development project which will be implemented in the next phase of the project.

The project components in the final design include the following:

- Pump, Pumping sump and pump control house
- Power generation/Solar system and associated infrastructure
- Irrigation pipelines (Conveyance, main, sub-mains)
- Storage tank
- Pipeline appurtenances (anchor blocks, section valves)
- Drains (Main, collectors)
- Farm access roads
- Cattle watering point
- Value addition agro-industry
- Bakery cottages industry

4.2 Design considerations

Irrigation development plan have been prepared for the site taking into consideration the following influencing factors:

- Local knowledge and experience;
- Water source and availability and distance to water source from the project area
- Emphasis on an efficient and economically viable irrigation system in the long term with respect to water supply, distribution and application;
- Conveyance and distribution system (closed pipeline);
- Irrigation method (furrow and basin);
- Literature review from existing documents;

4.3 Proposed development options

The development option was proposed by considering the following:

- Water source (River Oti[1]);
- Irrigation area;
- Intake system (pumping);
- pipelines for conveyance and distribution system
- Irrigation method and in-field irrigation system (furrows/basin);
- Pipeline appurtenances;
- Drainage system.

Based on the above stated factors and the recommended application method for Mandouri irrigation scheme, the following irrigation development option has been adopted and foe which the design has been made.

- **Conveyance and distributions are closed pipelines and application is furrow/basin.**

4.4 Irrigation system components

4.4.1 General Layout

The general layout of the irrigation system is shown in figure 3-1 below

- 1 No. Pump 35m Head at the intake
- 1 No. Conveyance pipeline
- 1 storage tank 600m^3 capacity
- 1 No. Main pipeline
- 5 No. Sub-Main pipelines
- 1 No. Main drain canals
- 5 No. Collector drain canals
- Delineated area and block boundaries;

The irrigation area is split into 5 blocks: 1, 2, 3, 4 and 5 as shown in Figure 3-2.

Sub-division of the area was based on the following:

- Topography – blocking of areas with similar topographical features;
- Existing drainage system (natural waterways/depressions) – used to form boundary between blocks;
- Soil types – areas with similar soils grouped together as much as possible;
- Discussions and agreements with farmers' representatives on the boundaries.

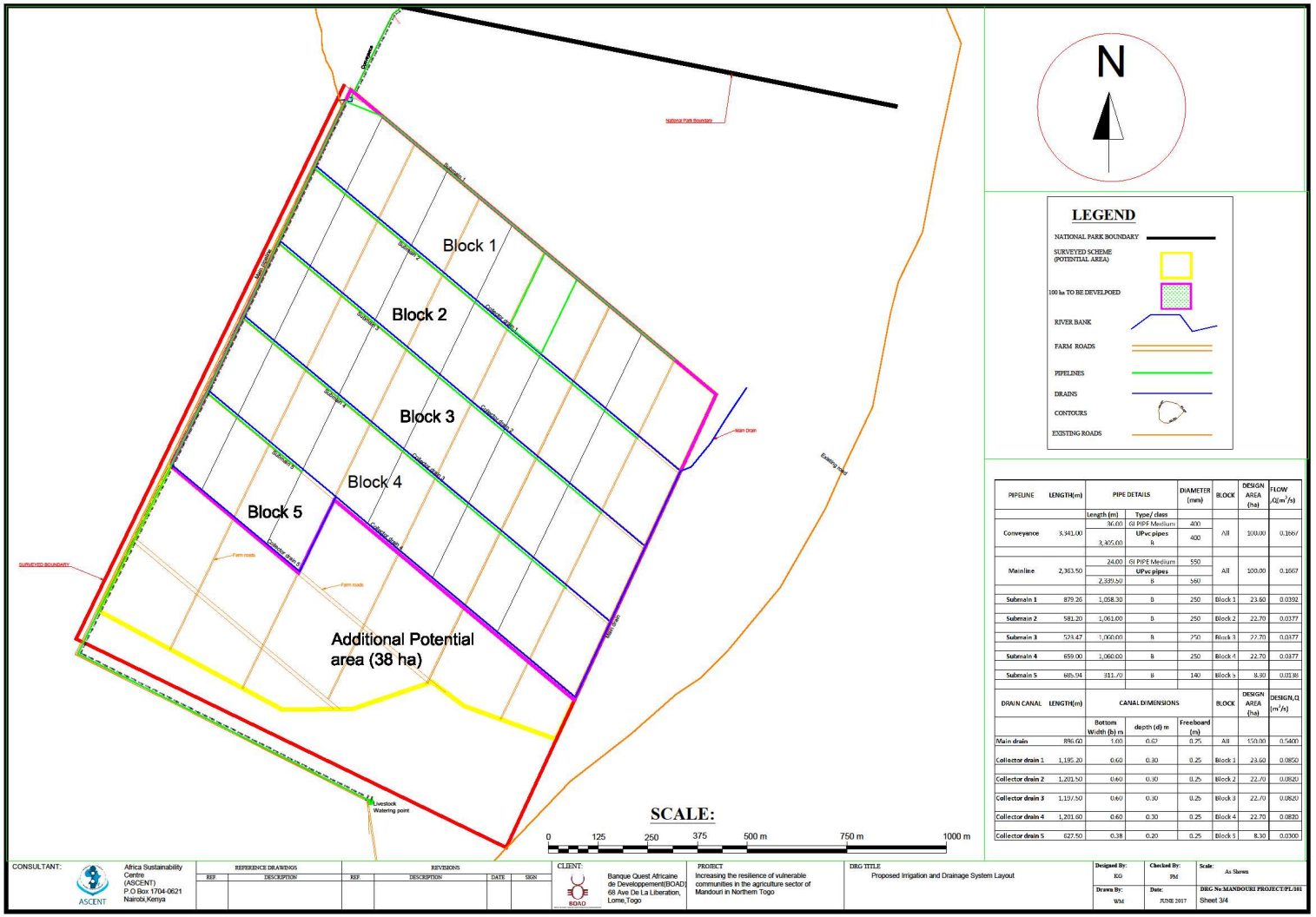
[1] Flood water harvesting and storage would have to be considered if hydrological analysis at the proposed abstraction point shows that stream flow would not be able to meet the irrigation water requirement for some of the growing period

4.4.2 Irrigation area

The delineated project area has a gross area of 106.38 ha while the net irrigation area is 100ha and distributed as shown in Table 4-1. There is an additional 38 ha potential area for future irrigation expansion.

Table 4-1 Gross and net Irrigation areas per block

Block	**Gross Areas(Ha)**	**Potential Net Irrigable Areas (Ha)**
1	25.10	23.6
2	24.15	22.7
3	24.15	22.7
4	24.15	22.7
5	8.83	8.30
Total	**106.38**	**100**



PIPELINE	LENGTH(m)	PIPE DETAILS		DIAMETER (mm)	BLOCK	DESIGN AREA (ha)	FLOW ,Q(m^3/s)
		Length (m)	Type/ class				
Conveyance	3,341.00	36.00	GI PIPE Medium	400	All	100.00	0.166/
		3,305.00	UPvc pipes B	400			
Mainline	2,363.50	24.00	GI PIPE Medium	550	All	100.00	0.166?
		2,339.50	UPvc pipes B	560			
Submain 1	879.26	1,058.30	B	250	Block 1	23.60	0.0392
Submain 2	581.20	1,061.00	B	250	Block 2	22.70	0.0377
Submain 3	523.47	1,060.00	B	250	Block 3	22.70	0.0377
Submain 4	659.00	1,060.00	B	250	Block 4	22.70	0.0377
Submain 5	685.94	311.70	B	140	Block 5	8.30	0.0138

DRAIN CANAL	LENGTH(m)	CANAL DIMENSIONS			BLOCK	DESIGN AREA (ha)	DESIGN,Q (m^3/s)
		Bottom Width (b) m	depth (d) m	Freeboard (m)			
Main drain	896.60	1.00	0.67	0.25	All	150.00	0.5400
Collector drain 1	1,195.20	0.60	0.30	0.25	Block 1	23.60	0.0850
Collector drain 2	1,201.50	0.60	0.30	0.25	Block 2	22.70	0.0820
Collector drain 3	1,197.50	0.60	0.30	0.25	Block 3	22.70	0.0820
Collector drain 4	1,201.60	0.60	0.30	0.25	Block 4	22.70	0.0820
Collector drain 5	627.50	0.38	0.20	0.25	Block 5	8.30	0.0300

Figure 4-1: General system layout

4.4.3 Mandouri Pump Design

A pump able to provide required irrigation water at a head of 39 m was designed for the irrigation system development. The pump will pump the 0.1667 m^3/s against a total head of 25 and empty the water into a tank 6 m above ground level at the scheme head.

A Franklin Electric pump FPS 650FS able to deliver the required water at the required head has been selected for the Mandouri project. The chart below gives the capacities of the FPS FS Series.

Pump			Capacity												
			l/min	0	3000	5000	6000	7000	8000	9000	10000	11000	12000	13000	13500
			m^3/h	0	180	300	360	420	480	540	600	660	720	780	810
	kW	HP	l/s	0	50	83,3	100	116,6	133,3	150	166,6	183,3	200	216,6	225
FPS-650FS/1/75kw	75	100		54	45	41	39,5	38,5	37	35	32	28	23	17,5	
FPS-650FS/1/92kw	92	125		61	51,5	47	45,5	44	43	41,5	39,5	36	32	26	22,5
FPS-650FS/1/110kw	110	150		68,5	59	54	52,5	51	50	48,5	47	45	41	35,5	31,5
FPS-650FS/1/130kw	130	175		76	66	60,5	58,5	57	56,5	55,5	54	52,5	49	43,5	39,5
FPS-650FS/2/150kw	150	200	H	105,5	95	88	85,5	82,5	79,5	75	69,5	61,5	51,5	39	31
FPS-650FS/2/170kw	170	230	m	115	102	96	93,5	91	88	84	78,5	70,5	61	49,5	43
FPS-650FS/2/185kw	185	250		124	108	101,5	99,5	97	94,5	90,5	85,5	78	68,5	57	50,5
FPS-650FS/3/220kw	220	300		157,5	139,5	131,5	128	123,5	118,5	111,5	102	90	74,5	56,5	45,5
FPS-650FS/3/250kw	250	340		171	151,5	143	139,5	135,5	130,5	124	116	104	90	73	63
FPS-650FS/3/300kw	300	400		196	171	161,5	158	154,5	150	144,5	137,5	126,5	113	97	86,5

From the chart above, the selected pump FPS-650FS will be able to provide the required flow at a head of 47 m and will require 110 Kw of power to be supplied to its motor for the water to be delivered at the Mandouri Scheme head.

As note elsewhere electricity in Mandouri is supplied from a diesel generator that operates for limited specified period during the day. The Mandouri irrigation project cannot therefore be operated based on power provision from the town supply. Two options were considered 1) to have a diesel-powered generator provide the required power, 2) to have solar generated power supply the required power to the pump. As the project has a focus on climate change mitigation. The second option was deemed the best as it is meets the objective of the project in the climate adaptation.

4.4.4 Pipeline Designs

The conveyance pipeline will convey water from the pumping station to the head of the scheme. The pipeline will pass through the national park area as it comes from the pumping station and cross existing roads to the head of the scheme. Valves including sluice valves, non-return valves and washouts will be incorporated in this section to control and regulate water flow.

i) Design Consideration

The main Pipelines design are based on peak flows to the project, the recommended flow velocities, the nature of the terrain, friction losses and the type of the materials. In order to achieve an optimum size for effective delivery of water to the project, the pipe diameters have been determined from the Continuity Equation:

$$Q = AV$$

Where:
Q = Discharge (m^3/s)
A = Cross section area of the pipe (m2)
V = mean flow velocity (m/s).

Hydraulic Calculations:

The hydraulic calculation involves the determination of the following:

- Energy line level at any point of the system (EL);
- Hydraulic grade line level(HGL);
- Hydraulic pressure Head (HP);
- Static Head (Hs).

The above parameters have been determined and provided as follows:

$$EL = reference\ static\ or\ energy\ level - (Hf)$$
$$HGL = El - Vf$$
$$HP = HGL - Pipe\ invert\ level$$
$$Hs = Static\ Energy\ Level - Pipe\ invert\ level$$
$$Hf = Friction\ losses$$
$$Vf = Velocity\ head\ losses = (V2/2g)$$

In determination of friction head losses (Hf) Hazen Williams's equation is used i.e.

$$\boldsymbol{Hf = 6.843 * L\ (V/C)\ 1.852/\ (D1.167)}$$

$Where$:
$Hf\ is =\ the\ friction\ head\ losses\ (m)$
$V\ is\ the\ average\ flow\ velocity\ (m/s)$
$L\ is\ the\ length\ of\ the\ pipeline\ (m)$
$D\ is\ the\ diameter\ of\ the\ pipe\ (m)$
$C\ is\ the\ discharge\ coefficient$
$Velocity\ is\ set\ i.e.minimum\ 0.3m/s\ and\ maximum\ of\ 2.0m/s$

Discharge Coefficient:

The following discharge coefficients have been used for the design of the pipelines.

Table 4-2: Discharge Coefficient

Type of Pipe	Discharge Coefficient 'C'
Steel Pipe / GI	100
PVC Pipe (D > 0.15m)	150
PVC Pipe (D < 0.15m)	150

ii) Pipe Material

The choice of pipe material to be used depends on general characteristics of the pipeline while the class of the pipes depends on the static pressure head along the pipe line.

The following pipe materials have been considered:

Steel / GI pipes in exposed areas (rocky, at the intake and road crossings) and inside valve chambers for the entire pipe network.

uPVC pipes for all buried pipes of 560mm,400mm, 250mm and 140mm. The depth of burying pipes is at an average of 1.0m below ground level.

iii) Design Discharges

The determination of pipe sizes is based on the discharge required to be conveyed along the line to meet peak crop water demand. Based on the area allocation, irrigation scheduling, the type of the crop and cropping pattern, the design flows have been determined.

iv) Pipe Size Selection and Details

Pipe diameters have been determined from the continuity equation; Q = AV, as described above.

The following velocity conditions were set to guide in the selection of the appropriate pipe diameters:

- A minimum flow velocity of 0.3 m/s to avoid siltation in the pipeline system.
- Maximum flow velocity of 2.0 m/s to avoid scouring of the pipes.
- The standard sizes of the pipes and allowable pressures.

A summary of irrigation system design flows and pipe network details are as shown in table 3-4 below

Table 4-3: Irrigation system design flows and pipe network details

PIPELINE	LENGTH (m)	PIPE DETAILS		DIAMETER (mm)	BLOCK	DESIGN AREA (ha)	FLOW, $Q(m^3/s)$
		Length (m)	**Type/ class**				
Conveyance	3,341.00	36.00	GI PIPE Medium	400	All	100.00	0.1667
			UPvc pipes	400			
		3,305.00	B				
Mainline	2,363.50	24.00	GI PIPE Medium	550	All	100.00	0.1667
			UPvc pipes				
		2,339.50	B	560			
Submain 1	1,058.30	1,058.30	B	250	Block 1	23.60	0.0392
Submain 2	1,061.00	1,061.00	B	250	Block 2	22.70	0.0377
Submain 3	1,060.00	1,060.00	B	250	Block 3	22.70	0.0377
Submain 4	1,060.00	1,060.00	B	250	Block 4	22.70	0.0377
Submain 5	311.70	311.70	B	140	Block 5	8.30	0.0138

4.4.5 Pipeline Appurtenances

i. Section Valves

Section valves have been designed to be located at off take lines to control the flows to various sections / blocks.

For ease of operation and inspection, all section valves are placed in lockable chambers. The chamber is designed to drain through a drain pipe. The chamber sizes vary according to the inlet/outlet pipe size and junction fittings. The minimum chamber size recommended is 1000 x 1000 mm and no uPVC pipes are to be within the chamber.

Table 4-4: Mandouri junction chambers

No	Chainage	Main pipeline		Off-take	
	(m)	Description	Pipe size(mm)	Description	Pipe size(mm)
	Conveyance				
1	3341	Conveyance	400	Mainline 1 (Off-take from the storage tank)	560
Mainline					
2	20	Mainline	560	Submain 1	250
3	200	Mainline	560	Submain 2	250
4	400	Mainline	560	Submain 3	250
5	600	Mainline	560	Submain 4	250
6	820	Mainline	560	Submain 5	140

ii. Anchor / Thrust Blocks

In all bends both vertical and horizontal, thrust blocks are provided to anchor the pipeline.

At steep areas, end of pipeline and at junctions, thrust blocks are also provided.

4.4.6 Drains

Mandouri is a relatively flat project area and thus making it susceptible to unwanted flooding and water logging. The drainage design proposes improvement of natural drainage routes and construction of new drainage canals.

Collector drains have been designed and laid out to drain excess irrigation and runoff water from the crop field. The collector drains discharges into the main drain.

Table 4-5 Summary of irrigation drains

DRAIN CANAL	LENGTH(m)	CANAL DIMENSIONS			BLOCK	DESIGN AREA (ha)	DESIGN, Q(m^3/s)
		Bottom Width (b) m	depth (d) m	Freeboard (m)			
Main drain	896.60	1.00	0.62	0.25	All	150.00	0.5400
Collector drain 1	1,195.20	0.60	0.30	0.25	Block 1	23.60	0.0850
Collector drain 2	1,201.50	0.60	0.30	0.25	Block 2	22.70	0.0820
Collector drain 3	1,197.50	0.60	0.30	0.25	Block 3	22.70	0.0820
Collector drain 4	1,201.60	0.60	0.30	0.25	Block 4	22.70	0.0820
Collector drain 5	627.50	0.38	0.20	0.25	Block 5	8.30	0.0300

4.4.7 In-field system

In line with the selected irrigation method and varying topographic features of the project area, surface application system will be used for the proposed Mandouri project area. A surface system has been adopted in the area based on the following considerations

- To allow for flood irrigated rice crop during the rain season
- To allow for furrow irrigation for crops grown during the dry period
- The available head residue of about 2 m provided by the storage tank

The infield system of a surface system has been proposed and is composed of;

- furrows to be used to for irrigation of crops grown during the dry season
- basin to be used for flood fed irrigation of the rain season rice crop
- and for the same basin to be used for supplemental irrigation for the flood irrigated rice crop during its maturity stage when it occurs in the month of October

4.5 Solar System Design

4.5.1 Power generation and solar system

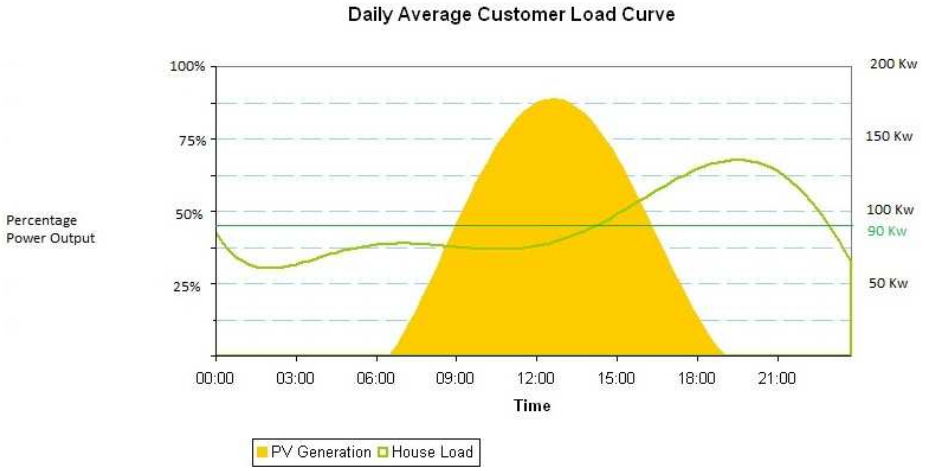
Solar systems are the best way of powering unconnected areas of Africa and the rest of the world. At this time when the world is trying to mitigate effects of climate change, solar power offers the best alternative to fossil fuel generated power both as a means of combating and mitigating effects of climate change.

The Solar PV system is designed to provide a full year service without change in performance due to weather patterns. The design has made consideration for water pumping and provided 8% power related value adding agro-processing facilities. The system designed for Mandouri project can be upgraded to big power plant by interconnecting similar micro grids.

4.5.2 System Capacity and design criteria

The System is designed have capacity to generate a maximum of 212,160 Watts. The solar inverters can handle Peak power of 200 Kilowatts. Battery inverters together with solar inverters can handle a peak of 216 Kilowatts. This gives the system ability to run on full load of 200 Kilowatts at any time, day or night. The system has capacity to generate 361 Mega watts hours of solar energy annually. This energy is sufficient to run 110 Kilowatts load (pumps) and 20 Kilowatts of the small agribusiness value addition facilities with 100% of energy being direct from the solar system.

Normally, there are losses when converting solar energy to electricity. Below is the solar curve with percentage output when the proposed 848 panels are installed facing south and 16% tilt angle.

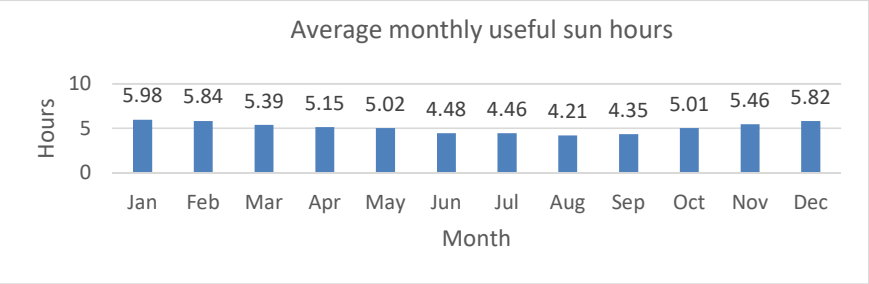


The above curve shows that solar energy generation will not reach 100%. The actual output must also be higher than the load demand. The Mandouri system is therefore designed at 200 kilowatts to provide a peak demand of 130Kw. Total maximum load being at 130 Kilowatts, is 65% of maximum PV capacity of 200 Kilowatts. The difference of at most 35% is used to charge the batteries to provide continuous power supply during cloud cover periods. For optimal operation of the system, it is

recommended that the small agribusiness value addition facilities only operate for a maximum of 6 hours during the day, i.e. 0900 Hrs to 1500 Hrs. Based on optimum designed operation the batteries used in the system will have a life span of not less than ten years.

4.5.3 Solar Power Mini-grid for Mandouri

Mandouri weather pattern shows that useful solar energy is available for an average of 4.65 hours per day throughout the year. The chart below shows average monthly useful sun hours.



Useful solar energy is equivalent to 1000Watts of solar energy per square meter. The process below describes the design of expected power generation using SMA Solar Technology AG software for the Mandouri Solar power system.

System overview

848 x JinkoSolar Holding Co. Ltd. JKM-250P-60-A (01/2014) (PV array 1)
Azimuth angle: 25 °, Tilt angle: 5 °, Mounting type: Roof, Peak power: 212.00 kWp

8 x STP 25000TL-30

Storage system

1 x MC-Box-36.3
Batteries: Lead

36 x Sunny Island 8.0H
Total nominal capacity: 1,826.48 kWh (equates to 38052 Ah at C10)
Of which can be utilized: 913.24 kWh (equates to 19026 Ah at C10)

Genset

Active power: 160 kW
Average energy efficiency: 3.50 kWh/l

PV design data

Total number of PV modules:	848	Spec. energy yield*:	1703 kWh/kWp
Peak power:	212.00 kWp	Line losses (in % of PV energy):	---
Number of PV inverters:	8	Unbalanced load:	0.00 VA
Nominal AC power of the PV inverters:	200.00 kW	Used PV energy:	333.82 MWh
AC active power:	200.00 kW	Used PV share:	92.5 %
Active power ratio:	94.3 %	PV share of the energy supply (during the day):	222.7 %
Max. available PV energy*:	360.94 MWh		
Energy usability factor:	100 %	Average annual solar fraction:	94.6 %

Evaluation of design

Project name: Mandouri Solar Minigrid
Project number:

Location: Togo / Mandouri
Ambient temperature:
Annual extreme low temperature: 0 °C
Average high Temperature: 0 °C
Annual extreme high temperature: 0 °C

Subproject 1

8 x STP 25000TL-30 (PV system section 2)

Peak power:	212.00 kWp
Total number of PV modules:	848
Number of PV inverters:	8
Max. DC power (cos φ = 1):	25.55 kW
Max. AC active power (cos φ = 1):	25.00 kW
Grid voltage:	415V (240V / 415V)
Nominal power ratio:	96 %
Dimensioning factor:	106 %
Displacement power factor cos φ:	1

STP 25000TL-30

PV design data

Input A: PV array 1
66 x JinkoSolar Holding Co. Ltd. JKM-250P-60-A (01/2014), Azimuth angle: 25 °, Tilt angle: 5 °, Mounting type: Roof

Input B: PV array 1
40 x JinkoSolar Holding Co. Ltd. JKM-250P-60-A (01/2014), Azimuth angle: 25 °, Tilt angle: 5 °, Mounting type: Roof

	Input A:	Input B:	
Number of strings:	3	2	
PV modules per string:	22	20	
Peak power (input):	16.50 kWp	10.00 kWp	
Typical PV voltage:	674 V	612 V	
Min. PV voltage:	658 V	598 V	
Min. DC voltage (Grid voltage 240 V):	150 V	150 V	
Max. PV voltage:	894 V	813 V	
Max. DC voltage:	1000 V	1000 V	
Max. MPP current of PV array:	24.6 A	16.4 A	
Max. operating input current per MPPT:	33 A	33 A	

PV/Inverter compatible

Wire sizing

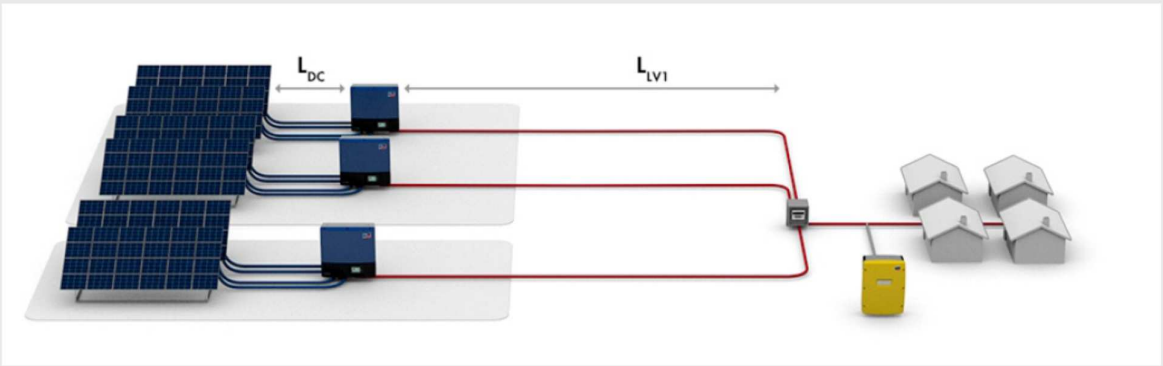
Project name: Mandouri Solar Minigrid **Location: Togo / Mandouri**

Project number:

Overview

	DC	LV	Total
Power loss at nominal operation	175.52 W	1.55 kW	1.73 kW
Rel. power loss at rated nominal operation	0.09 %	0.78 %	0.86 %
Total cable length	800.00 m	400.00 m	1200.00 m
Cable cross-sections	6 mm²	16 mm²	6 mm² 16 mm²

Graphic



DC cables

		Cable material	Single length	Cross section	Voltage drop	Rel. power loss
Subproject 1						
8 x STP 25000TL-30 PV system section 2	A	Copper	10.00 m	6 mm²	501.6 mV	0.08 %
	B	Copper	10.00 m	6 mm²	501.6 mV	0.09 %

Lines LV1

	Cable material	Single length	Cross section	Line resistance	Rel. power loss
Subproject 1					
8 x STP 25000TL-30 PV system section 2	Copper	50.00 m	16 mm²	R: 17.917 mΩ XL: 3.750 mΩ	0.78 %

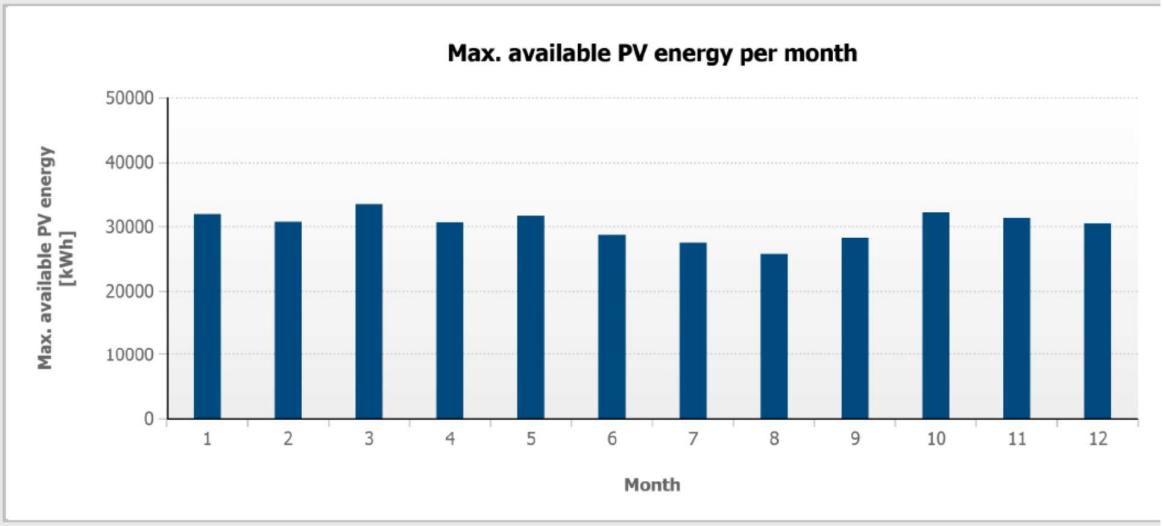
The displayed results are approximate values to give a general indication to users of possible operating results. The results are determined mathematically based on standardized assumptions. The actual operating results will be dictated significantly by the actual irradiation conditions, the actual efficiency, the genset operating conditions and the individual consumption behavior and can deviate from the calculated results. SMA SOLAR TECHNOLOGY AG THEREFORE ASSUMES NO LIABILITY FOR YIELD SHORTFALLS IN THE EVENT OF DEVIATIONS BETWEEN THE CALCULATED- AND ACTUAL OPERATING RESULTS.

Monthly values

Project name: Mandouri Solar Minigrid **Location: Togo / Mandouri**

Project number:

Diagram



Table

Month	Max. available PV energy [kWh]	Used PV energy [kWh]	Consumption [kWh]	Solar fraction
1	31812	29405	25430	100 %
2	30605	27413	23025	100 %
3	33357	29980	25505	100 %
4	30498	27295	24574	94 %
5	31579	28858	25505	96 %
6	28572	27305	24658	97 %
7	27344	26726	25527	88 %
8	25562	23778	25465	81 %
9	28124	25956	24726	88 %
10	32044	29824	25434	100 %
11	31123	28006	24648	97 %
12	30318	29276	25505	96 %

Analyses of the energy and power in the system

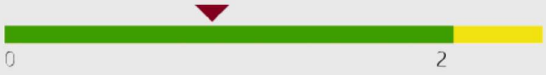
Project name: Mandouri Solar Minigrid **Location: Togo / Mandouri**

Project number:

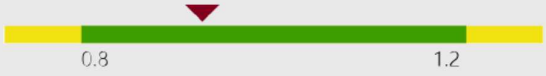
Power

System compatible

Nominal AC power PV inverters / storage system: 0.93



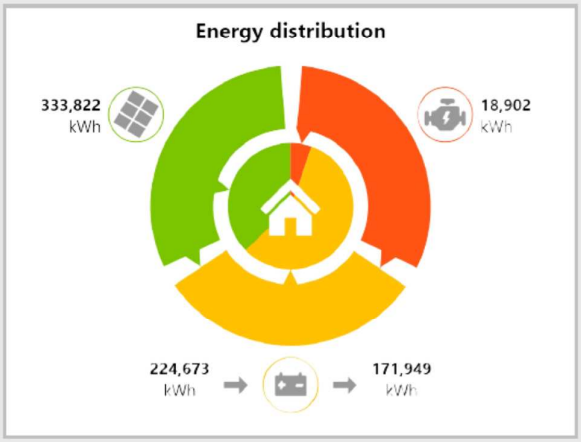
Nominal AC power genset / storage system: 0.93



Usable storage capacity: 913.2 kWh (1 d)

Total nominal AC power of the system:	616 kW
Nominal AC power PV inverters:	200 kW
Nominal AC power storage system:	216 kW
Nominal AC power genset:	200 kW
Power reserve:	0 kW
Energy deficit:	0 kWh
Nominal AC power PV inverters / storage system:	0.93
Nominal AC power genset / storage system:	0.93
Usable storage capacity:	913.2 kWh
Autonomous time:	1 d
Average annual solar fraction:	94.6 %

Energy



Annual energy consumption:	300 MWh
Max. available PV energy:	361 MWh
Used PV energy:	334 MWh
Directly consumed PV energy:	125 MWh
Intermediately stored PV energy:	209 MWh
Annual energy generation of the genset:	18,902 kWh
Annual nominal energy throughputs of the battery:	123
Annual fuel consumption:	5,303 l

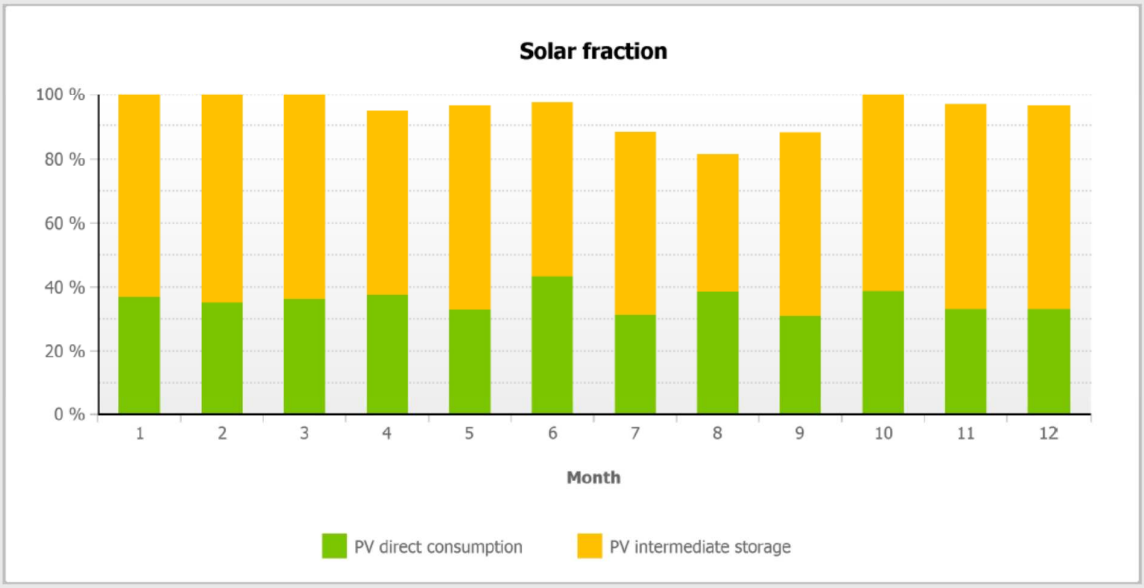
The displayed results are approximate values to give a general indication to users of possible operating results. The results are determined mathematically based on standardized assumptions. The actual operating results will be dictated significantly by the actual irradiation conditions, the actual efficiency, the genset operating conditions and the individual consumption behavior and can deviate from the calculated results. SMA SOLAR TECHNOLOGY AG THEREFORE ASSUMES NO LIABILITY FOR YIELD SHORTFALLS IN THE EVENT OF DEVIATIONS BETWEEN THE CALCULATED- AND ACTUAL OPERATING RESULTS.

Analyses of the energy and power in the system

Project name: Mandouri Solar Minigrid **Location: Togo / Mandouri**

Project number:

Solar fraction



Month	Solar fraction [%]	Used PV share [%]	Fuel consumption [l]
1	100	92	0
2	100	90	0
3	100	90	0
4	94	89	503
5	96	91	411
6	97	96	229
7	88	98	1006
8	81	93	1509
9	88	92	1006
10	100	93	0
11	97	90	274
12	96	97	366

The displayed results are approximate values to give a general indication to users of possible operating results. The results are determined mathematically based on standardized assumptions. The actual operating results will be dictated significantly by the actual irradiation conditions, the actual efficiency, the genset operating conditions and the individual consumption behavior and can deviate from the calculated results. SMA SOLAR TECHNOLOGY AG THEREFORE ASSUMES NO LIABILITY FOR YIELD SHORTFALLS IN THE EVENT OF DEVIATIONS BETWEEN THE CALCULATED- AND ACTUAL OPERATING RESULTS.

Storage system

Project name: Mandouri Solar Minigrid **Location: Togo / Mandouri**

Project number:

Power

AC power at 25 °C:	216 kW
AC power at 40 °C:	195.5 kW
AC power at 25 °C for 30 min:	288 kW

Battery

Batteries:	Lead
Total nominal capacity:	1,826.48 kWh (equates to 38052 Ah at C10)
Of which can be utilized:	913.24 kWh (equates to 19026 Ah at C10)

System Components

	Device	Settings per cluster/device	
Multicluster Box	MC-Box-36.3		
Cluster 1	3 x Sunny Island 8.0H	Batteries:	Lead
Cluster 2	3 x Sunny Island 8.0H	Capacity:	152.21 kWh (equates to 3171 Ah at C10)
Cluster 3	3 x Sunny Island 8.0H	Of which can be utilized:	50 % (equates to 1585 Ah at C10)
Cluster 4	3 x Sunny Island 8.0H		
Cluster 5	3 x Sunny Island 8.0H		
Cluster 6	3 x Sunny Island 8.0H		
Cluster 7	3 x Sunny Island 8.0H		
Cluster 8	3 x Sunny Island 8.0H		
Cluster 9	3 x Sunny Island 8.0H		
Cluster 10	3 x Sunny Island 8.0H		
Cluster 11	3 x Sunny Island 8.0H		
Cluster 12	3 x Sunny Island 8.0H		

Load profile overview

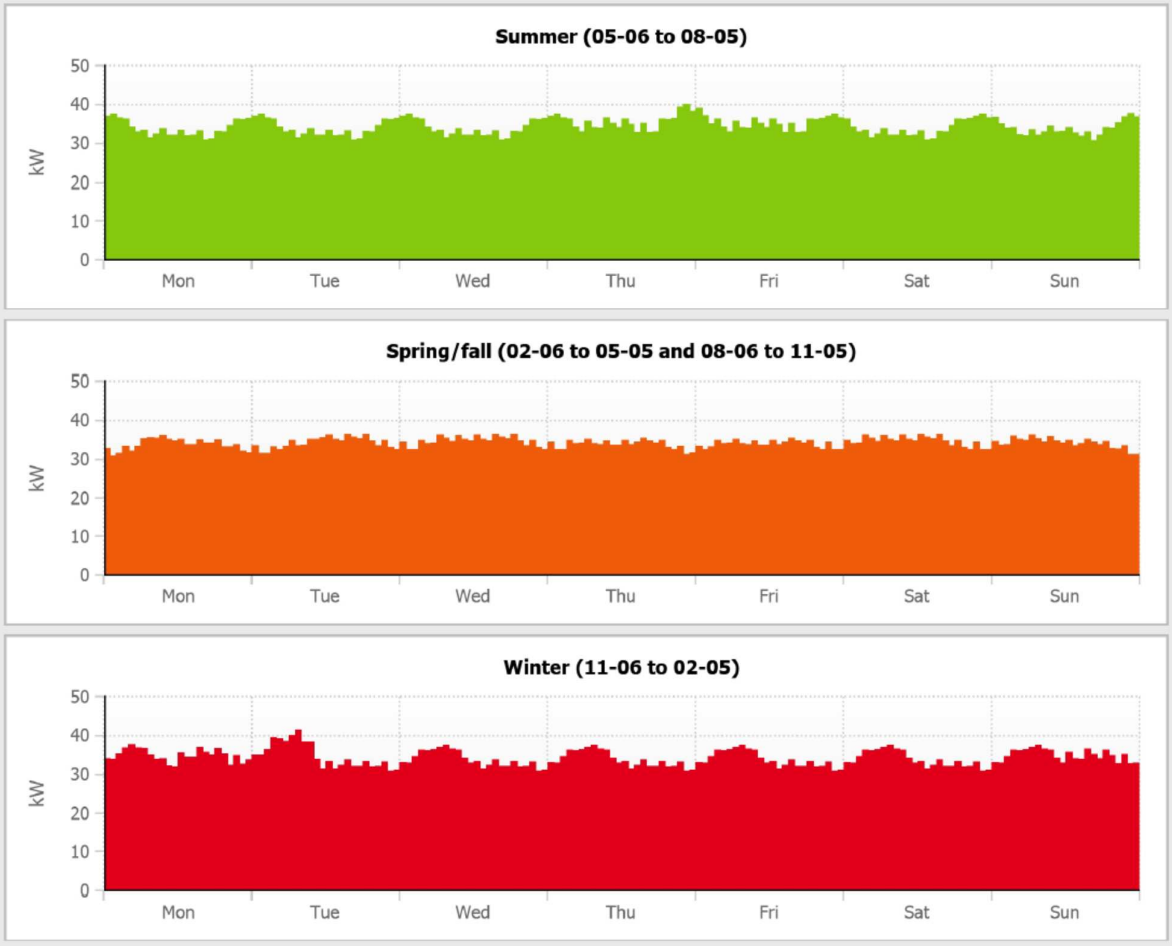
Project name: Mandouri Solar Minigrid **Location: Togo / Mandouri**

Project number:

Overview

Load profile	Annual energy consumption	30 minute power
Village with production plant	300000 kWh	56.5 kW
Total	**300 MWh**	**56.5 kW**

Average weekly profile by seasons



The displayed results are approximate values to give a general indication to users of possible operating results. The results are determined mathematically based on standardized assumptions. The actual operating results will be dictated significantly by the actual irradiation conditions, the actual efficiency, the genset operating conditions and the individual consumption behavior and can deviate from the calculated results. SMA SOLAR TECHNOLOGY AG THEREFORE ASSUMES NO LIABILITY FOR YIELD SHORTFALLS IN THE EVENT OF DEVIATIONS BETWEEN THE CALCULATED- AND ACTUAL OPERATING RESULTS.

4.5.4 Solar System Components

The solar system that will meet the required power for the water pumping and the proposed value addition agro-processing facilities will have the following components.

Table 4-6 Solar system components

ITEM	Description
On-grid solar inverter	25KW SMA Tri-power 25000TL • Converts Solar DC power into usable 3 phase AC power. This power drives the pumps, excess is stored in batteries for other use.
Solar panel	260W, Poly grade A, Jinko 260P-60 Solar Panels • 20pcs in series,6 groups parallel for one inverter
Panel bracket system	For mount the solar panels, Iron hot-dipped with galvanizing material, Ground support type • with all the connectors and accessories.
Battery inverter	6 Kw sunny Island 8.0 single phase, inverters/chargers • Bidirectional inverters for charging and discharging the batteries during excess solar energy and during inadequate solar energy respectively.
Battery	2V/3200AH "OPzV" battery • 24 Pcs Per cluster, 3 clusters, 12 CLUSTERS
Battery Racks	One cabinet can install 24pcs 2V/1000AH batteries • with battery cable connection and battery breaker
SMA Multi-cluster-box 36	8 ways input 1output, 1000Vdc/100A, with Anti-diode, wall mount type, IP65 • To combine Power from battery inverters, PV inverters and generator. This is also point of connection to load. Also allows generator AutoStart
Solar cable	• 4mm2/1000Vdc solar panel cable
DC cable	• 16mm2/750 Vdc cable, from the combiner box to the solar inverter cable connection terminal
DC waterproof terminal	• MC4 connector (one pair, male and female)
AC cable	• 2*25mm2, 4 core (Red, yellow, Blue and Black)
Electrical 3 phase, 500 KVA Transmission line	Electric Poles, 50mm, Aluminum wire, D- Sets, Line taps, Guy wire, Guy wire insulators, Stay rods, Bolts, Fuse & Fuse Carrier. End to End MCCBs. • To transmit power for a distance of at most 5Km from pump site to the village
Electrical Distribution Board	1. Combining Solar power generated in PV plant. 2. Distributing power to Pumps, local loads and to the transformer. 3 Distributing power to loads in the village
200 KVA or 500KVA 3 Phase step-up/Stepdown (415/11000) Transformers	• To step up power to reduce line losses during transmission.
Data Monitoring system	• for whole system monitoring

5 FARMERS ORGANIZATION AND MANAGEMENT

5.1 Introduction

As mentioned, the farmers in the production area have been organised by The Ministry of Agriculture in cooperative for the purpose of the traditional and improved flood irrigated rice cultivation. It is proposed that this project utilises the same organisation for the purpose of managing the irrigation system to be developed.

5.2 Mandouri project organization and management

An irrigation project organization and management defines how the various project components namely physical (infrastructure, water and equipment), social (institutions, farmers and technical personnel), biological (crops and cropping patterns) and economic (inputs and outputs and their associated costs and prices) interlink and how decision making is undertaken to ensure a functional system. A project organization and management structure defines the actors, or stakeholders and their roles and responsibilities and the decision-making process. The effectiveness of an irrigation project organization and management structure therefore determines the project performance and sustainability.

It is the objective of the implementing agency, BOAD and the Ministry of Environment and other partners to ensure Mndouri project will eventually be managed and operated by the community. Formation of and strengthening of a community-based institution and strong irrigation water users' association should therefore be an integral part of the development process.

5.3 Community mobilization

Community mobilization is the process undertaken within a community to ensure the community participates in decision-making. The overall objective of community and stakeholder mobilization, organization and participation in an irrigation project is to ensure that the community members and other stakeholders are adequately sensitized on the project and prepared to effectively play their role in the project planning, implementation, operation and management. The specific objectives are:

- Ensuring that the community and stakeholders understand the project concept in order to relate their needs and aspirations with the goals and objectives of the project;
- Identifying community challenges, constraints, strengths and weaknesses so that the project design can make use of the community strengths as foundations of the project;
- Identifying community needs to facilitate the alignment of project components, activities and outputs to meet the felt needs of the community;

- Identifying project stakeholders, their needs and concerns in order to take them into consideration during design of the project;
- Organizing the farmers into Irrigation Water Users' Association (IWUA)

5.4 Proposed IWUA organization structure

The basic organizational unit will be the area served by each hydrant or outlet. The hydrant leaders should elect members to represent the sub-block in the scheme management committee. Al beneficiary farmers should elect an executive committee to be responsible for the day to day running of the scheme. A scheme advisory committee composed of relevant professionals and stakeholders is proposed to support the scheme management committee and guide the overall planning and management of the scheme.

5.5 IWUA formation process

To enhance Operation and Maintenance (O&M) activities of the scheme, the following is a generic process of IWUA formation to be considered and especially in the process of specifying the roles and responsibilities of IWUA in O&M

Group dynamics

- Provide technical support to the farmers to establish the appropriate project governance structures including formulation of project by-laws for the apex project organization and the individual project units.
- Development of bye-laws
- Endorsement of bye-laws by all farmers in a general meeting
- Election of scheme leadership starting with sub-block leaders to the executive committee.
- Training of leaders
- specify obligations and responsibilities of all parties in the O&M phase of the project;
- Recommending appropriate mechanisms for O&M service fees collection and management;

6 VALUE ADDITION AGRO-INDUTRY AND COTTAGE INDUSTRY

6.1 Tomato paste Processing

As indicated the solar power production caters for power provision to value addition agro-industries. It is proposed to set up a tomato paste processing that can be able to process excess tomatoes into paste. A processing plant with a peak power demand of 10 Kw is proposed. Such processing equipment will require construction of operation rooms as well as storage of tomatoes before processing and the paste after processing. The buildings are proposed to be constructed under the project.

6.2 Bakery

Substantial amount of bread is consumed in Mandouri. To meet quality bread demand, it is proposed also to setup a bakery to run on the solar energy. An oven with peak demand of 10 Kw is proposed. The bakery will require construction of operation rooms as well as storage of flour before processing and the bread before selling. The buildings are proposed to be constructed under the project.

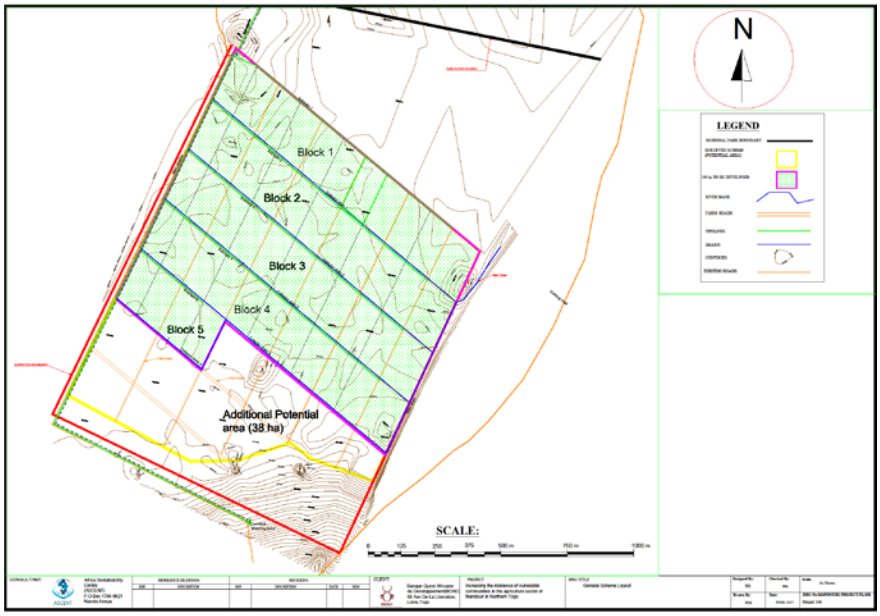
6.3 Management and operation of agro-processing facilities

It is expected that the farmers participating in irrigated agriculture will as well be the beneficiaries of the agro-processing facilities. It is however proposed that the processing facilities be run, operated and management by women who may be farmers themselves or wives of farmers.

INCREASING THE RESILIENCE OF VULNERABLE COMMUNITIES IN THE AGRICULTURE SECTOR OF MANDOURI IN NORTHERN TOGO

BOAD

Banque Ouest Africaine de Développement (BOAD)
68 Ave De La Liberation,
Lomé, Togo



DRAFT FINAL DESIGN REPORT

VOL II-BILL OF QUANTITIES

JULY 2017

ASCENT

Africa Sustainability Centre (ASCENT)
PO BOX 1704-0621
Nairobi, Kenya

GRAND SUMMARY

Bill No.	Description	AMOUNT (USD)
1	Preliminaries and Generals	255,480.00
2	Pump sump and pumping system	371,015.14
3	Conveyance Pipeline	186,744.01
4	Main line	86,464.77
5	Sub-mains	190,221.83
6	Drainage canals	92,121.15
7	Infield system	105,900.00
8	Access roads	806,246.00
9	Solar system and agro proccessing	1,692,945.80
10	Storage tank	118,919.50
11	Day works (Provisional)	
	Sub-Total (Bill 2- Bill 10)	**3,906,058.20**
	Contingencies (10% of Sub-total)	365,057.82
	GRAND TOTAL	**4,271,116.02**

Bill No .1- PRELIMINARY AND GENERALS

ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (USD)	AMOUNT (USD)
1.1	**Condition of contract**				
1.1.1	Allow for compliance with all conditions of contract which includes , provision of performance bond, and insurence.	PC	1.00	10,000.00	10,000.00
1.2	**Project Office:**				
1.2.1	Allow for the purchase of land for construction of scheme office	Acres	1.00	5,000.00	5,000.00
1.2.2	Allow for construction of scheme office and facilities	PL	1.00	30,000.00	30,000.00
1.2.3	Allow for maintenance, operation and repair of the office and workshop in accordance with the Specifications. payment.	Month	12.00	700.00	8,400.00
1.2.4	Allow for procurrement of Furniture and Equipment for the Engineer's Office	PC	1.00	5,000.00	5,000.00
1.3	**Contractor Site camp**				
1.3.1	Allow for the construction of the site camp	Lump sum	1.00	6,000.00	6,000.00
1.4	Access roads				
1.4.1	Allow for purchase of land for pipeline (conveyance and mainline)	Acres	15.00	5,000.00	75,000.00
1.5	Photographs				
	Provision of photographs on progress of the works in accordance with the specification.	Month	12.00	150.00	1,800.00
1.6	**Concrete Strength Tests**				
1.6.1	Concrete Strength tests (six cubes / test) in accordance with the as directed by engineer	No.	20.00	60.00	1,200.00
1.7	**Signboards**				
1.7.1	Provision, erection and maintenance of project signboards in accordance with the Specifications shown in drawings	No.	4.00	700.00	2,800.00
1.8	**Survey Equipment:**				
1.8.1	Provide and maintain survey equipment and accessories as listed in the Specifications.	Lump Sum	1.00	30,000.00	30,000.00
1.9	**Communication**				
1.9.1	Allow for purchase of 4 Mobile phones for the Engineer's site staff:	PC sum	1.00	1,000.00	1,000.00
1.9.2	Reimbursement for cost of airtime used on mobile telephones.	month	12.00	300.00	3,600.00
1.9.3	Add overheads and profits for items 1.9.1.1& 1.9.2	%	4,600.00	10%	460.00
1.10	**Vehicles for Resident Engineer and his Staff**				
1.10.1	Purchase of one 4WD Vehicles for Resident Engineer and his staff. The vehicle shall revert back to the Employer at the end of the contract period.	P C sum	1.00	40,000.00	40,000.00
1.10.2	Add overheads and profits for item 1.10.1	%	40,000.00	10%	4,000.00
1.10.3	Fuel, Maintenanceand Insurance for Resident Engineer's Vehicle Inclusive of 3000 km per month	Months	12.00	300.00	3,600.00
	SUB-TOTAL CARRIED FORWARD TO NEXT PAGE				**227,860.00**

	SUB-TOTAL CARRIED FORWARD FROM PREVIOUS PAGE				**227,860.00**
1.10.4	E.O for coverage over 3000 km per month (provisional)	km	3,000.00	1.50	4,500.00
1.10.5	Driver for Resident Engineer's Vehicle	Months	12.00	400.00	4,800.00
1.11	**Residential Accomodation for Resident Engineer and his Staff**				
1.11.1	Allow for Renting,and equiping of the house.	Months	12.00	100.00	1,200.00
1.11.2	Add overheads and profits for item 1.11.1	%	1,200.00	10%	120.00
1.11.3	Allow for testing of the system for 14 days prior to handing over including all costs.	Days	30.00	400.00	12,000.00
1.12	**Headworks and SBs**				
1.12.1	Allow for purchase of land for accessibility and construction of intake	Acres	1.00	5,000.00	5,000.00
	TOTAL CARRIED OVER TO GRAND SUMMARY				**255,480.00**

Bill No. 2 - Pump Intake					
ITEM	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE (USD)**	**AMOUNT (USD)**
2.1	**RIVER DIVERSION/ACCESS TO PUMP INTAKE**				
2.1.1	Provide for stream diversion works and/or coffer dam, to include for all labor, materials and superintendence during the construction period, and reinstatement at the end.	Lumpsum	1.00	30,000.00	30,000.00
2.2	**EXCAVATION/EARTHWORKS**				
	To include for all trimming to levels, backfilling with approved selected fill, compacting, disposal of surplus material and reinstatement.				
2.2.1	For pump station sump and to depth not exceeding 1.0m and set sump external and internal wall footings to specification	m^3	60.00	3.00	180.00
2.2.2	For sump inlet channel to depth not exceeding 1.0m and form sections as specified	m^3	120.00	3.00	360.00
2.3	**CONCRETE WORKS**				
	Provide and place the following concrete mixes including all form-work.				
2.3.1	RC concrete grade 25/20 for pump chamber and retaining wall	m^3	645.00	150.00	96,750.00
	Reinforcement				
2.3.2	Provide support and fix the following reinforcement, including all cutting, bending and supports for floors, walls, slabs, etc as shown in the drawings				
2.3.3	For Sump inlet channel A142 BRC Mesh	m^2	615.00	5.00	3,075.00
2.3.4	For Pump Chamber and Retaining Wall Y10	Kg	8,212.05	2.00	16,424.10
2.3.5	For Pump Chamber and Retaining Wall Y16	Kg	1,094.24	2.00	2,188.47
2.3.6	For Pump Chamber and Retaining Wall Y20	Kg	43,406.87	2.00	86,813.73
2.3.7	For Pump Chamber and Retaining Wall Y25	Kg	9,136.92	2.00	18,273.84
2.4	**SAND PACK FILTER**				
2.4.1	Provide all materials and place as specified	m^3	135.00	100.00	13,500.00
2.5	**SUBMERSIBLE PUMP**				
2.5.1	Provide, install, test and commission pump as specified	Lumpsum	1	67,850.00	67,850.00
2.5.2	Provide all materials and construct pump control room as specified	Lumpsum	1	35,600.00	35,600.00
	TOTAL CARRIED OVER TO GRAND SUMMARY				**371,015.14**

Bill No.3- Conveyance Pipelines

ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (USD)	AMOUNT (USD)
3.1	**SITE CLEARANCE AND SETTING OUT**				
3.1.1	Clear site of all trees (less than 1000 mm girth), bushes, shrubs, etc and dispose as specified	m^2	20,046.00	1.00	20,046.00
3.1.2	E.O for stumps removal (provisional)	No	1,000.00	6.00	6,000.00
3.2	**Excavation and Backfilling**				
	Rates for excavation and backfilling in trench shall include for trimming trench bottom and for providing selected bedding and surround materials from the excavations with the specifications. Excavation and backfilling in trench normal material for depth not exceeding 2.0 m				
3.2.1	400 mm dia	m^3	4,677.40	2.00	9,354.80
3.2.2	E.O for excavation in soft rock (provisional)	m^3	233.87	18.00	4,209.66
3.2.3	E.O for excavation in hard rock (provisional)	m^3	233.87	36.00	8,419.32
3.3	**Upvc PIPEWORK**				
	Provide, lay, joint and test the following flexible spigot and socket pipe				
	Note: The following have been used on the drawings to specify pipe				
	Class Working Pressure (m)				
	B 60	m			
	C 100	m			
	D 120	m			
	E 160	m			
	Upvc Straights				
	Class B				
3.3.1	400 mm dia	m	3305.00	37.48	123,876.69
3.4	**STEEL PIPEWORKS**				
	Provide, lay, Joint and test the following steel pipe and fittings. Rates to include for the supply of V/J coupling for each pipe joint, all jointing materials, cutting, wastage, joint works and poured bitumen for completing pipe protection.				
	Steel pipe Straights				
	Medium duty				
3.4.1	400 mm dia Single Flanged Pipes	m	36.00	166.67	6,000.22
	Steel Pipe Fittings				
	Couplings				
3.4.2	400/400 mm dia GI V/J couplings (Flexible Joints)	No	4.00	108.00	432.00
3.4.3	250/400 mm dia GI V/J couplings (Flexible Joints)	No	2.00	108.00	216.00
	SUB-TOTAL CARRIED FORWARD TO NEXT PAGE				**178,554.68**

Bill No.3- Conveyance Pipelines					
ITEM	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE (USD)**	**AMOUNT (USD)**
	SUB-TOTAL CARRIED FORWARD FROM PREVIOUS PAGE				**178,554.68**
3.5	**BLOCK CHAMBER**				
	Excavate for, provide all materials and construct complete inspection valve chambers of specified internal dimensions at the pipe junctions. Rates to including thrust blocks, pipe supports as shown in the drawings.				
3.5.1	2000 x 1500 x 1200 mm	No.	1.00	144.00	144.00
	Provide, handle, install and test the following steel pipes and fittings, valves and specials. Special rates shall include for completing all pipe joints as specified in the specification				
	1 No. Section Chamber for offtake to Mainline 1				
3.5.2	400 mm dia single flanged steel spigot (500mm Long)	No	1.00	156.00	156.00
3.5.3	550 mm dia single flanged GI piece (500mm long)	No	1.00	198.00	198.00
3.5.4	400 x 400 x 550 mm dia tee with all flanged branch	No	1.00	300.00	300.00
3.5.5	400 mm dia double flanged sluice valve	No	1.00	1,380.00	1,380.00
3.5.6	550 mm dia double flanged sluice valve	No	1.00	2,100.00	2,100.00
3.5.7	400 / 400 mm dia uPVC/GI adaptor	No	1.00	84.00	84.00
3.5.8	400 / 550 mm dia uPVC/GI adaptor	No	1.00	108.00	108.00
3.6	**BENDS**				
	UPVC fiitings (Horizontal Bends)				
	90 deg				
	At chainages 0+60 and 0+380				
3.6.1	400 mm dia	No.	3.00	74.40	223.20
	30 deg				
	At chainage 3+120				
3.6.2	400 mm dia	No.	1.00	74.40	74.40
	SUB-TOTAL CARRIED FORWARD TO NEXT PAGE				**183,322.28**

Bill No.3- Conveyance Pipelines					
ITEM	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE (USD)**	**AMOUNT (USD)**
	SUB-TOTAL CARRIED FORWARD FROM PREVIOUS PAGE				**183,322.28**
3.7	**CONCRETE WORKS**				
3.7.1	Excavate for, provide all materials and construct complete anchor and thrust blocks , air valves, bends, tees, steep slopes and end caps of specified dimensions as shown in the drawings.	m^3	23.39	144.00	3,367.73
3.8	**Marker post**				
3.8.1	Provide marker posts as specified and as shown in the drawings prior to handing over including all costs.	No.	3.00	18.00	54.00
	TOTAL CARRIED OVER TO GRAND SUMMARY				**186,744.01**

Bill No 4. - Mainline A Pipeline					
ITEM	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE (USD)**	**AMOUNT (USD)**
4.1.	**Excavation and Backfilling**				
	Rates for excavation and backfilling in trench shall include for trimming trench bottom and for providing selected bedding and surround materials from the excavations with the specifications. Excavation and backfilling in normal material for depth of excavation not exceeding 1.5 m unless otherwise specified				
4.1.1	Dia 560 mm pipe	m^3	4,379.54	2.00	8,759.09
4.1.2	E.O for excavation in soft rock (provisional)	m^3	437.95	18.00	7,883.18
4.1.3	E.O for excavation in hard rock (provisional)	m^3	437.95	36.00	15,766.36
4.2	**Upvc Pipe Work**				
	Provide, lay, joint and test the following flexible spigot and socket pipe and fittings with rubber ring joints. Rates to include for all jointly materials, cutting wastage and anchorage.				
	Note: The following have been used on the drawings to specify pipe diameters/types/classes. Pipe dimensions/working pressures shall conform to KS-06-149 Part 2:2000.				
	Class Working Pressure (m)				
	B 60	m			
	C 100	m			
	D 120	m			
	E 160	m			
	Upvc Straights				
	Class B				
4.2.1	Dia 560 mm pipe	m	2363.50	7.77	18,355.41
	Reducers				
4.2.2	560 x 400 mm dia reducer	No.	1	201.60	201.60
4.3	**STEEL PIPEWORKS**				
	Provide, lay, Joint and test the following steel pipe and fittings. Rates to include for the supply of V/J coupling for each pipe joint, all jointing materials, cutting, wastage, joint works and poured bitumen for completing pipe protection.				
	Steel pipe Straights				
	Medium duty				
4.3.1	550 mm dia Single Flanged Pipes	m	24.00	263.56	6,325.39
	Steel Pipe Fittings				
	Couplings				
4.3.2	560/550 mm dia GI V/J couplings (Flexible Joints)	No	2.00	144.00	288.00
	SUB-TOTAL CARRIED FORWARD TO NEXT PAGE				**57,579.03**

Bill No 4. - Mainline A Pipeline					
ITEM	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE (USD)**	**AMOUNT (USD)**
	SUB-TOTAL CARRIED FORWARD FROM PREVIOUS PAGE				**57,579.03**
4.4	**SECTION VALVE CHAMBERS**				
	Excavate for, provide all materials and construct complete inspection valve chambers with specified internal dimensions at the pipe junctions. Rates to include for all thrust blocks , pipe supports, inspection covers, etc as detailed in the drawings. Provide, handle, install and test the following steel (or GI)/HDPE pipes and fittings and valves in the pipeline junctions (Section valve chambers). Rates shall include for completing all pipe joints as specified in the specification				
4.4.1	1200 x 1200 x 1200 mm masonry chamber	No	5.00	120.00	600.00
	11 No. Section Chamber for offtake to Submains 1 to 5 at Chainages 0+20,0+200,0+400,0+600 and 0+820 respectively				
	Saddle Clamps				
4.4.2	560 x140 mm dia saddle clamp (mild steel)	No	1.00	114.00	114.00
	Tees				
4.4.3	550 mm x 250 mm dia double flanged tee	No	4.00	300.00	1,200.00
	Gate Valves				
4.4.4	550 mm dia flanged gate valve	No	5.00	2,100.00	10,500.00
4.4.5	Ditto 250 mm dia	No	4.00	960.00	3,840.00
4.4.6	Ditto 125 mm dia	No	1.00	420.00	420.00
	VJ Couplings/Stepped Adaptors				
4.4.7	560/550 mm dia GI / uPVC adaptor	No	10.00	144.00	1,440.00
4.4.8	Ditto 250/250 mm dia	No	4.00	74.40	297.60
4.4.9	Ditto 140/125 mm dia	No	1.00	33.60	33.60
	Spigots				
4.4.10	550 mm dia GI pipe (0.5m long Double flanged)	No	10.00	288.00	2,880.00
4.4.11	Ditto 250 mm dia	No	4.00	126.00	504.00
4.4.12	Ditto 125 mm dia	No	10.00	66.00	660.00
	SUB-TOTAL CARRIED FORWARD TO NEXT PAGE				**80,068.23**

Bill No 4. - Mainline A Pipeline					
ITEM	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE (USD)**	**AMOUNT (USD)**
	SUB-TOTAL CARRIED FORWARD FROM PREVIOUS PAGE				**80,068.23**
4.5	**CONCRETE WORKS**				
4.5.1	Excavate for, provide all materials and construct complete anchor and thrust blocks , air valves, bends, tees, steep slopes and end caps of specified dimensions as shown in the drawings.	m^3	43.80	144.00	6,306.54
4.6	**Marker posts**				
4.6.1	Provide marker posts as specified and as shown in the drawinds prior to handing over including all costs.	No.	5.00	18.00	90.00
	TOTAL CARRIED OVER TO GRAND SUMMARY				**86,464.77**

Bill No 5- Submains					
ITEM	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE (USD)**	**AMOUNT (USD)**
5.1	**Excavation and Backfilling**				
	Rates for excavation and backfilling in trench shall include for trimming trench bottom and for providing selected bedding and surround materials from the excavations with the specifications. Excavation and backfilling in normal material for depth of excavation not exceeding 1.5 m unless otherwise specified				
5.1.1	Dia 250 mm pipe	m^3	5,299.13	2.00	10,598.25
5.1.2	Dia 140 mm pipe	m^3	355.34	2.00	710.68
5.1.3	E.O for excavation in soft rock (provisional)	m^3	565.45	18.00	10,178.03
5.1.4	E.O for excavation in hard rock (provisional)	m^3	565.45	36.00	20,356.07
5.2	**Upvc Pipe Work**				
	Provide, lay, joint and test the following flexible spigot and socket pipe and fittings with rubber ring joints. Rates to include for all jointly materials, cutting wastage and anchorage.				
	Note: The following have been used on the drawings to specify pipe diameters/types/classes. Pipe dimensions/working pressures shall conform to KS-06-149 Part 2:2000.				
	Class Working Pressure (m)				
	B 60	m			
	C 100	m			
	D 120	m			
	E 160	m			
	Upvc Straights				
	Class B				
5.2.1	Dia 250 mm pipe	m	4239.30	15.02	63,675.13
5.2.2	Dia 140 mm pipe	m	311.70	4.70	1,465.24
	SUB-TOTAL CARRIED FORWARD TO NEXT PAGE				**106,983.40**

Bill No 5- Submains					
ITEM	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE (USD)**	**AMOUNT (USD)**
	SUB-TOTAL CARRIED FORWARD FROM PREVIOUS PAGE				**106,983.40**
5.3	**SECTION VALVE CHAMBERS**				
	Excavate for, provide all materials and construct complete inspection valve chambers with specified internal dimensions at the pipe junctions. Rates to include for all thrust blocks , pipe supports, inspection covers, etc as detailed in the drawings. Provide, handle, install and test the following steel (or GI)/UPVC pipes and fittings and valves in the pipeline junctions (Section valve chambers). Rates shall include for completing all pipe joints as specified in the specification				
5.3.1	1000x 1000 x 1000 mm masonry chamber	No	48.00	120.00	5,760.00
	48 No. Section Chamber for offtake from Submains to provide block hydrants				
	Tees				
5.3.2	250 mm x 100 mm dia double flanged tee	No	44.00	132.00	5,808.00
5.3.3	125 mm x 100 mm dia double flanged tee	No	4.00	78.00	312.00
	Gate Valves				
5.3.4	250 mm dia flanged gate valve	No	44.00	960.00	42,240.00
5.3.5	Ditto 125 mm dia	No	4.00	420.00	1,680.00
	VJ Couplings/Stepped Adaptors				
5.3.6	250/250 mm dia GI / uPVC adaptor	No	88.00	74.40	6,547.20
5.3.7	Ditto 140/125 mm dia	No	8.00	33.60	268.80
	Spigots				
5.3.8	250 mm dia GI pipe (0.5m long Double flanged)	No	88.00	126.00	11,088.00
5.3.9	Ditto 125 mm dia	No	8.00	66.00	528.00
	SUB-TOTAL CARRIED FORWARD TO NEXT PAGE				**181,215.40**

Bill No 5- Submains					
ITEM	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE (USD)**	**AMOUNT (USD)**
	SUB-TOTAL CARRIED FORWARD FROM PREVIOUS PAGE				**181,215.40**
5.4	**CONCRETE WORKS**				
5.4.1	Excavate for, provide all materials and construct complete anchor and thrust blocks , air valves, bends, tees, steep slopes and end caps of specified dimensions as shown in the drawings.	m^3	56.54	144.00	8,142.43
5.5	**Marker posts**				
5.5.1	Provide marker posts as specified and as shown in the drawinds prior to handing over including all costs.	No.	48.00	18.00	864.00
	TOTAL CARRIED OVER TO GRAND SUMMARY				**190,221.83**

ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (USD)	AMOUNT (USD)
Bill No.6 Drainage canals					
	Provide for Earth canal reaches as specified and as shown in the drawings.				
6.1	**Site clearance**				
	Clear site of all overgrowth grass, trees (less than 500 mm diameter), bushes, shrubs, etc, and strip to a depth of not more than 150mm, stockpile and dispose as specified.				
6.1.1	Stripping of canal reach from chainage 0+000 to 0+896.56 m -Main drain	m^2	4,392	1.00	4,391.93
6.1.2	Ditto for collector drain 1 from chainage 0+000 to 1+195.2 m	m^2	4,492	1.00	4,491.96
6.1.3	Ditto for collectort drain 2 from chainage 0+000 to 1+201.5m	m^2	4,712	1.00	4,711.61
6.1.4	Ditto for collectort drain 3 from chainage 0+000 to 1+197.5 m	m^2	4,788	1.00	4,787.85
6.1.5	Ditto for collectort drain 4 from chainage 0+000 to 1+201.5m	m^2	4,880	1.00	4,880.05
6.1.6	Ditto for collectort drain 5 from chainage 0+000 to 0+627.45 m	m^2	1,774	1.00	1,773.52
6.2	**Excavation**				
	To include for all excavations and trimming to levels as specified				
6.2.1	Excavation in normal soil from chainage 0+000 to 1+195.2 m	m^3	3,171	2.50	7,927.04
6.2.2	Ditto for collector drain 1 from chainage 0+000 to 1+195.2 m	m^3	2,465	2.50	6,161.37
6.2.3	Ditto for collectort drain 2 from chainage 0+000 to 1+201.5m	m^3	2,719	2.50	6,796.78
6.2.4	Ditto for collectort drain 3 from chainage 0+000 to 1+197.5 m	m^3	2,986	2.50	7,465.59
6.2.5	Ditto for collectort drain 4 from chainage 0+000 to 1+201.5m	m^3	2,936	2.50	7,339.40
6.2.6	Ditto for collectort drain 5 from chainage 0+000 to 0+627.45 m	m^3	698	2.50	1,745.23
6.2.7	E.O for excavation in soft rock (provisional)	m^3	748.71	18.00	13,476.74
6.2.8	E.O for excavation in hard rock (provisional)	m^3	449.22	36.00	16,172.09
	TOTAL CARRIED OVER TO GRAND SUMMARY				**92,121.15**

Bill No.8 : Access Roads					
ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (USD)	AMOUNT (USD)
	Provide for road construction as specified and as shown in the drawings.				
8.1	**Setting out**				
8.1.1	Setting out of access roads on Conveyance pipeline	m	3341.00	2.00	**6,682.00**
8.1.2	Ditto on Mainline	m	2240.00	2.00	**4,480.00**
8.1.3	Ditto on submains	m	4551.00	2.00	**9,102.00**
8.1.4	Ditto on main drain	m	900.00	2.00	**1,800.00**
8.1.5	Ditto on farm roads	m	7000.00	2.00	**14,000.00**
8.2	**Road strip**				
	Clear site of all overgrowth grass, trees (less than 500 mm diameter), bushes, shrubs, etc, and strip to a depth of not more than 150 mm, stockpile and dispose as specified.				
8.2.1	Stripping of all roads	m^2	180,320	2.00	**360,640.00**
8.3	**Road Embankment Fill**				
	Earth fill to embankment with approved borrow materials from within a radius of 30 km as specified compacted to 300mm depth				
8.3.1	Embankment fill from chainage 0+000 to 0+483.30 m	m^3	54,096	6.50	**351,624.00**
8.4	**Road Murruming**				
8.4.1	Prodive 150mm thick murrum layer on conveyance road	m^3	501	35.00	**17,540.25**
8.4.2	Ditto on Mainline	m^3	336	35.00	**11,760.00**
8.4.3	Ditto on submains	m^3	683	35.00	**23,892.75**
8.4.4	Ditto on main drain	m^3	135	35.00	**4,725.00**
	TOTAL CARRIED OVER TO GRAND SUMMARY				**806,246.00**

	Bill No. 9- Solar Power System and Agro-processing Facilities				
ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (USD)	AMOUNT (USD)
	Solar Power System, control and transmission				
1	**SMA SUNNY TRIPOWER 25000TL**	Pcs.	8	3,261.35	26,090.78
	Solar inverter for grid feed in Maximal DC power: 25550 W Maximum input voltage: 1000V Maximum input current:33A Rated AC power @ 230 V; 50Hz: 25000W Dimensions: 66,1 x 68,2 x 26,4 cm, weight: 61 Kg Origin: Made in Germany				
2	**HECKERT SOLAR NeMo 260 P**	Pcs.	816	168.00	137,088.00
	Polycrystalline 60 cells PV-Module With 38 mm silver Aluminum Frame Maximum power Pmmp 260STC Efficiency of module STC 16,0 Short circuit current Isc: 8,97 STC Open circuit voltage Usc:39,35 STC Voltage @ maximal load Umpp:31,25 STC Current @ maximal load Impp:8,40 STC Maximum system voltage 1000V Dimensions:99,1 cm x 164,0 cm x 3,8 cm Module weight: 17,7 Kg Origin: made in Germany				
3	**SCHLETER PVMAX KIT COMBI OF 11**	Pcs.	8	5,976.37	47,810.98
	with 12 supports and 4 extension support 96 x Grndng mdl clamp Rapid2+ 30-39 mount 104 x Grndng mdl clamp Rapid2+ H 30-39 mount assy 16x End clamp Rapid2+ 38mm for ground mounting without foundation weight 1980 Kg Origin: made in Germany				
4	**SMA SUNNY ISLAND 8.0 H**	Pcs.	12	1,177.68	14,132.16
	Battery inverter (master) With SRC-20, and RS485 + CAN Ac rated voltage 230 V @ 50Hz frequency Maximal AC input current: 50A Maximal AC input power: 11500W Rated power 6000W Maximal output current: 26A/120A Rated battery input voltage: 48V Maximal battery charging current: 140 A Maximum efficiency: 95,5 % Dimensions: 46,7 cm x 61,2 cm x 24,2 cm Weight: 63 Kg Origin: Made in Germany				
5	**SMA SUNNY ISLAND 8.0 H**	Pcs.	24	3,560.27	85,446.43
	Battery inverter (slave) Ac rated voltage 230 V @ 50Hz frequency Maximal AC input current: 50A Maximal AC input power: 11500W Rated power 6000W Maximal output current: 26A/120A Rated battery input voltage: 48V Maximal battery charging current: 140 A Maximum efficiency: 95,5 % Without SRC-20 With RS485 +CAN Dimensions: 46,7 cm x 61,2 cm x 24,2 cm Weight: 63 Kg Origin: Made in Germany				
6	**SMA Speed Wire + CAN communication**	Pc.	1	235.03	235.03
7	**BAE SECURA 17 PVV 3230 PPOL**	Pcs.	288	1,007.64	290,200.32
	Lead acid batteries Maintenance free Valve regulated lead acid batteries (VRLA) Nominal capacity: @C100 h 3260; @C10h 2480 Nominal voltage 48 V Number of cycles @20% DOD 7500 cycles Dimensions: 21,5 cm x 49,0 cm x 81,5 cm Weight: 173.6 Kg Origin: Made in Germany				
8	**SMA MC-BOX-36.3-11**	Pc.	1	13,840.63	13,840.63
	For sunny Island, main AC distribution Rated voltage 230V Ac voltage range:300 V-433V Connection for sunny island 36 AC rated power:216 kW Rated grid input power: 1 x 3 phase Rated input power:300 kW Ambient temperature -25 °C …+ 65°C Dimensions: 120 cm x 200 cm x 80 cm Weight: 400 Kg Origin: Made in Germany				
9	**HELUKABEL SOLARFLEX PV 1 X 4mm²**	M.	1000	0.64	636.00
	Solar cable Bare copper, tinned, finely stranded Double insulated Nominal voltage 1000V Temperature range -40°C up to + 90°C Weather and UV resistant Resistant to short-circuit Sheath colour: natural/black Weight : 1,68 kg/1 m Origin: Made in Germany			0.00	
10	**HELUKABEL SOLARFLEX X PV 1-F 1 X 16mm²**	M.	100	2.30	230.40
	Solar cable Bare copper, tinned, finely stranded Double insulated Nominal voltage 1000V Temperature range -40°C up to + 90°C Weather and UV resistant Resistant to short-circuit Sheath colour: natural/black Weight : 1,68 kg/1 m Origin: Made in Germany Temperature range -40°C up to + 90°C Weather and UV resistant Resistant to short-circuit Sheath colours: natural/black Weight: 0,19kg/1 m Origin: Made in Germany			0.00	
11	**HELUKABEL HO7RN-F 4G25 mm²**	M.	500	9.83	4,914.00
	AC cable Copper conductor fine wire stranded, bare Rubber core insulation sheathed cable Temperature range -30°C to + 60°C Nominal voltage 750V up to 1000V Weather and UV resistant Resistant to short-circuit Weight.1,86 kg/1 m Origin: Made in Germany				
12	**WEIDMÜLLER PV - Stick**	Set.	60	4.36	261.36
	Connection system push in Continuous operating temperature -40°C…+85°C Rated current: 30A Cable diameter 4mm²/6mm² Origin: Made in Germany				

13	**LET AC- CONNECTION BOX (100 KW RATED)**	Pcs.	3	9,687.60	29,062.80
	Interconnection for SMA Inverter to in-house distribution and grid connection Combining solar power generated in PV plant Distributing power to pumps, local loads and to the transformer Distributing power to loads in the village with circuit breaker and SPD Origin: Made in Germany				
14	**SMA Cluster Controller**	Pc.	1	1,025.23	1,025.23
	Monitoring and controlling for PV system Mounting type: Top. Hat rail mounting Status display: LC display. LED Communication Inverter with Speedwire Data interface: HTTP,FTP MODBUS TCP/UDP, SMTP, Sunny Portal Inverters data network (LAN): 2 ports Data storage 2 USB 2,0 high speed ports, type A Inputs voltage: 18 V to 30 V DC Power consumption: 12 W Ambient temperature: -25° C to + 60°C Language of manual: English Dimensions: 27,5 cm x 13,7 cm x 7,1 cm Weight: 0,9 Kg Origin: made in Germany				
15	**BAE SGU 2-27 HH**	Pcs.	12	836.78	10,041.41
	Battery Racks 4 x pole pair Dimensions: 270 x 116 x 28,5 x 110 cm (L x W x H1 x H2); weight: 87,50 Kg Origin: Made in Germany				
16	**Sea fright cost for 40´Container**	Pc	1	23,868.00	23,868.00
	Including export standard packaging on wooden pallets Issuing export document and transport documents Loading and unloading 5 units x 40´container Road transport from warehouse to harbor				
17	**AIR CONDITIONING**				
17.1	SAMSUNG 100000 BTU FLOOR STANDING (R22 GAS)		1.00	60,000.00	60,000.00
17.2	Copper tubes with insulation		20.00	10.00	200.00
17.3	4 sq. mm 3 core Flex cable		20.00	8.00	160.00
17.4	Double pole switch		10.00	10.00	100.00
18	**POWER TRANSMISSION AND CONTROLL**				
18.1	10 Meters, Reinforced Concrete electricity Poles		130.00	500.00	65,000.00
18.2	20,000 Meters, 50mm Alluminium wire		20,000.00	2.00	40,000.00
18.3	Step-up/step-down Transformers, 0.415/11, 200 KVA		2.00	12,000.00	24,000.00
18.4	6000 meters, 4 core, 4 sq. mm Remote pump switch ON and OFF signal cable		6,000.00	20.00	120,000.00
18.5	D- Sets		1.00	20,000.00	20,000.00
18.6	Line taps 50 mm^2				
18.7	Guy wire				
18.8	Guy wire insulators				
18.9	Stay rods				
18.10	$50MM^3$ 4-Core Cable /Mtr				
18.11	$100MM^2$ Line taps				
18.12	Drop cable 16 mm^2 /Metre				
18.13	Bolts 7mm,5mm				
18.14	Earth Wire 10mm				
18.15	Fuse Carrier				
	Value Addition Agro-Industries				
1	**10Kw Tomato paste Processing**		LS	98,000.00	98,000.00
	Processing equipment including construction of operation rooms as well as storage and initial running capital				
2	**10Kw Bakery**		LS	110,000.00	110,000.00
	Oven including construction of operation rooms as well as storage and initial running capital				
	Add installation labour at 30% cost of material and equipment				366,703.06
	Add suppervision cost at 8.5%				103,899.20
	TOTAL CARRIED OVER TO GRAND SUMMARY				**1,692,945.80**

BILL No. 10: 500 m^3 Water Storage Tank

ITEM	DESCRIPTION	UNIT	QTY	RATE (USD)	AMOUNT (USD)
	CLASS E: EARTHWORKS				
10.1	**Excavation**				
	500 m3				
	Excavations shall include for strutting, shuttering, stabilizing excavated surfaces and keeping excavations free of water bailing out, pumping or other means				
10.1.1	Material other than topsoil, or artificial hard material depth not exceeding 1.0m commencing from existing ground surface	m^3	257	3.00	771.00
10.1.2	Depth range 1.0 - 1.5m	m^3	64	4.00	256.00
10.1.3	In rock depth not exceeding 1.5m	m^3	64	12.00	768.00
10.2	**Filling**				
	Filling to completed structures including compaction as specified				
10.2.1	Selected excavated material other than topsoil, rock or artificial hard material	m^3	64	1.50	96.00
10.2.2	300mm approved hardcore fill	m^3	77	6.00	462.00
10.2.3	Approved pumice or gravel 100mm thick to roof slab	m^3	26	70.00	1,820.00
10.3	**CLASS F: IN SITU CONCRETE**				
	Placing of concrete				
	Mass concrete class 10/15				
10.3.1	Blinding layer, 75mm thick under base slab and wall footings	m^3	19	50.00	950.00
	Reinforced Concrete class 25/20 :				
10.3.2	Base Slab	m^3	59	150.00	8,850.00
10.3.3	Column Bases	m^3	0.5	150.00	75.00
10.3.4	Wall Foundation	m^3	22	150.00	3,300.00
10.3.5	Roof Slab	m^3	39	150.00	5,850.00
10.3.6	Beams	m^3	15	150.00	2,250.00
	PAGE TOTAL CARRIED TO COLLECTION				**25,448.00**

10.3.7	Roof parapet wall	m^3	3	150.00	450.00
10.3.8	Walls	m^3	68	150.00	10,200.00
10.3.9	Columns	m^3	2	150.00	300.00
10.3.10	Columns heads	m^3	1	150.00	150.00
10.4	**CLASS G: CONCRETE ANCILLARIES**				
	Formwork				
	Sawn vertical to:				
10.4.1	External wall face upto 150mm below parapet wall	m^2	193	5.00	965.00
10.4.2	External face to base slab	m^2	19	5.00	95.00
	Wrot vertical to:				
10.4.3	External wall face down to 150mm below surface of roof parapet wall	m^2	10	5.00	50.00
10.4.4	Internal surface of wall footing	m^2	42	5.00	210.00
10.4.5	Column bases	m^2	1	5.00	5.00
10.4.6	Columns (500mm wide)	m^2	14	5.00	70.00
10.4.7	Column head (50mm deep)	m^2	1	5.00	5.00
10.4.8	Internal faces of walls	m^2	194	5.00	970.00
10.4.9	External and Internal edges of up stand to roof parapet, including boxing out for roof drain pipes	m^2	4	5.00	20.00
10.4.10	Vertical sides of roof beams	m^2	64	5.00	320.00
	Wrot horizontal to:				
10.4.11	Soffit of roof slab including props	m^2	257	5.00	1,285.00
10.4.12	Soffit of roof beams	m^2	10	5.00	50.00
	Wrot inclined to:				
10.4.13	Column heads	m^2	22	5.00	110.00
	PAGE TOTAL CARRIED TO COLLECTION				**15,255.00**

	Extras for concrete and formwork				
10.4.14	Form opening 1000 X 1000mm opening for roof access	nr	1	5.00	5.00
10.4.15	Form opening 3150 X 1200mm opening for inlet pipe access	nr	1	10.00	10.00
10.4.16	Form 1000 X 000 X 600mm deep sump for washout in the floor slab	nr	1	100.00	100.00
	Reinforcement				
	Rate to include for supplying, delivery, cutting, bending, supporting and securing concrete				
	High yield tensile steel				
10.4.17	10mm nominal diameter	Kg	10,341	1.50	15,511.50
10.4.18	Ditto but nominal diameter 16mm	Kg	2,738	1.50	4,107.00
	Mild steel				
10.4.19	8mm nominal diameter	Kg	444	1.50	666.00
10.5	**JOINTS AND WATER STOPS**				
	(Rates to include for all rebates, shuttering, PVC waterstop, resin bonded cork joint sealers and bituminous painting)				
10.5.1	Expansion joint between wall base and floor slab. Include 240mm rearguard water stops	m	91	15.00	1,365.00
10.5.2	Ditto between column bases and floor slab	m	72	15.00	1,080.00
10.5.3	Ditto between wall and wall base and excluding PVC water stops	m	91	15.00	1,365.00
10.5.4	Construction joint between wall and wall base together with 150mm wide eyeleted water stop with central bulb	m	91	15.00	1,365.00
10.5.5	Construction joint between wall panels. Include for 240mm wide plain rearguard water stops	m	32	15.00	480.00
10.5.6	Ditto between adjacent bays of floor slabs	m	45	15.00	675.00
10.5.7	Ditto between bases	m	56	15.00	840.00
10.5.8	6mm thick joint filler on top of walls	m	56	10.00	560.00
10.5.9	30mm wide by 30mm deep trapezoidal false joints with sealer on roof slab	m	50	10.00	500.00
10.5.10	Partial construction joint in roof slab. Include for 140mm wide plain PVC water stops priming of surface and 50mm wide adhesive tape	m	36	15.00	540.00

	PAGE TOTAL CARRIED TO COLLECTION				**29,169.50**
	E.O joint and sealer items for junctions between water stops				
10.5.11	Flat cross Mark JI	m	28	12.00	336.00
10.5.12	Ell on edge Mark J2	m	28	12.00	336.00
10.5.13	Ell on edge Mark J3	m	30	12.00	360.00
10.5.14	Ell on edge Mark J4	m	4	12.00	48.00
10.5.15	Flat Y mark J5	m	60	12.00	720.00
10.5.16	Flat cross Mark J6	m	4	12.00	48.00
10.6	**CLASS I: PIPEWORK - PIPES**				
	Drainage				
		m	50	10.00	500.00
10.6.1	150 DN uPVC washout pipe				
10.6.2	110mm Dia. uPVC roof drains. Include for building into 450mm RC parapet and include for all down pipe and fittings	nr	4	25.00	100.00
10.6.3	150mm GMS washout pipe	m	3	28.00	84.00
10.7	**CLASS J: PIPEWORK - FITTINGS AND VALVES**				
	Inlet pipe				
10.7.1	DN 150 Flange adaptor	nr	1	300.00	300.00
10.7.2	DN 150 double flanged 90^0 bend	nr	2	300.00	600.00
10.7.3	150 single flanged pipe 4000m long	nr	1	200.00	200.00
10.7.4	150 double flanged pipe 500m long with puddle flange	m	1	50.00	50.00
10.7.5	150 flanged float Valve	m	1	400.00	400.00
	Outlet pipe				
10.7.6	150 plain ended pipe 1000m long with puddle flange	nr	1	30.00	30.00
10.7.7	150mm Dia. Flange adopter	nr	1	200.00	200.00
10.7.8	150 Double flanged 90^0 bend (long radius)	nr	1	200.00	200.00
10.7.9	150 Dia. flanged bell mouth	nr	1	200.00	200.00
	PAGE TOTAL CARRIED TO COLLECTION				**4,712.00**

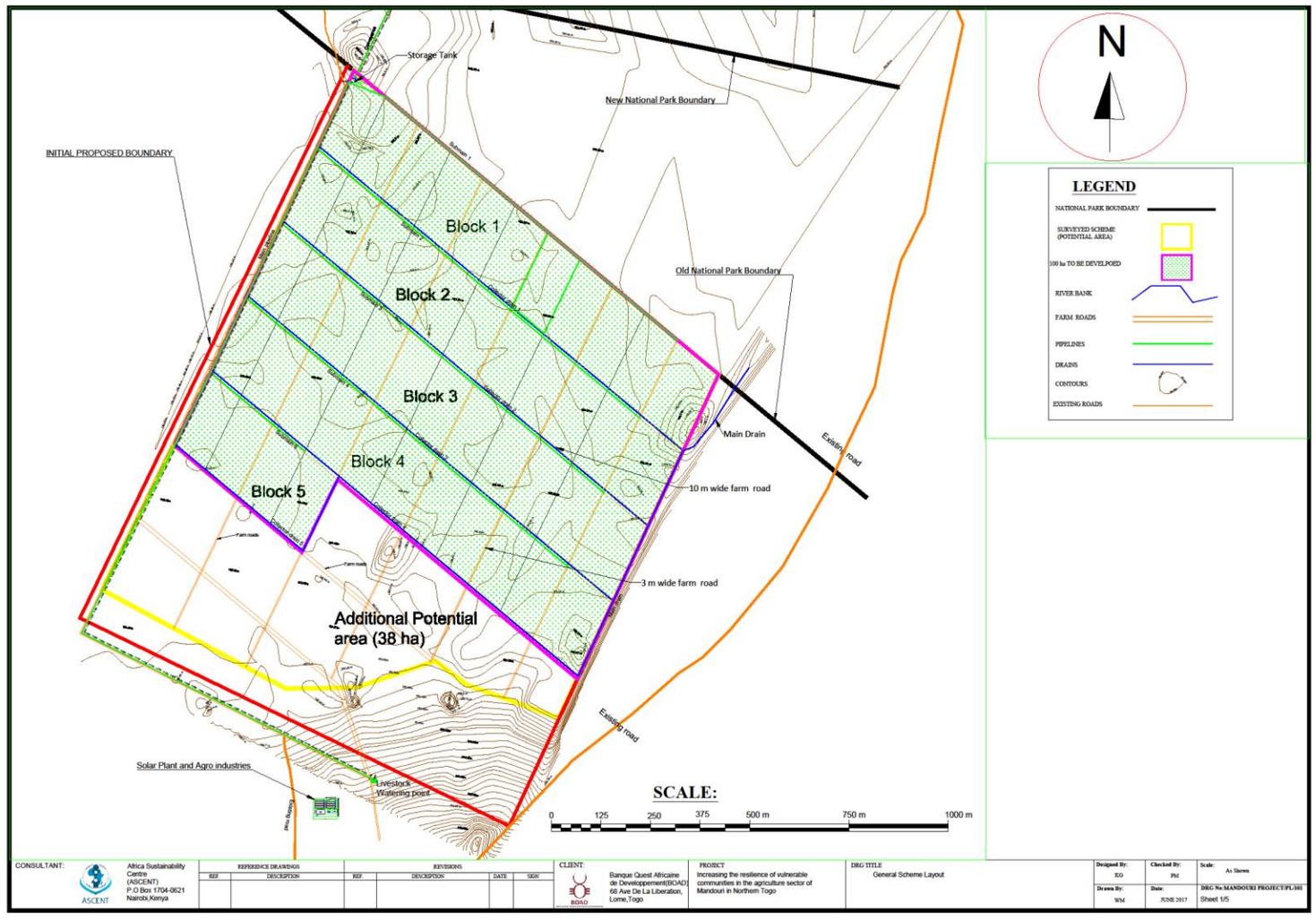
	Washout pipe				
10.7.10	150mm Dia. Flange adopter	nr	1	200.00	200.00
10.7.11	150mm Dia. GI double flanged 90^0 bend	nr	1	300.00	300.00
10.7.12	150mm Dia. GI single flanged pipe 6000mm long	nr	2	250.00	500.00
10.7.13	150mm Dia. GI single flanged pipe 1090mm long	nr	2	50.00	100.00
10.7.14	150 Dia. flanged bell mouth	nr	1	150.00	150.00
10.7.15	150 Dia. Double flanged sluice valve with cap and key	nr	1	450.00	450.00
10.7.16	150 Dia. Double flanged Kent Water Meter	nr	1	250.00	250.00
10.8	**CLASS K: PIPEWORK - MANHOLES AND PIPEWORK ANCILLARIES**				
	Chambers				
10.8.1	Provide materials and construct in situ concrete valve chambers, depth not exceeding 1.5m	nr	1	150.00	150.00
10.8.2	Ditto but depth 1.5-2m	nr	2	250.00	500.00
10.9	**CLASS N: MISCELLANEOUS METALWORKS**				
10.9.1	GMS ladder 400mm wide with stringers and rungs fabricated from 40mm and 30mm Dia. M.S tubes respectively.	nr	1	1,000.00	1,000.00
10.9.2	1400 square GMS grill over overflow pipe	nr	1	15.00	15.00
10.9.3	50mm Dia. GS pipe vent pipe 250mm long with screw on short radius elbow incorporating aluminium insect proof screen on outlet and overflow chambers	nr	4	25.00	100.00
10.9.4	Install all accessories for depth measuring staff gauge. Rate to include for all fittings	nr	1	500.00	500.00
	testing and sterilization				
10.9.5	Test and sterilize reservoir and all pipeworks	Item			40,000.00
10.10	**CLASS L: PIPEWORK - SUPPORTS AND PROTECTION, ANCILLARIES TO LAYING AND EXCAVATION**				
10.10.1	Class 20 mass concrete in pipe surrounds under reservoir	m^3	1	120.00	120.00
	PAGE TOTAL CARRIED TO COLLECTION				**44,335.00**

	COLLECTION				
	From Page 1				25,448.00
	From Page 2				15,255.00
	From Page 3				29,169.50
	From Page 4				4,712.00
	From Page 5				44,335.00
	TOTAL CARRIED OVER TO GRAND SUMMARY				**118,919.50**

Bill No 11-Day works					
ITEM	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE (USD)**	**AMOUNT (USD)**
11.1	**THE WHOLE OF THIS BILL IS PROVISIONAL**				
	LABOUR				
	The rates should include for all costs, such as insurance, traveling time, overtime, accommodation, use of small tools of trade, supervision, overheads and profit. Only time engaged upon work will be paid for:				
11.2	Unskilled labour	Hrs	100		
11.3	Semi-skilled labour	Hrs	80		
11.4	Skilled Labour	Hrs	65		
	PLANT				
	The rates should be included for all operational and maintenance costs, fuel, oil, operators, turn boys, Supervision, overhead and profits. Only the time employed on work will be paid for and the rates should include the idle, traveling and overtime.				
11.5	Compressor CP with 2 jacks	Hrs	40		
11.6	Concrete vibrator (petrol or diesel)	Hrs	32		
11.7	Concrete mixer 10/7	Hrs	25		
11.8	Tipper 7 tones	Hrs	46		
11.9	Portable water pump 50mp 50mm inclusive of hoses, couplings, valves and	Hrs	32		
	MATERIALS				
11.1	Ordinary Portland cement	tone	0.5		
11.11	Mild steel/High yield steel	tone	0.5		
11.12	Fine aggregate for concrete	m^3	12		
11.11	Coarse Aggregate for concrete max. size 19mm	m^3	12		
11.14	Use of Shuttering timber	m^2	50		
	TOTAL CARRIED OVER TO COLLECTION				

Banque Ouest Africaine de Développement (BOAD)
68 Ave De La Liberation,
Lomé, Togo

INCREASING THE RESILIENCE OF VULNERABLE COMMUNITIES IN THE AGRICULTURE SECTOR OF MANDOURI IN NORTHERN TOGO



VOLUME III : BOOK OF DRAWINGS

Africa Sustainability Centre (ASCENT)
PO BOX 1704-0621
Nairobi, Kenya

JULY 2017

MANDOURI IRRIGATION DEVELOPMENT PROJECT

TENDER DRAWINGS

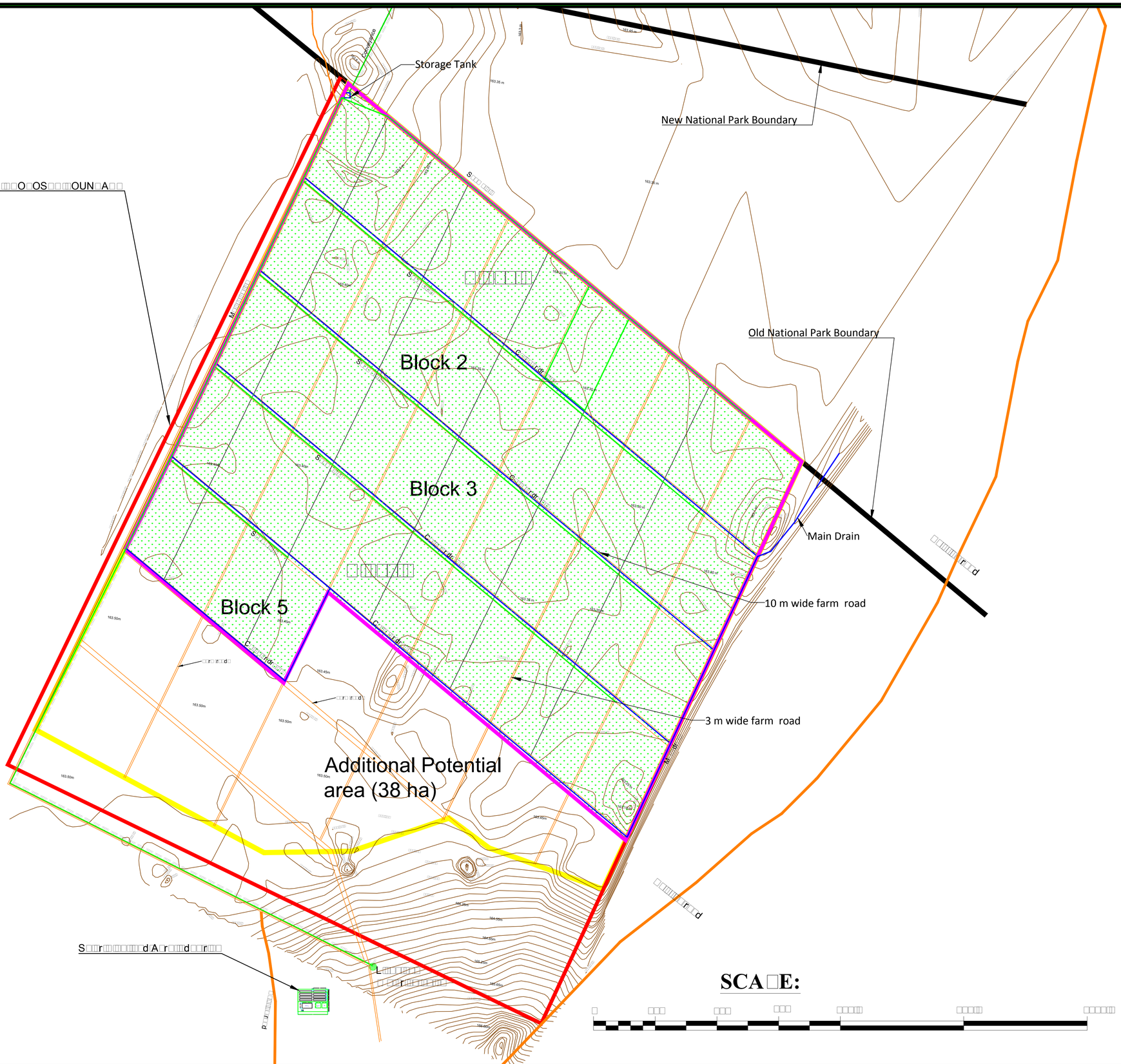
DRG No	DRAWING TITLE	SHEETS
MANDOURI PROJECT/TD/00	DRAWING LIST	1/1
	GENERAL MAPS	
MANDOURI PROJECT/PL/101	GENERAL SCHEME LAYOUT	1/5
MANDOURI PROJECT/PL/101	PROJECT LAYOUT WITH IMAGE	2/5
MANDOURI PROJECT/PL/101	PROPOSED IRRIGATION AND DRAINAGE SYSTEM LAYOUT	3/5
MANDOURI PROJECT/PL/101	CONTOUR MAP (PROJECT AREA)	4/5
MANDOURI PROJECT/PL/101	PROPOSED FARM ROADS	5/5
	SUMP PUMP	
MANDOURI PROJECT/SP/201	SUMP PUMP LOCATION LAYOUT	1/3
MANDOURI PROJECT/SP/201	SUMP PUMP PLAN AND SECTIONS	2/3
MANDOURI PROJECT/SP/201	INTAKE SUMP PUMP DIMENSIONS	3/3
	SOLAR SYSTEM	1/1
MANDOURI PROJECT/CT/501	SOLAR PV SYSTEM AREA LAYOUT	1/3
	IRRIGATION PROFILES	
MANDOURI PROJECT/TD/100	CONVEYANCE PIPELINE PROFILE	1/4
MANDOURI PROJECT/TD/100	CONVEYANCE PIPELINE PROFILE	2/4
MANDOURI PROJECT/TD/100	CONVEYANCE PIPELINE PROFILE	3/4
MANDOURI PROJECT/TD/100	CONVEYANCE PIPELINE PROFILE	4/4
MANDOURI PROJECT/TD/101	MAINLINE PIPELINE PROFILE	1/1
MANDOURI PROJECT/TD/101	MAINLINE PIPELINE PROFILE	1/2
MANDOURI PROJECT/TD/101	MAINLINE PIPELINE PROFILE	1/3
MANDOURI PROJECT/TD/102	SUBMAIN 1 PIPELINE PROFILE	1/1
MANDOURI PROJECT/TD/103	SUBMAIN 2 PIPELINE PROFILE	1/1
MANDOURI PROJECT/TD/104	SUBMAIN 3 PIPELINE PROFILE	1/1
MANDOURI PROJECT/TD/105	SUBMAIN 4 PIPELINE PROFILE	1/1
MANDOURI PROJECT/TD/106	SUBMAIN 5 PIPELINE PROFILE	1/1

MANDOURI IRRIGATION DEVELOPMENT PROJECT

TENDER DRAWINGS

DRG No	DRAWING TITLE	SHEETS
	DRAINAGE PROFILES	
MANDOURI PROJECT/TD/200	MAIN DRAIN PROFILE	1/1
MANDOURI PROJECT/TD/201	COLLECTOR DRAIN 1 PROFILE	1/1
MANDOURI PROJECT/TD/202	COLLECTOR DRAIN 2 PROFILE	1/1
MANDOURI PROJECT/TD/203	COLLECTOR DRAIN 3 PROFILE	1/1
MANDOURI PROJECT/TD/204	COLLECTOR DRAIN 4 PROFILE	1/1
MANDOURI PROJECT/TD/205	COLLECTOR DRAIN 5 PROFILE	1/1
	STORAGE TANK	
MANDOURI PROJECT/TD/401	WATER STORAGE TANK	1/2
MANDOURI PROJECT/TD/401	WATER STORAGE TANK	2/2
	PIPELINE STRUCTURES	
MANDOURI PROJECT/TD/301	THRUST BLOCKS AND TRENCH DETAILS	1/1
MANDOURI PROJECT/TD/301	JUNCTION CHAMBER	1/2
MANDOURI PROJECT/TD/301	JUNCTION CHAMBER-SECTION VALVES SCHEDULE	2/2
MANDOURI PROJECT/TD/603	MARKER POSTS	1/1
	PROJECT FACILITIES	
MANDOURI PROJECT/TD/601	IWUA'S OFFICE	1/1
MANDOURI PROJECT/TD/602	PROJECT SIGN BOARD	1/1

1. GENERAL LAYOUTS



N

LEGEND

- NATIONAL PARK BOUNDARY
- SURVEYED SCHEME POTENTIAL AREA
- 100 Ha TO BE DEVELPOED
- RIVER BANK
- FARM ROADS
- PIPELINES
- DRAINS
- CONTOURS
- EXISTING ROADS

SCALE:

CONSULTANT: ASCENT

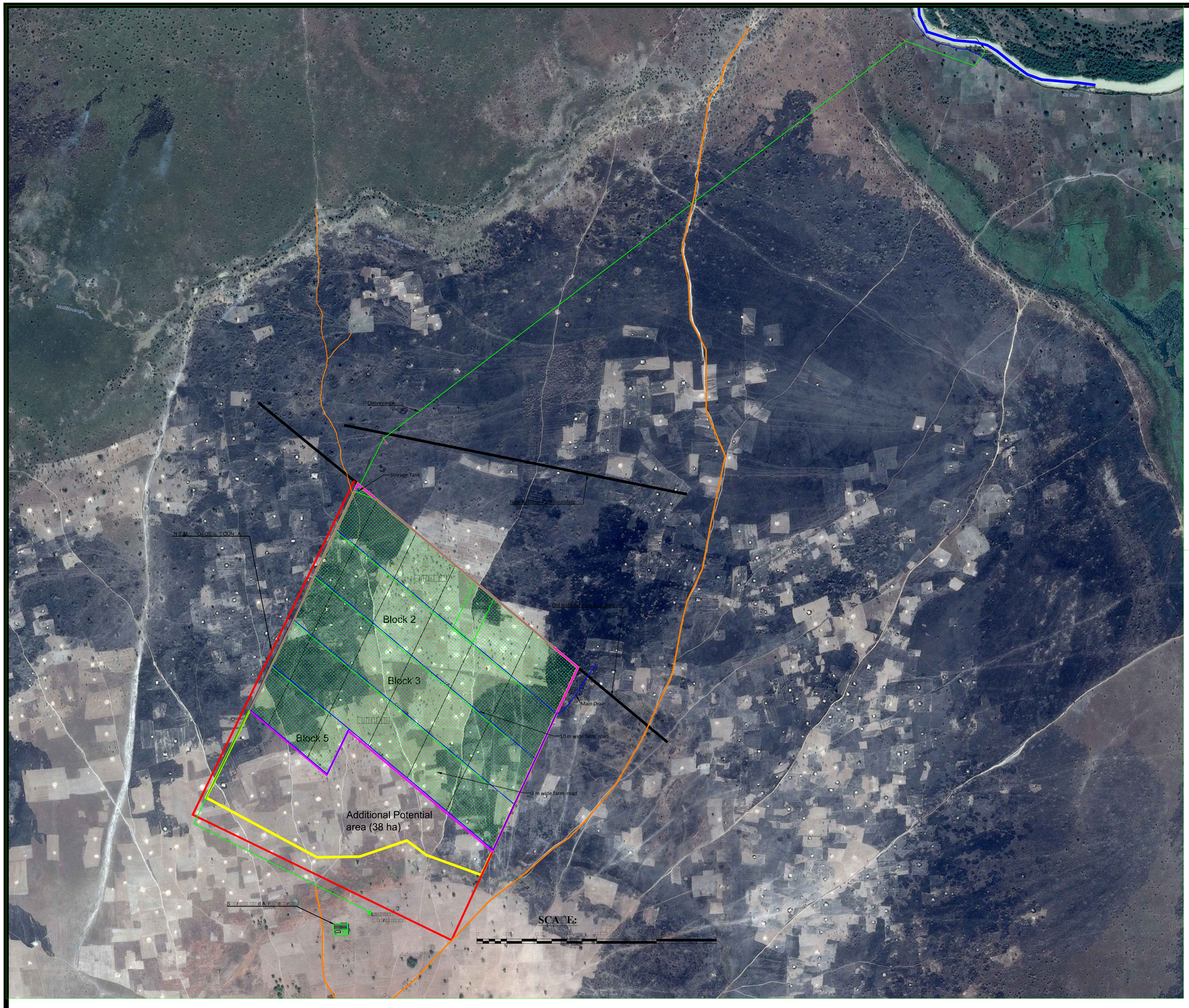
REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT: BOAD

PROJECT

DRG TITLE

Designed By: KG	**Checked By:** PM	**Scale:**
Drawn By: WM	**Date:** JUNE 2017	**DRG No:MANDOURI PROJECT/P**



N

□EGEND

- NATIONAL PARK □OUNDAR□
- SURVE□ED SC□EME □POTENTIAL AREA□
- 100 □a TO □E DEVELPOED
- RIVER □ANK
- FARM ROADS
- PIPELINES
- DRAINS
- CONTOURS
- E□ISTING ROADS

CONSULTANT: ASCENT

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REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT: BOAD

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DRG TITLE
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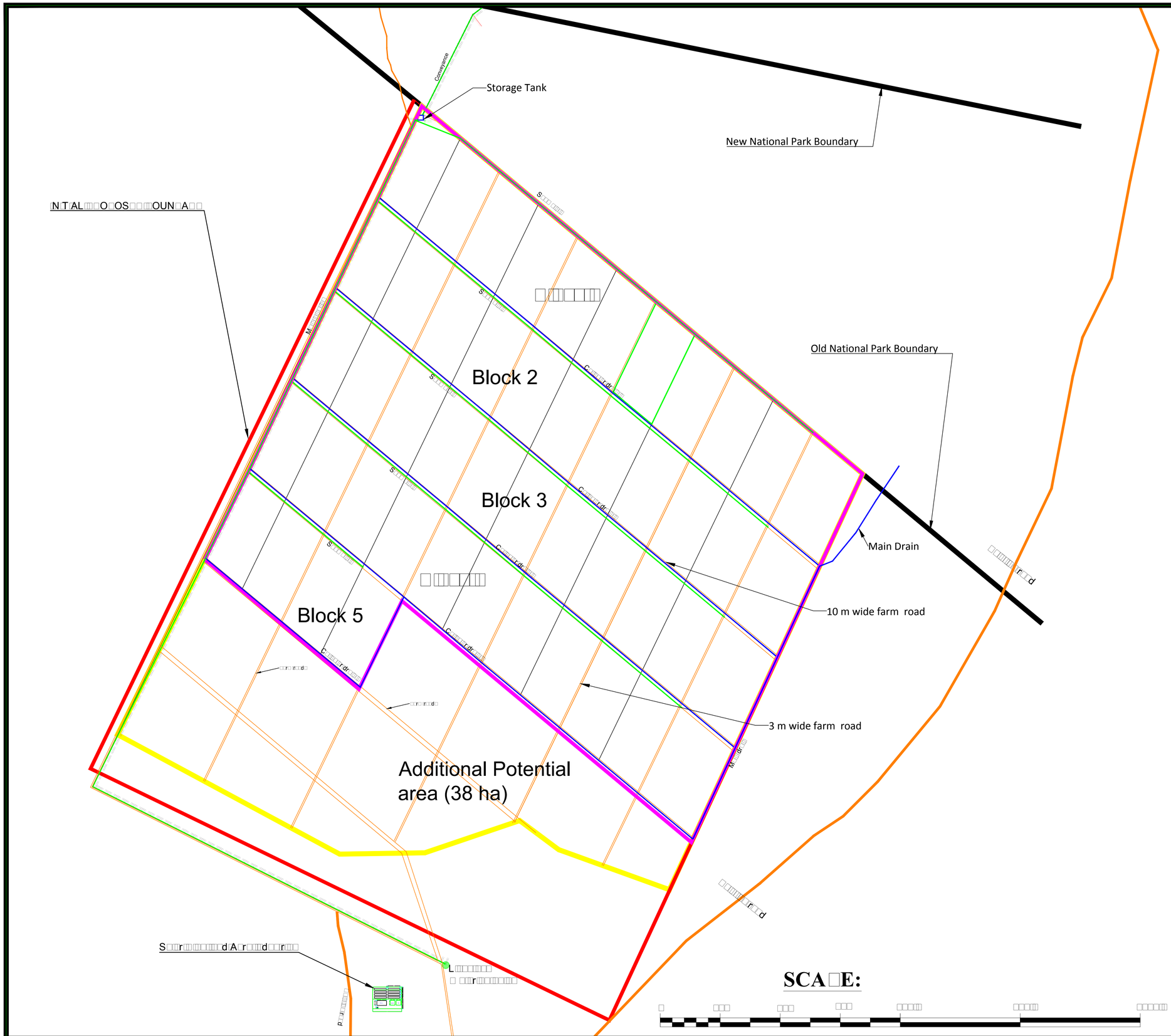
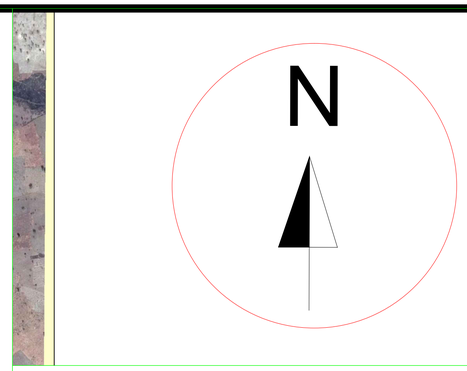
Designed By:	Checked By:	Scale:
KG	PM	A□S□□□n
Drawn By:	**Date:**	**DRG No:MANDOURI PROJECT/P□/□□□**
WM	JUNE 2017	S□□□□□□□□





LEGEND

- NATIONAL PARK BOUNDARY
- SURVEYED SCHEME POTENTIAL AREA
- 100 Ha TO BE DEVELPOED
- RIVER BANK
- FARM ROADS
- PIPELINES
- DRAINS
- CONTOURS
- EXISTING ROADS

PIPELINE	LENGTH(m)	PIPE DETAILS		DIAMETER (mm)	BLOCK	DESIGN AREA (ha)	FLOW ,Q(m^3/s)
		Length (m)	Type/ class				
Conveyance	3,341.00	36.00	GI PIPE Medium	400	All	100.00	0.1667
			UPvc pipes	400			
		3,305.00	B				
Mainline	2,363.50	24.00	GI PIPE Medium	550	All	100.00	0.1667
			UPvc pipes				
		2,339.50	B	560			
Submain 1	1,058.30	1,058.30	B	250	Block 1	23.60	0.0392
Submain 2	1,061.00	1,061.00	B	250	Block 2	22.70	0.0377
Submain 3	1,060.00	1,060.00	B	250	Block 3	22.70	0.0377
Submain 4	1,060.00	1,060.00	B	250	Block 4	22.70	0.0377
Submain 5	311.70	311.70	B	140	Block 5	8.30	0.0138

DRAIN CANAL	LENGTH(m)	CANAL DIMENSIONS			BLOCK	DESIGN AREA (ha)	DESIGN,Q (m^3/s)
		Bottom Width (b) m	depth (d) m	Freeboard (m)			
Main drain	896.60	1.00	0.62	0.25	All	150.00	0.5400
Collector drain 1	1,195.20	0.60	0.30	0.25	Block 1	23.60	0.0850
Collector drain 2	1,201.50	0.60	0.30	0.25	Block 2	22.70	0.0820
Collector drain 3	1,197.50	0.60	0.30	0.25	Block 3	22.70	0.0820
Collector drain 4	1,201.60	0.60	0.30	0.25	Block 4	22.70	0.0820
Collector drain 5	627.50	0.38	0.20	0.25	Block 5	8.30	0.0300

SCALE:

CONSULTANT: ASCENT

REFERENCE DRAWINGS

REF.	DESCRIPTION

REVISIONS

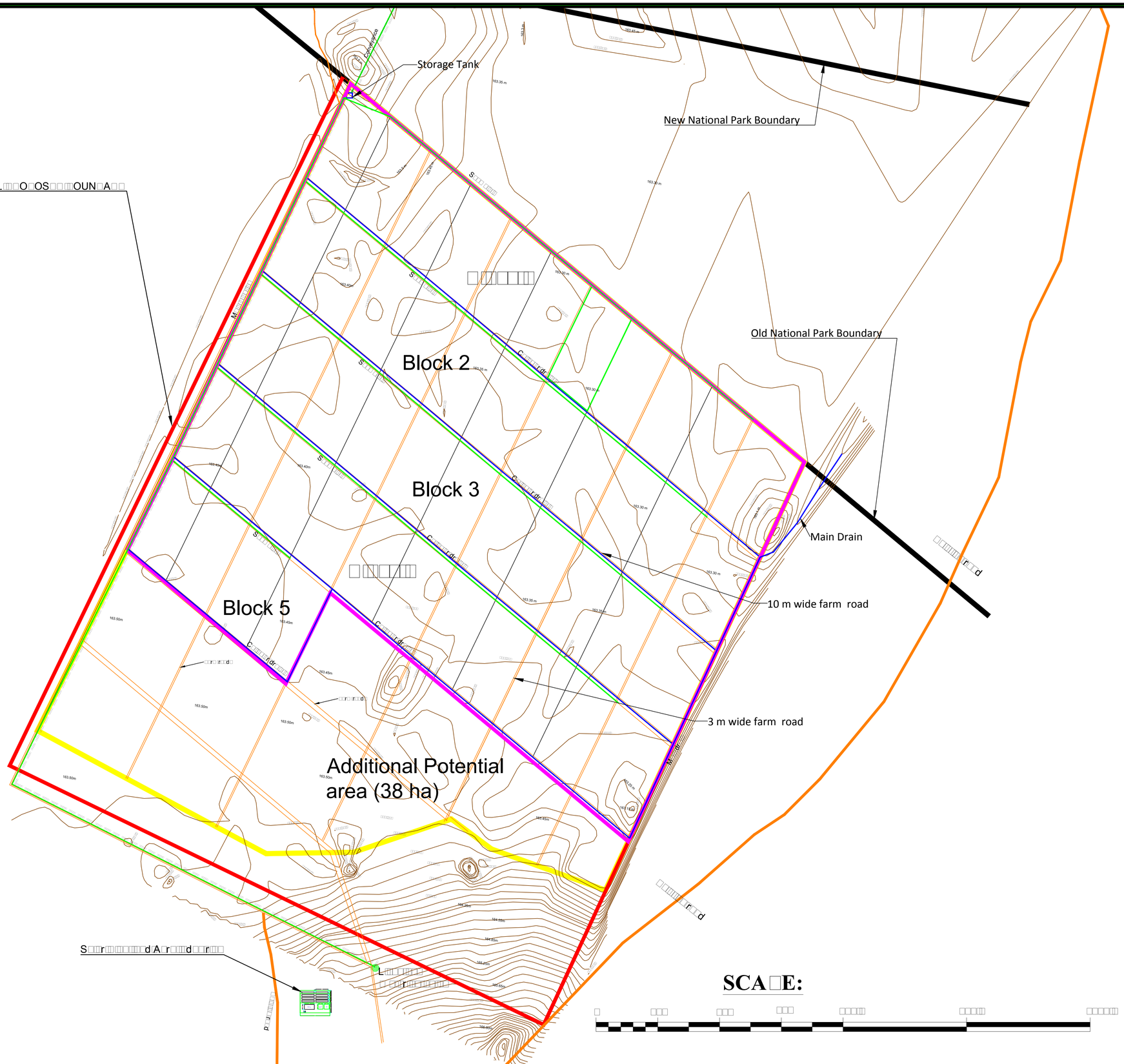
REF.	DESCRIPTION	DATE	SIGN

CLIENT: BOAD

PROJECT

DRG TITLE

Designed By:	Checked By:	Scale:
KG	PM	
Drawn By:	Date:	DRG No:MANDOURI PROJECT/P/
WM	JUNE 2017	



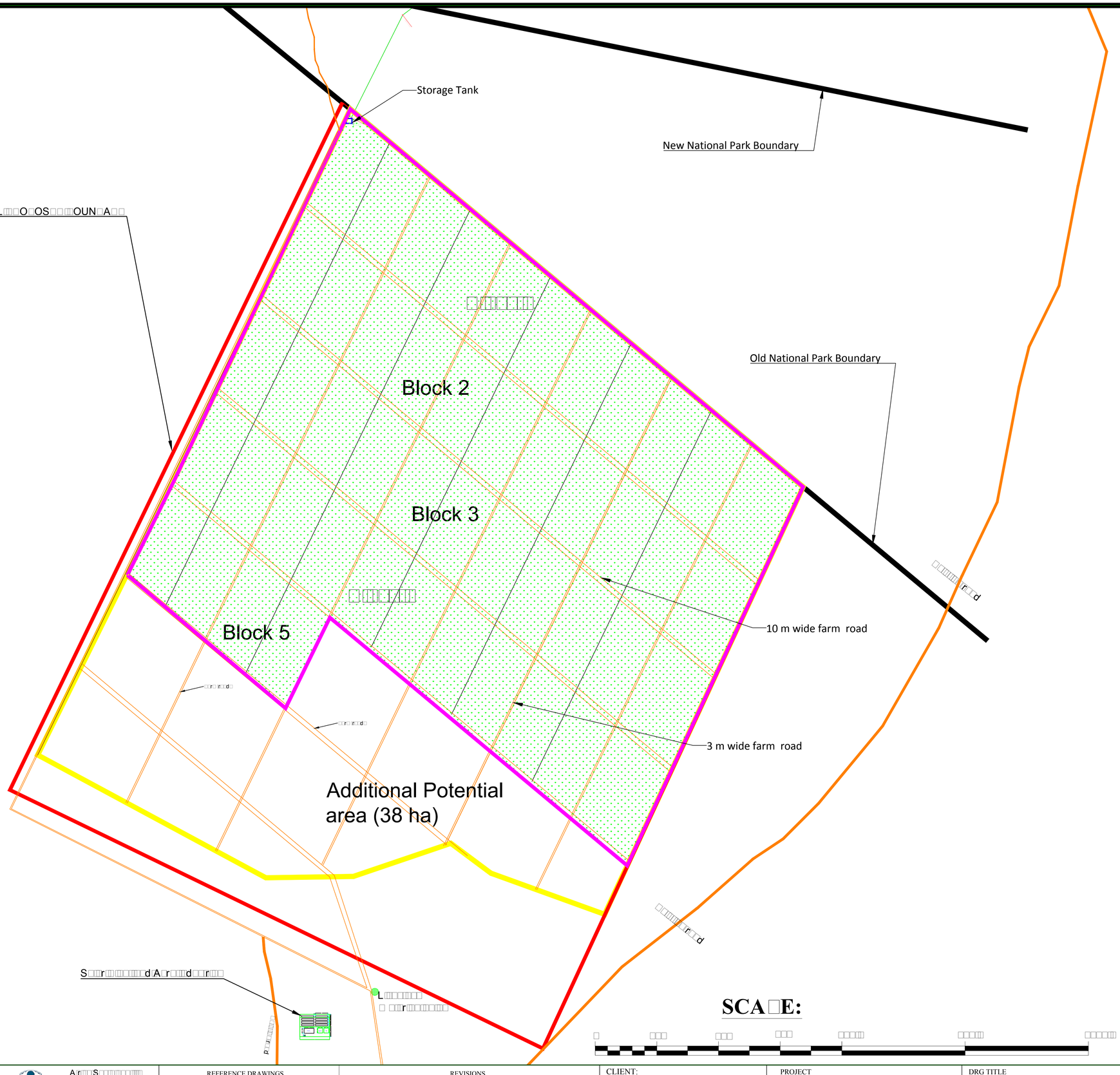
N

LEGEND

- NATIONAL PARK BOUNDARY
- SURVEYED SCHEME POTENTIAL AREA
- 100 Ha TO BE DEVELPOED
- RIVER BANK
- FARM ROADS
- PIPELINES
- DRAINS
- CONTOURS
- EXISTING ROADS

SCALE:

CONSULTANT:	REFERENCE DRAWINGS		REVISIONS				CLIENT:	PROJECT	DRG TITLE	Designed By:	Checked By:	Scale:
ASCENT	REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN	BOADA			KG	PM	As Shown
										Drawn By:	Date:	DRG No:MANDOURI PROJECT/P/0
										WM	JUNE 2017	



N

LEGEND

- NATIONAL PARK BOUNDARY
- SURVEYED SCHEME POTENTIAL AREA
- 100 Ha TO BE DEVELPOED
- RIVER BANK
- FARM ROADS
- PIPELINES
- DRAINS
- CONTOURS
- EXISTING ROADS

SCALE:

PIPELINE	LENGTH(m)	PIPE DETAILS		DIAMETER (mm)	BLOCK	DESIGN AREA (ha)	FLOW ,Q(m^3/s)
		Length (m)	Type/ class				
Conveyance	3,341.00	36.00	GI PIPE Medium	400	All	100.00	0.1667
			UPvc pipes	400			
		3,305.00	B				
Mainline	2,363.50	24.00	GI PIPE Medium	550	All	100.00	0.1667
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DRAIN CANAL	LENGTH(m)	CANAL DIMENSIONS			BLOCK	DESIGN AREA (ha)	DESIGN,Q (m^3/s)
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Collector drain 3	1,197.50	0.60	0.30	0.25	Block 3	22.70	0.0820
Collector drain 4	1,201.60	0.60	0.30	0.25	Block 4	22.70	0.0820
Collector drain 5	627.50	0.38	0.20	0.25	Block 5	8.30	0.0300

CONSULTANT: ASCENT

REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

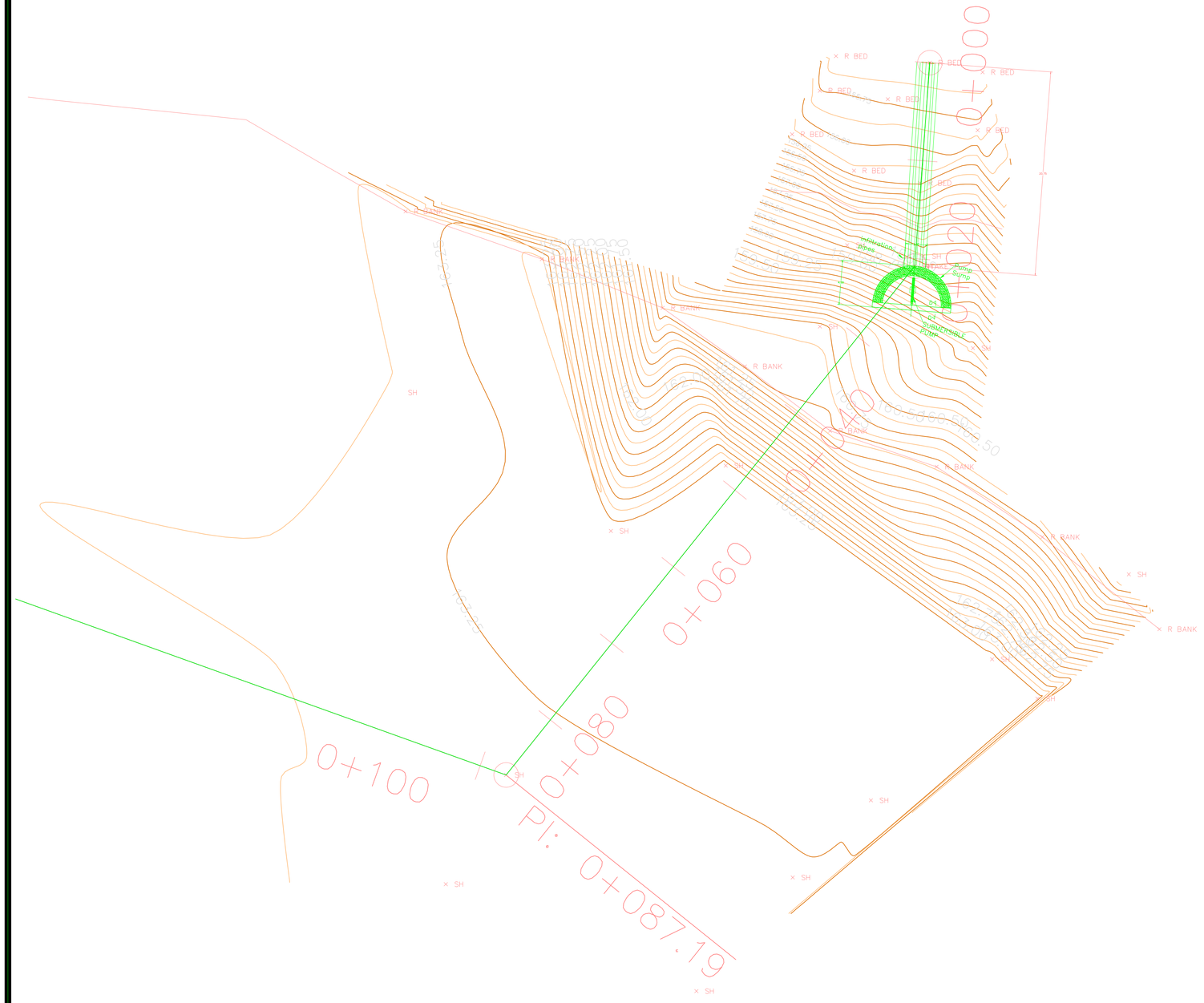
CLIENT: BOAD

PROJECT

DRG TITLE

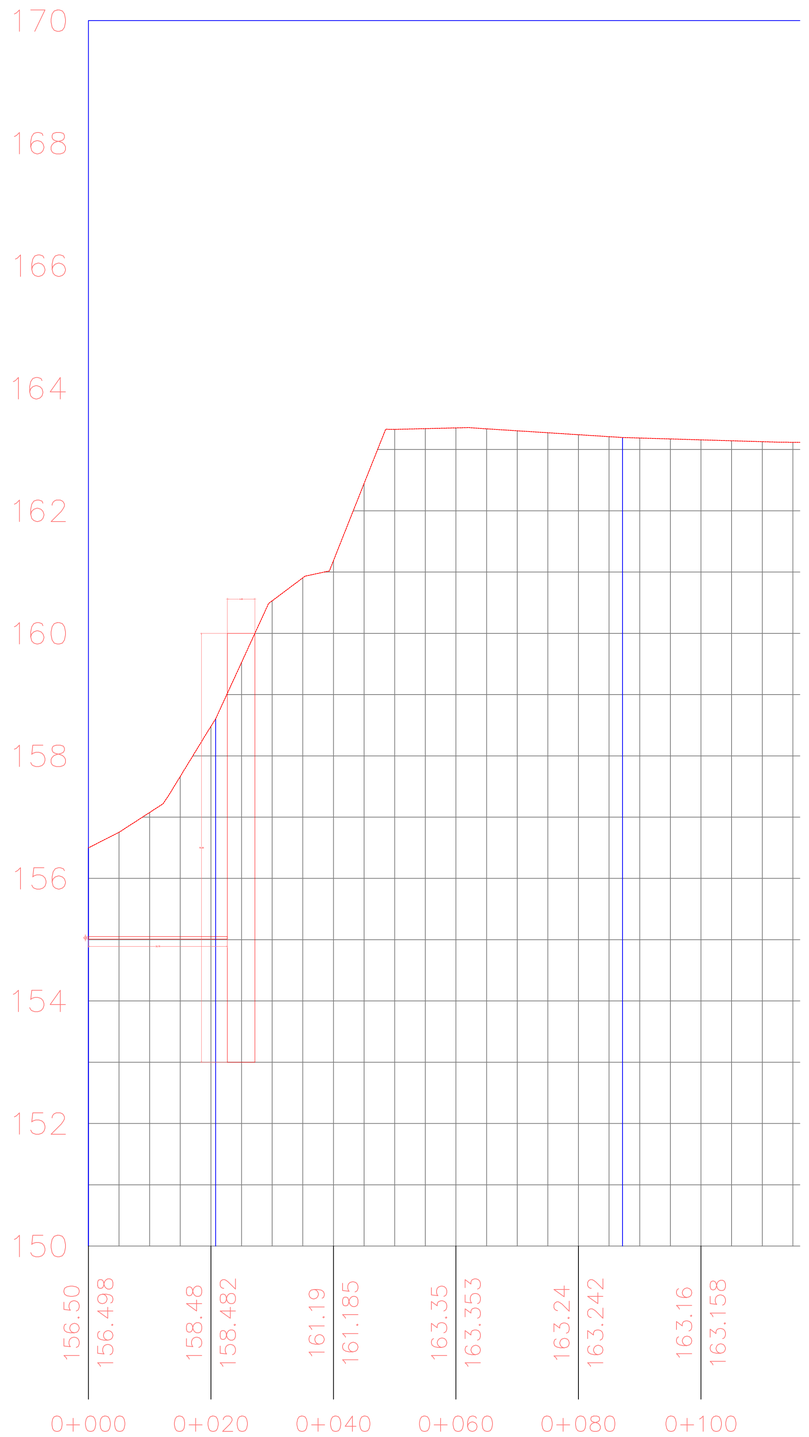
Designed By:	Checked By:	Scale:
KG	PM	
Drawn By:	Date:	DRG No:MANDOURI PROJECT/P
WM	JUNE 2017	

2. PUMP SUMP



PUMP STATION LAYOUT AND LOCATION

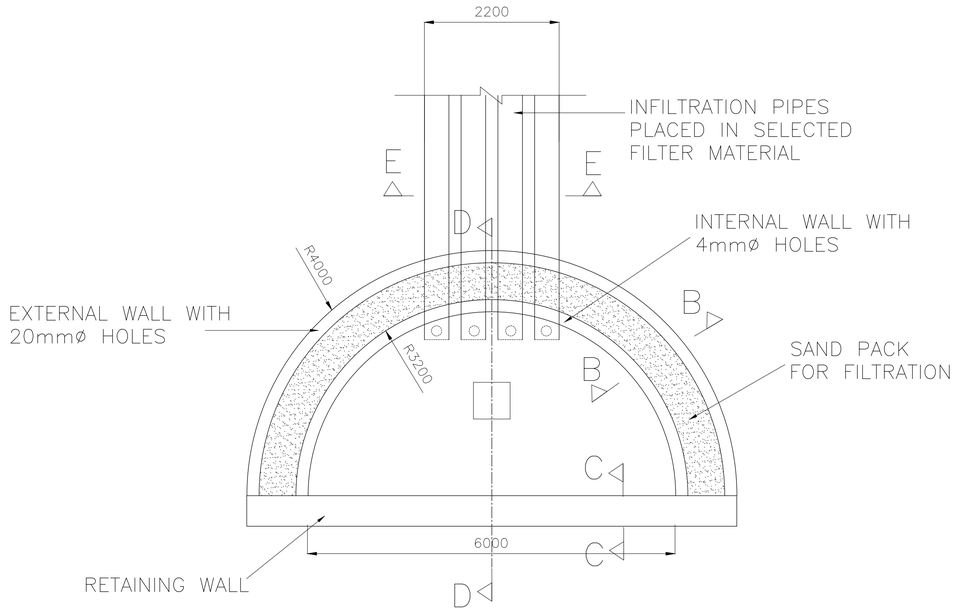
SCALE: 1:1000



PUMP STATION PLACEMENT & SIZING

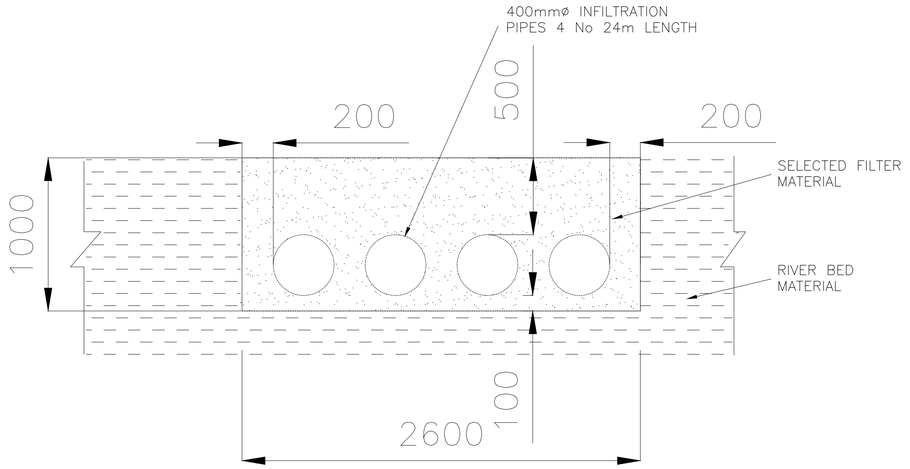
SCALE: 1: 2000

CONSULTANT: ASCENT — Africa Sustainability Centre (ASCENT) P.O Box 1704–0621 Nairobi,Kenya	REFERENCE DRAWINGS: REF. / DESCRIPTION	REVISIONS: REF. / DESCRIPTION / DATE / SIGN	CLIENT: BOAD — Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo	PROJECT: Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo	DRG TITLE: PUMP STATION LAYOUT, LOCATION, PLACEMENT AND SIZING	Designed By: KG / Checked By: PM / Scale: A□S□c□n	Drawn By: WM / Date: JUNE 2017 / DRG No:MANDOURI PROJECT/SP/20□ Sheet 1/3



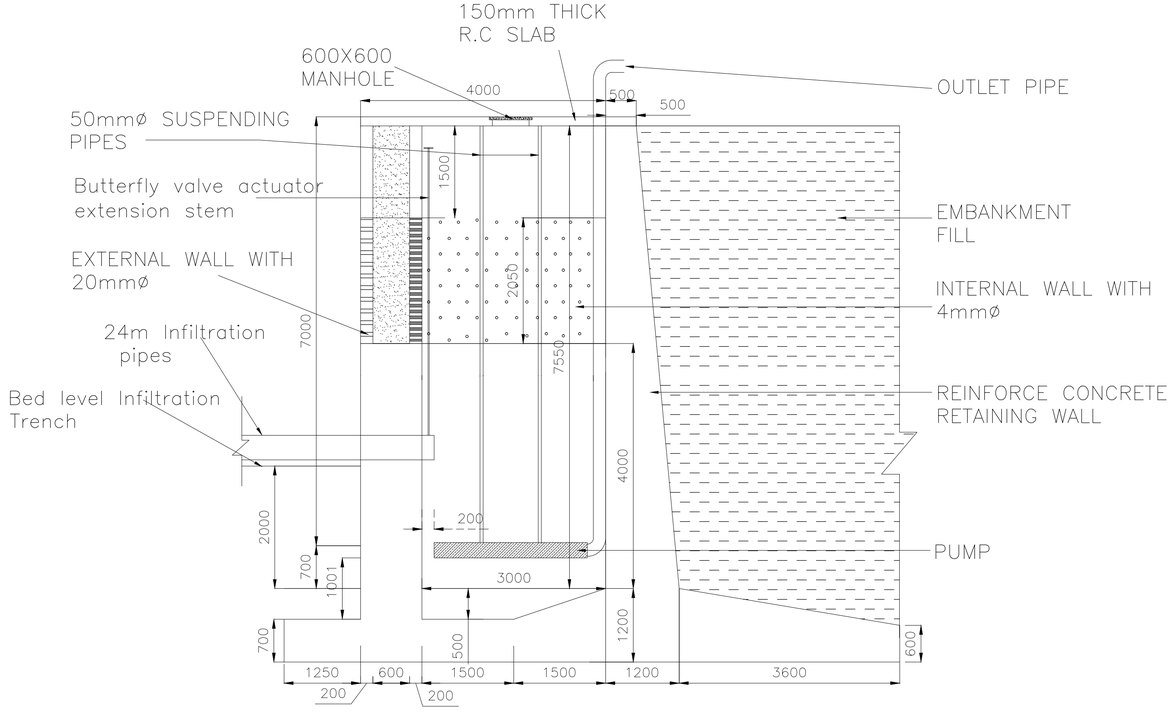
PUMP SUMP

SCALE:1:100 Dimension in mm



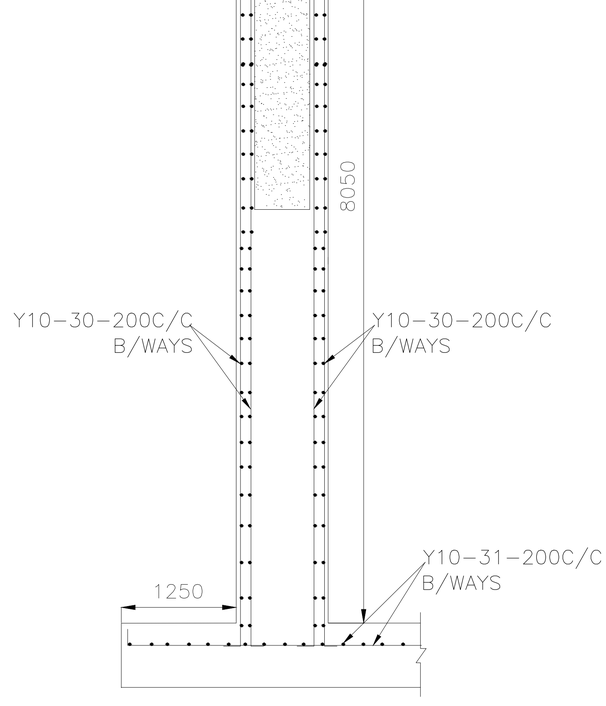
SECTION E–E

SCALE:1:50 Dimension in mm



SECTION D–D

SCALE:1:100 Dimension in mm



SECTION B–B

PUMP SUMP WALLS

SCALE:1:100 Dimension in mm

CONSULTANT: Africa Sustainability Centre (ASCENT) P.O Box 1704–0621 Nairobi,Kenya

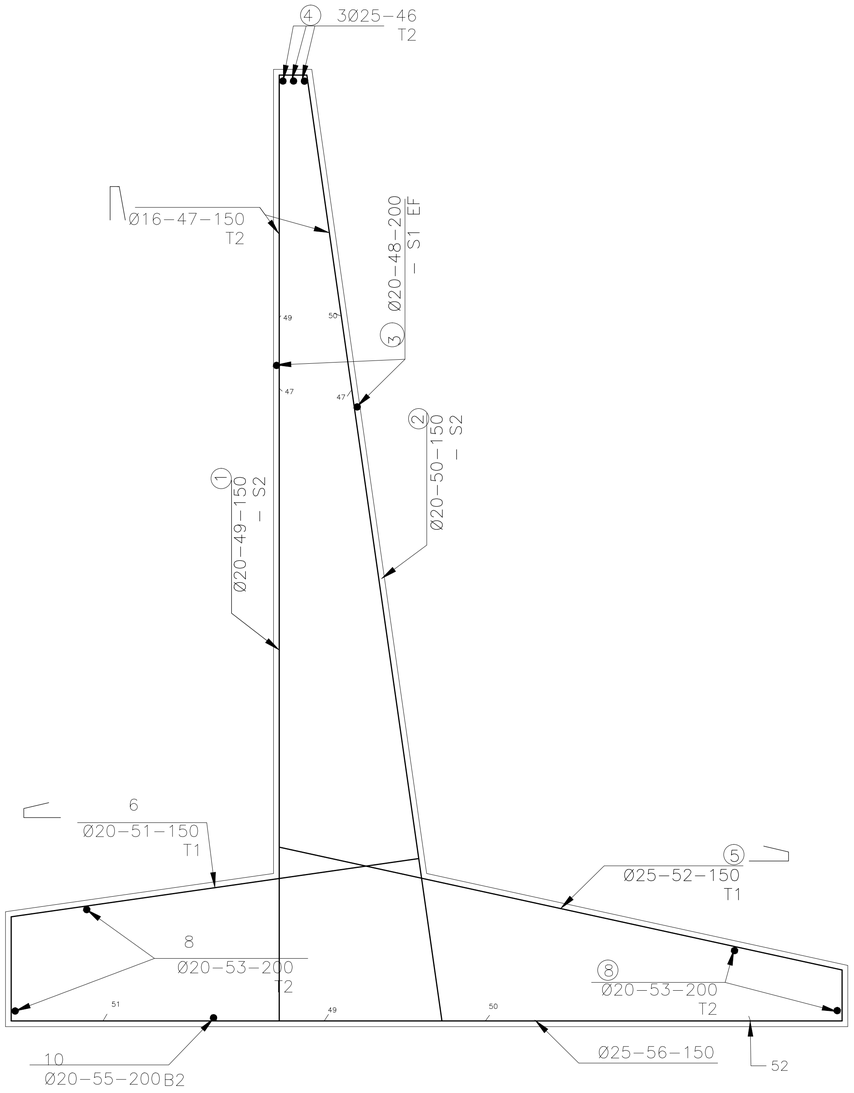
REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT: BOAD — Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo

PROJECT: Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

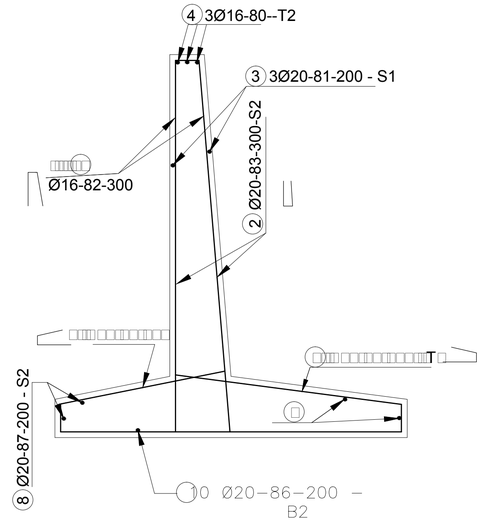
DRG TITLE: PUMP SUMP PLAN AND SECTIONS

Designed By:	Checked By:	Scale:
KG	PM	A□S□□□n
Drawn By:	**Date:**	**DRG No:MANDOURI PROJECT/SP/20□**
WM	JUNE 2017	Sheet 2/3



SECTION C–C

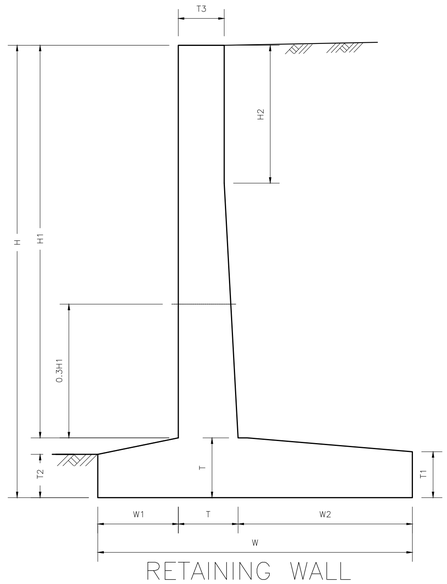
SCALE:1:100 Dimension in mm



TYPE – 2

RETAINING WALL – TYPE 2

H	Dia (Ø) OF BARS / SPACING									
mm	1	2	3	4	5	6	7	8	10	11
2100	-	12@300	12@200	2Ø16	12@300	-	-	12@200	12@200	12@300
2800	-	12@300	12@200	2Ø16	12@300	-	-	12@200	12@200	12@300
3500	-	16@300	16@200	2Ø16	16@300	-	-	16@200	16@200	12@300
4200	-	20@300	20@200	3Ø16	16@300	-	-	20@200	20@200	16@300
5000	-	20@300	20@200	3Ø16	20@300	16@300	-	20@200	20@200	16@300
6000	20@300	25@300	20@200	3Ø16	25@300	20@300	-	20@200	20@200	16@300
7000	20@250	25@250	20@200	3Ø20	25@250	20@250	-	20@200	20@200	16@250
8000	20@200	25@200	20@200	3Ø20	25@200	20@200	-	20@200	20@200	16@200
9000	20@200	28@200	20@200	3Ø20	25@200	20@200	20@200	20@200	20@200	16@200
10000	20@200	28@200	20@200	3Ø20	28@200	20@200	25@200	20@200	20@200	16@200
11200	20@170	28@170	20@200	3Ø20	28@170	20@170	25@170	20@200	20@200	16@170
12500	20@150	28@150	20@200	3Ø25	28@150	20@150	25@150	20@200	20@200	16@150



RETAINING WALL

H	H1	H2	W	W1	W2	T	T1	T2	T3	A
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	sqm
2100	1750	-	1900	400	1150	350	150	150	180	1.0
2800	2300	-	2500	400	1600	500	200	200	240	1.8
3500	3000	-	3200	400	2200	600/500	300	300	300	2.9
4200	3600	-	3600	800	2200	600	400	400	400	3.7
5000	4200	-	4400	1100	2500	800	500	500	450	5.6
6000	5000	-	5300	1300	3000	1000	600	600	450	8.1
7000	5800	-	6300	1500	3600	1200	600	700	500	11.0
8000	6650	-	7400	1600	4450	1350	650	800	500	14.1
9000	7500	-	8100	2000	4600	1500	700	900	500	17.2
10000	8400	-	9000	2500	4700	1600	700	1200	500	20.3
11200	9400	-	10000	2700	5500	1800	700	1350	500	25.2
12500	10500	1500	11000	3200	5800	2000	800	1500	500	29.7

CONSULTANT: Africa Sustainability Centre (ASCENT) P.O Box 1704–0621 Nairobi,Kenya

REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT: Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo

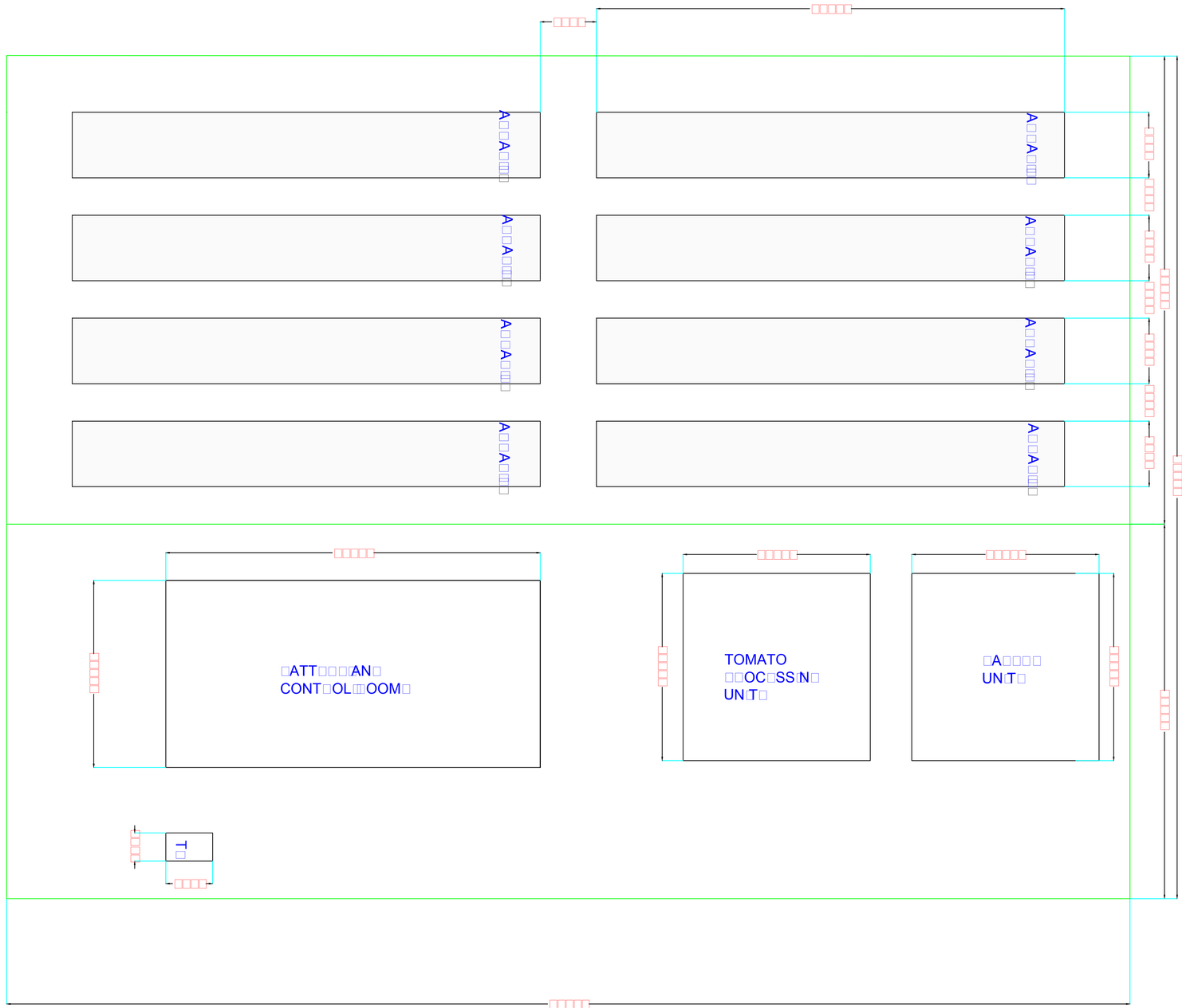
PROJECT: Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

DRG TITLE: PUMP SUMP RETAINING WALL SECTION AND DIMENSION TABLE

Designed By:	Checked By:	Scale:
KG	PM	A□S□c□n
Drawn By:	**Date:**	**DRG No:MANDOURI PROJECT/SP/20□**
WM	JUNE 2017	Sheet 3/3

3. SOLAR SYSTEM LAYOUT

SOLA□ □□□S□ST□M□A□□A□LA□OUT□



LEGEND.

Fence outline.

104 Solar PV Array.

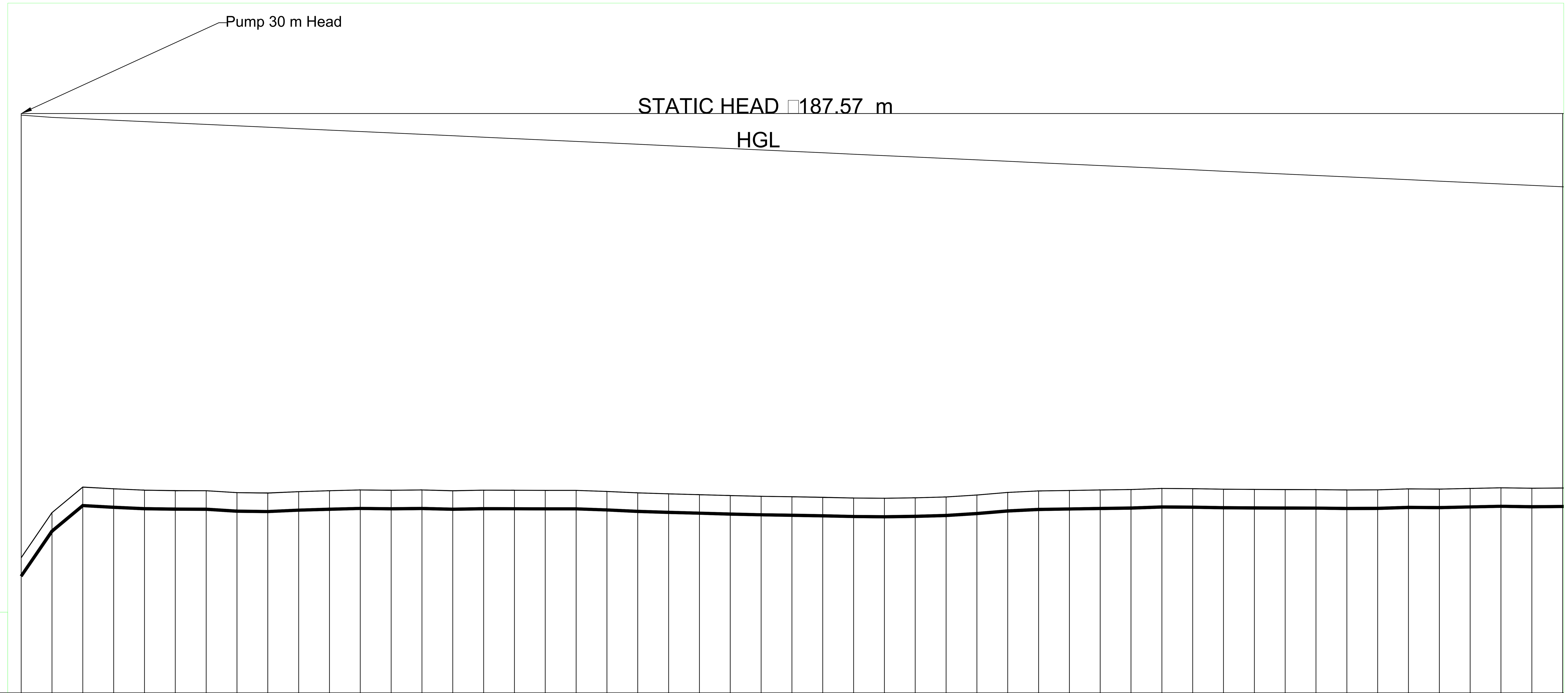
All measurement are in mm.
This drawing should not be interpreted solely but integrated with others..

N

CONSULTANT:	REFERENCE DRAWINGS		REVISIONS				CLIENT:	PROJECT	DRG TITLE	Designed By:	Checked By:	Scale:
A□r□□S□□□□□□□□□□□□ C□□r□ □ASC□NT□ □O□□□□□□□□□□□□ N□r□□□□□□□□	REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN	□□□□□□□ □□□□A□r□□□□ d□□□□□□□□□□ □□□□OA□□ □□A□□□□L□L□□r□□□□□ L□□ □T□□□	□□r□□□□□□□□□r□□□□□□□□□□□□r□□□□ □□□ □ □□□□□□□□□□□□r□□□□r□□□□r□□□ M□□d□□r□□□N□r□□r□T□□□	SOLA□ □□□S□ST□M□A□□A□LA□OUT□	KG	PM	A□S□o□n
ASCENT							BOAD			Drawn By: WM	Date: JUNE 2017	DRG No:MANDOURI PROJECT/SP/□□ S□□□□□□□□

4. IRRIGATION PROFILES

4.1 CONVEYANCE PIPELINE PROFILES



LEGEND

- EXISTING GROUND LEVEL
- INVERT LEVEL (IL)

DATUM
150 m amsl

HYDRAULIC GRADE (m asl): (blank)

STEADY-STATE HEAD (m): (blank)

DESIGN FLOW (l/s): 166.7 l/s

OFFTAKE (l/s): (blank)

PIPE DETAILS: 400 mm Diameter uPVC Pipe

BEDDING DETAILS: (blank)

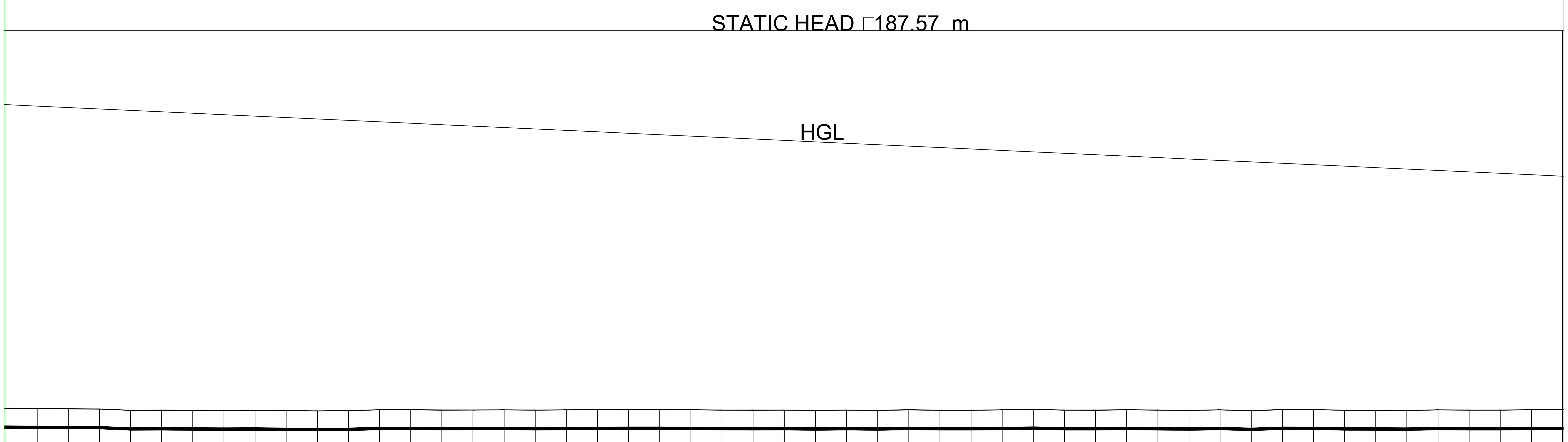
HORI□ONTAL ALIGNMENT: (blank)

HORI□ONTAL ANGULAR DEVIATION: (blank)

CHAINAGE (m)	GROUND LEVEL (m asl)	INVERT LEVEL (m asl)	TRENCH DEPTH (m)	GRADIENT (m/□m) (to next station)	VERTICAL ANGULAR DEVIATION
000.00	158.770	157.569	1.200	146.00	
020.00	161.690	160.489	1.200	82.80	3.6°
040.00	163.345	162.145	1.200	-5.55	5.1°
060.00	163.235	162.034	1.200	-4.50	0.1°
080.00	163.145	161.944	1.200	-1.50	0.2°
100.00	163.115	161.914	1.200	-0.30	0.1°
120.00	163.110	161.908	1.200	-6.20	0.3°
140.00	162.985	161.784	1.200	-1.20	0.3°
160.00	162.960	161.760	1.200	4.45	0.3°
180.00	163.050	161.849	1.200	3.05	0.1°
200.00	163.110	161.910	1.200	2.60	0.0°
220.00	163.160	161.962	1.200	-1.25	0.2°
240.00	163.135	161.937	1.200	1.05	0.1°
260.00	163.160	161.958	1.200	-2.55	0.2°
280.00	163.105	161.907	1.200	1.80	0.2°
300.00	163.145	161.943	1.200	-0.15	0.1°
320.00	163.140	161.940	1.200	-0.30	0.0°
340.00	163.135	161.934	1.200	-0.05	0.0°
360.00	163.135	161.933	1.200	-3.45	0.2°
380.00	163.065	161.864	1.200	-4.70	0.1°
400.00	162.970	161.770	1.200	-3.20	0.1°
420.00	162.905	161.706	1.200	-2.60	0.0°
440.00	162.855	161.654	1.200	-2.95	0.0°
460.00	162.795	161.595	1.200	-2.30	0.0°
480.00	162.750	161.549	1.200	-1.45	0.0°
400.00	162.720	161.520	1.200	-1.95	0.0°
520.00	162.680	161.481	1.200	-2.15	0.0°
540.00	162.640	161.438	1.200	-0.85	0.1°
560.00	162.620	161.421	1.200	1.40	0.1°
580.00	162.650	161.449	1.200	2.70	0.1°
600.00	162.705	161.503	1.200	6.30	0.2°
620.00	162.830	161.629	1.200	8.45	0.1°
640.00	163.000	161.798	1.200	4.80	0.2°
660.00	163.095	161.894	1.200	1.65	0.2°
680.00	163.125	161.927	1.200	1.55	0.0°
700.00	163.160	161.958	1.200	1.35	0.0°
720.00	163.185	161.985	1.200	3.65	0.1°
740.00	163.260	162.058	1.200	-0.80	0.3°
760.00	163.240	162.042	1.200	-1.65	0.0°
780.00	163.210	162.009	1.200	-0.80	0.0°
800.00	163.195	161.993	1.200	-0.45	0.0°
820.00	163.185	161.984	1.200	-0.10	0.0°
840.00	163.180	161.982	1.200	-1.10	0.1°
860.00	163.160	161.960	1.200	0.25	0.1°
880.00	163.165	161.965	1.200	3.15	0.2°
900.00	163.230	162.028	1.200	-0.75	0.2°
920.00	163.215	162.013	1.200	2.35	0.2°
940.00	163.260	162.060	1.200	2.00	0.0°
960.00	163.300	162.100	1.200	-1.55	0.2°
980.00	163.270	162.069	1.200	0.90	0.1°
1000.00	163.285	162.087	1.200		0.

CONSULTANT:	REFERENCE DRAWINGS	REVISIONS	CLIENT:	PROJECT	DRG TITLE
Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya	REF. / DESCRIPTION	REF. / DESCRIPTION / DATE / SIGN	Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo	Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo	Conveyance profile Chainage 0+000.00 to 1+000.00m

Designed By:	Checked By:	Scales:
□G	PM	Hor. scale 1:2000 Ver. Scale 1:200
Drawn By: WM	**Date:** JUNE 2017	**DRG No:MANDOURI PROJECT/TD/□00** Sheet 1/4



LEGEND

EXISTING GROUND LEVEL

INVERT LEVEL (IL)

DATUM
150 m amsl

HYDRAULIC GRADE (m asl):

STEADY-STATE HEAD (m):

DESIGN FLOW (l/s): 166.7 l/s

OFFTAKE (l/s):

PIPE DETAILS: 400mm Diameter uPVC Pipe

BEDDING DETAILS:

HORIZONTAL ALIGNMENT:

HORIZONTAL ANGULAR DEVIATION:

GRADIENT (m/m): 146.00

CHAINAGE (m)	GROUND LEVEL (m asl)	INVERT LEVEL (m asl)	TRENCH DEPTH (m)	GRADIENT (m/m)	VERTICAL ANGULAR DEVIATION
					1°
1020.00	163.275	162.073	1.200	-0.70	0.0°
1040.00	163.260	162.061	1.200	-0.60	0.0°
1060.00	163.255	162.053	1.200	-0.40	0.2°
1080.00	163.170	161.969	1.200	-4.20	0.3°
1100.00	163.175	161.977	1.200	0.40	0.1°
1120.00	163.165	161.966	1.200	-0.55	0.0°
1140.00	163.155	161.957	1.200	-0.45	0.0°
1160.00	163.165	161.965	1.200	0.40	0.1°
1180.00	163.145	161.946	1.200	-0.95	0.0°
1200.00	163.125	161.925	1.200	-1.05	0.1°
1220.00	163.145	161.945	1.200	1.00	0.1°
1240.00	163.200	162.002	1.200	2.85	0.2°
1260.00	163.200	161.999	1.200	-0.15	0.0°
1280.00	163.185	161.984	1.200	-0.75	0.1°
1300.00	163.190	161.990	1.200	0.30	0.0°
1320.00	163.195	161.996	1.200	0.30	0.1°
1340.00	163.180	161.981	1.200	-0.75	0.1°
1360.00	163.195	161.995	1.200	0.70	0.0°
1380.00	163.210	162.010	1.200	0.75	0.0°
1400.00	163.220	162.018	1.200	0.40	0.0°
1420.00	163.215	162.017	1.200	-0.05	0.0°
1440.00	163.205	162.004	1.200	-0.65	0.0°
1460.00	163.180	161.982	1.200	-1.10	0.0°
1480.00	163.175	161.977	1.200	-0.25	0.0°
1400.00	163.180	161.982	1.200	0.25	0.1°
1520.00	163.165	161.964	1.200	-0.90	0.1°
1540.00	163.185	161.983	1.200	0.95	0.1°
1560.00	163.165	161.967	1.200	-0.80	0.1°
1580.00	163.200	161.998	1.200	1.55	0.2°
1600.00	163.175	161.976	1.200	-1.10	0.1°
1620.00	163.175	161.975	1.200	-0.05	0.1°
1640.00	163.195	161.994	1.200	0.95	0.0°
1660.00	163.225	162.024	1.200	1.50	0.2°
1680.00	163.180	161.980	1.200	-2.20	0.1°
1700.00	163.175	161.977	1.200	-0.15	0.1°
1720.00	163.200	161.999	1.200	1.10	0.1°
1740.00	163.180	161.978	1.200	-1.05	0.0°
1760.00	163.165	161.967	1.200	-0.55	0.1°
1780.00	163.195	161.993	1.200	1.30	0.2°
1800.00	163.145	161.944	1.200	-2.45	0.3°
1820.00	163.210	162.012	1.200	3.40	0.2°
1840.00	163.210	162.010	1.200	-0.10	0.1°
1860.00	163.170	161.972	1.200	-1.90	0.1°
1880.00	163.165	161.964	1.200	-0.40	0.0°
1900.00	163.160	161.958	1.200	-0.30	0.1°
1920.00	163.195	161.995	1.200	1.85	0.1°
1940.00	163.180	161.980	1.200	-0.75	0.0°
1960.00	163.180	161.978	1.200	-0.10	0.1°
1980.00	163.200	161.999	1.200	1.05	0.1°
2000.00	163.200	162.002	1.200	0.15	0.

CONSULTANT:

Africa Sustainability Centre (ASCENT)
P.O Box 1704-0621
Nairobi,Kenya

REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT:

Banque Quest Africaine de Developpement(BOAD)
68 Ave De La Liberation,
Lome,Togo

PROJECT
Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

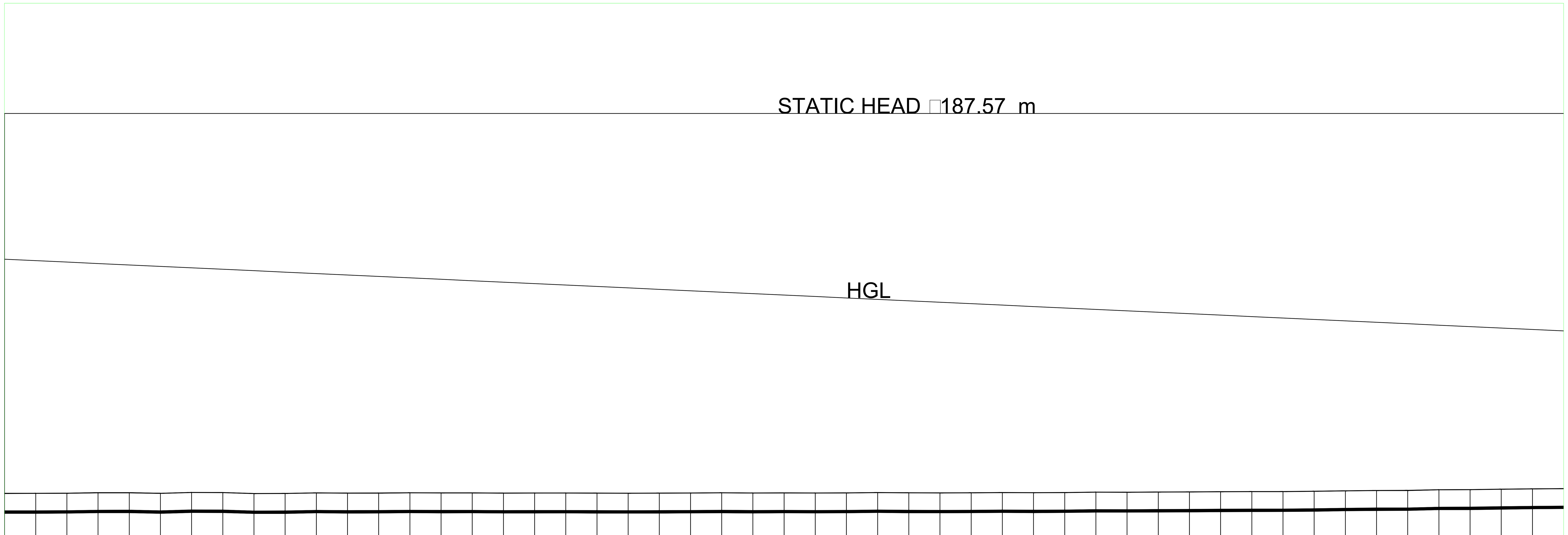
DRG TITLE
Conveyance profile

Chainage 1+000.00 to 2+000.00m

Designed By:	Checked By:	Scales:
G	PM	Hor. scale 1:2000 Ver. Scale 1:200
Drawn By:	Date:	DRG No:MANDOURI PROJECT/TD/00
WM	JUNE 2017	Sheet 2/4

LEGEND

- EXISTING GROUND LEVEL
- INVERT LEVEL (IL)



DATUM
150 m amsl

HYDRAULIC GRADE (m asl)

DESIGN FLOW (l/s): 166.7 l/s

OFFTAKE (l/s)

PIPE DETAILS: 400mm Diameter uPVC Pipe

BEDDING DETAILS

GRADIENT (m/□m): 146.00

VERTICAL ANGULAR DEVIATION: 0° (at start)

HORI□ONTAL ALIGNMENT

HORI□ONTAL ANGULAR DEVIATION

CHAINAGE (m)	GROUND LEVEL (m asl)	INVERT LEVEL (m asl)	TRENCH DEPTH (m)	STEADY-STATE HEAD (m)	GRADIENT (m/□m)	VERTICAL ANGULAR DEVIATION
2020.00	163.205	162.003	1.200		0.05	0.0°
2040.00	163.215	162.014	1.200		0.55	0.1°
2060.00	163.245	162.043	1.200		1.45	0.1°
2080.00	163.245	162.044	1.200		0.05	0.1°
2100.00	163.205	162.005	1.200		-1.95	0.3°
2120.00	163.260	162.061	1.200		2.80	0.2°
2140.00	163.255	162.053	1.200		-0.40	0.1°
2160.00	163.195	161.993	1.200		-3.00	0.2°
2180.00	163.195	161.996	1.200		0.15	0.1°
2200.00	163.235	162.035	1.200		1.95	0.2°
2220.00	163.220	162.018	1.200		-0.85	0.1°
2240.00	163.225	162.023	1.200		0.25	0.0°
2260.00	163.240	162.041	1.200		0.90	0.1°
2280.00	163.230	162.032	1.200		-0.45	0.0°
2300.00	163.235	162.035	1.200		0.15	0.0°
2320.00	163.220	162.021	1.200		-0.70	0.1°
2340.00	163.225	162.025	1.200		0.20	0.0°
2360.00	163.225	162.027	1.200		0.10	0.0°
2380.00	163.220	162.019	1.200		-0.40	0.0°
2400.00	163.215	162.014	1.200		-0.25	0.0°
2420.00	163.215	162.017	1.200		0.15	0.0°
2440.00	163.230	162.029	1.200		0.60	0.0°
2460.00	163.240	162.039	1.200		0.50	0.1°
2480.00	163.225	162.025	1.200		-0.70	0.1°
2400.00	163.235	162.035	1.200		0.50	0.0°
2520.00	163.230	162.029	1.200		-0.30	0.0°
2540.00	163.235	162.034	1.200		0.25	0.0°
2560.00	163.255	162.056	1.200		1.10	0.1°
2580.00	163.240	162.040	1.200		-0.80	0.0°
2600.00	163.235	162.034	1.200		-0.30	0.0°
2620.00	163.240	162.042	1.200		0.40	0.0°
2640.00	163.255	162.056	1.200		0.70	0.1°
2660.00	163.245	162.047	1.200		-0.45	0.1°
2680.00	163.255	162.056	1.200		0.45	0.0°
2700.00	163.280	162.081	1.200		1.25	0.1°
2720.00	163.275	162.077	1.200		-0.20	0.0°
2740.00	163.285	162.086	1.200		0.45	0.0°
2760.00	163.295	162.096	1.200		0.50	0.0°
2780.00	163.310	162.110	1.200		0.70	0.0°
2800.00	163.315	162.117	1.200		0.35	0.0°
2820.00	163.320	162.119	1.200		0.10	0.0°
2840.00	163.335	162.135	1.200		0.80	0.0°
2860.00	163.365	162.167	1.200		1.60	0.0°
2880.00	163.385	162.187	1.200		1.00	0.0°
2900.00	163.390	162.190	1.200		0.15	0.1°
2920.00	163.440	162.238	1.200		2.40	0.1°
2940.00	163.440	162.241	1.200		0.15	0.1°
2960.00	163.470	162.270	1.200		1.45	0.0°
2980.00	163.495	162.294	1.200		1.20	0.0°
3000.00	163.510	162.308	1.200		0.70	0.

CONSULTANT: Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya

REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT: Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo

PROJECT: Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

DRG TITLE: Conveyance profile

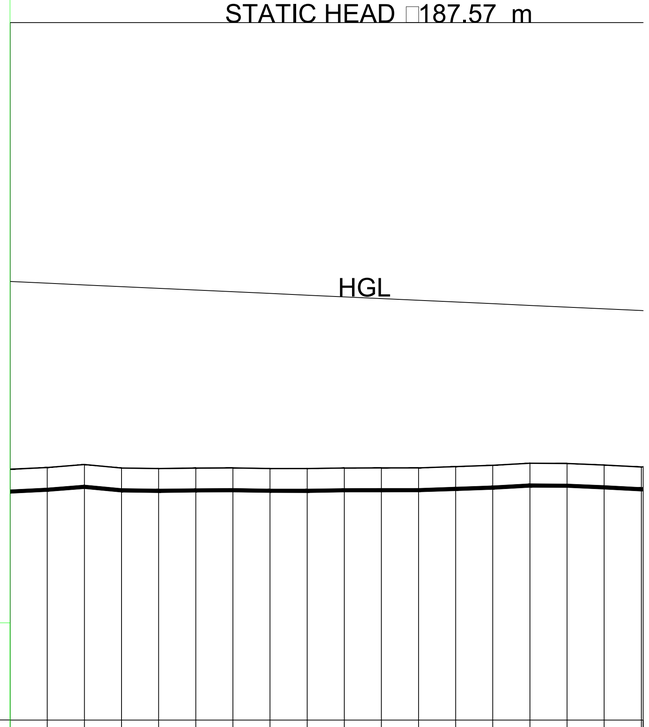
Chainage2+000.00 to 3+000.00m

Designed By:	Checked By:	Scales:
□G	PM	Hor. scale 1:2000 Ver. Scale 1:200
Drawn By: WM	**Date:** JUNE 2017	**DRG No:MANDOURI PROJECT/TD/□00** Sheet 3/4

LEGEND

EXISTING GROUND LEVEL

INVERT LEVEL (IL)



DATUM
150 m amsl

HYDRAULIC GRADE (m asl)																			
CHAINAGE (m)	3020.00	3040.00	3060.00	3080.00	3100.00	3120.00	3140.00	3160.00	3180.00	3200.00	3220.00	3240.00	3260.00	3280.00	3300.00	3320.00	3340.00	3341.00	
GROUND LEVEL (m asl)	163.605	163.765	163.575	163.545	163.570	163.580	163.550	163.545	163.575	163.580	163.585	163.650	163.720	163.830	163.820	163.735	163.630	163.635	
INVERT LEVEL (m asl)	162.404	162.564	162.374	162.344	162.371	162.381	162.349	162.344	162.376	162.380	162.384	162.449	162.521	162.632	162.622	162.533	162.429	162.435	
TRENCH DEPTH (m)	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	
STEADY-STATE HEAD (m)																			
DESIGN FLOW (l/s)	166.7 l/s																		
OFFTAKE (l/s)																			
PIPE DETAILS	400mm Diameter uPVC Pipe																		
BEDDING DETAILS																			
GRADIENT (m/m)	146.00	4.80	8.00	-9.50	-1.50	1.35	0.50	-1.60	-0.25	1.60	0.20	0.20	3.25	3.60	5.55	-0.50	-4.15	6.00	0.20
VERTICAL ANGULAR DEVIATION	2°	0.2°	1.0°	0.5°	0.2°	0.0°	0.1°	0.1°	0.1°	0.1°	0.0°	0.2°	0.0°	0.1°	0.3°	0.2°	0.0°	0.6°	
HORIZONTAL ALIGNMENT																			
HORIZONTAL ANGULAR DEVIATION																			

CONSULTANT:

ASCENT

Africa Sustainability Centre
(ASCENT)
P.O Box 1704-0621
Nairobi,Kenya

REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT:

BOAD

Banque Quest Africaine de Developpement(BOAD)
68 Ave De La Liberation,
Lome,Togo

PROJECT

Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

DRG TITLE

Conveyance profile

Chainage 3+000.00 to 3+341.00m

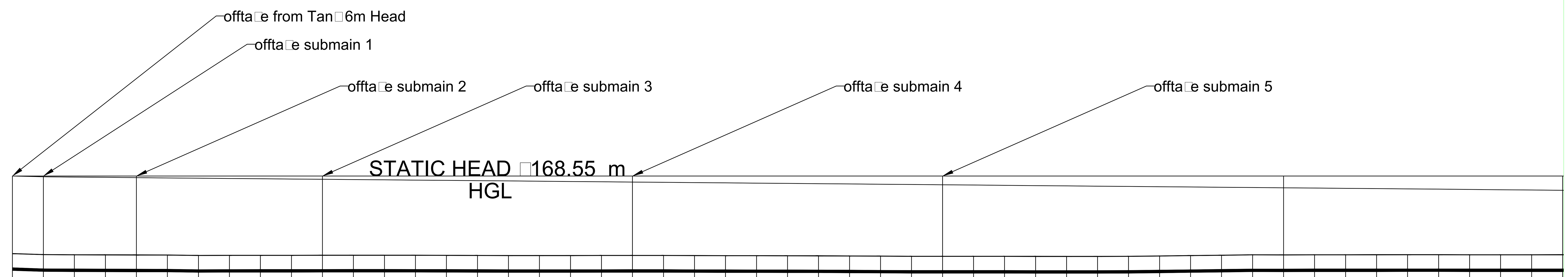
Designed By:	Checked By:	Scales:
G	PM	Hor. scale 1:2000 Ver. Scale 1:200
Drawn By:	**Date:**	**DRG No:MANDOURI PROJECT/TD/00**
WM	JUNE 2017	Sheet 4/4

4.2 MAIN PIPELINE PROFILES

LEGEND

EXISTING GROUND LEVEL

INVERT LEVEL (IL)



DATUM
150 m amsl

HYDRAULIC GRADE (m asl)										
CHAINAGE (m)	000.00	020.00	040.00	060.00	080.00	100.00	120.00	140.00	160.00	180.00
GROUND LEVEL (m asl)	163.555	163.485	163.475	163.470	163.465	163.455	163.430	163.435	163.440	163.440
INVERT LEVEL (m asl)	162.553	162.485	162.476	162.470	162.463	162.457	162.430	162.436	162.438	162.440
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
STEADY-STATE HEAD (m)										
GRADIENT (m/□m)		-3.40	-0.45	-0.30	-0.35	-0.30	-1.35	0.30	0.10	0.10
VERTICAL ANGULAR DEVIATION		0.2°	0.0°	0.0°	0.0°	0.1°	0.1°	0.0°	0.0°	0.0°

CHAINAGE (m)	200.00	220.00	240.00	260.00	280.00	300.00	320.00	340.00	360.00	380.00
GROUND LEVEL (m asl)	163.445	163.450	163.445	163.445	163.440	163.435	163.425	163.425	163.425	163.430
INVERT LEVEL (m asl)	162.443	162.448	162.446	162.443	162.439	162.433	162.424	162.425	162.427	162.430
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
GRADIENT (m/□m)	0.15	0.25	-0.10	-0.15	-0.20	-0.30	-0.45	0.05	0.10	0.15
VERTICAL ANGULAR DEVIATION	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°

CHAINAGE (m)	400.00	420.00	440.00	460.00	480.00	500.00	520.00	540.00	560.00	580.00
GROUND LEVEL (m asl)	163.435	163.430	163.420	163.420	163.415	163.415	163.410	163.400	163.390	163.380
INVERT LEVEL (m asl)	162.433	162.431	162.422	162.419	162.416	162.413	162.408	162.398	162.388	162.378
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
GRADIENT (m/□m)	0.15	-0.10	-0.45	-0.15	-0.15	-0.15	-0.25	-0.50	-0.50	-0.50
VERTICAL ANGULAR DEVIATION	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°

CHAINAGE (m)	600.00	620.00	640.00	660.00	680.00	700.00	720.00	740.00	760.00	780.00
GROUND LEVEL (m asl)	163.375	163.380	163.375	163.370	163.370	163.370	163.375	163.395	163.420	163.450
INVERT LEVEL (m asl)	162.376	162.378	162.375	162.372	162.369	162.370	162.376	162.397	162.422	162.448
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
GRADIENT (m/□m)	-0.10	0.10	-0.15	-0.15	-0.15	0.05	0.30	1.05	1.25	1.30
VERTICAL ANGULAR DEVIATION	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°

CHAINAGE (m)	800.00	820.00	840.00	860.00	880.00	900.00	920.00	940.00	960.00	980.00	1000.00
GROUND LEVEL (m asl)	163.470	163.465	163.475	163.475	163.475	163.480	163.480	163.475	163.475	163.475	163.475
INVERT LEVEL (m asl)	162.472	162.467	162.474	162.476	162.477	162.478	162.478	162.476	162.474	162.473	162.477
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
GRADIENT (m/□m)	1.20	-0.25	0.35	0.10	0.05	0.05	0.00	-0.10	-0.10	-0.05	0.20
VERTICAL ANGULAR DEVIATION	0.1°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.

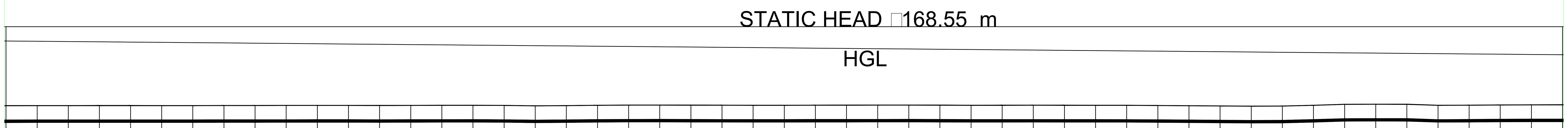
DESIGN FLOW (l/s)	166.7 l/s
OFFTAKE (l/s)	
PIPE DETAILS	560 mm Diameter uPVC Pipe
BEDDING DETAILS	
HORI□ONTAL ALIGNMENT	
HORI□ONTAL ANGULAR DEVIATION	

CONSULTANT:	Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya	
REFERENCE DRAWINGS	REF.	DESCRIPTION
REVISIONS	REF. / DESCRIPTION	DATE / SIGN
CLIENT:	Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo	
PROJECT	Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo	
DRG TITLE	Main pipeline profile	Chainage 0+000.00 to 1+000.00m
Designed By: □G	Checked By: PM	Scales: Hor. scale 1:2000 Ver. Scale 1:200
Drawn By: WM	Date: JUNE 2017	DRG No:MANDOURI PROJECT/TD/□0□ Sheet 1/3

LEGEND

EXISTING GROUND LEVEL

INVERT LEVEL (IL)



DATUM
150 m amsl

HYDRAULIC GRADE (m asl)											
CHAINAGE (m)		1020.00	1040.00	1060.00	1080.00	1100.00	1120.00	1140.00	1160.00	1180.00	1200.00
GROUND LEVEL (m asl)		163.485	163.485	163.485	163.485	163.480	163.480	163.490	163.490	163.495	163.495
INVERT LEVEL (m asl)		162.483	162.483	162.484	162.484	162.481	162.480	162.488	162.490	162.493	162.495
TRENCH DEPTH (m)		1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
STEADY-STATE HEAD (m)											
GRADIENT (m/□m)		0.30	0.00	0.05	0.00	-0.15	-0.05	0.40	0.10	0.15	0.10
VERTICAL ANGULAR DEVIATION	0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°

CHAINAGE (m)	1220.00	1240.00	1260.00	1280.00	1300.00	1320.00	1340.00	1360.00	1380.00	1400.00
GROUND LEVEL (m asl)	163.495	163.490	163.495	163.500	163.505	163.495	163.470	163.480	163.500	163.515
INVERT LEVEL (m asl)	162.494	162.491	162.495	162.499	162.503	162.493	162.469	162.481	162.501	162.513
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
GRADIENT (m/□m)	-0.05	-0.15	0.20	0.20	0.20	-0.50	-1.20	0.60	1.00	0.60
VERTICAL ANGULAR DEVIATION	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.1°	0.0°	0.0°	0.0°

CHAINAGE (m)	1420.00	1440.00	1460.00	1480.00	1500.00	1520.00	1540.00	1560.00	1580.00	1600.00
GROUND LEVEL (m asl)	163.515	163.510	163.505	163.505	163.505	163.510	163.510	163.515	163.515	163.510
INVERT LEVEL (m asl)	162.517	162.512	162.507	162.503	162.503	162.509	162.512	162.514	162.515	162.512
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
GRADIENT (m/□m)	0.20	-0.25	-0.25	-0.20	0.00	0.30	0.15	0.10	0.05	-0.15
VERTICAL ANGULAR DEVIATION	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°

CHAINAGE (m)	1620.00	1640.00	1660.00	1680.00	1700.00	1720.00	1740.00	1760.00	1780.00	1800.00
GROUND LEVEL (m asl)	163.505	163.505	163.505	163.505	163.505	163.500	163.490	163.475	163.460	163.445
INVERT LEVEL (m asl)	162.504	162.505	162.507	162.505	162.503	162.500	162.488	162.473	162.459	162.447
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
GRADIENT (m/□m)	-0.40	0.05	0.10	-0.10	-0.10	-0.15	-0.60	-0.75	-0.70	-0.60
VERTICAL ANGULAR DEVIATION	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.1°

CHAINAGE (m)	1820.00	1840.00	1860.00	1880.00	1900.00	1920.00	1940.00	1960.00	1980.00	2000.00
GROUND LEVEL (m asl)	163.455	163.505	163.560	163.570	163.570	163.500	163.510	163.520	163.530	163.535
INVERT LEVEL (m asl)	162.454	162.503	162.562	162.570	162.568	162.500	162.508	162.522	162.529	162.533
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
GRADIENT (m/□m)	0.35	2.45	2.95	0.40	-0.10	-3.40	0.40	0.70	0.35	0.20
VERTICAL ANGULAR DEVIATION	0.1°	0.0°	0.1°	0.0°	0.2°	0.2°	0.0°	0.0°	0.0°	0.

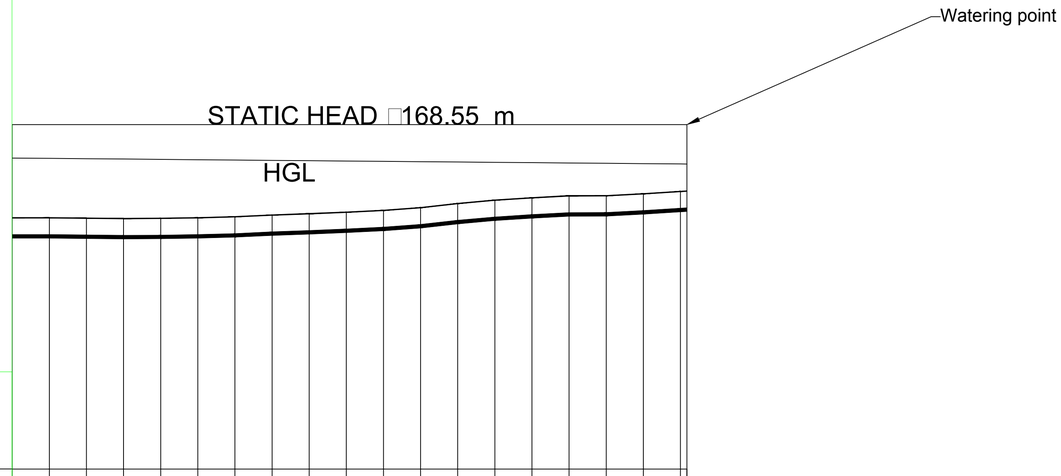
DESIGN FLOW (l/s)	166.7 l/s
OFFTAKE (l/s)	
PIPE DETAILS	560 mm Diameter uPVC Pipe
BEDDING DETAILS	
HORI□ONTAL ALIGNMENT	
HORI□ONTAL ANGULAR DEVIATION	

CONSULTANT:	REFERENCE DRAWINGS		REVISIONS				CLIENT:	PROJECT	DRG TITLE	Designed By:	Checked By:	Scales:
Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya	REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN	Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo	Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo	Main pipeline profile	□G	PM	Hor. scale 1:2000 Ver. Scale 1:200
									Chainage 1+000.00 to 2+000.00m	Drawn By: WM	Date: JUNE 2017	DRG No:MANDOURI PROJECT/TD/□0□ Sheet 2/3

LEGEND

EXISTING GROUND LEVEL

INVERT LEVEL (IL)



DATUM
150 m amsl

HYDRAULIC GRADE (m asl)																				
CHAINAGE (m)	2020.00	2040.00	2060.00	2080.00	2100.00	2120.00	2140.00	2160.00	2180.00	2200.00	2220.00	2240.00	2260.00	2280.00	2300.00	2320.00	2340.00	2360.00	2363.50	
GROUND LEVEL (m asl)	163.535	163.515	163.490	163.505	163.535	163.590	163.680	163.755	163.835	163.935	164.080	164.305	164.480	164.610	164.715	164.720	164.825	164.955	164.975	
INVERT LEVEL (m asl)	162.536	162.515	162.492	162.504	162.536	162.588	162.680	162.753	162.833	162.933	163.079	163.303	163.482	163.609	163.717	163.721	163.827	163.954	163.974	
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
STEADY-STATE HEAD (m)																				
DESIGN FLOW (l/s)	166.7 l/s																			
OFFTAKE (l/s)																				
PIPE DETAILS	560mm Diameter uPVC Pipe																			
BEDDING DETAILS																				
GRADIENT (m/□m)	0.15	-1.05	-1.15	0.60	1.60	2.60	4.60	3.65	4.00	5.00	7.30	11.20	8.95	6.35	5.40	0.20	5.30	5.7035		
VERTICAL ANGULAR DEVIATION	0°	0.1°	0.0°	0.1°	0.1°	0.1°	0.1°	0.1°	0.0°	0.1°	0.1°	0.2°	0.1°	0.1°	0.1°	0.3°	0.3°	0.1°	0.0°	
HORI□ONTAL ALIGNMENT																				
HORI□ONTAL ANGULAR DEVIATION																				

CONSULTANT: Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya

REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT: Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo

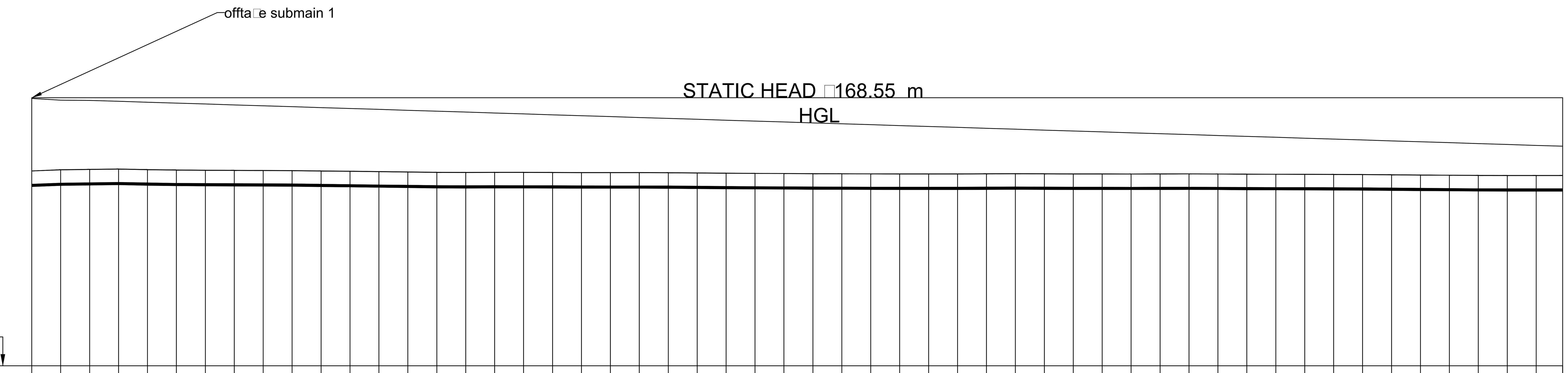
PROJECT: Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

DRG TITLE: Main pipeline profile

Chainage2+000.00 to 2+363.50m

Designed By:	Checked By:	Scales:
□G	PM	Hor. scale 1:2000 Ver. Scale 1:200
Drawn By:	**Date:**	**DRG No:MANDOURI PROJECT/TD/□0□**
WM	JUNE 2017	Sheet 3/3

4.3 SUBMAIN PIPELINES PROFILES



LEGEND

EXISTING GROUND LEVEL

INVERT LEVEL (IL)

CHAINAGE (m)	000.00	020.00	040.00	060.00	080.00	100.00	120.00	140.00	160.00
HYDRAULIC GRADE (m asl)									
GROUND LEVEL (m asl)	163.485	163.560	163.585	163.615	163.575	163.545	163.535	163.525	163.515
INVERT LEVEL (m asl)	162.485	162.562	162.587	162.613	162.576	162.545	162.534	162.526	162.517
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
STEADY-STATE HEAD (m)									
GRADIENT (m/□m)	3.85	1.25	1.30	-1.85	-1.55	-0.55	-0.40	-0.45	-0.55
VERTICAL ANGULAR DEVIATION		0.1°	0.0°	0.2°	0.0°	0.1°	0.0°	0.0°	0.0°

CHAINAGE (m)	180.00	200.00	220.00	240.00	260.00	280.00	300.00	320.00	340.00
HYDRAULIC GRADE (m asl)									
GROUND LEVEL (m asl)	163.505	163.485	163.460	163.435	163.410	163.390	163.380	163.385	163.385
INVERT LEVEL (m asl)	162.506	162.484	162.460	162.436	162.412	162.388	162.382	162.387	162.385
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
STEADY-STATE HEAD (m)									
GRADIENT (m/□m)	-1.10	-1.20	-1.20	-1.20	-1.20	-0.30	0.25	-0.10	-0.35
VERTICAL ANGULAR DEVIATION	0.0°	0.0°	0.0°	0.0°	0.0°	0.1°	0.0°	0.0°	0.0°

CHAINAGE (m)	360.00	380.00	400.00	420.00	440.00	460.00	480.00	500.00	520.00
HYDRAULIC GRADE (m asl)									
GROUND LEVEL (m asl)	163.380	163.370	163.370	163.370	163.360	163.345	163.330	163.315	163.305
INVERT LEVEL (m asl)	162.378	162.372	162.369	162.369	162.361	162.345	162.330	162.316	162.307
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
STEADY-STATE HEAD (m)									
GRADIENT (m/□m)	-0.30	-0.15	0.00	-0.40	-0.80	-0.75	-0.70	-0.45	-0.45
VERTICAL ANGULAR DEVIATION	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°

CHAINAGE (m)	540.00	560.00	580.00	600.00	620.00	640.00	660.00	680.00	700.00
HYDRAULIC GRADE (m asl)									
GROUND LEVEL (m asl)	163.300	163.290	163.280	163.275	163.280	163.280	163.285	163.295	163.285
INVERT LEVEL (m asl)	162.298	162.290	162.282	162.277	162.278	162.281	162.286	162.296	162.286
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
STEADY-STATE HEAD (m)									
GRADIENT (m/□m)	-0.40	-0.40	-0.25	0.05	0.15	0.25	0.50	-0.50	-0.25
VERTICAL ANGULAR DEVIATION	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.1°	0.0°

CHAINAGE (m)	720.00	740.00	760.00	780.00	800.00	820.00	840.00	860.00	880.00
HYDRAULIC GRADE (m asl)									
GROUND LEVEL (m asl)	163.280	163.275	163.275	163.275	163.280	163.275	163.260	163.255	163.250
INVERT LEVEL (m asl)	162.281	162.276	162.273	162.277	162.282	162.273	162.262	162.256	162.251
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
STEADY-STATE HEAD (m)									
GRADIENT (m/□m)	-0.25	-0.15	0.20	0.25	-0.45	-0.55	-0.30	-0.25	-0.25
VERTICAL ANGULAR DEVIATION	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°

CHAINAGE (m)	900.00	920.00	940.00	960.00	980.00	1000.00	1020.00	1040.00	1058.30
HYDRAULIC GRADE (m asl)									
GROUND LEVEL (m asl)	163.245	163.235	163.220	163.205	163.190	163.175	163.170	163.165	163.165
INVERT LEVEL (m asl)	162.246	162.234	162.219	162.204	162.189	162.174	162.168	162.167	162.167
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
STEADY-STATE HEAD (m)									
GRADIENT (m/□m)	-0.60	-0.75	-0.75	-0.75	-0.75	-0.30	-0.05	0.00	
VERTICAL ANGULAR DEVIATION	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	

DESIGN FLOW (l/s)	39.2 l/s
OFFTAKE (l/s)	
PIPE DETAILS	250 mm Diameter uPVC Pipe
BEDDING DETAILS	
HORI□ONTAL ALIGNMENT	
HORI□ONTAL ANGULAR DEVIATION	

CONSULTANT:	REFERENCE DRAWINGS		REVISIONS			
Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya	REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT: Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo 473

PROJECT: Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

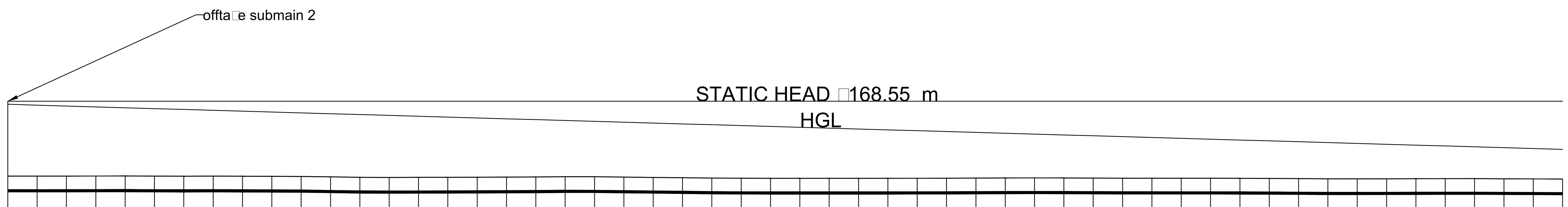
DRG TITLE: Sub main 1 profile

Chainage 0+000.00 to 1+058.30m

Designed By:	Checked By:	Scales:
□G	PM	Hor. scale 1:2000 Ver. Scale 1:200
Drawn By:	Date:	DRG No:MANDOURI PROJECT/TD/□02
WM	JUNE 2017	Sheet 1/1

LEGEND

- EXISTING GROUND LEVEL
- INVERT LEVEL (IL)



DATUM
150 m amsl

CHAINAGE (m)	GROUND LEVEL (m asl)	INVERT LEVEL (m asl)	TRENCH DEPTH (m)	GRADIENT (m/□m)	VERTICAL ANGULAR DEVIATION
000.00	163.445	162.443	1.000	-0.15	
020.00	163.440	162.440	1.000	0.15	0.0°
040.00	163.445	162.443	1.000	0.25	0.0°
060.00	163.450	162.448	1.000	0.20	0.0°
080.00	163.450	162.452	1.000	-0.60	0.0°
100.00	163.440	162.440	1.000	-0.10	0.0°
120.00	163.440	162.438	1.000	0.30	0.0°
140.00	163.445	162.444	1.000	-0.40	0.0°
160.00	163.435	162.436	1.000	-0.40	0.0°
180.00	163.430	162.428	1.000	-0.40	0.0°
200.00	163.420	162.420	1.000	-1.50	0.1°
220.00	163.390	162.390	1.000	-1.45	0.0°
240.00	163.360	162.361	1.000	-0.40	0.1°
260.00	163.355	162.353	1.000	0.10	0.0°
280.00	163.355	162.355	1.000	0.30	0.0°
300.00	163.360	162.361	1.000	0.40	0.0°
320.00	163.370	162.369	1.000	0.35	0.0°
340.00	163.375	162.376	1.000	0.55	0.0°
360.00	163.385	162.387	1.000	0.65	0.0°
380.00	163.400	162.400	1.000	-0.10	0.0°
400.00	163.400	162.398	1.000	-1.10	0.1°
420.00	163.375	162.376	1.000	-1.10	0.0°
440.00	163.355	162.354	1.000	-1.10	0.0°
460.00	163.330	162.332	1.000	-1.15	0.0°
480.00	163.310	162.309	1.000	-0.65	0.0°
500.00	163.295	162.296	1.000	-0.15	0.0°
520.00	163.295	162.293	1.000	-0.10	0.0°
540.00	163.290	162.291	1.000	-0.05	0.0°
560.00	163.290	162.290	1.000	0.00	0.0°
580.00	163.290	162.290	1.000	0.00	0.0°
600.00	163.290	162.290	1.000	0.25	0.0°
620.00	163.295	162.295	1.000	0.35	0.0°
640.00	163.300	162.302	1.000	0.35	0.0°
660.00	163.310	162.309	1.000	0.35	0.0°
680.00	163.315	162.316	1.000	0.25	0.0°
700.00	163.320	162.321	1.000	-0.30	0.0°
720.00	163.315	162.315	1.000	-0.35	0.0°
740.00	163.310	162.308	1.000	-0.30	0.0°
760.00	163.300	162.302	1.000	-0.20	0.0°
780.00	163.300	162.298	1.000	-0.10	0.0°
800.00	163.295	162.296	1.000	0.05	0.0°
820.00	163.295	162.297	1.000	-0.20	0.0°
840.00	163.295	162.293	1.000	-0.55	0.0°
860.00	163.280	162.282	1.000	-0.55	0.0°
880.00	163.270	162.271	1.000	-0.55	0.0°
900.00	163.260	162.260	1.000	-0.10	0.0°
920.00	163.260	162.258	1.000	0.15	0.0°
940.00	163.260	162.261	1.000	0.20	0.0°
960.00	163.265	162.265	1.000	0.25	0.0°
980.00	163.270	162.270	1.000	0.05	0.0°
1000.00	163.270	162.271	1.000	-0.50	0.0°
1020.00	163.260	162.261	1.000	-0.40	0.0°
1040.00	163.255	162.253	1.000	-0.45	0.0°
1060.00	163.245	162.244	1.000		

HYDRAULIC GRADE (m asl)	
STEADY-STATE HEAD (m)	
DESIGN FLOW (l/s)	37.7 l/s
OFFTAKE (l/s)	
PIPE DETAILS	250 mm Diameter uPVC Pipe
BEDDING DETAILS	
HORI□ONTAL ALIGNMENT	
HORI□ONTAL ANGULAR DEVIATION	

CONSULTANT: Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya

ASCENT

REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT: Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo

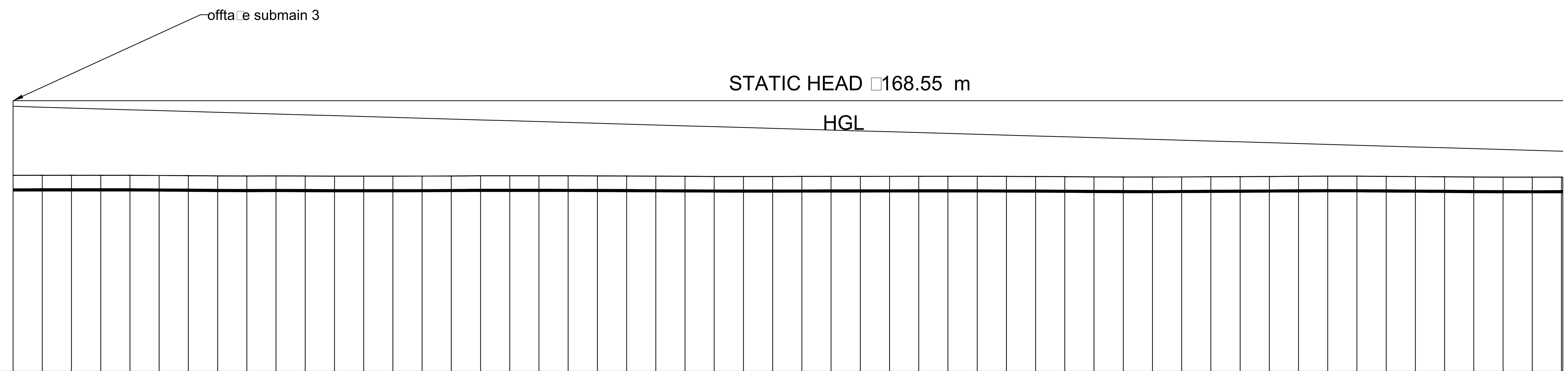
BOAD

PROJECT
Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

DRG TITLE
Sub main 2 profile

Chainage 0+000.00 to 1+060.00m

Designed By:	Checked By:	Scales:
□G	PM	Hor. scale 1:2000 Ver. Scale 1:200
Drawn By:	**Date:**	**DRG No:MANDOURI PROJECT/TD/□0□**
WM	JUNE 2017	Sheet 1/1



CHAINAGE (m)	HYDRAULIC GRADE (m asl)	GROUND LEVEL (m asl)	INVERT LEVEL (m asl)	TRENCH DEPTH (m)	STEADY-STATE HEAD (m)	GRADIENT (m/□m)	VERTICAL ANGULAR DEVIATION
000.00		163.435	162.433	1.000		0.05	
020.00		163.435	162.434	1.000		0.15	0.0°
040.00		163.435	162.437	1.000		0.05	0.0°
060.00		163.440	162.438	1.000		-0.15	0.0°
080.00		163.435	162.435	1.000		-0.65	0.0°
100.00		163.420	162.422	1.000		-0.65	0.0°
120.00		163.410	162.409	1.000		-0.70	0.0°
140.00		163.395	162.395	1.000		-0.55	0.0°
160.00		163.385	162.384	1.000		0.40	0.1°
180.00		163.390	162.392	1.000		-0.30	0.0°
200.00		163.385	162.386	1.000		-0.45	0.0°
220.00		163.375	162.377	1.000		-0.05	0.0°
240.00		163.375	162.376	1.000		0.10	0.0°
260.00		163.380	162.378	1.000		0.10	0.0°
280.00		163.380	162.380	1.000		0.40	0.0°
300.00		163.390	162.388	1.000		0.65	0.0°
320.00		163.400	162.401	1.000		0.05	0.0°
340.00		163.400	162.402	1.000		-0.05	0.0°
360.00		163.400	162.401	1.000		-0.15	0.0°
380.00		163.400	162.398	1.000		-0.25	0.0°
400.00		163.395	162.393	1.000		-0.50	0.0°
420.00		163.385	162.383	1.000		-0.45	0.0°
440.00		163.375	162.374	1.000		-0.45	0.0°
460.00		163.365	162.365	1.000		-0.55	0.0°
480.00		163.355	162.354	1.000		-0.15	0.0°
500.00		163.350	162.351	1.000		0.05	0.0°
520.00		163.350	162.352	1.000		0.15	0.0°
540.00		163.355	162.355	1.000		0.15	0.0°
560.00		163.360	162.358	1.000		0.10	0.0°
580.00		163.360	162.360	1.000		0.15	0.0°
600.00		163.365	162.363	1.000		0.25	0.0°
620.00		163.370	162.368	1.000		0.10	0.0°
640.00		163.370	162.370	1.000		-0.30	0.0°
660.00		163.365	162.364	1.000		-0.35	0.0°
680.00		163.355	162.357	1.000		-0.35	0.0°
700.00		163.350	162.350	1.000		-0.55	0.0°
720.00		163.340	162.339	1.000		-0.55	0.0°
740.00		163.330	162.328	1.000		-0.55	0.0°
760.00		163.315	162.317	1.000		-0.15	0.0°
780.00		163.315	162.314	1.000		0.35	0.0°
800.00		163.320	162.321	1.000		0.55	0.0°
820.00		163.330	162.332	1.000		0.55	0.0°
840.00		163.345	162.343	1.000		0.55	0.0°
860.00		163.355	162.354	1.000		0.60	0.0°
880.00		163.365	162.366	1.000		0.60	0.0°
900.00		163.380	162.378	1.000		-0.30	0.1°
920.00		163.370	162.372	1.000		-0.65	0.0°
940.00		163.360	162.359	1.000		-0.65	0.0°
960.00		163.345	162.346	1.000		-0.65	0.0°
980.00		163.335	162.333	1.000		-0.65	0.0°
1000.00		163.320	162.320	1.000		-0.45	0.0°
1020.00		163.310	162.311	1.000		-0.25	0.0°
1040.00		163.305	162.306	1.000		0.15	0.0°
1060.00		163.310	162.309	1.000		1.1	0.1°
1060.90		163.310	162.310	1.000			

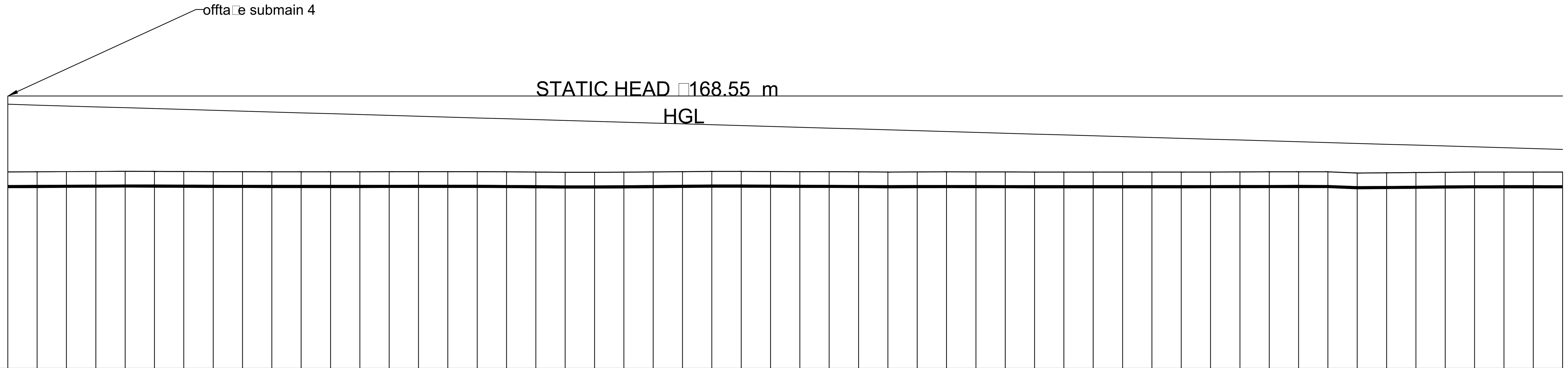
DESIGN FLOW (l/s)	37.7 l/s
OFFTAKE (l/s)	
PIPE DETAILS	250 mm Diameter uPVC Pipe
BEDDING DETAILS	
HORI□ONTAL ALIGNMENT	
HORI□ONTAL ANGULAR DEVIATION	

CONSULTANT: Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya	REFERENCE DRAWINGS (REF. / DESCRIPTION)	REVISIONS (REF. / DESCRIPTION / DATE / SIGN)	CLIENT: Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo	PROJECT: Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo	DRG TITLE: Sub main 3 profile. Chainage 0+000.00 to 1+060.90m	Designed By: □G; Checked By: PM; Drawn By: WM; Date: JUNE 2017; Scales: Hor. scale 1:2000, Ver. Scale 1:200; DRG No:MANDOURI PROJECT/TD/□0□; Sheet 1/1

LEGEND

EXISTING GROUND LEVEL

INVERT LEVEL (IL)



DATUM
150 m amsl

CHAINAGE (m)	GROUND LEVEL (m asl)	INVERT LEVEL (m asl)	TRENCH DEPTH (m)	GRADIENT (m/□m)	VERTICAL ANGULAR DEVIATION
000.00	163.375	162.376	1.000	0.55	
020.00	163.385	162.387	1.000	0.50	0.0°
040.00	163.395	162.397	1.000	0.40	0.0°
060.00	163.405	162.405	1.000	0.50	0.0°
080.00	163.415	162.415	1.000	-0.30	0.0°
100.00	163.410	162.409	1.000	-0.35	0.0°
120.00	163.400	162.402	1.000	-0.35	0.0°
140.00	163.395	162.395	1.000	-0.30	0.0°
160.00	163.390	162.389	1.000	-0.25	0.0°
180.00	163.385	162.384	1.000	-0.05	0.0°
200.00	163.385	162.383	1.000	0.00	0.0°
220.00	163.385	162.383	1.000	0.05	0.0°
240.00	163.385	162.384	1.000	0.25	0.0°
260.00	163.390	162.389	1.000	0.20	0.0°
280.00	163.395	162.393	1.000	0.10	0.0°
300.00	163.395	162.395	1.000	-0.05	0.0°
320.00	163.395	162.394	1.000	-0.65	0.0°
340.00	163.380	162.381	1.000	-0.70	0.0°
360.00	163.365	162.367	1.000	-0.70	0.0°
380.00	163.355	162.353	1.000	0.00	0.0°
400.00	163.355	162.353	1.000	0.45	0.0°
420.00	163.360	162.362	1.000	0.70	0.0°
440.00	163.375	162.376	1.000	0.85	0.0°
460.00	163.395	162.393	1.000	0.80	0.0°
480.00	163.410	162.409	1.000	-0.05	0.0°
500.00	163.410	162.408	1.000	-0.30	0.0°
520.00	163.400	162.402	1.000	-0.35	0.0°
540.00	163.395	162.395	1.000	-0.30	0.0°
560.00	163.390	162.389	1.000	-0.35	0.0°
580.00	163.380	162.382	1.000	-0.75	0.0°
600.00	163.365	162.367	1.000	0.40	0.1°
620.00	163.375	162.375	1.000	0.30	0.0°
640.00	163.380	162.381	1.000	-0.10	0.0°
660.00	163.380	162.379	1.000	-0.35	0.0°
680.00	163.370	162.372	1.000	-0.25	0.0°
700.00	163.365	162.367	1.000	-0.05	0.0°
720.00	163.365	162.366	1.000	0.00	0.0°
740.00	163.365	162.366	1.000	0.00	0.0°
760.00	163.365	162.366	1.000	0.00	0.0°
780.00	163.365	162.366	1.000	0.00	0.0°
800.00	163.365	162.366	1.000	0.25	0.0°
820.00	163.370	162.371	1.000	0.25	0.0°
840.00	163.375	162.376	1.000	0.25	0.0°
860.00	163.380	162.381	1.000	0.25	0.0°
880.00	163.385	162.386	1.000	-0.25	0.0°
900.00	163.380	162.381	1.000	-4.05	0.2°
920.00	163.300	162.300	1.000	0.70	0.3°
940.00	163.315	162.314	1.000	0.85	0.0°
960.00	163.330	162.331	1.000	0.90	0.0°
980.00	163.350	162.349	1.000	0.75	0.0°
1000.00	163.365	162.364	1.000	0.15	0.0°
1020.00	163.365	162.367	1.000	0.00	0.0°
1040.00	163.365	162.367	1.000	-0.10	0.0°
1060.00	163.365	162.365	1.000		

HYDRAULIC GRADE (m asl)

STEADY-STATE HEAD (m)

DESIGN FLOW (l/s): 37.7 l/s

OFFTAKE (l/s)

PIPE DETAILS: 250 mm Diameter uPVC Pipe

BEDDING DETAILS

HORI□ONTAL ALIGNMENT

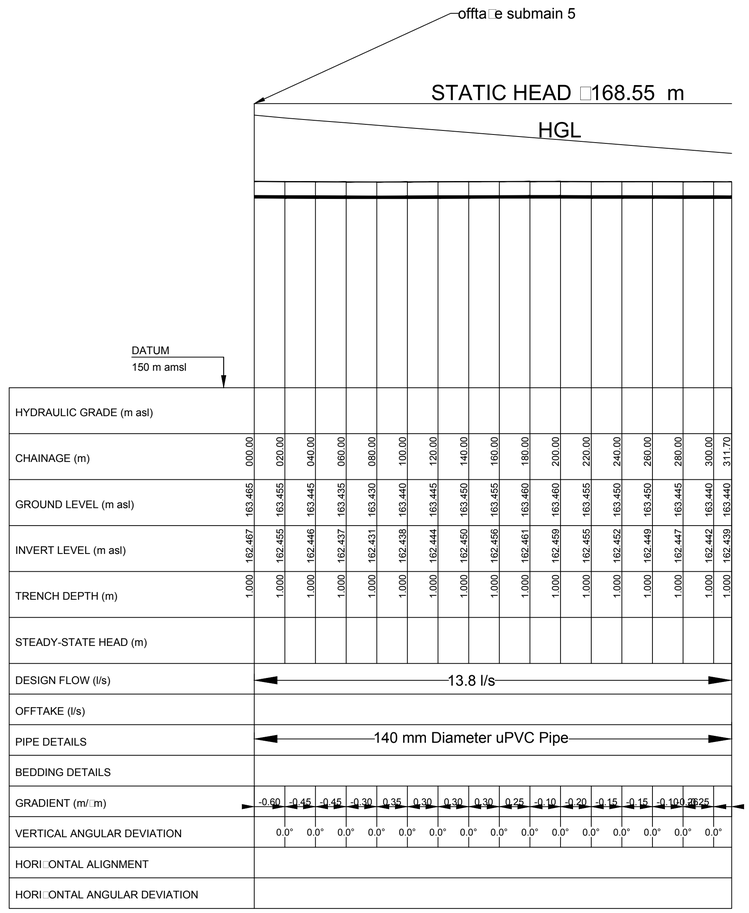
HORI□ONTAL ANGULAR DEVIATION

CONSULTANT:	REFERENCE DRAWINGS	REVISIONS	CLIENT:	PROJECT	DRG TITLE	Designed By: □G	Checked By: PM	Scales: Hor. scale 1:2000, Ver. Scale 1:200
Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya	REF. / DESCRIPTION	REF. / DESCRIPTION / DATE / SIGN	Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo	Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo	Sub main 4 profile Chainage 0+000.00 to 1+060.00m	Drawn By: WM	Date: JUNE 2017	DRG No:MANDOURI PROJECT/TD/□05 Sheet 1/1

LEGEND

EXISTING GROUND LEVEL

INVERT LEVEL (IL)



HYDRAULIC GRADE (m asl)																						
CHAINAGE (m)	000.00	020.00	040.00	060.00	080.00	100.00	120.00	140.00	160.00	180.00	200.00	220.00	240.00	260.00	280.00	300.00	311.70					
GROUND LEVEL (m asl)	163.465	163.455	163.445	163.435	163.430	163.440	163.445	163.450	163.455	163.460	163.460	163.455	163.450	163.450	163.445	163.440	163.440					
INVERT LEVEL (m asl)	162.467	162.455	162.446	162.437	162.431	162.438	162.444	162.450	162.456	162.461	162.459	162.455	162.452	162.449	162.447	162.442	162.439					
TRENCH DEPTH (m)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000					
STEADY-STATE HEAD (m)																						
DESIGN FLOW (l/s)	13.8 l/s																					
OFFTAKE (l/s)																						
PIPE DETAILS	140 mm Diameter uPVC Pipe																					
BEDDING DETAILS																						
GRADIENT (m/□m)	-0.60	-0.45	-0.45	-0.30	-0.35	-0.30	-0.30	-0.30	-0.30	-0.25	-0.10	-0.20	-0.15	-0.15	-0.10	-0.25						
VERTICAL ANGULAR DEVIATION	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°	0.0°						
HORI□ONTAL ALIGNMENT																						
HORI□ONTAL ANGULAR DEVIATION																						

CONSULTANT:

Africa Sustainability Centre (ASCENT)
P.O Box 1704-0621
Nairobi,Kenya

REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT:

Banque Quest Africaine de Developpement(BOAD)
68 Ave De La Liberation,
Lome,Togo

PROJECT

Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

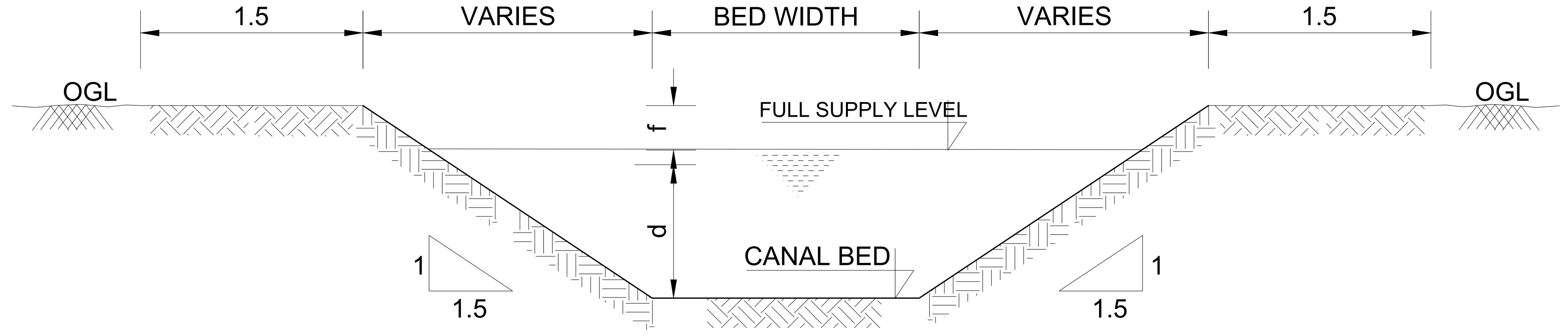
DRG TITLE

Sub main 5 profile

Chainage 0+000.00 to 0+311.70m

Designed By:	Checked By:	Scales:
□G	PM	Hor. scale 1:2000 Ver. Scale 1:200
Drawn By:	**Date:**	**DRG No:MANDOURI PROJECT/TD/□0□**
WM	JUNE 2017	Sheet 1/1

5. DRAINAGE CANALS PROFILES



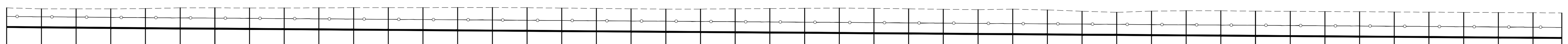
TYPICAL EARTHED CANAL SECTION

SCALE: 1:50

LEGEND

- EXISTING GROUND LEVEL
- DESIGN WATER LEVEL
- CANAL DESIGN BED LEVEL

Horizontal Scale 0 50 100m
1:2000



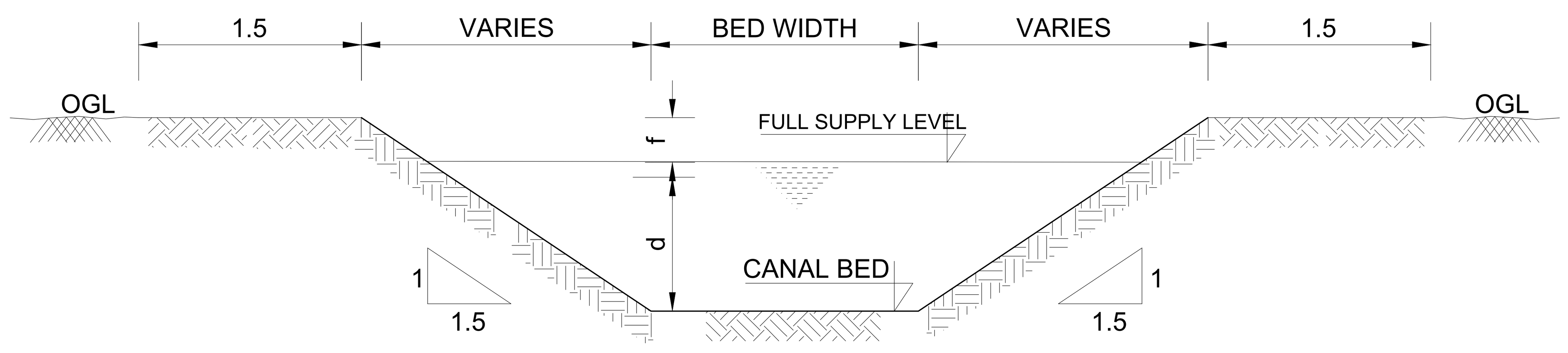
DATUM
155 m amsl

CHAINAGE (m)	GROUND LEVEL (m asl)	FULL SUPPLY LEVEL (m amsl)	CANAL BED LEVEL (m amsl)
000.00	163.340	162.839	162.221
020.00	163.285	162.814	162.196
040.00	163.285	162.800	162.182
060.00	163.280	162.780	162.162
080.00	163.295	162.766	162.148
100.00	163.340	162.752	162.134
120.00	163.340	162.738	162.120
120.00	163.340	162.738	162.120
140.00	163.335	162.724	162.106
160.00	163.330	162.710	162.092
180.00	163.340	162.696	162.078
200.00	163.350	162.682	162.064
220.00	163.350	162.668	162.050
240.00	163.355	162.654	162.036
260.00	163.355	162.640	162.022
280.00	163.360	162.626	162.008
300.00	163.350	162.612	161.994
320.00	163.325	162.598	161.980
340.00	163.305	162.584	161.966
360.00	163.285	162.570	161.952
380.00	163.265	162.556	161.938
400.00	163.270	162.542	161.924
420.00	163.285	162.528	161.910
440.00	163.300	162.514	161.896
460.00	163.315	162.500	161.882
480.00	163.330	162.486	161.868
500.00	163.310	162.472	161.854
520.00	163.285	162.458	161.840
540.00	163.255	162.444	161.826
560.00	163.235	162.430	161.812
580.00	163.265	162.416	161.798
600.00	163.220	162.402	161.784
620.00	163.145	162.388	161.770
640.00	163.075	162.374	161.756
660.00	163.150	162.360	161.742
680.00	163.170	162.346	161.728
700.00	163.170	162.332	161.714
720.00	163.145	162.318	161.700
720.00	163.145	162.318	161.700
740.00	163.140	162.304	161.686
760.00	163.120	162.290	161.672
780.00	163.115	162.276	161.658
800.00	163.100	162.262	161.644
820.00	163.090	162.248	161.630
840.00	163.075	162.234	161.616
860.00	163.065	162.220	161.602
880.00	163.055	162.206	161.588
896.56	163.040	162.195	161.577

DESIGN FLOW (l/s)	540
DESIGN BED SLOPE (m/m)	0.007
INSIDE SLOPE	1.5
CANAL BED WIDTH (m)	1.0

MAIN DRAIN _CH-0+000.00-0+896.56m

CONSULTANT:	REFERENCE DRAWINGS	REVISIONS	CLIENT:	PROJECT	DRG TITLE	Designed By:	Checked By:	Scales:
Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya	REF. / DESCRIPTION	REF. / DESCRIPTION / DATE / SIGN	Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo	Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo	Main Drain profile Chainage 0+000.00 to 0+896.56m	WM	PM	Hor. scale 1:2000 Ver. Scale 1:200
						Drawn By: WM	Date: JUNE 2017	DRG No:MANDOURI PROJECT/TD/200 Sheet 1/1



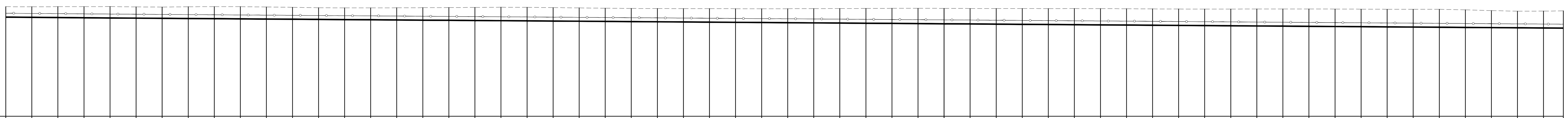
TYPICAL EARTHED CANAL SECTION

SCALE: 1:50

LEGEND

EXISTING GROUND LEVEL
DESIGN WATER LEVEL
CANAL DESIGN BED LEVEL

Horizontal Scale 0 50 100m
1:2000



DATUM
155 m amsl

CHAINAGE (m)	000.00	020.00	040.00	060.00	080.00	100.00	120.00	120.00	140.00	160.00	180.00	200.00	220.00	240.00	260.00	280.00
GROUND LEVEL (m asl)	163.440	163.440	163.440	163.445	163.450	163.425	163.415	163.415	163.435	163.445	163.440	163.420	163.390	163.360	163.350	163.350
FULL SUPPLY LEVEL (m amsl)	162.940	162.922	162.908	162.888	162.874	162.860	162.846	162.846	162.832	162.818	162.804	162.790	162.776	162.762	162.748	162.734
CANAL BED LEVEL (m amsl)	162.640	162.622	162.608	162.588	162.574	162.560	162.546	162.546	162.532	162.518	162.504	162.490	162.476	162.462	162.448	162.434

CHAINAGE (m)	300.00	320.00	340.00	360.00	380.00	400.00	420.00	440.00	460.00	480.00	500.00	520.00	540.00	560.00	580.00	600.00
GROUND LEVEL (m asl)	163.355	163.365	163.375	163.385	163.400	163.390	163.370	163.350	163.325	163.305	163.300	163.295	163.290	163.285	163.285	163.285
FULL SUPPLY LEVEL (m amsl)	162.720	162.706	162.692	162.678	162.664	162.650	162.636	162.622	162.608	162.594	162.580	162.566	162.552	162.538	162.524	162.510
CANAL BED LEVEL (m amsl)	162.420	162.406	162.392	162.378	162.364	162.350	162.336	162.322	162.308	162.294	162.280	162.266	162.252	162.238	162.224	162.210

CHAINAGE (m)	620.00	640.00	660.00	680.00	700.00	720.00	720.00	740.00	760.00	780.00	800.00	820.00	840.00	860.00	880.00	900.00
GROUND LEVEL (m asl)	163.290	163.300	163.305	163.315	163.320	163.310	163.310	163.305	163.300	163.295	163.295	163.295	163.295	163.285	163.270	163.260
FULL SUPPLY LEVEL (m amsl)	162.496	162.482	162.468	162.454	162.440	162.426	162.426	162.412	162.398	162.384	162.370	162.356	162.342	162.328	162.314	162.300
CANAL BED LEVEL (m amsl)	162.196	162.182	162.168	162.154	162.140	162.126	162.126	162.112	162.098	162.084	162.070	162.056	162.042	162.028	162.014	162.000

CHAINAGE (m)	920.00	940.00	960.00	980.00	1000.00	1020.00	1040.00	1060.00	1080.00	1100.00	1120.00	1140.00	1160.00	1180.00	1195.20
GROUND LEVEL (m asl)	163.260	163.260	163.265	163.265	163.270	163.260	163.250	163.245	163.240	163.240	163.195	163.140	163.095	163.105	163.120
FULL SUPPLY LEVEL (m amsl)	162.286	162.272	162.258	162.244	162.230	162.216	162.202	162.188	162.174	162.160	162.146	162.132	162.118	162.104	162.093
CANAL BED LEVEL (m amsl)	161.986	161.972	161.958	161.944	161.930	161.916	161.902	161.888	161.874	161.860	161.846	161.832	161.818	161.804	161.793

DESIGN FLOW (l/s)	90
DESIGN BED SLOPE (m/m)	0.0007
INSIDE SLOPE	1.5
CANAL BED WIDTH (m)	0.6

COLLECTOR DRAIN 1_CH-0+000.00-1+195.20m

CONSULTANT:	Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya

REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT: Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo

PROJECT: Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

DRG TITLE: Collector Drain 1 profile

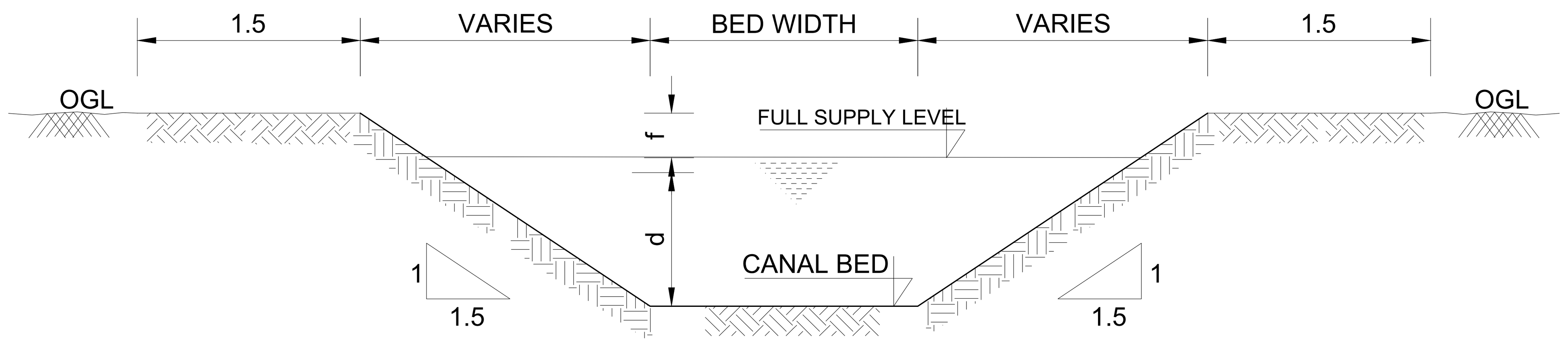
Chainage 0+000.00 to 1+195.20m

Designed By:	Checked By:	Scales:
WM	PM	Hor. scale 1:2000 Ver. Scale 1:200
Drawn By:	Date:	DRG No:MANDOURI PROJECT/TD/20
WM	JUNE 2017	Sheet 1/1

LEGEND

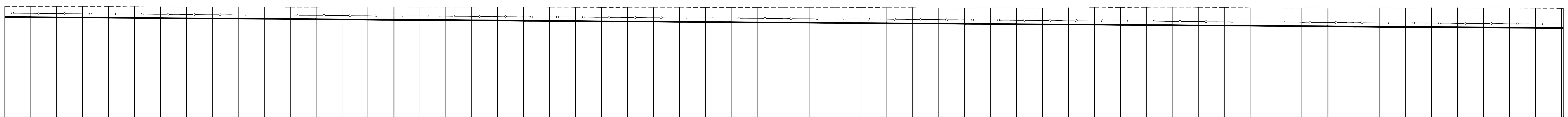
- EXISTING GROUND LEVEL
- DESIGN WATER LEVEL
- CANAL DESIGN BED LEVEL

Horizontal Scale 0 50 100m 1:2000



TYPICAL EARTHED CANAL SECTION

SCALE: 1:50



DATUM
155 m amsl

CHAINAGE (m)	GROUND LEVEL (m asl)	FULL SUPPLY LEVEL (m amsl)	CANAL BED LEVEL (m amsl)
000.00	163.430	162.931	162.631
020.00	163.435	162.913	162.613
040.00	163.435	162.899	162.599
060.00	163.440	162.879	162.579
080.00	163.435	162.865	162.565
100.00	163.425	162.851	162.551
120.00	163.410	162.837	162.537
120.00	163.410	162.837	162.537
140.00	163.400	162.823	162.523
160.00	163.385	162.809	162.509
180.00	163.390	162.795	162.495
200.00	163.380	162.781	162.481
220.00	163.375	162.767	162.467
240.00	163.380	162.753	162.453
260.00	163.380	162.739	162.439
280.00	163.380	162.725	162.425
300.00	163.390	162.711	162.411
320.00	163.400	162.697	162.397
340.00	163.400	162.683	162.383
360.00	163.395	162.669	162.369
380.00	163.395	162.655	162.355
400.00	163.390	162.641	162.341
420.00	163.380	162.627	162.327
440.00	163.370	162.613	162.313
460.00	163.360	162.599	162.299
480.00	163.350	162.585	162.285
500.00	163.350	162.571	162.271
520.00	163.350	162.557	162.257
540.00	163.355	162.543	162.243
560.00	163.355	162.529	162.229
580.00	163.360	162.515	162.215
600.00	163.365	162.501	162.201
620.00	163.365	162.487	162.187
640.00	163.365	162.473	162.173
660.00	163.360	162.459	162.159
680.00	163.350	162.445	162.145
700.00	163.345	162.431	162.131
720.00	163.335	162.417	162.117
720.00	163.335	162.417	162.117
740.00	163.320	162.403	162.103
760.00	163.315	162.389	162.089
780.00	163.315	162.375	162.075
800.00	163.325	162.361	162.061
820.00	163.335	162.347	162.047
840.00	163.345	162.333	162.033
860.00	163.360	162.319	162.019
880.00	163.370	162.305	162.005
900.00	163.375	162.291	161.991
920.00	163.370	162.277	161.977
940.00	163.355	162.263	161.963
960.00	163.345	162.249	161.949
980.00	163.330	162.235	161.935
1000.00	163.315	162.221	161.921
1020.00	163.310	162.207	161.907
1040.00	163.305	162.193	161.893
1060.00	163.315	162.179	161.879
1080.00	163.325	162.165	161.865
1100.00	163.335	162.151	161.851
1120.00	163.335	162.137	161.837
1140.00	163.320	162.123	161.823
1160.00	163.305	162.109	161.809
1180.00	163.295	162.095	161.795
1200.00	163.280	162.081	161.781
1201.50	163.280	162.080	161.780

DESIGN FLOW (l/s)	90
DESIGN BED SLOPE (m/m)	0.0007
INSIDE SLOPE	1.5
CANAL BED WIDTH (m)	0.6

COLLECTOR DRAIN 2_CH-0+000.00-1+201.50m

CONSULTANT:	REFERENCE DRAWINGS (REF. / DESCRIPTION)	REVISIONS (REF. / DESCRIPTION / DATE / SIGN)	CLIENT:	PROJECT	DRG TITLE	Designed By: WM	Checked By: PM	Scales: Hor. scale 1:2000 Ver. Scale 1:200
ASCENT – Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya			BOAD – Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo	Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo	Collector Drain 2 profile Chainage 0+000.00 to 1+201.50m	Drawn By: WM	Date: JUNE 2017	DRG No:MANDOURI PROJECT/TD/202 Sheet 1/1

LEGEND

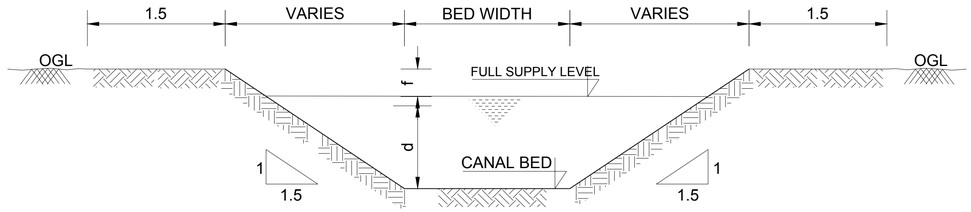
EXISTING GROUND LEVEL

DESIGN WATER LEVEL

CANAL DESIGN BED LEVEL

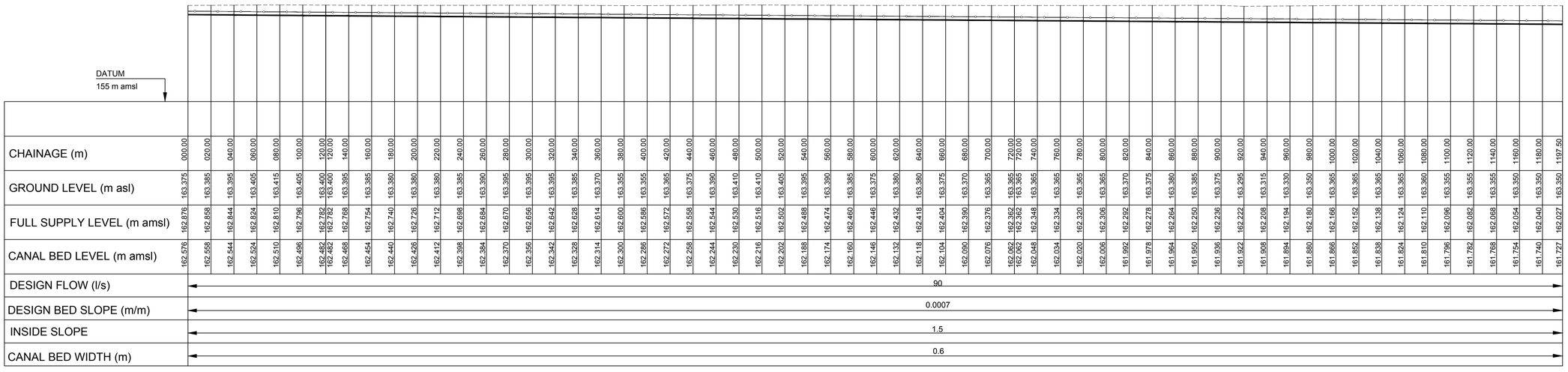
Horizontal Scale 0 50 100m

1:2000



TYPICAL EARTHED CANAL SECTION

SCALE: 1:50



CHAINAGE (m)	GROUND LEVEL (m asl)	FULL SUPPLY LEVEL (m amsl)	CANAL BED LEVEL (m amsl)
000.00	163.375	162.876	162.576
020.00	163.385	162.858	162.558
040.00	163.395	162.844	162.544
060.00	163.405	162.824	162.524
080.00	163.415	162.810	162.510
100.00	163.405	162.796	162.496
120.00	163.400	162.782	162.482
120.00	163.400	162.782	162.482
140.00	163.395	162.768	162.468
160.00	163.385	162.754	162.454
180.00	163.380	162.740	162.440
200.00	163.380	162.726	162.426
220.00	163.380	162.712	162.412
240.00	163.385	162.698	162.398
260.00	163.390	162.684	162.384
280.00	163.395	162.670	162.370
300.00	163.395	162.656	162.356
320.00	163.395	162.642	162.342
340.00	163.385	162.628	162.328
360.00	163.370	162.614	162.314
380.00	163.355	162.600	162.300
400.00	163.355	162.586	162.286
420.00	163.365	162.572	162.272
440.00	163.375	162.558	162.258
460.00	163.390	162.544	162.244
480.00	163.410	162.530	162.230
500.00	163.410	162.516	162.216
520.00	163.405	162.502	162.202
540.00	163.395	162.488	162.188
560.00	163.380	162.474	162.174
580.00	163.385	162.460	162.160
600.00	163.375	162.446	162.146
620.00	163.380	162.432	162.132
640.00	163.380	162.418	162.118
660.00	163.375	162.404	162.104
680.00	163.370	162.390	162.090
700.00	163.365	162.376	162.076
720.00	163.365	162.362	162.062
720.00	163.365	162.362	162.062
740.00	163.365	162.348	162.048
760.00	163.365	162.334	162.034
780.00	163.365	162.320	162.020
800.00	163.365	162.306	162.006
820.00	163.370	162.292	161.992
840.00	163.375	162.278	161.978
860.00	163.380	162.264	161.964
880.00	163.385	162.250	161.950
900.00	163.375	162.236	161.936
920.00	163.295	162.222	161.922
940.00	163.315	162.208	161.908
960.00	163.330	162.194	161.894
980.00	163.350	162.180	161.880
1000.00	163.365	162.166	161.866
1020.00	163.365	162.152	161.852
1040.00	163.365	162.138	161.838
1060.00	163.365	162.124	161.824
1080.00	163.360	162.110	161.810
1100.00	163.355	162.096	161.796
1120.00	163.355	162.082	161.782
1140.00	163.355	162.068	161.768
1160.00	163.350	162.054	161.754
1180.00	163.350	162.040	161.740
1197.50	163.350	162.027	161.727
DESIGN FLOW (l/s)	90		
DESIGN BED SLOPE (m/m)	0.0007		
INSIDE SLOPE	1.5		
CANAL BED WIDTH (m)	0.6		

COLLECTOR DRAIN 3_CH-0+000.00-1+197.50m

CONSULTANT: Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya

REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT: Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo

PROJECT: Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

DRG TITLE: Collector Drain 3 profile

Chainage 0+000.00 to 1+197.50m

Designed By:	Checked By:	Scales:
WM	PM	Hor. scale 1:2000 Ver. Scale 1:200
Drawn By:	**Date:**	**DRG No:MANDOURI PROJECT/TD/20**
WM	JUNE 2017	Sheet 1/1

LEGEND

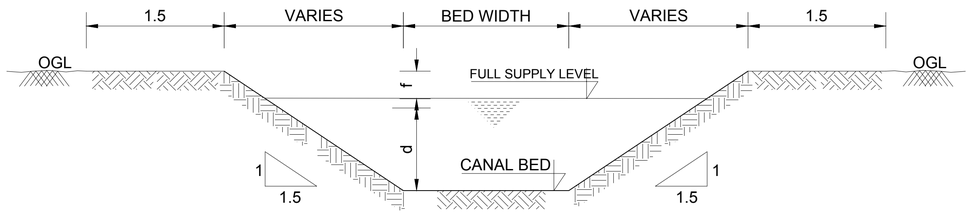
EXISTING GROUND LEVEL

DESIGN WATER LEVEL

CANAL DESIGN BED LEVEL

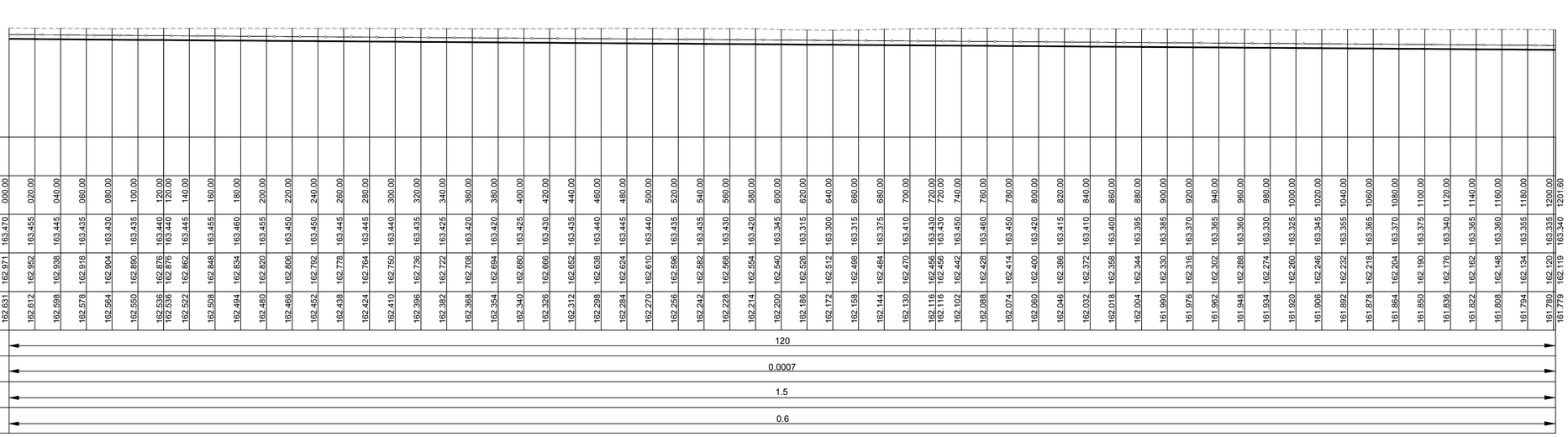
Horizontal Scale 0 50 100m

1:2000



TYPICAL EARTHED CANAL SECTION

SCALE: 1:50



CHAINAGE (m)	000.00	020.00	040.00	060.00	080.00	100.00	120.00	120.00	140.00	160.00	180.00	200.00	220.00	240.00	260.00	280.00	300.00	320.00	340.00	360.00	380.00	400.00	420.00	440.00	460.00	480.00	500.00	520.00	540.00	560.00	580.00	600.00	620.00	640.00	660.00	680.00	700.00	720.00	740.00	760.00	780.00	800.00	820.00	840.00	860.00	880.00	900.00	920.00	940.00	960.00	980.00	1000.00	1020.00	1040.00	1060.00	1080.00	1100.00	1120.00	1140.00	1160.00	1180.00	1200.00	1201.60
GROUND LEVEL (m asl)	163.470	163.455	163.445	163.435	163.430	163.435	163.440	163.440	163.445	163.455	163.460	163.455	163.450	163.450	163.445	163.445	163.440	163.435	163.425	163.420	163.420	163.425	163.430	163.435	163.440	163.445	163.440	163.435	163.435	163.430	163.420	163.345	163.315	163.300	163.315	163.375	163.410	163.430	163.450	163.460	163.450	163.420	163.415	163.410	163.400	163.395	163.385	163.370	163.365	163.360	163.330	163.325	163.345	163.355	163.365	163.370	163.375	163.340	163.365	163.360	163.355	163.335	163.340
FULL SUPPLY LEVEL (m amsl)	162.971	162.952	162.938	162.918	162.904	162.890	162.876	162.876	162.862	162.848	162.834	162.820	162.806	162.792	162.778	162.764	162.750	162.736	162.722	162.708	162.694	162.680	162.666	162.652	162.638	162.624	162.610	162.596	162.582	162.568	162.554	162.540	162.526	162.512	162.498	162.484	162.470	162.456	162.442	162.428	162.414	162.400	162.386	162.372	162.358	162.344	162.330	162.316	162.302	162.288	162.274	162.260	162.246	162.232	162.218	162.204	162.190	162.176	162.162	162.148	162.134	162.120	162.119
CANAL BED LEVEL (m amsl)	162.631	162.612	162.598	162.578	162.564	162.550	162.536	162.536	162.522	162.508	162.494	162.480	162.466	162.452	162.438	162.424	162.410	162.396	162.382	162.368	162.354	162.340	162.326	162.312	162.298	162.284	162.270	162.256	162.242	162.228	162.214	162.200	162.186	162.172	162.158	162.144	162.130	162.116	162.102	162.088	162.074	162.060	162.046	162.032	162.018	162.004	161.990	161.976	161.962	161.948	161.934	161.920	161.906	161.892	161.878	161.864	161.850	161.836	161.822	161.808	161.794	161.780	161.779
DESIGN FLOW (l/s)	120
DESIGN BED SLOPE (m/m)	0.0007
INSIDE SLOPE	1.5
CANAL BED WIDTH (m)	0.6

COLLECTOR DRAIN 4_CH-0+000.00-1+201.60m

CONSULTANT: Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya

REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT: BOAD — Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo

PROJECT: Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

DRG TITLE: Collector Drain 4 profile

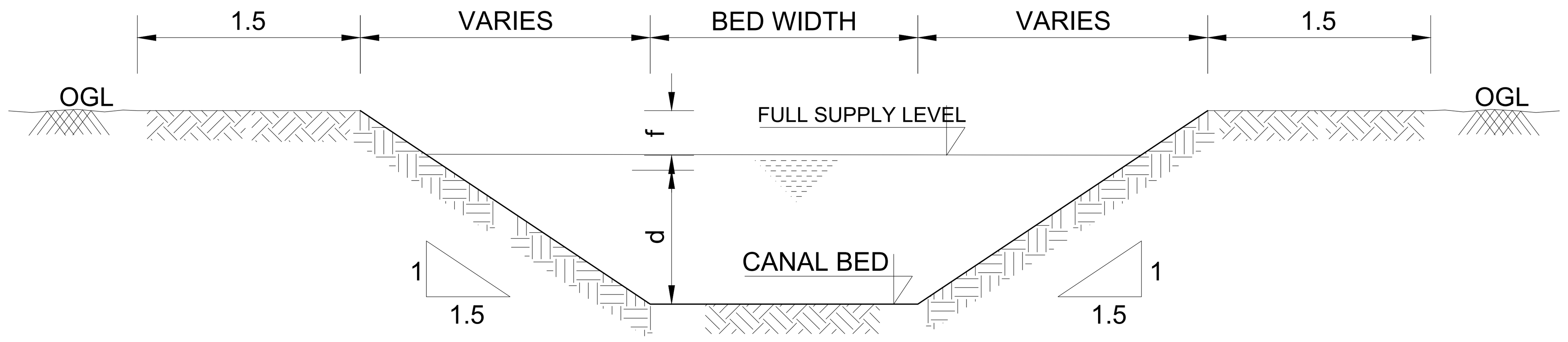
Chainage 0+000.00 to 1+201.60m

Designed By:	Checked By:	Scales:
WM	PM	Hor. scale 1:2000 Ver. Scale 1:200
Drawn By:	**Date:**	**DRG No:MANDOURI PROJECT/TD/20**
WM	JUNE 2017	Sheet 1/1

LEGEND

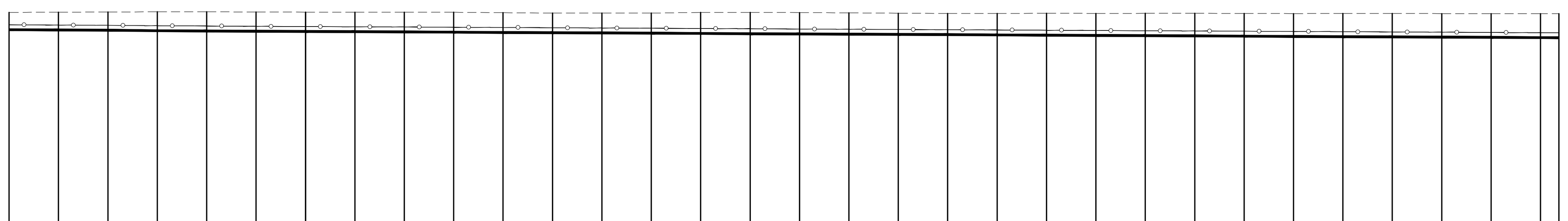
- EXISTING GROUND LEVEL
- DESIGN WATER LEVEL
- CANAL DESIGN BED LEVEL

Horizontal Scale 0 — 50 — 100m
1:2000



TYPICAL EARTHED CANAL SECTION

SCALE: 1:50



DATUM
155 m amsl

CHAINAGE (m)	GROUND LEVEL (m asl)	FULL SUPPLY LEVEL (m amsl)	CANAL BED LEVEL (m amsl)
000.00	163.485	162.983	162.783
020.00	163.490	162.971	162.771
040.00	163.500	162.961	162.761
060.00	163.505	162.941	162.741
080.00	163.505	162.931	162.731
100.00	163.500	162.921	162.721
120.00	163.495	162.911	162.711
120.00	163.495	162.911	162.711
140.00	163.490	162.901	162.701
160.00	163.490	162.891	162.691
180.00	163.490	162.881	162.681
200.00	163.470	162.871	162.671
220.00	163.455	162.861	162.661
240.00	163.455	162.851	162.651
260.00	163.455	162.841	162.641
280.00	163.485	162.831	162.631
300.00	163.485	162.821	162.621
320.00	163.475	162.811	162.611
340.00	163.465	162.801	162.601
360.00	163.450	162.791	162.591
380.00	163.440	162.781	162.581
400.00	163.440	162.771	162.571
420.00	163.445	162.761	162.561
440.00	163.445	162.751	162.551
460.00	163.445	162.741	162.541
480.00	163.445	162.731	162.531
500.00	163.440	162.721	162.521
520.00	163.435	162.711	162.511
540.00	163.435	162.701	162.501
560.00	163.440	162.691	162.491
580.00	163.435	162.681	162.481
600.00	163.430	162.671	162.471
620.00	163.430	162.661	162.461
627.45	163.430	162.658	162.458

Parameter	Value (entire length)
DESIGN FLOW (l/s)	30
DESIGN BED SLOPE (m/m)	0.0005
INSIDE SLOPE	1.5
CANAL BED WIDTH (m)	0.38

COLLECTOR DRAIN 5_CH-0+000.00-0+627.45m

CONSULTANT: Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya

REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT: Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo

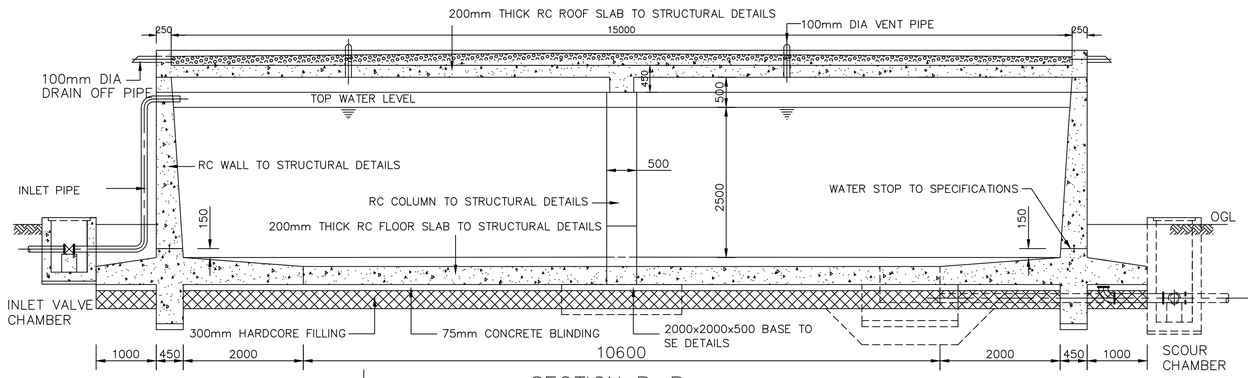
PROJECT: Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

DRG TITLE: Collector Drain 5 profile

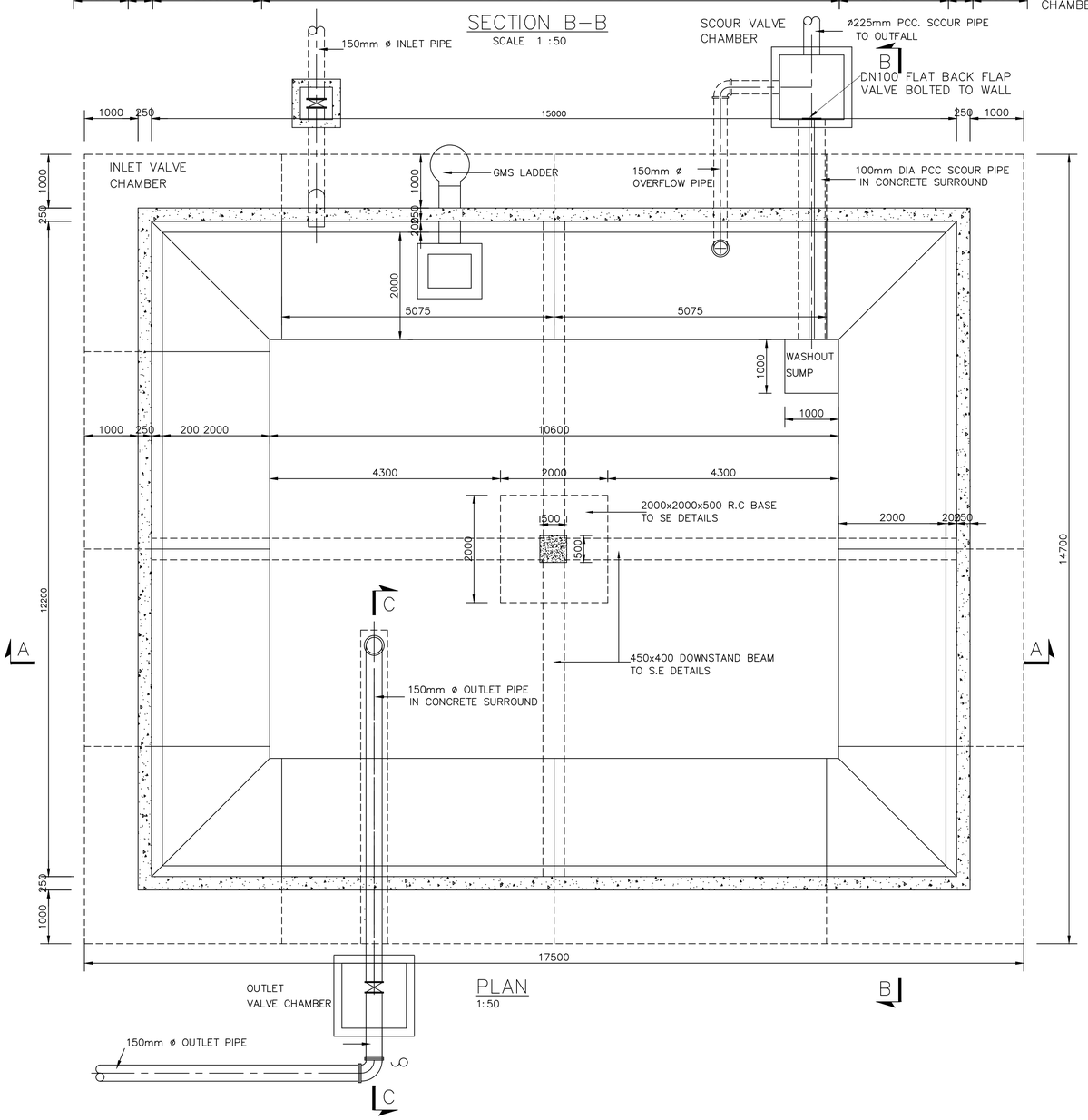
Chainage 0+000.00 to 0+627.45m

Designed By:	Checked By:	Scales:
WM	PM	Hor. scale 1:2000 Ver. Scale 1:200
Drawn By:	**Date:**	**DRG No:MANDOURI PROJECT/TD/205**
WM	JUNE 2017	Sheet 1/1

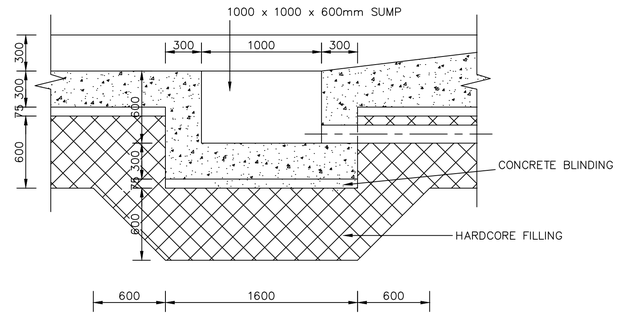
6. STORAGE TANK



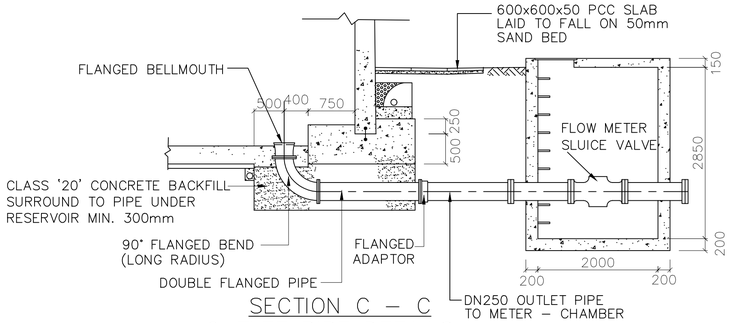
SECTION B–B
SCALE 1 :50



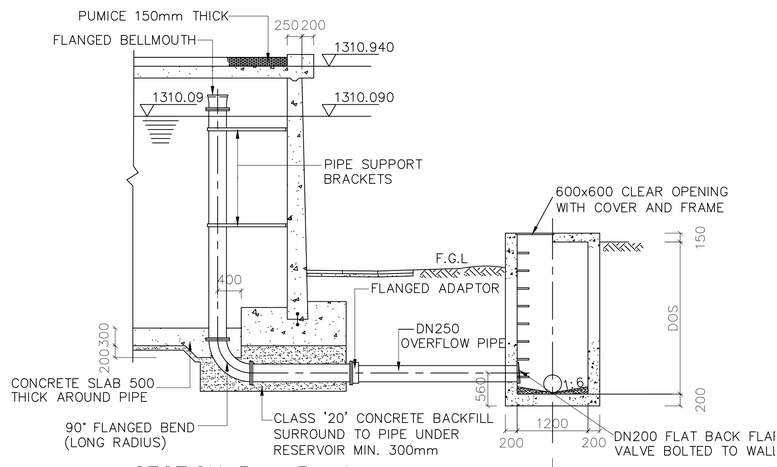
PLAN
1:50



SUMP TYPICAL SECTION
1 : 25 (AT A1)



SECTION C – C
OUTLET PIPE DETAILS



SECTION 5 – 5
OVERFLOW PIPE DETAILS
SCALE, 1:50

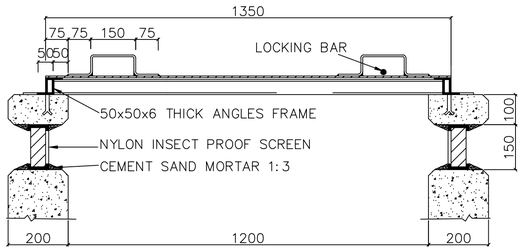
NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES
2. ALL JOINTS ARE TO STRUCTURAL DETAILS
3. CONCRETE TO BE AS FOLLOWS;
   BLINDING CLASS 15
   MASS CONCRETE FILL CLASS 20
   REINFORCED CONCRETE CLASS 25

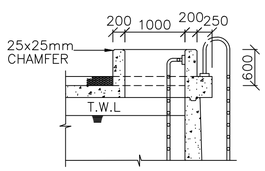
CONSULTANT: Africa Sustainability Centre (ASCENT) P.O Box 1704–0621 Nairobi,Kenya	REFERENCE DRAWINGS: REF. / DESCRIPTION	REVISIONS: REF. / DESCRIPTION / DATE / SIGN	CLIENT: Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo	PROJECT: Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo	DRG TITLE: WATER STORAGE TANK S□□□□□□□□□□	Designed By: KG / Drawn By: WM	Checked By: PM / Date: JUNE 2017	Scales: AS S□OWN / DRG No:MANDOURI PROJECT/TD/□D□

NOTES

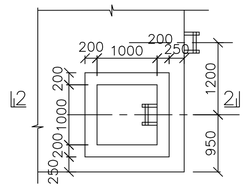
1. ALL DIMENSIONS ARE IN MILLIMETRES
2. ALL JOINTS ARE TO STRUCTURAL DETAILS
3. CONCRETE TO BE AS FOLLOWS;
   BLINDING CLASS 15
   MASS CONCRETE FILL CLASS 20
   REINFORCED CONCRETE CLASS 25



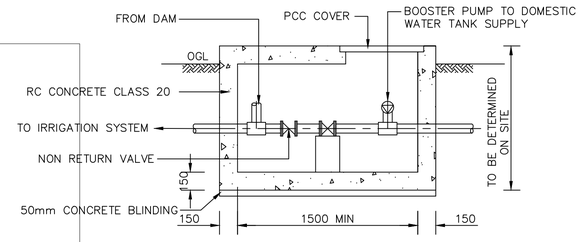
ACCESS OPENING COVER DETAILS
SCALE, 1:10



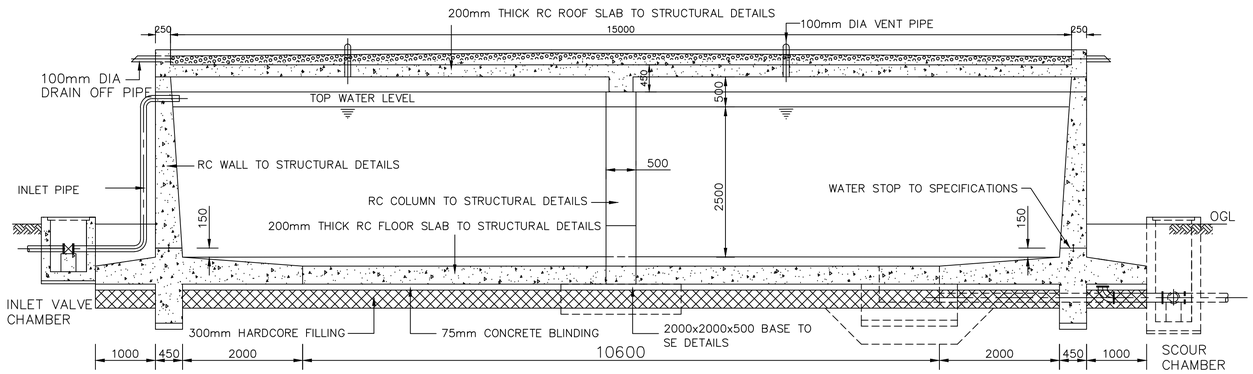
SECTION 2 – 2
SCALE 1:50



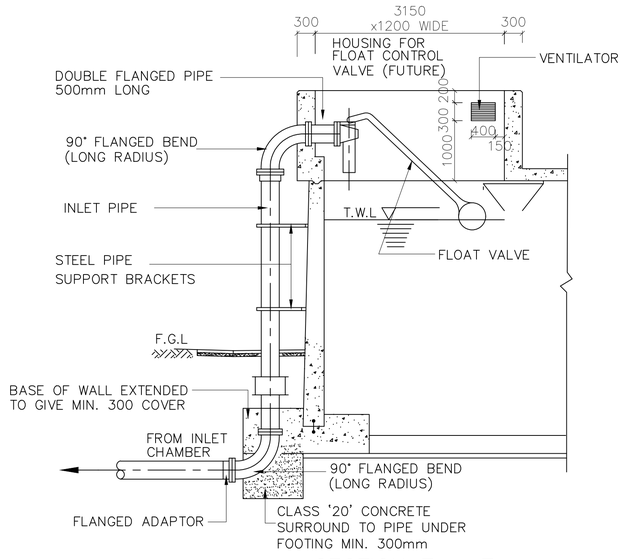
ACCESS OPENING PLAN
SCALE 1:50



TYPICAL VALVE CHAMBER
1 : 25

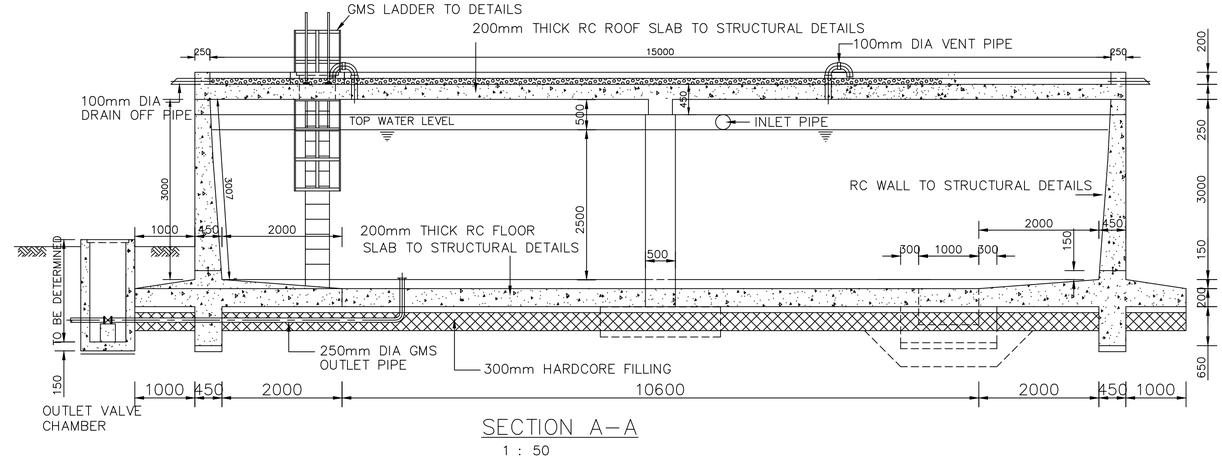


SECTION B–B
SCALE 1 :50

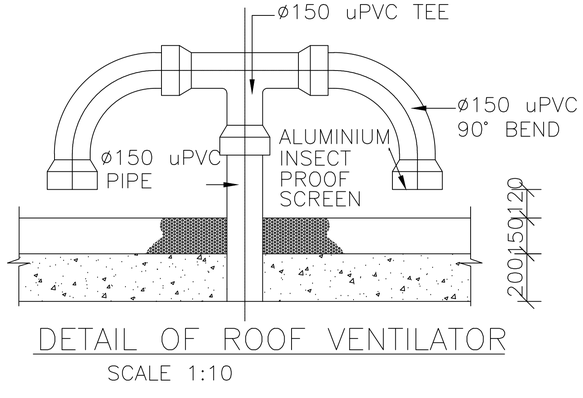


SECTION 7 – 7

INLET PIPE DETAILS
SCALE, 1:50



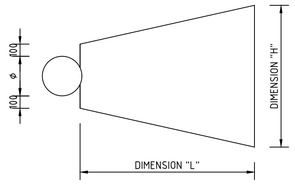
SECTION A–A
1 : 50



DETAIL OF ROOF VENTILATOR
SCALE 1:10

CONSULTANT: Africa Sustainability Centre (ASCENT) P.O Box 1704–0621 Nairobi,Kenya	REFERENCE DRAWINGS		REVISIONS				CLIENT: Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo	PROJECT: Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo	DRG TITLE: WATER STORAGE TANK S□□□□□□□□□□	Designed By: KG	Checked By: PM	Scales: AS S□OWN
	REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN				Drawn By: WM	Date: JUNE 2017	DRG No:MANDOURI PROJECT/TD/□D□

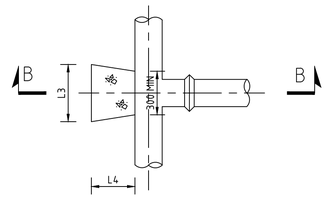
7. PIPELINE STRUCTURES



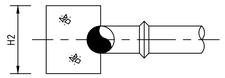
SECTION

PIPELINE DIAMETER D (mm)	W1 (mm)	A1 (mm)
63	100	300
90	300	300
110	350	500
160	450	500

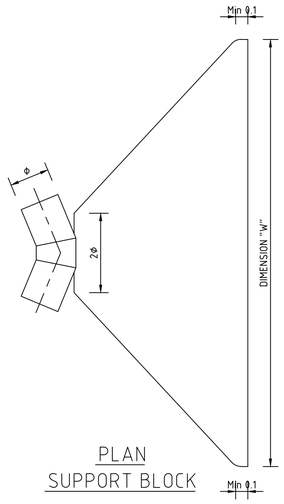
GATE VALVE THRUST BLOCK DIMENSIONS



TEE



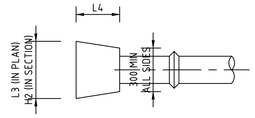
SECTION B-B



PLAN
SUPPORT BLOCK

NOMINAL BORE (mm)		110	140	200	250	300	400	500	560
11.25° BEND	L (m)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
	W (m)	0.30	0.30	0.30	0.38	0.38	0.48	0.60	0.71
	H (m)	0.33	0.48	0.60	0.97	0.97	1.22	1.52	1.83
22.5° BEND	L (m)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
	W (m)	0.30	0.34	0.42	0.52	0.68	0.85	1.07	1.28
	H (m)	0.33	0.48	0.60	0.75	0.97	1.22	1.52	1.83
45° BEND	L (m)	0.30	0.30	0.30	0.30	0.30	0.35	0.44	0.53
	W (m)	0.41	0.60	0.75	0.93	1.21	1.52	1.90	2.28
	H (m)	0.33	0.48	0.60	0.75	0.97	1.22	1.52	1.83
90° BEND	L (m)	0.30	0.34	0.42	0.53	0.68	0.86	1.07	1.29
	W (m)	0.68	1.00	1.24	1.56	2.02	2.53	3.16	3.79
	H (m)	0.33	0.48	0.60	0.75	0.97	1.22	1.52	1.83

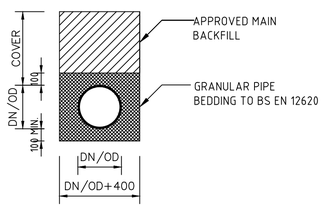
SUPPORT BLOCK SCHEDULE OF DIMENSIONS



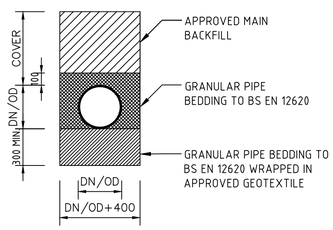
END CAP

NOMINAL BORE (mm)	110	140	200	250	300	400	500	560
H2 (m)	0.33	0.48	0.60	0.75	0.97	1.22	1.52	1.83
L3 (m)	0.50	0.72	0.90	1.13	1.46	1.83	2.29	2.74
L4 (m)	0.30	0.30	0.34	0.43	0.55	0.69	0.87	1.04

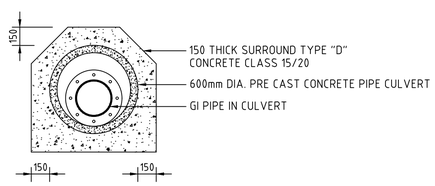
THRUST BLOCK FOR TEES AND END CAPS
FINAL DIMENSIONS TO BE CONFIRMED ON SITE BY THE ENGINEER.



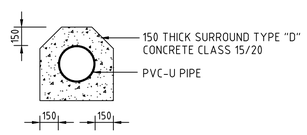
PIPE LAID IN NORMAL
& ROCK CONDITIONS
1:25 (AT A1), 1:50 (AT A3)



PIPE LAID ON SOFT
TRENCH BOTTOM
1:25 (AT A1), 1:50 (AT A3)



PIPE CROSSING ON MAJOR ROADS
1:25 (AT A1), 1:50 (AT A3)



PVC-U PIPE CROSSING ON MINOR ROADS
1:25 (AT A1), 1:50 (AT A3)

NOTES
PIPE TRENCHES DESIGNED IN ACCORDANCE WITH THE NATIONAL ANNEX TO BS EN 1295-1:1998.
MODULUS OF NATIVE SOIL ASSUMED TO BE:
7 MPa FOR TRENCHES IN NORMAL SOILS
2 MPa CROSSING SWAMPY GROUND.
TRENCHES DESIGNED FOR:
BACKFILL LOADS;
SURCHARGE FOR MINOR ROADS;
INTERNAL PRESSURES 80 kPa BELOW ATMOSPHERIC (EXCEPT WHERE SUCH PRESSURES CANNOT OCCUR IN THE SYSTEM)
THE DESIGN PRESSURE IN THE PIPE UNDER ZERO FLOW CONDITIONS.
BEDDING MATERIALS AND THE REQUIRED DEGREES OF COMPACTION ARE SHOWN ON THE RELEVANT PIPE LONGITUDINAL SECTIONS.

CONSULTANT: Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya

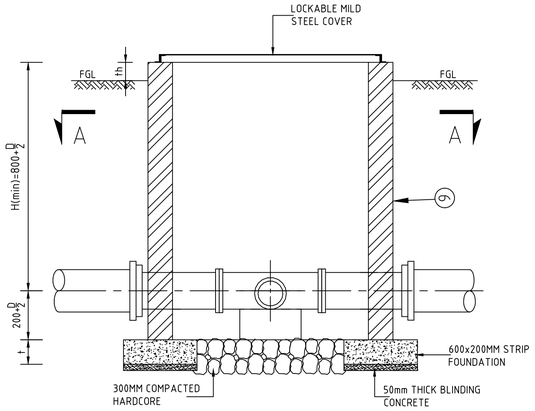
REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT: Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo

PROJECT: Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

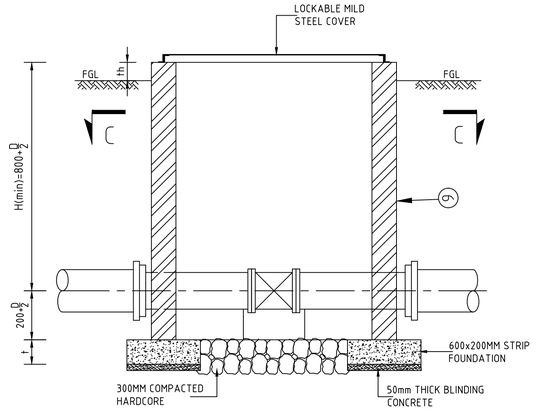
DRG TITLE: THRUST BLOCKS AND TRENCH DETAILS

Designed By:	Checked By:	Scales:
KG	PM	1:25 (AT A1) 1:15 (AT A3)
Drawn By:	**Date:**	**DRG No:MANDOURI PROJECT/TD/**
WM	JUNE 2017	



SECTION B-B

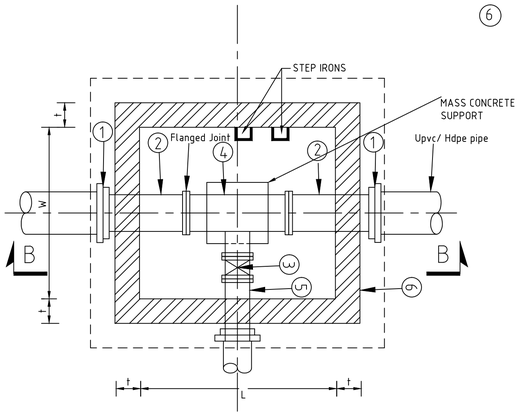
SCALE 1:25 (A1) & 1:50 (A3)



SECTION D-D

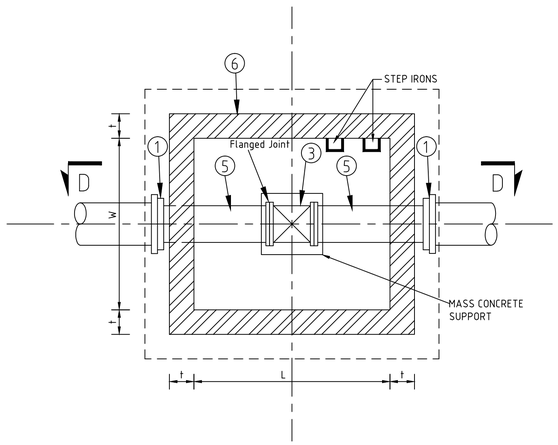
SCALE 1:25 (A1) & 1:50 (A3)

1. VJ Couplings / Flexible couplings to Suit Steel/Upvc
2. Double flanged GI pipe piece
3. Flanged gate valve of offtaking diameter
4. Flanged branch tee
5. Double flanged GI pipe piece of the offtaking Diameter
6. 200 mm masonry wall



SECTIONAL PLAN A-A

SCALE 1:25 (A1) & 1:50 (A3)



SECTIONAL PLAN C-C

SCALE 1:25 (A1) & 1:50 (A3)

SECTION VALVE CHAMBER (TYPE I)

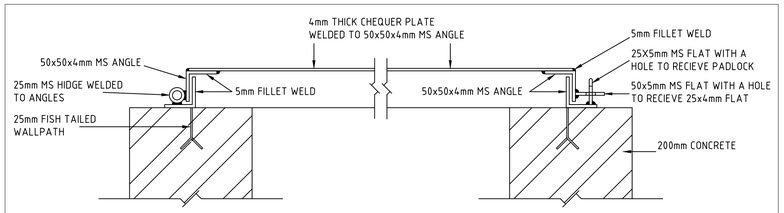
OFFTAKE AND SECTION VALVE CHAMBER (TYPE II)

DIMENSIONS FOR CHAMBER VALVE CHAMBERS

SIZE(mm)				LINE	NO.
L	W	H	t		
2000	1500	1200	200	Conveyance	1
1200	1200	1200	200	Mainline	5
1000	1000	1000	200	Submains	48

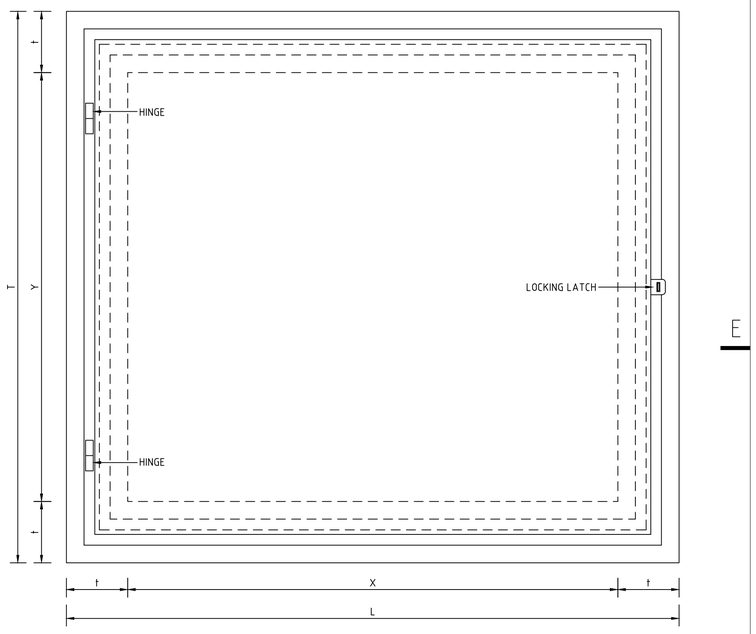
NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED
2. MASS CONCRETE CLASS C15 IN STRIP FOOTING
3. BLINDING CONCRETE CLASS C10
4. ALL THE FITTINGS IN THE CHAMBERS ARE TO BE ASSEMBLED AS SPECIFIED IN THE JUNCTION DETAILS DRAWINGS



SECTION E-E

SCALE 1:5 (A1) & 1:10 (A3)



COVER PLAN

SCALE 1:10 (A1) & 1:20 (A3)

MS COVER PLATE

CONSULTANT: Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya	REFERENCE DRAWINGS: REF. / DESCRIPTION	REVISIONS: REF. / DESCRIPTION / DATE / SIGN	CLIENT: BOAD — Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo	PROJECT: Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo	DRG TITLE: SECTION VALVE CHAMBER DETAILS	Designed By: KG / Drawn By: WM	Checked By: PM / Date: JUNE 2017	Scales: AS S□OWN / DRG No:MANDOURI PROJECT/TD/□02

MANDOURI IRRIGATION PROJECT
SECTION VALVES SCHEDULE

Chainage	Main Pipeline		Off-take	
	Description	Pipe size(mm)	Description	Pipe size(mm)
CONVEYANCE				
3340.00	Conveyance	400	Mainline A	560
Mainline				
20.00	Mainline	560	SUBMAIN 1	250
200.00	Mainline	560	SUBMAIN 2	250
400.00	Mainline	560	SUBMAIN 3	250
600.00	Mainline	560	SUBMAIN 4	250
820.00	Mainline	560	SUBMAIN 5	140
SUBMAINS				
No. of Hydrants	**Main Pipeline**		**Off-take**	
11.00	SUBMAIN 1	250	BLOCK 1 HYDRANTS	100
11.00	SUBMAIN 2	250	BLOCK 2 HYDRANTS	100
11.00	SUBMAIN 3	250	BLOCK 3 HYDRANTS	100
11.00	SUBMAIN 4	250	BLOCK 4 HYDRANTS	100
4.00	SUBMAIN 5	140	BLOCK 5 HYDRANTS	100

CONSULTANT:
ASCENT
Africa Sustainability Centre (ASCENT)
P.O Box 1704-0621
Nairobi,Kenya

REFERENCE DRAWINGS

REF.	DESCRIPTION

REVISIONS

REF.	DESCRIPTION	DATE	SIGN

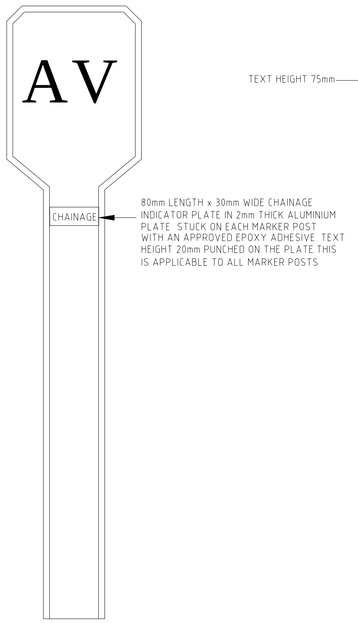
CLIENT:
BOAD
Banque Quest Africaine de Developpement(BOAD)
68 Ave De La Liberation,
Lome,Togo

PROJECT
Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

DRG TITLE
SECTION VALVE CHAMBER SCHEDULE

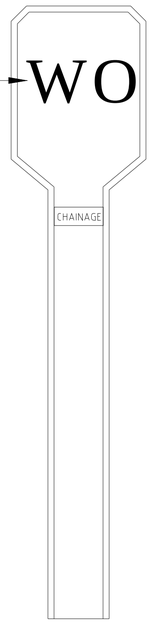
S□□□□□□□□□□

Designed By:	Checked By:	Scales:
KG	PM	AS S□OWN
Drawn By:	**Date:**	**DRG No:MANDOURI PROJECT/TD/□02**
WM	JUNE 2017	

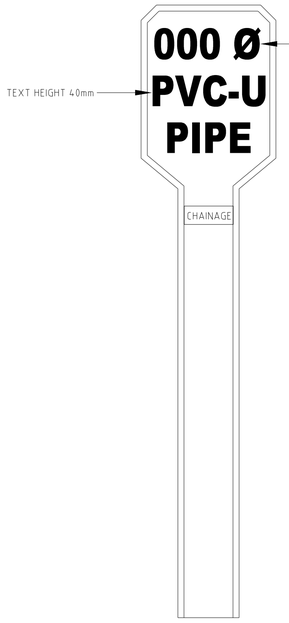


80mm LENGTH x 30mm WIDE CHAINAGE INDICATOR PLATE IN 2mm THICK ALUMINIUM PLATE. STUCK ON EACH MARKER POST WITH AN APPROVED EPOXY ADHESIVE. TEXT HEIGHT 20mm PUNCHED ON THE PLATE.THIS IS APPLICABLE TO ALL MARKER POSTS

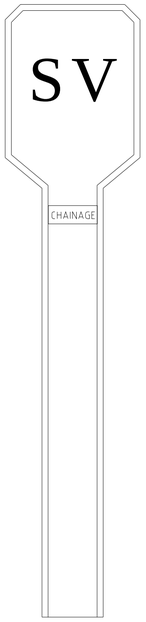
AIR VALVE
SCALE 1:5



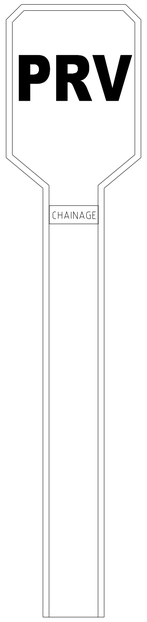
WASHOUT
SCALE 1:5



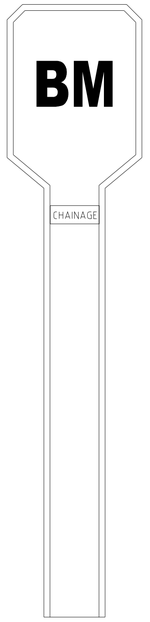
STEEL/uPVC PIPE
SCALE 1:5



GATE VALVE
SCALE 1:5
(APPLICABLE TO ISOLATION VALVES)

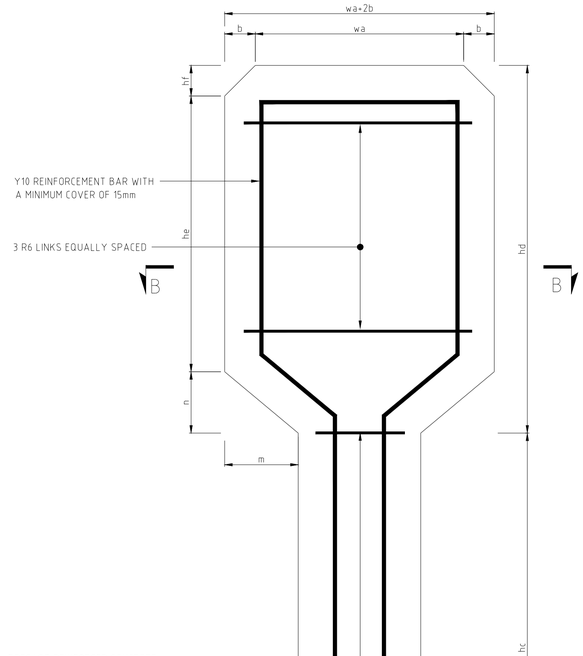


PRESSURE REDUCING VALVE
SCALE 1:5



BULK METER
SCALE 1:5

0 100 200 300 400 500mm

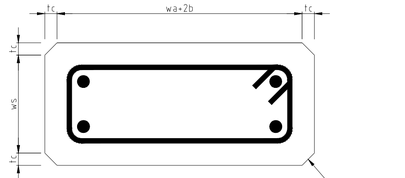


REINFORCEMENT AND INSTALLATION DETAILS
SCALE 1 : 2.5

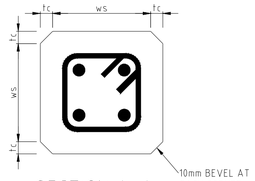
0 50 100 150 200 250mm

NOTES

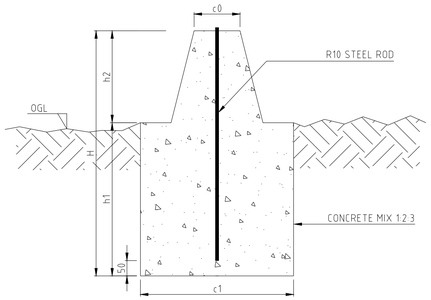
1. MARKER POST POSITIONS TO BE AGREED WITH THE ENGINEER PRIOR TO INSTALLATION.
2. CONTRACTOR TO CAST SAMPLE FOR APPROVAL FOR EACH TYPE OF POST THAT IS REQUIRED FOR THIS CONTRACT.
3. ENGRAVED LETTERS TO BE PAINTED WITH ONE APPROPRIATE UNDERCOAT AND TWO COATS OF WATER-BLUE GLOSS PAINT.



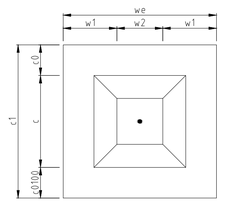
SECTION B-B
SCALE 1 : 2.5



SECTION A-A
SCALE 1 : 2.5



SECTIONAL VIEW
SCALE 1:10



PLAN VIEW
SCALE 1:10

COMBINED TRIANGULATION & BENCHMARK BEACONS

0 100 500 1000 mm

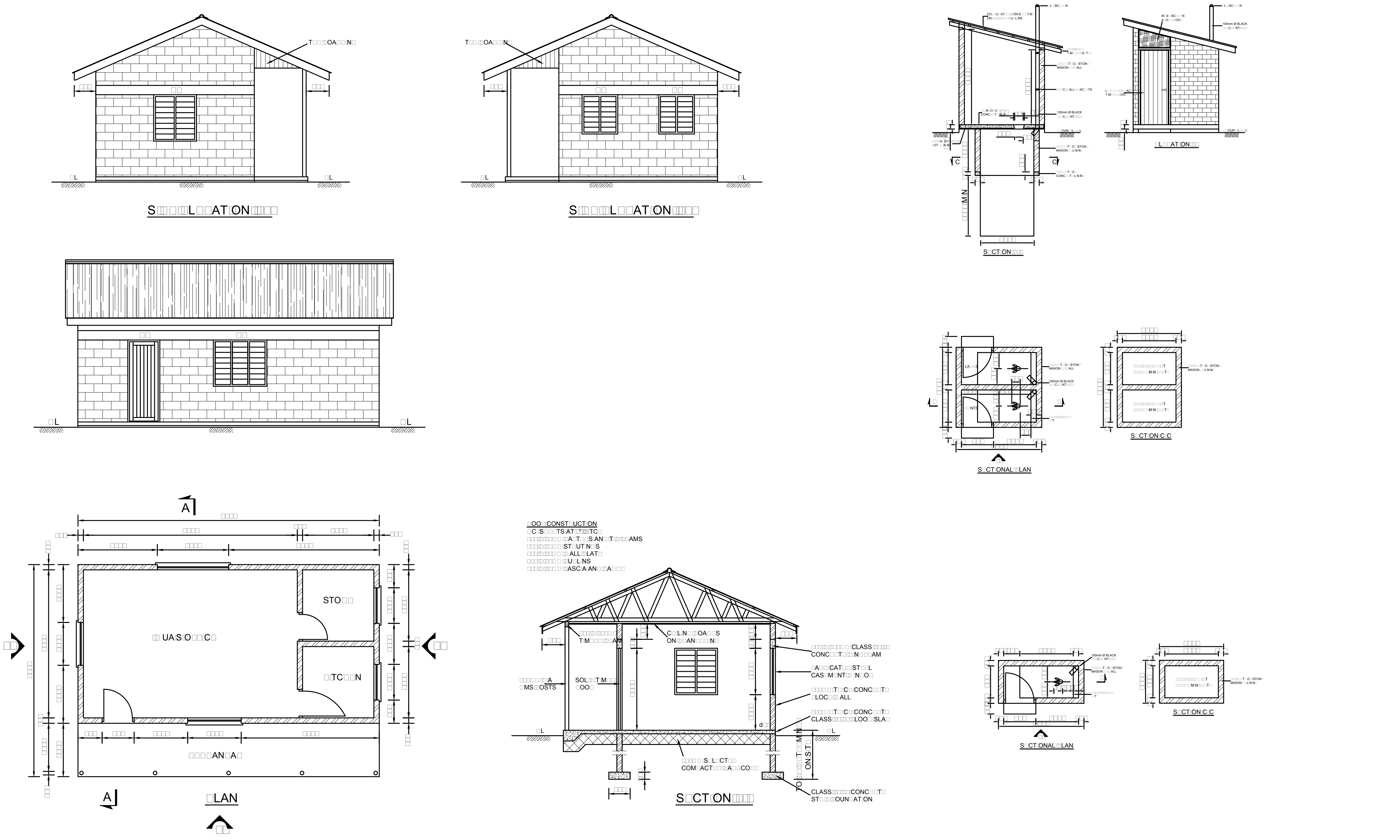
CONSULTANT: Africa Sustainability Centre (ASCENT) P.O Box 1704-0621 Nairobi,Kenya	REFERENCE DRAWINGS		REVISIONS				CLIENT: Banque Quest Africaine de Developpement(BOAD) 68 Ave De La Liberation, Lome,Togo
	REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN	

PROJECT: Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

DRG TITLE: MARKER POSTS

Designed By:	Checked By:	Scales:
KG	PM	AS S□OWN
Drawn By:	Date:	DRG No:MANDOURI PROJECT/TD/□0□
WM	JUNE 2017	

8. PROJECT FACILITIES



CONSULTANT:

ASCENT

REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

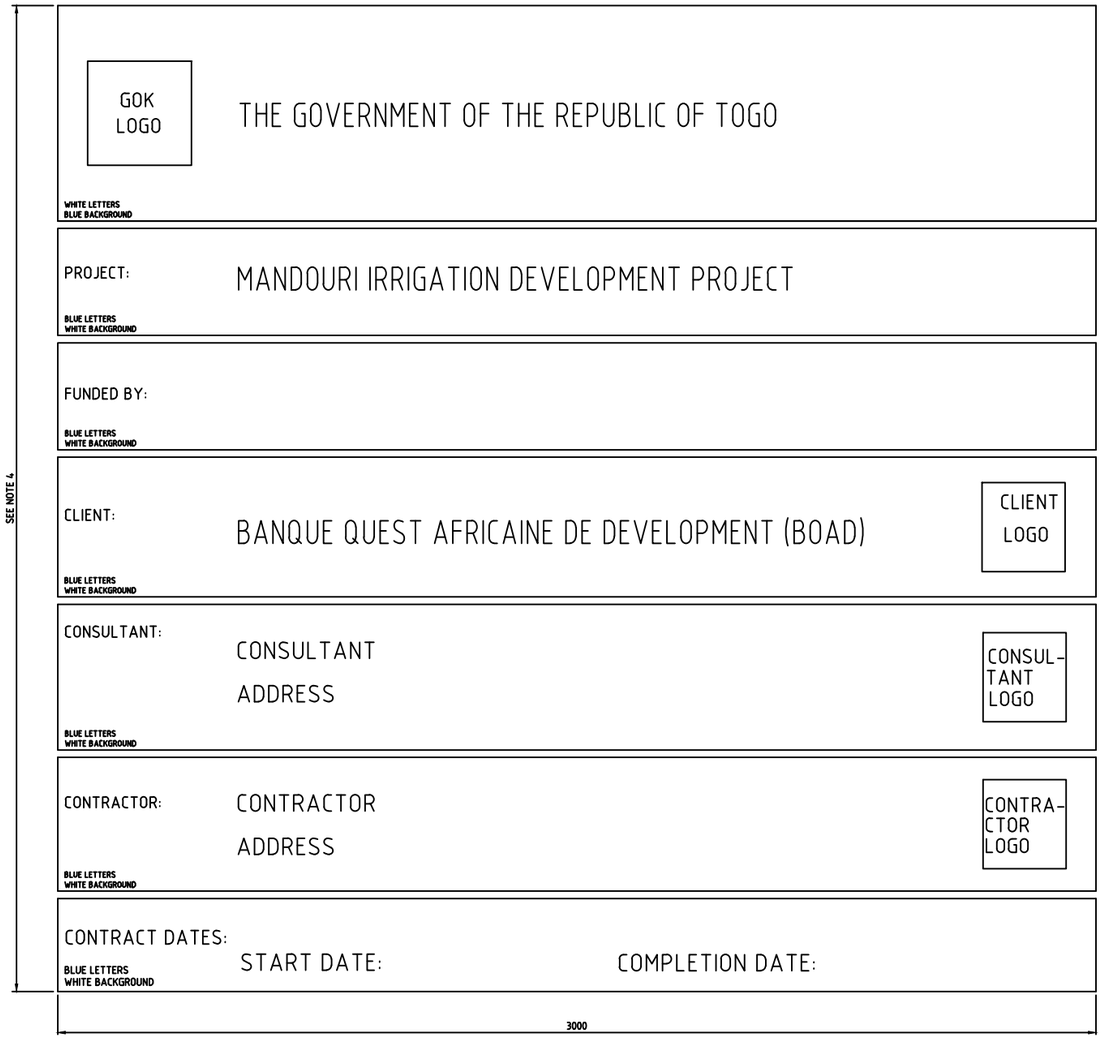
CLIENT:

BOAD

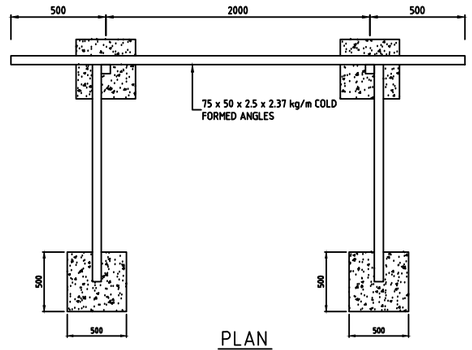
PROJECT

DRG TITLE

Designed By:	Checked By:	Scales:
KG	PM	S□ale 1:1
Drawn By:	**Date:**	**DRG No:MANDOURI PROJECT/TD/60□**
WM	JUNE 2017	



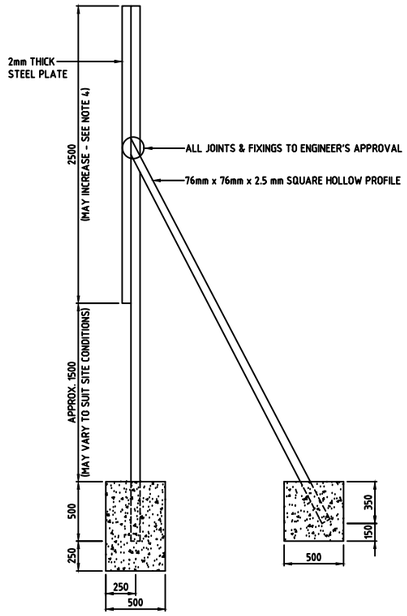
FRONT ELEVATION
SCALE 1:10



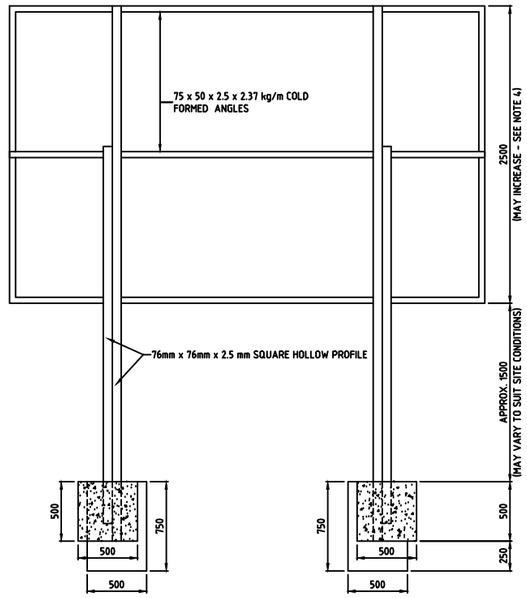
PLAN
SCALE 1 : 25

NOTES

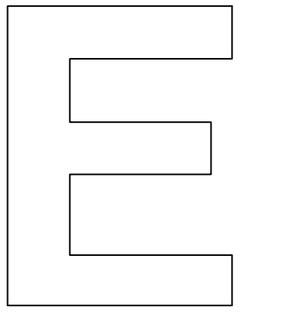
1. THE LETTERING TYPE TO BE USED IS HELVETICA MEDIUM.
2. THE LETTERING SIZE AND DIMENSIONS ARE AS SHOWN.
3. THE NAME OF THE PROJECT AND CLIENT MAY BE RE-SIZED PROPORTIONATELY IN THE EVENT OF IT BEING TOO LONG.
4. THE HEIGHT OF THE SIGN BOARD MAY VARY DEPENDING ON THE NUMBER OF PROFESSIONAL SERVICES THAT ARE TO BE SHOWN. NOTE THAT ALL THE PROFESSIONAL SERVICES ARE TO BE SHOWN.
6. EMBLEMS/INSIGNIA/COMPANY LOGOS ARE TO BE IN THEIR CORRECT RESPECTIVE COLOURS ON A WHITE BACKGROUND AND ARE TO BE PLACED AS SHOWN
7. THE METAL FRAME AND SUPPORTS TO BE PAINTED WITH ONE COAT PRIMER AND TWO COATS FINISH. PAINT TO THE ENGINEER'S APPROVAL.



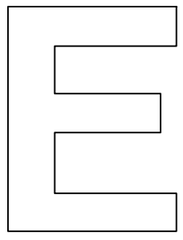
SIDE ELEVATION
SCALE 1 : 25



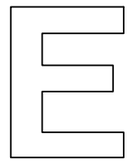
REAR ELEVATION
SCALE 1 : 25



HELVETICA MEDIUM 100mm MAIN LETTERS FOR PROJECT NAME AND 150mm MAIN LETTERS FOR CLIENT'S NAME



HELVETICA MEDIUM 75mm MAIN LETTERS FOR CONSULTANTS AND CONTRACTOR



HELVETICA MEDIUM 50mm MAIN LETTERS FOR OTHER PROFESSIONAL FIRMS

CONSULTANT:
Africa Sustainability Centre (ASCENT)
P.O Box 1704-0621
Nairobi,Kenya

REFERENCE DRAWINGS		REVISIONS			
REF.	DESCRIPTION	REF.	DESCRIPTION	DATE	SIGN

CLIENT:
Banque Quest Africaine de Developpement(BOAD)
68 Ave De La Liberation,
Lome,Togo

PROJECT
Increasing the resilience of vulnerable communities in the agriculture sector of Mandouri in Northern Togo

DRG TITLE
PROJECT SIGN BOARD

Designed By:	Checked By:	Scales:
KG	PM	Front Elevation 1:10 Side and Rear Elevation 1:25
Drawn By:	**Date:**	**DRG No:MANDOURI PROJECT/TD/602**
WM	JUNE 2017	