ADAPTATION FUND

DATE OF RECEIPT:
ADAPTATION FUND PROJECT ID:
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PROJECT/PROGRAMME PROPOSAL

PART I: PROJECT INFORMATION

PROJECT CATEGORY:	REGULAR PROJECT
COUNTRY/IES:	BENIN
TITLE OF PROJECT/PROGRAMME:	ADAPTATION OF COTONOU LAGOON ECOSYSTEMS AND HUMAN COMMUNITIES TO SEA LEVEL RISE AND EXTREME WEATHER EVENTS IMPACTS
TYPE OF IMPLEMENTING ENTITY:	NATIONAL IMPLEMENTING ENTITY
IMPLEMENTING ENTITY:	FONDS NATIONAL POUR L'ENVIRONNEMENT (FNE)
EXECUTING ENTITY/IES:	DGE (DIRECTORATE OF ENVIRONMENT OF BENIN), MUNICIPALITY OF COTONOU, NGO, COMMUNITY ASSOCIATIONS.
AMOUNT OF FINANCING REQUESTED:	**US$ 8,913,255** (in U.S Dollars Equivalent)

PROJECT BACKGROUND AND CONTEXT:

1- Benin ratified the United Nations Framework Convention on climate change on June 30th, 1994 and the Kyoto protocol on February 25th, 2002.

2- With a total population of 9,6 million Inhabitants in 2012, and 115,762 km², the monetary poverty affecting 40.3% of its population in 2006 / 2007 (INSAE, 2008), a human development index of 0.435 in 2010, and a Gross Domestic Product (GDP) below the minimum required rate of 7% for achieving the Millennium Development Goals (MDG), Benin still has numerous challenges to struggle with as part of the various poverty reduction strategies. The most significant increase in poverty between 2007 and 2009 was recorded in agriculture-animal husbandry-fishery-forestry, trade, industry, transport and Public work sectors and civil engineering (BTP) which nevertheless occupy the majority of the active population. The economic growth initially projected for about 3% was estimated at 2.1% in 2010 against 2.7 % in 2009. This regression is the result of the combined effects of poor performance recorded in the cotton sector, foodstuffs production sluggishness, harvest losses due to floods and low implementation of public investment projects. This occurs in a context of a moderate inflation trend, that is, an annual average of 2.1 % inflation (PNUD, 2011).

3- The Report on the Millennium Development Goals (MDG) "BENIN 2000+10" reveals that the major constraints hindering the achievement of the MDGs are namely:

- The low growth and inadequacy of pro-poor growth strategies;
- The low capacities of primary education services in terms of projects cycle management and lack of reliable information system (school card, number and situation of the infrastructures…);
- The low capacity of the services in charge of gender mainstreaming promotion as matter of projects cycle management and lack of sex-disaggregated statistic data;
- Lack of local component of the National Health Development Plan;
- The environment protection services' low capacity to implement the multilateral agreements activities in the field of environment;
- The lack of planning tools at the Water and Power supply sector level and the low capacity of Water supply services in projects cycle management;
- The lack of marketing policy;
- The low capacity in terms of mobilization, management and aid coordination
- The lack of operational Monitoring-Evaluation mechanism in the sectors of agriculture, education, and in the ministry in charge of Gender promotion.

4- The distribution of foods consumption expenses by the way of Integrated Module Survey on the households living conditions (EMICoV) in 2006 and 2007) revealed that 26.5% of the population suffered from hunger in 2007 against 23.1% in 2006. As such, the number of underfed persons increased by 3.4 points between 2006 and 2007. This upwards trend could be explained by the 2007 food crisis impacts. The results by residence area reveal that food shortage is more dominant in rural area (28.4%) than in urban area (23.2%).

5- In the field of gender promotion, the various laws and measures enforcement contributed to strengthening the legal and institutional framework in view of reducing gender imbalance and enhancing women participation in the development process, though participation of Benin woman still, is far away from the objective of gender equity. As far as women participation in decision-making is concerned, there is a slight progress at the level of Parliament and local representation, mainly: (i) an increase of 3 points in the women representativeness at the National Assembly and local government, mainly: (i) an increase of 3 points on women representativeness within the National Assembly; 10% for the current legislative term (2007-2011) against 7.22% for the previous one (2003-2007); and an increase of 0.43 point in women representativeness during the last local elections organized in 2008: 4.18% (60 women were elected out of 1,435 municipal councilors), against 3.75% (that is, 46 women elect out of a total of 1,199 municipal councilors) for the 2003 elections.

6- Though, in progress as a whole, health indicators could not reach the set targets. Health centers attendance rate increased from 45.6% in 2007 to 46.1% in 2009, while the pentavalent vaccination coverage rate for the 0-11 month children increased from 96% in 2007 to 98% in 2009. The percentage of under 5 year-children sleeping under treated mosquito nets is steady between 2008 and 2009, that is, 56.3% against a set target of 60% in 2009.

7- The industrial fabric still is embryonic (7.8% of GDP in 2009). In order to boost a processing-oriented economy with competitive enterprises, the following actions are planned: (i) promote the creation and development of new competitive industrial enterprises; (ii) continue the strengthening of the institutional, legal, judiciary and regulatory environment; (iii) proceed with reviewing the investments law to make it more encouraging; (iv) promote the frameworks of exchanges and consultation between the stakeholders of the industrial sector; (v) build the industrial companies' capacities as well as those of the support and coaching institutions; (vi) implement appropriate institutional reforms in order to make Benin more attractive to direct foreign investments in the fields like mining, hydrocarbons and other potentially-attractive sectors; and (vii) create an Investment Promotion Agency.

8- Being in progress, the indicators relating to decentralization should be reinforced, mainly with the passing of the law on Inter-community cooperation and the adoption by Government in 2009, of the National Decentralization and Devolution Policy (PONADEC), As such, the indicator « number of development territories constituted and formalized » increased from four (04) in 2007 to ten (10) in 2009. The same applies to many other indicators, mainly:

(i) the share of the Local Governments' expenses in the total General Budget of Government, which stabilized at 8.8% in 2009 against 4.1% in 2007;

(ii) the increase of the remittances to the local governments between 2007 and 2009, thanks to the launching of FADeC (Local Government Development Support Funds), passing from 1.5% of the General Budget of the State in 2007 to 3.7% in 2009; and

(ii) the share of investment expenses in the total expenses of the Local Governments which increased from 26% in 2007 to 45.6% in 2009.

1.1 Climate context on the coastal zone of Cotonou

1.1.1 Previous climatic trends

9- The previous climatic trends are explicit on two elements controlling the situation of resources and human activities in the lagoon system: the rainfalls and the temperature

a) Spatio-temporal variability and trends in precipitations

The average pluviometric trends characterizing the period 1951-2010 in Cotonou is of bimodal type showing two maxima (diagram.1) : June for the main rainy season (354.6 mm) and October for the small rainy season (147,6 mm).

The inter-annual variability analysis of the rains observed over the same period reveals short periods of deficit alternating with some years of excess. (fig.2).

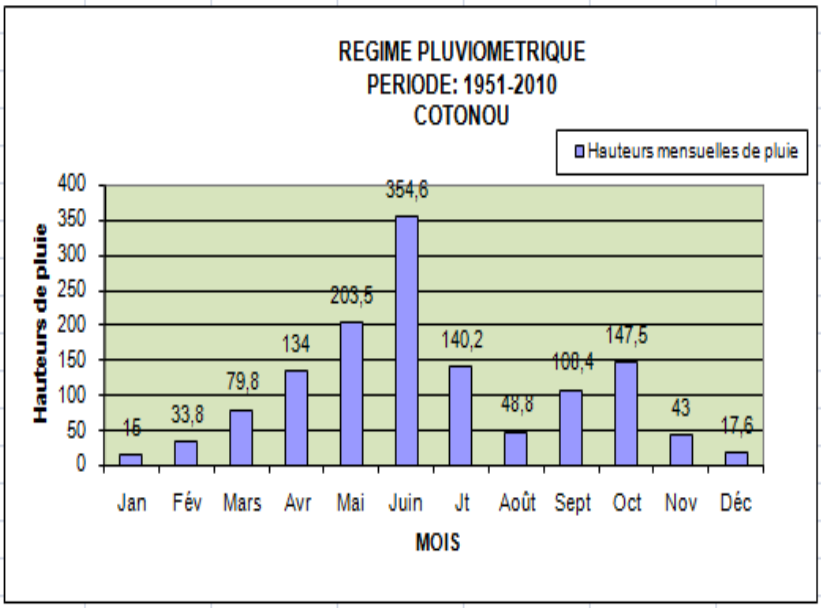


Diagram 1 : *Pluviometric trends in Cotonou from 1951 to 2010.*
Source of the data: SMN (2010)

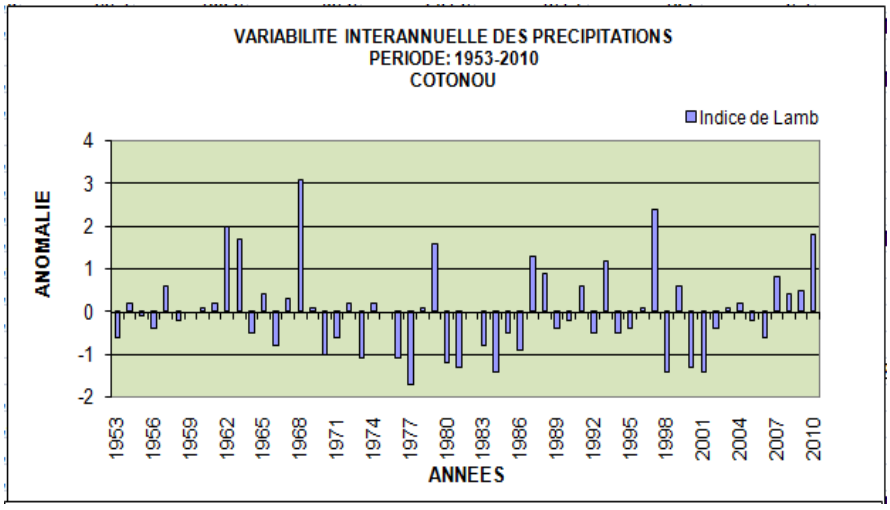


Diagram 2 : Inter-annual v*ariability of precipitations in Cotonou from 1951 to 2010.*
Source of data: SMN (2010)

The highest deficits were noted in 1977 and 1983 (Years of drought) while the highest pluviometric excesses date far back to the years 1968 and 1997 (Years of floods).
At seasonal scale, this situation is characterized by some abnormalities materialized by:

- High concentration of rains over a short period, disturbing most of human activities;
- A sudden interruption of rains during the season;

- The paucity, during some years, of the clear demarcation between the two rainy seasons, which results in an increase of the flood phenomenon.

If at annual scale, the current climate analysis does not reflect significant trends in the precipitations variability, whereas the seasonal analysis reveals some major differences during the periods prior to 1971. It was observed that there were some delays of more than a month for the starting of useful rains; that disturbed agricultural activities planning in the region of the shoreline.

The analysis *of the inter-annual variability of the number of rainy days* during the period 1951 – 2009 reveals the general downward trends of the annual number of rainy days since the 50 with the passage from positive variances between 1970 and 1775 and a stabilization around the mid of the period from 2005. (diagram 3).

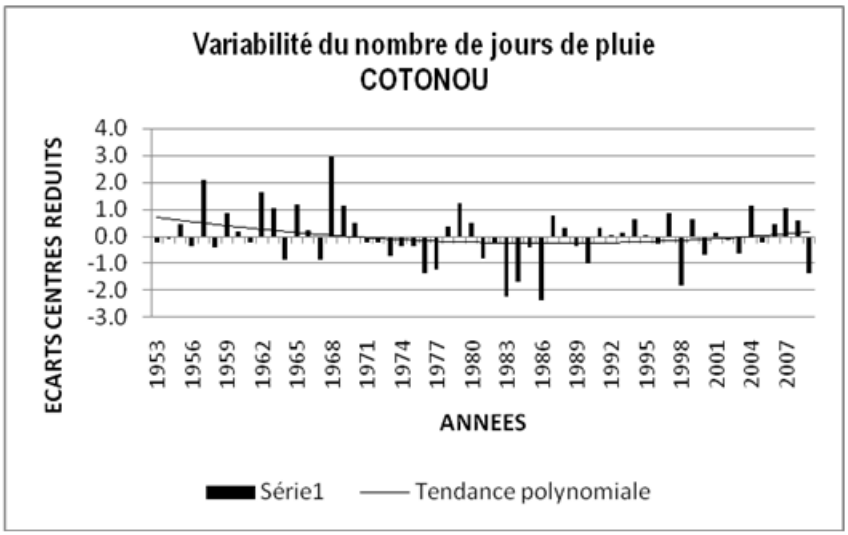


Diagram 3:*Inter-annual variability of rainy days in Cotonou from 1951 to 2010.*
Source of Data: SMN (2010)

By and large, the annual average number of baseline rainy days Between1971-2000 is situated around the characteristic average of the period 1951 – 2010 in the shoreline area and all the regions in Benin.

b) Spatio-temporal Variability and Trends of the temperatures

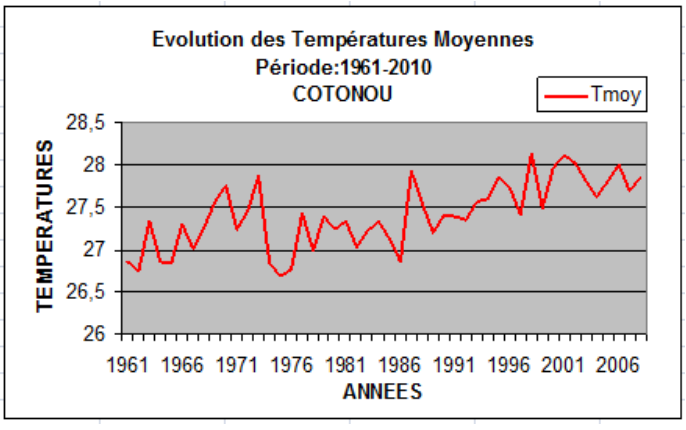


Diagram 4*: Evolution of average temperature in Cotonou from 1961 to 2010.*
Source of Data: SMN (2010

The evolution of the average temperature in Cotonou from 1961 to 2010 reveals a general upward trend (diagram.4). The variances between the average normal temperatures recorded every year during the same season are sensitively in the range of minus 0.6 to +0.8°C and these do not allow to earmark an upward trend unless at the end of the decade 1970-1980 (Diagram.5).

The average minimum temperatures also sensitively increased (in the range of +0.5 to 1°C) during the last decade, particularly from 2003.

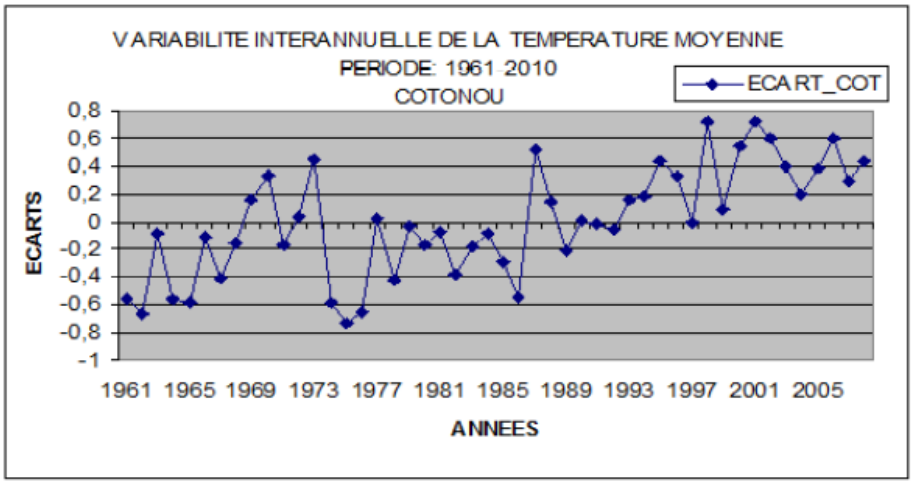


Diagram 5 : *Inter-annual variability of the average temperature in Cotonou from 1961 to 2010. Source of Data : SMN (2010)*

1.1.2 Climatic scenarios

10-This has to do with describing in a coherent and plausible way the future situation of the climate in the lagoon environment.

11-Among the baseline scenarios proposed by the Intergovernmental Panel on Climate Change (GIEC/IPCC) for such studies, and mainstreamed in the version 5.3 of software MAGICC/SCENGEN (Wigley, 2008), scenarios A1B and B1 are in use in Benin since a decade as part of the works of IMPETUS Project (or *Integrated approach for the Limited Water Resources Management in West Africa)* in North-Western Region of Benin. They have been adopted in this study in order to forecast at global level and at various future temporal horizons, the major climatic parameters covered by the vulnerability / adaptation study.

12-The IPCC scenarios A1B and B1 describe the future evolution of the climatic conditions by 2100, based on the economic, energy and environmental assumptions. Both scenarios admit the assumption of Globalization of economy that is already under verification through the Global economy process adopted by the International Community since the end of the last century. The first scenario is more economy-oriented than the second which is more open on environmental concerns. The Scenario A1B assumes an international technological but environment-friendly development respecting the equilibrium between the sources of energy while scenario B1 targets energetic sustainability. The average variances A1B-AIM and B1-AIM integrated in the software MAGICC 5.3 are the versions of the scenarios A1B and B1 of the IPCC/GIEC exploited in order to forecast the major climatic patterns at global level and at different future temporal horizons.

13-**The temporal horizons** of 2015, 2025, 2050 and 2100 have been selected with a view to mainstreaming the socio-economic and ecological impacts of the climate change. The local data are deduced from the general level by the *"downscaling"* technique, from the output of MAGICC and the climatic normal 1971-2000 of the temperature and rainfall. SCENGEN is used in order to obtain the spatio-temporal representations of the climate change impacts at each grid point. (of resolution 2.5° of latitude on 2.5° of longitude) by using the results of the experiments of the

coupled *Atmospheric-Ocean general circulation models* (MCGAO/*AOGCM)* available in the software. The average climatic sensitivity was set at 3°C, in compliance with the indications given by the IPCC/GIEC (Solomon *et al.*, 2007), and the average coefficient of turbulent exchange k_z equal to *2.3 cm²/s*.

14- The use of the first results of simulation and experiences acquired in Benin and within the West African Sub-region on the general and regional models has enabled to select (4) models among the twenty (20) proposed by MAGICC/SCENGEN. Those are: CGCM3.1 (T47), MRI-CGCM2.3.2, UKMO-HadCM3, UKMO-HadGEM1 (cf. technical manual MAGICC/SCENGEN 5.3 version 2, 2008). The output data generated by the software are of an average value of four models on the cells of the grid, in line with the recommendations of the software designers (Santer *et al.*, 1990; Giorgi et Mearns, 2002; Tebaldi *et al.*, 2004). The limits of the grid cell covering the Cotonou Region are *5°N – 7.5°N* and *0° - 2.5°E.*

a) Precipitations Scenario

15- In the study region, one could, by 2100, witness a practically steady annual pluviometry, as the variances observed every five years do not exceeding 0.2%. A downward trend would therefore characterize the early period 2000 – 2100 (Table 1).

Table 1. *Abnomal forecast annual precipitations from 2000 to 2100 along the Cotonou shoreline* (Grid Cell*: 5°N-7.5°N et 0° - 2.5°E).*

Years	1971-2000	2005	2010	2015	2020	2025	2050	2075	2100
Variations		-0.06	-0.36	-0.62	-0.88	-0.82	0.49	3.62	3.97
Precipitations	980	979	976	974	971	972	985	1,015	1,019

16- At monthly scale, greater variations would be observed in the precipitations during March and April which mark the first passage of the Inter Tropical Front and the beginning of the first rainy season in the region. They will culminate with a reduction of the precipitations up to 21% in April by 2100 (Diagram.7). The variances between the precipitations of March and April would intensify until the year 2025, obliging the rural populations to situate the beginning of agricultural activities in April or in May.

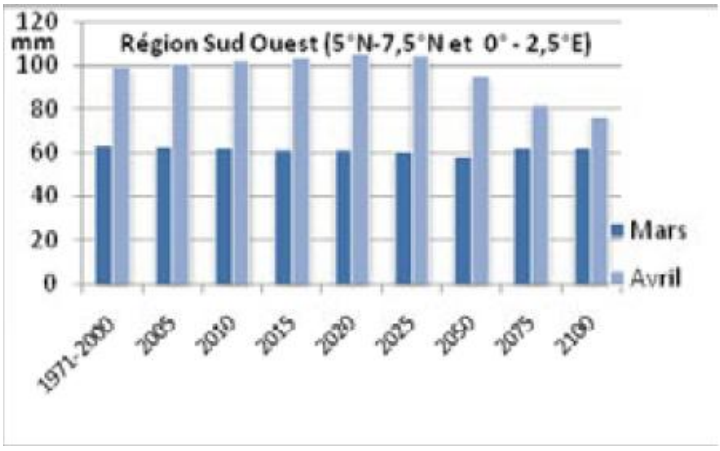


Diagram7: *Forecast of the Monthly precipitations of March and April for the South-Western Regions, from 2000 to 2100*

b) Scenario of temperature

17- According to the forecast, the temperatures would be upward in all the regions of Benin and in Cotonou (Table 2). By 2100, the highest thermal increase could reach 3.27°C in the North-Western region of the country, as regard the baseline period 1971 - 2100. The lowest increase value would be 2.6°C. It would characterize the South-Western region of the country where the Cotonou Lagoon System is located.

Table 2 – *Annual Average Temperatures Variations forecast from 2000 to 2100 along the Cotonou shoreline (Grid Cell: 5°N-7.5°N and 0° - 2.5°E).*

Years	2000	2005	2010	2015	2020	2025	2050	2075	2100
Variations (°C)		0.21	0.29	0.39	0.5	0.63	1.55	2.24	2.77
Temperature	27.4	27.61	27.69	27.79	27.9	28.03	28.95	29.64	30.17

One could implicitly expect an increase in the water deficit and the potential evapotranspiration (ETP).

1.1.3 Scenario of rise in sea water level and subsequent losses of land

18- Vulnerability studies and assessment carried out as part of the National Adaptation Programme of Action (PANA) and the Second Beninese National Document on Climate Change (SNC) have revealed that the shoreline, water resources, agriculture and forestry are the most vulnerable sectors to climate change. Based on some climatic and non climatic scenario established for the future evolution of the coastal area, and according to the indications provided by DIVA Software, the sea level could continuously rise up to reach about 0.81 m, during the period 2000 – 2100, confirming in so doing the Intergovernmental Panel on Climate Change (IPCC)'s forecast (diagram 7; table 3). Water resources will also be affected both quantitatively and qualitatively with a drastic impact on agriculture and populations' health. The vulnerability of water resources sector will also be materialized by a downward trend in the annual pluviometry varying between 3% and 8% (scenario A1B) or between 4% and 5% (scenario B1), a displacement of the isohyetal line 1000 by more than 350 km southwards between 2025 and 2050 along with all its impacts.

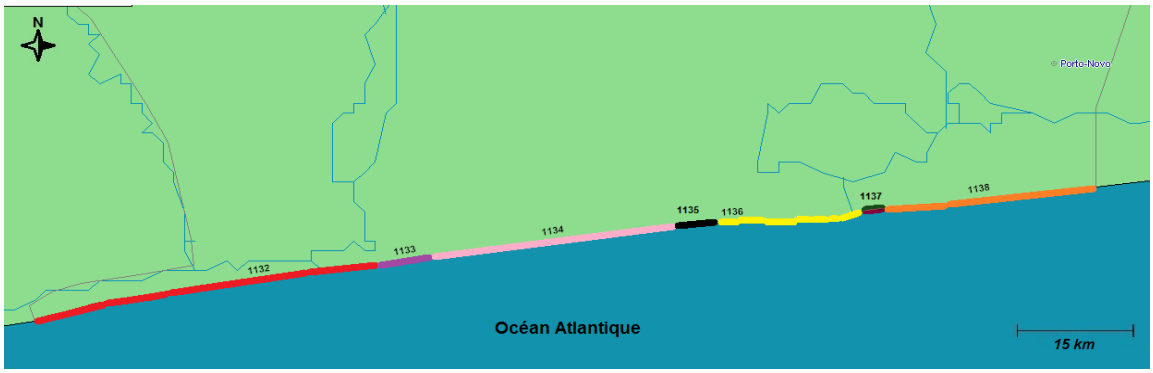


Diagram 7: Coastal segments in the Beninese shoreline (according to Consortium DINAS-COAST (2004)). Coastal segment concerned by the Cotonou Lagoon is 1,136 (the yellow strip).

Specifically, the major climatic risks the coastal area is exposed to are the rise in sea level, floods, violent winds, and increase in the sea surface temperature (TSM). Vulnerable living conditions will be observed in this area settled by fishermen, farm operators, craftsmen, salt miners, traders, tourists and industrials. The most vulnerable among the means of livelihood are agriculture and truck-farming, fishery and aquaculture, handicraft and trade, salt mining, tourism and industry. The potential impacts have to do with seal level rise, losses or gains of land (in surface and in volume) as a result of erosion or advance of the shoreline, the status of the mangrove. (Diagram 8, 9 and 10).

Table 1.1 : Sea Level Rise in the Cotonou shore by 2100 (m)

Scenarios	Variants	Sea Level Rise by 2100 (m)
A1B	High	0.813
	Medium	0.422
	Low	0.206
B1	High	0.634
	Medium	0.323
	Low	0.151

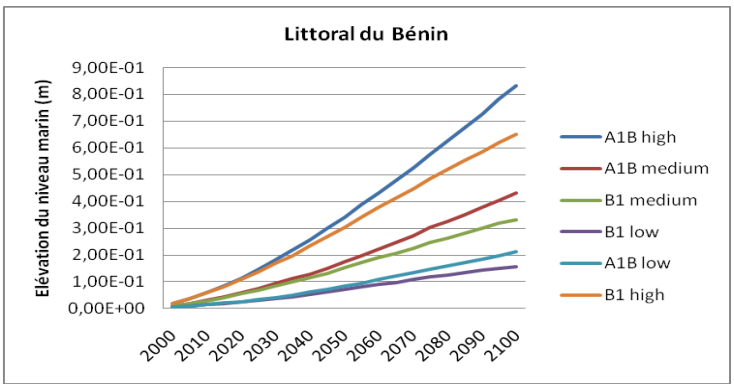


Diagram 8: Evolution of sea level rise along the Cotonou shoreline until 2010

The Cotonou channel commonly referred to as *Cotonou lagoon*, with a length of 4.5 km, an average width, of 300 m, and a depth of 5 to 10 m, appeared further to the September 1885 catastrophic flooding as a result of Ouémé river floods and overflowing of Nokoué Lake.

In order to dispose of the waters seawards and protect the nascent Cotonou town, the colonial administration, on September 21, 1885 made dredge a 1.5 m width and 1 m depth channel in-between the Nokoué Lake and the sea, passing through the areas settled by the poorest populations (Bourgoinie, 1972; Pliya, 1980). According to Colleuil (1984), the resulting violent flow was sufficient to generate within a few days a 200 m width channel which divided the town into two sectors to date. (Diagram 11 and 12). From that moment on, the social life has been reorganized around the water body,

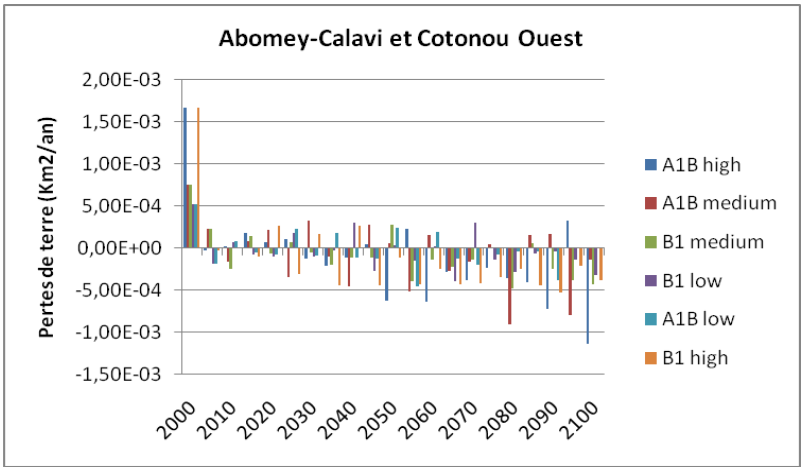


Diagram 9: Evolution of the losses of on-surface lands on West Cotonou coast until 2100.

with the populations settling, in the most precarious conditions along unstabilized banks (more than 30% of the Cotonou Populations), making Cotonou, the Benin town with the highest poverty index: 38% against less than 30% in towns like Porto-Novo, Parakou, Abomey, Bohicon (PNUD, 1996, USAID-UNICEF-INSAE, 1996).

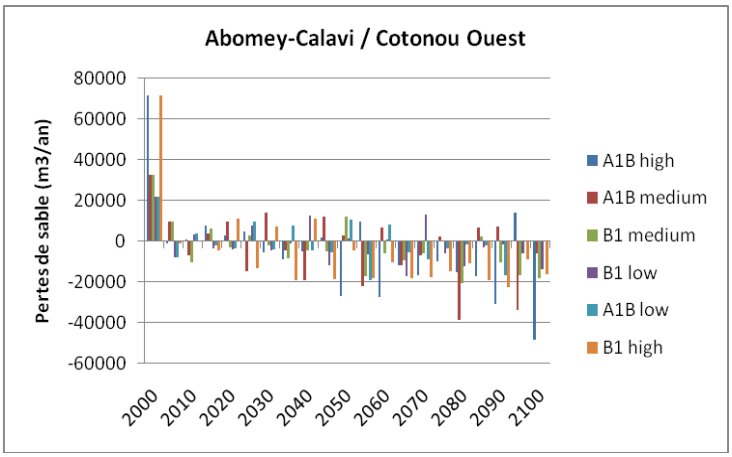


Diagram 10: Evolution of the volume losses of lands on West Cotonou coast until 2100.

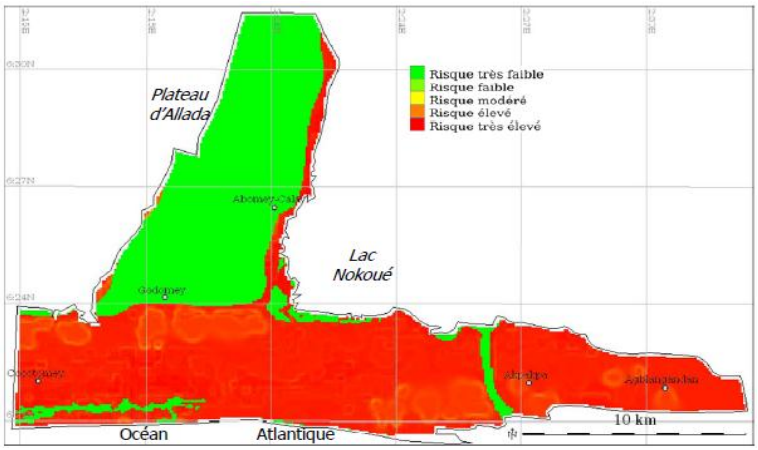


Diagram 1.5 : Degrees of flood risk of the Cotonou lagoon environment (CREDEL ONG, 2010).

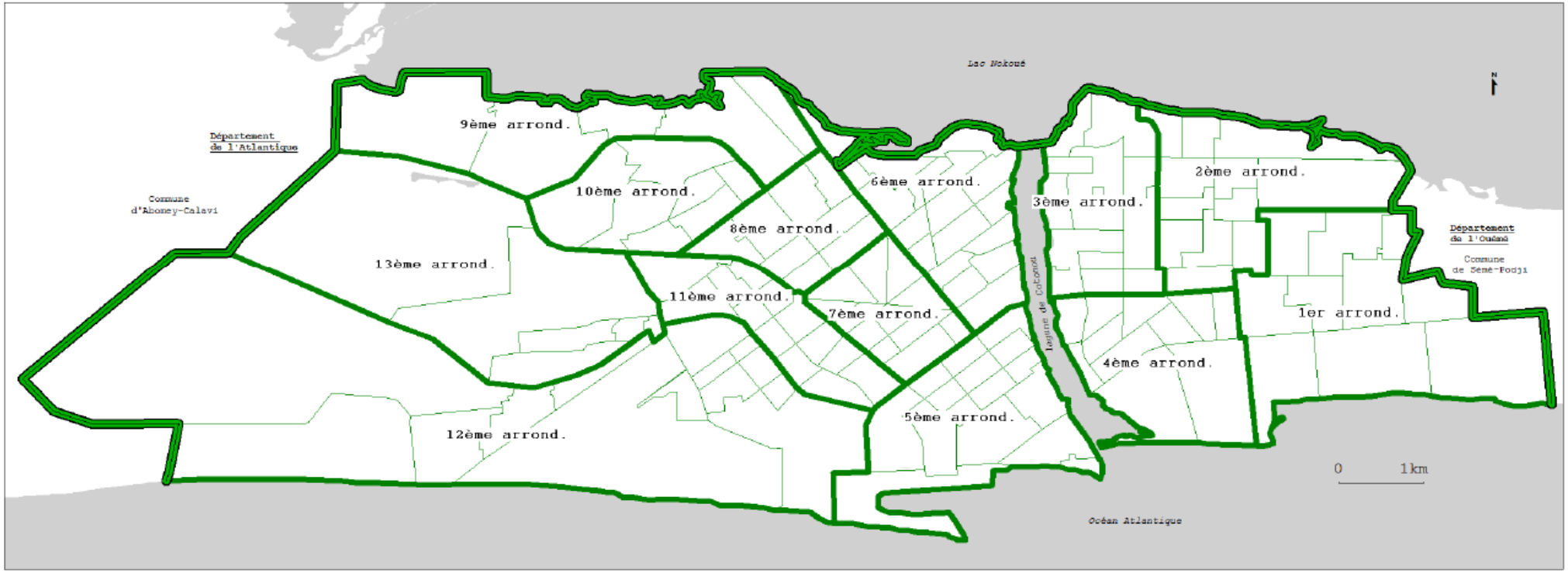


Diagram 12: Map of Cotonou town (Cotonou Municipality, 2008)

1.2. Socioeconomic context

19-Cotonou town contributes about 64.7% of urban poverty in Benin (PNUD, 1997). The major human activities poles in the surroundings of Cotonou lagoon are the Cotonou International Market, the Government welfare and administrative services, the private companies in the sectors of Hotel industry and catering, home-made dyeing and fisheries, inland water transportions of persons and goods.

20-The Cotonou International Market (Dantokpa Market including the Gbogbanou segment), where more than 500,000 users rush every day to encounter the 100,000 marketers, occupies the West shore of the lagoon covering a surface of 18 hectares (Diagram. 13). As a result of the transfer of the market on this site in 1962, there is an increase in the man-made pressure on the lagoon system, mainly bringing about various new sources of pollution (Ayadokoun, 1992; Montcho, 2005; Lawani, 2007; Vissin *et al.*, 2010).

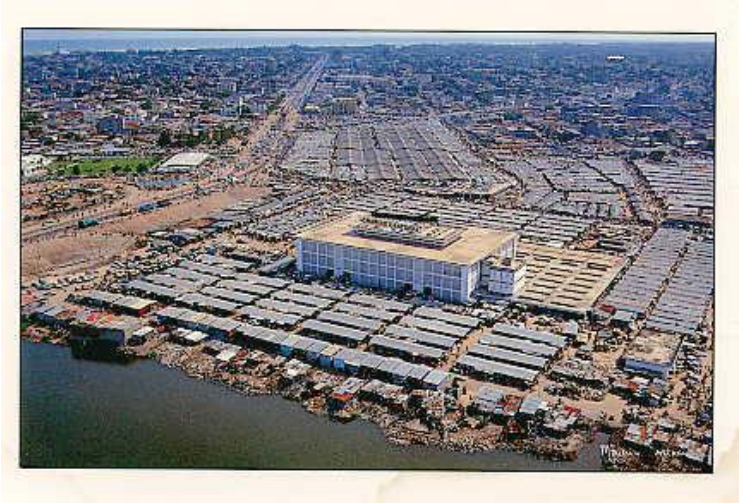


Diagram 13. Partial view of Dantokpa Market (www.cotonou.org)

The physical and biological characteristics of the Cotonou channel evolve at the rate of the periodical alternation of obstruction and opening. When the channel is opened, some volume of the overflowing water from Ouémé river and Nokoué lake directly flow into the sea, resulting in acceleration of the water level drops in the whole lower delta. (Pélissier, 1963). Every year, from December to April, there is always a reverse of water stream prompting salty water to sweep and flow into Nokoué Lake meanwhile the following floods reduce the water salinity.

21-At the same time the daily swell movements maintain a regular flow and ebb regime of sea water. As a result there are some impacts on the environment and human communities, on the sedimentation and filling up speed, water salinity as well as on the flora and wildlife sometimes prosperous, sometimes limited both within the channel and the whole South west Benin lagoon complex.

22- Districts or Town Sections directly covered by the project are indicated in the Diagram14. Table 4 shows the number of persons who can primarily benefit from the project.

23- Based on the third General Census of the Population and the Housing in 2002, about 15% of the poorest and most vulnerable populations of Cotonou will be covered in the short and medium terms. However, in the long term, the whole Cotonou town will be protected against floods and sea water level rise.

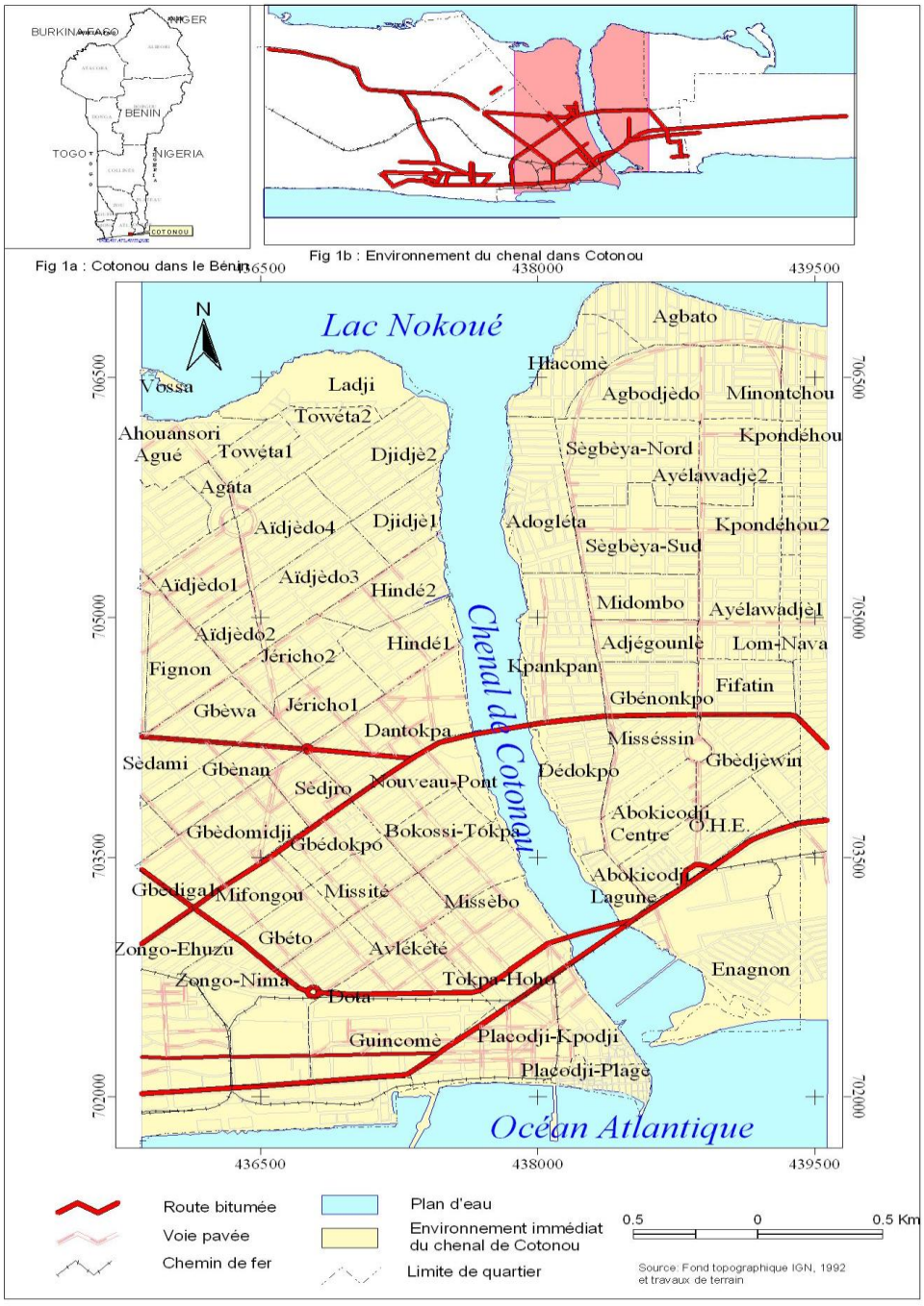


Diagram 14: Districts covered by the project

24-The socioeconomic groups targeted by this project are the direct project beneficiaries or those who are positively or negatively affected by its implementation. Those populations, community organizations, local authorities covered will benefit from:

- Infrastructures installed by the project;
- Economic and sanitary knock-on-effects induced by the banks fit-up;
- Capacity building for the grassroots stakeholders on issues such as vulnerability and adaptation of their mode and means of livelihood to the climate change.

25-More specifically, the various social-professional categories involved are:

- Fishermen
- Wholesale fishmongers (sellers of processed or not fish resources)
- Lagoon sand miners
- Restaurant managers
- Mangers of touristic and recreational centers (hotels, nightclubs, game rooms)
- Dyers
- Non Governmental Organizations
- Youth, women, physically-challenged persons associations, various business operators.

26-The secondary stakeholders are those that will influence the development project or indirectly affected. Those include: the Government, Cotonou Municipality, Project personnel, implementing agencies, SOGEMA, the NGOs working in the sector, private sector companies, banks and other development bodies.

27-The benefits derived from this project are basically the enhancement of the living conditions of the riparian populations and the protection of the banks. The infrastructures fit-up will foster the organization of economic, tourist and recreational activities. The Lagoon sanitation will improve the water physicochemical parameters and favor the living resources: reproduction of shrimp and fish species, migration of aquatic species from sea waters to fresh waters, etc. It will also favor waterside populations' health and that of all fishing products consumers who also are project beneficiaries as they will consume healthy products without any neither of risk microbiological poisoning nor through the heavy metals present in the lake.

28- Companies like CRUSTAMER, which harvest and process shrimps that have suspended their exports could resume. Women and women groupings who earn significant resources from shrimp harvest could easily increase their income. The village communities living on Nokoué Lake and Totché channel (Ganvié, Aguégué and others) could also feel the effects of the control of the channel opening onto the sea, since their ecosystems belong to the same fluvial-laguna complex referred to as the Beninese South-East complex.

Table 4: Riparian populations directly covered by the project

Town Sections	Areas	Concerned population			Number of households	Average size of the households
		Total	Men	Women		
3rd	Adogléta	5,500	2,689	2,811	1,302	4.2
	Gbenonkpo	3,171	1,529	1,642	757	4.2
	Hlacomey	1,552	806	746	339	4.6
	Kpankpan	5,637	1,787	2,850	1,208	4.7
	Midombo	5,476	2,638	2,838	1,229	4.5
	Agbato	6,143	3,024	3,119	1,339	4.6
4th	Abokicodji Centre	3,088	1,447	1,641	678	4.6
	Abokicodji lagune	1,455	757	698	269	5.4
	Dedokpo	5,042	2,476	2,566	1,114	4.5
	Enagnon	11,792	6,344	5,448	2,805	4.2
5th	Wlacodji Kpodji	603	293	310	159	3.8
	Wlacodji plage,	6,103	3,098	3,005	1,676	3.6
	Tokpa Hoho	1,899	895	1,004	446	4.3
	Missèbo,	1,539	744	795	371	4.1
	Bocossi tokpa	1,799	833	966	414	4.3
	Nouveau pont	1,324	608	716	361	3.7
6th	Dantokpa,	2,396	1,136	1,260	587	4.1
	Aïdjèdo 3,	5,037	2,445	2,592	1,255	4.0
	Hindé 1	4,795	2,293	2,502	1,121	4.3
	Hindé 2	4,157	2,108	2,049	965	4.3
	Djidjè 1,	4,117	2,039	2,078	954	4.3
	Djidjè 2,	4,637	2,277	2,360	1,039	4.5
	Ladji	6,075	3,132	2,943	1,220	5.0

Source : RGPH, 2002

1.3. Environmental context

29- The Cotonou lagoon's major environmental problems likely to worsen with the rise in sea water level and the extreme weather events (mainly floods, long-term drought and violent winds) result from (i) the erosion and degradation of socio-community as well as economic infrastructures established along the lagoon shores, (ii) pollution by household waste, used waters, home-made dyeing waste, oil products and other economic activities waste, (iii) occurrence of seasonal floods along the shores and riparian areas, (iv) breach of the regulation governing the fishing activities and (v) the low level of awareness of the local populations about the climatic risks and adaptation techniques.

i) Lagoon shores erosion and socio-community and economic infrastructures degradation

30- From the opening of the channel to its current situation, one observes an increase in the flows and ebbs between Atlantique Ocean and Nokoué Lake, throughout the Cotonou Lagoon (Dégbé, 2009). As a result of that, there is a physical erosion and degradation of the banks and the socio-community and economic infrastructures built along the Lagoon (Diagram 15). Generally, the erosion phenomenon is aggravated with the violent winds and floods. The ecosystem dynamics enables to forecast the forthcoming worsening of the situation with the rise in sea water level and the extreme weather events.

Overview

Partial view

Diagram15: Hôtel du Lac on the Cotonou Lagoon bank

31- Yet, one observes the collapse of the platforms of socio-administrative buildings, terraces of hotels and restaurants and other economic infrastructure established along the vicinity of the Lagoon. During the flood periods, the average waters level is higher than their level when these infrastructures were under construction 20 to 50 years ago. The violent winds are the causes of the huge waves sweeping into the lagoon, eroding the unstable shores and hurling the resulting solid waste and refuses of the wild dump onto the shores. The waves' impacts added to those of household and industrial used waters poured out by the urban gutters and local small-sized dyeing industries worsen more the unhealthy conditions of Cotonou Lagoon water and shores.

ii) *Pollution by the household waste, used waters, refuses produced by the local small-sized dyeing industries, the petroleum products and other waste generated by economic activities.*

32- The water quality in the channel and the exchanges between the sea and lagoon system will be negatively affected by the rise in sea water level and extreme weather events. Presently, it is during the low water that the sea water sweeps more into the Cotonou Lagoon (November-March). This period might prolong with the rise in sea water level which changes the water regime and quality as well as the ichtyofauna composition. More specifically, the waters drainage into the sea will be slowed down while the sand filling of the lagoon will be accelerated; floods will be more catastrophic and as a result the economic and social costs will be very high.

33-According to the findings published by Soclo (1999) and Roche International (2000), in the 1990s, Cotonou town used to produce annually 150,000 metric tons *solid waste* generated by the the households and Dantokpa market; the major part of this is disposed on the lagoon shores. At the end of the years 2000, the waste generation was estimated at 260,000 metric tons with its collection entrusted with 54 specialized Non Governmental Organizations. The refuse landfill strewing over the channel shores are composed of putrescent materials, biomedical waste, used apparatuses, batteries, heaps of iron and steel scrap, etc (Diagram 16).

34-The used waters volume is evaluated to 4,750,000 m^3 per annum, 72% of which is generated by the households and Dantokpa market and 28% by the industries and public services. 397,000 m^3 if this is disposed of in the lagoon. The main sources of used water are as follows:

- The local small-sized dyeing industries established along the channel banks since the 1990s;
- The urban waste of the Akpakpa-centre rainwater collecting sewer;
- The urban waste of the new bridge rainwater collecting sewer;
- The urban waste of Midombo rainwater collecting sewer;
- The urban waste of Hlacomey rainwater collecting sewer;
- The urban waste of Jéricho rainwater collecting sewer;
- The urban waste of the Dantokpa market rainwater collecting sewer;
- The urban waste of the Dantokpa Secondary School rainwater collecting sewer;
- The used water waste generated by "*Maternité Lagune* de Cotonou".

35-The construction of about fifty profit-making floating latrines onto the channel at Agbato size for instance, worsens more the water pollution.

36-The Cotonou channel is navigable for the transportation of goods and persons along the channel and from one bank to the other. Inland water transportation of goods and persons has no direct impact on the aquatic environment, but the risk of ecosystem degradation is huge when it comes to chemical pollution of water with the spillovers of ***chemical products*** smuggled from Nigeria, transported by inland water route and off-loaded in bulk over night per hundred jerry cans. Those petroleum products are frequently poured into the water during the handling operations.

37-The situation of the pathogenic germs is much more alarming. For instance, as far as the total coliforms are concerned, their number varies between 4,000 and 6,000/100ml in June (rainy season) and between 2,000 and 14,000 /100ml in September (end of the short dry season). As for the faecal coliforms, their number varies between 2,000 and 6,000/100ml in June with their quantities fluctuating between 1,000 and 11,200/100ml in September while the admitted standard for clean water is a maximum of 100 / 100ml. The coliforms-induced contamination is also observed in the wells in the riparian areas of the Cotonou Lagoon. (table 5)

Table 5: Bacteriological analysis of the Towéta 1 wells (according to Dovonou, 2008).

Parameter Sites	Total germs (1 ml)	Escherichia coli (100 ml) (1)	Faecal streptococci (100 ml) (2)	(1)/(2)	Clostridium perfringens (100 ml)	Staphylococci (100 ml)	Salmonella and Shigella (100 ml)
Well 1	700	1,100	120	9	1,500	8,000	450
Well 2	200	1,600	280	6	1,400	7,000	400
Well 3	350	1,500	250	6	1,800	7,500	250
Well 4	300	1,900	200	9	1,600	6,000	300
Well 5	600	2,200	300	7	2,000	8,000	500

Those bacteriological contaminations are favored by the changes undergone by the physic-chemical parameters of the channel water.

38-The temperatures recorded in the channel ranged between 28.5 and 30.8 °C (Bonou and Adisso 2002). These values are higher to the temperature of the ambient air which is 27 °C. If temperature is a factor conditioning the abundance of living fauna and flora, the variation of a few degrees in the water temperature could, for instance, be a prejudice for the fish or other microorganisms that are important in the food chain.

39-The pH values recorded in the Cotonou channel vary between 7.3 and 8.55 (Bonou and Adisso, 2002). These values which are higher to those of the sea and raw waters which pH mostly range between 6.5 and 8.5 (Guilcher, 1959), are allegedly due to the used waters disposed of in the channel by the rainwater collecting sewers. If by definition, the pH of the water measures the acid-base equilibrium in most of the natural waters, it mostly depends on the carbon dioxide – carbon bicarbonate – carbonate equilibrium. pH decreases when the CO_2 content increases and vice versa. The pH recorded in the channel and which is superior to the one of sea water and raw waters could, for instance, be harmful to the freshwater or anadromous species.

40-As far as the water salinity is concerned, the values recorded in the channel towards the river mouth (near to the sea) are higher (33.8 and 32.85‰) than those recorded far away from the river mouth which were 30.05 and 31.33‰ (Soclo, 1999). Salinity which indicates the salt content in a given mass of solution is an important factor for biodiversity. It varies according to the depth, temperature, input and output of the sea water (Marc, 1997). In the Cotonou Nokoué Lake-Lagoon system, the highest average salinity is observed at the inlet of the Cotonou channel with a striking difference between the surface water (9‰) and the bottom water (17‰). The highest annual salinity is observed in December with 36‰ in surface and 25‰ at the bottom (Mama, 2010). The salinity influences the electrical conductivity which translates the overall ions content in the water. The conductivity varies according to the electrolyte contents in the water and mostly with the temperature. (Le Barbe, 1993). The electrical conductivity in the channel varies between 41.5 and 51.6 mS/cm (Bonou and Adisso, 2002). The conductivity values recorded in the Cotonou channel that are superior to the threshold value (>500µs/cm) reported by

Belaud (1987), reveal that the channel water are highly polluted as a whole. The polluting ions peaks, namely ammonium ($NH4^+$) and nitrates ($NO3^-$) in the Cotonou Lagoon are observed between February and mid-May respectively, 0.9 mg/L and 5 mg/L (Mama, 2010)

41- Gases are of paramount importance for the welfare of the species living in the water. Among those gases, there is oxygen for the fish, CO_2 for the algae and the phytoplankton that are responsible for photosynthesis. The major part of the oxygen dissolved in the water is generated by the air where it represents 20.95% of dry air (Martin, 1985). The recorded values of oxygen dissolved in the Cotonou channel water range between 2 and 7.2 mg/l (Bonou and Adisso, 2002). Those values are low due to the high salinity of the water as the more saline is a solution, and the less dissolved oxygen it contains.

42- In view of the above-mentioned impacts, one can agree with Bonou and Adisso (2002) whose studies have confirmed that the Cotonou channel waters are subject to organic pollution under various forms, namely:

- Less oxygenated and less airy environment;
- Disturbed nitrogen cycle (low rate of nitrate and high rate of nitrites);
- Oligothrophic and less productive environment (low rate of phosphates);
- High faecal-borne bacteries corresponding to high values of biological demand in oxygen (BDO5) and chemical demand in oxygen (CDO).

43- It is worth recalling that the water content of oxydizable materials responsible for its impoverishment in dissolved dioxide can be assessed by measuring the quantity of dioxygen needed for their degradation. In the Cotonou Lagoon, the highest value of demand of biological oxygen (DBO5) is recorded in February (35 mg/L). At the same time, the highest average content of chlorophyll in the surface water (60 µg/L) translates an important activity of photosynthetic production. It is three times less in depth (20 µg/L), and, the highest activity is performed in December (140 µg/L).

44- However, the heavy metals (lead, cadmium, copper, zinc and iron) brought by the dyeing waste and other metallic residues have a negative impact on the oysters living in the channel (Dovonou, 2000).

45- By reference to the water quality standards (table 6) one realizes that the Cotonou channel pollution situation is alarming, and this can generate other negative impacts on the aquatic ecosystems. That pollution could lead to a drastic decrease in productivity of the channel as a whole, and halieutic resources, in particular.

46- One should fear the risk of disappearance of this water body as a result of the sand filling, because its environment becomes more and more anoxic.

47- Faecal pollution could constitute another hazard to human populations' health and more specifically the fishing populations, although that water is not used for drinking purposes. It could be a potential source of contamination through swimming, mostly to the fishermen and sometimes to some riparians. The numerous wastes strewing over the channel banks or which are directly disposed of in the channel affect the physico-chemical parameters of the water body, and subsequently the water quality as well as the biocoenosis. As such, organic and chemical

pollutions emanating from those wastes and the induced hydro-sedimentological changes constitute the major factors deteriorating the quality of fish habitat.

Table 6: Multi-criteria matrix of water quality assessment (Beaux, 1998)

Decreasing quality	Excellent	Good	Passable	mediocre	pollution
Quality class	1A	1B	2	3	4
Temperature (°C)	<20	20-22	22-25	25-30	>30
Conductivity (µs/cm)	<400	400-750	750-1500	1500-3000	-
pH	6.5-8.5	6.5-8.5	6.5-8.5	5.5-9.5	<5.5 or >9.5
Dissolved Oxygen (mg/L)	>7	567	365	<3	-
Substance in suspension (mg/L)	0	<30	-	30-70	<70
BDO5 (mg/L)	<3	3-5	5-10	10-25	25
DCO (mg/L)	<20	20-25	25-40	40-80	>80
Nitrates (mg/L)	0	<44	-	44-100	>100
Ammonium (mg/L)	<0.1	0.1-0.5	0.5-2	2-8	>8

48- Fishing dwells the main permanent activity performed along the Cotonou channel by professional fishermen. But the general unhealthy state observed in the vicinity of the lagoon also affects halieutic products which are in majority improper for consumption. The works by Youssao *et al.* (2011) revealed among the most consumed fish species like *Sarotherodon melanotheron*, *Tilapia guineensis* and *Hemichromis fasciatus*, harvested in the Cotonou lagoon during the minimum flow period, lead content of 1.25 to 1.50 mg/kg and exceeding 2 mg/kg at the level of the fish liver. As those values are higher than the standard values ranging between 0.2 and 0.4 mg/kg set by the World Health Organization (WHO, 1995). Among the most highly-prized shrimp species on the market (*Penaeus notialis* and *Macrobrachium sp.*), the Lead content is still the highest during the minimum flow period. It was 3.5 mg/kg between August and September 2008 (Changotadé, 2010). That was initially, in 2004 and during a period of over a year and half, one of the reasons behind the suspension of shrimps imports from Benin by the European Union Foods and Veterinary Office. Fish and shrimps consume Lead from the sedimentary deposits in which Lead content reached 535 mg/kg during the minimum flow period. In August-September (period of high water), Lead content in the sedimentary deposits varies between 0.2 and 1.6 mg/kg.

49- The ecological impact of water pollution is observed at the level of the organisms, populations, biocoenosis and ecosystem. At the organisms' level, water pollution, in particular the induced poisoning could be first and foremost identified based on morphological and physiological criteria (Gaujous, 1995). As such, should there be a chronic poisoning the next observation is the birth of abnormal forms, the

decrease in the growth rate among the individuals and the decrease in fertility. With the pollution impacts, the organisms change their behaviours and move towards some sites where the physic-chemical conditions are better. Aquatic organisms affected by an acute poisoning change their way of swimming and behave otherwise in the water. The juvenile population is drastically reduced as they are more sensitive to poisoning than the adult. The change of the sex-ratio is significant: one observes more stunted males.

iii) Seasonal flooding of the banks and riparian areas

50- Before the construction of Cotonou Port and its Eastern breakwater, Cotonou channel and Nokoué Lake used to behave like a lagoon closed to the minimum flow and opened to the rise in water level. During the minimum flow, the sea water level was averagely higher than the lake water's one. There was generally an average salinity in the lake due to the Ouémé and Sô rivers fresh water inflow, though in small volume, is slightly higher in the channel because of its closeness to the sea. A West to East salinity gradient was observed in the Lake. During the rise in water level, the level of the lake and channel was higher than that of the sea up to the disruption of the sandy belt of the mouth. Water level in the lake and the channel depended on the magnitude of the overflow and the mouth width. Those were essentially fresh waters. When the overflow happened to be disposed of to the sea throughout the Cotonou channel, the shoreline drift quickly closed the sand opening, limiting in so doing, the salty water flow in the channel and Nokoué lake (Roche International, 2000).

iv) Regulation governing in the Lagoon fisheries

51- Fishing activities in the Cotonou channel are carried out by the riparian and professional fishermen originating the lakeside villages established along the Nokoué Lake. Some of the fishing gears and techniques used are sources of potential bloody conflicts among the fishing communities. That is the case of the narrow-mesh gears used by about 3,295 fishermen registered in twenty-one (21) villages on the Nokoué Lake, Porto-Novo lagoon and Cotonou channel (Alapini, 2001; Bonou and Adisso, 2002). Due to the devastating character of this gear, its use is prohibited on all the water bodies in the Republic of Benin, by Decree N°98-522 dated November 5, 1998.

52- Regarding precisely the South-East fluvial-lagoon network, the Ministerial Order N°068/MDR/DC/CC/CP/ dated March 12, 1997, stating Fishery Regulation on the Ouémé River-Porto Novo Lagoon Delta- Nokoué Lake Complex, in the provisions of its article 20, prohibits fishing on the Cotonou channel. The end-purpose is to enable this water body to play a role of physical and biological exchange between the sea and the Nokoué Lake, to facilitate the halieutic species migration in both directions, to provide the sprawling grounds with adequate protection with a view to ensuring the natural restocking of Nokoué Lake and to reestablish the ecological equilibrium along the channel. Through that Ministerial Order, Public Authorities have proved their willingness to protect the ecosystem. But the fishing communities still are adamantly against its enforcement. As a matter of fact, eleven (11) fishing campings are identified in the riparian areas of the channel (Badahoui *and al.*, 2009). Those are Dancodji campings (Akpakpa Dodomé), Placondji Jetée, Ancien Pont (between the Old Bridge and the third bridge and the Directorate of Fisheries),

Abokicodji Lagoon, Dédokpo (between Yatch Club and Martin Luther King Bridge), Kpankpan, Midombo, Adogléta, Agbato, Minontchou and Ladji Campings. In these campings, the fishermen have access neither to potable water, nor to a sustainable housing, nor to a adequate sufficient habitable space. Sanitation and land security are compromised in the area. Those campings are established on the waste heaps and constitute unhealthy areas the occupation of which is strictly prohibited by the public authorities. Along the channel, 270 canoes have been registered at the same time (some are drawn alongside the fishing campings while others are operating on the channel water body), as well as 22 fish-trap (acadja) parkings, 352 pilling for set nets, 28 cast nets and 14 prawn nets traps (in a sedentary fishery specifically designed for the prawns. During the night, the fishermen hang vigil light to the net traps in order to attract the prawns and shrimps which are trapped into the gear pockets). Fishery is the main permanent activity of professional fishermen along the Cotonou channel. However, the unauthorized fishing activities not only harm the movements of migrant species between the sea and the lagoon system, but also affect the populations health due to the high-level contaminations observed in the fishing products. It is important and urgent to prompt the stakeholders, including the services in charge of regulation, to agree on a minimum of consensus in the well understood interest of each group of stakeholders.

v) Level of the local populations awareness on the climatic risks and adaptation techniques

53-The writing of national documents relating to climate change and commitments of Benin as part of the United Nations Framework Convention on the Climate Change has regularly been a matter of participative approach involving all the stakeholders. That is mainly the case of the National Action Program on Adaptation to climate change (PANA) which ended in 2007. Cotonou Municipality is part of the fishery agro-ecological area which is one of the four most vulnerable segments to climate change in the country: The most vulnerable communities actively partook in the works through their representatives and the NGOs. However, while addressing specific thematic such as the Cotonou Lagoon Ecosystem and human systems vulnerability to the climate change, few stakeholders showed a cognitive understanding of the issue. This translates the need for conducting a permanent information and awareness campaigns to the large public, beyond the national traditional campaigns. That is why at local level, it would be relevant to ensure the sensitization/ training of municipal, district and town sections' authorities. It is their responsibility to meet the grassroots communities' needs in term of sensitization and training. All the same, awareness campaigns will be permanently organized in the course of the project implementation, and beyond, on the very Cotonou Lagoon shores. As such, the special conditions of its origin, the regulatory role it plays on the floods in Cotonou as well as on the wildlife and flora within the South Benin Lagoon complex, the situation of poverty of the riparian populations with their constant high pressure on this ecosystem also pressurized by the Cotonou International market users, constitute some circumstances worsening the Cotonou channel vulnerability to the negative impacts of climatic variability, extreme weather and climate change. That is why Benin Government envisages accompanying the most vulnerable livelihoods along along the cotonou Lagoon with a view to implementing

the most appropriate adaptation strategies through the resolution of problems like shores' erosion and infrastructure degradation, health, access to potable water supply and sanitation in a clean environment that meets the requirements of modern life for the current and future generations.

54- This project is a part of a large coastal protection program to address the rise of sea water level identified by the Benin Government in the National Action Program on Adaptation (PANA) to climate change (MEHU, 2007). This is the general context substantiating this project which aims at enabling the Cotonou channel to fully play its regulatory role of hydrological regime of the Beninese South-west fluvio-lagoon system and its role of facilitator of migrations of aquatic fauna in between the sea and the fluvio-lagoon system, irrespective of the negative impacts expected from the climate change. The main beneficiaries are the fluvio-lagoon ecosystem components and the Cotonou populations, mainly the riparian communities of the channel.

55- It should be noted in the sector of environment that a permanent effort is expended towards mainstreaming the crosscutting nature of environment in the various strategic documents. On this purpose, the Government shall see to ensure that the national development process is implemented in the strict respect of the global environmental standards enshrined in the conventions ratified by Benin. In this regard, the national policy aims at: (i) strengthening the mainstreaming of environmental issues in any development projects as well as in the decision-making processes by implementing the Strategic Environmental Evaluation (SEE); (ii) developing environment management tools such as the Millennium Ecosystems Evaluation approach (EEM), promoted by the United Nations System; and (iii) the enforcement of the regional and international conventions. The sustainable management of environment, ecosystem and human communities around the Cotonou lagoon, by and for the populations concerned, ie, the riparian populations, the Dantokpa and Gbogbanou International Markets users, the thousands of economic agents and craftsmen established along the banks and that undergo the ecosystem degradation impacts as well as the high pollution of those shores, are parts and parcel of this policy.

56- Were this project not implemented, the Cotonou lagoon might fill up, bringing about the loss of its biodiversity and exposing half of Cotonou town to quasi-permanent floods which would subsequently disorganize the economy of the town.

57- Due to the small sizes of the water stretch and considering the magnitude of the major climatic phenomena, climate risks in the coastal area (rise of the sea level, floods and prolonged droughts, violent winds, increased of sea surface temperature) are not differentiated with the first observations, in the space and alongside the lagoon. Where they are realized, the climate risks quickly spread over the stretch of water. However, in-depth studies reveal how the magnitude of minor variations in climatic risks will be appreciated in microclimatology. On the contrary, the environmental issues are well differentiated along the lagoon as far as of human activities nature and intensity are concerned. (Diagrams .16 and 17).

58- Adaptation measures are not the only response to flooding risks although these are the most visible, and furthermore draw the populations' attention. The prolonged droughts which determine a long-term minimum flow favors the sea water inflow responsible for the erosion the slopes feet just like the waves induced by the violent winds and boats and power-driven canoes during the same period.(reinforced concrete wall sustained by light enrockments proposed in Component1.

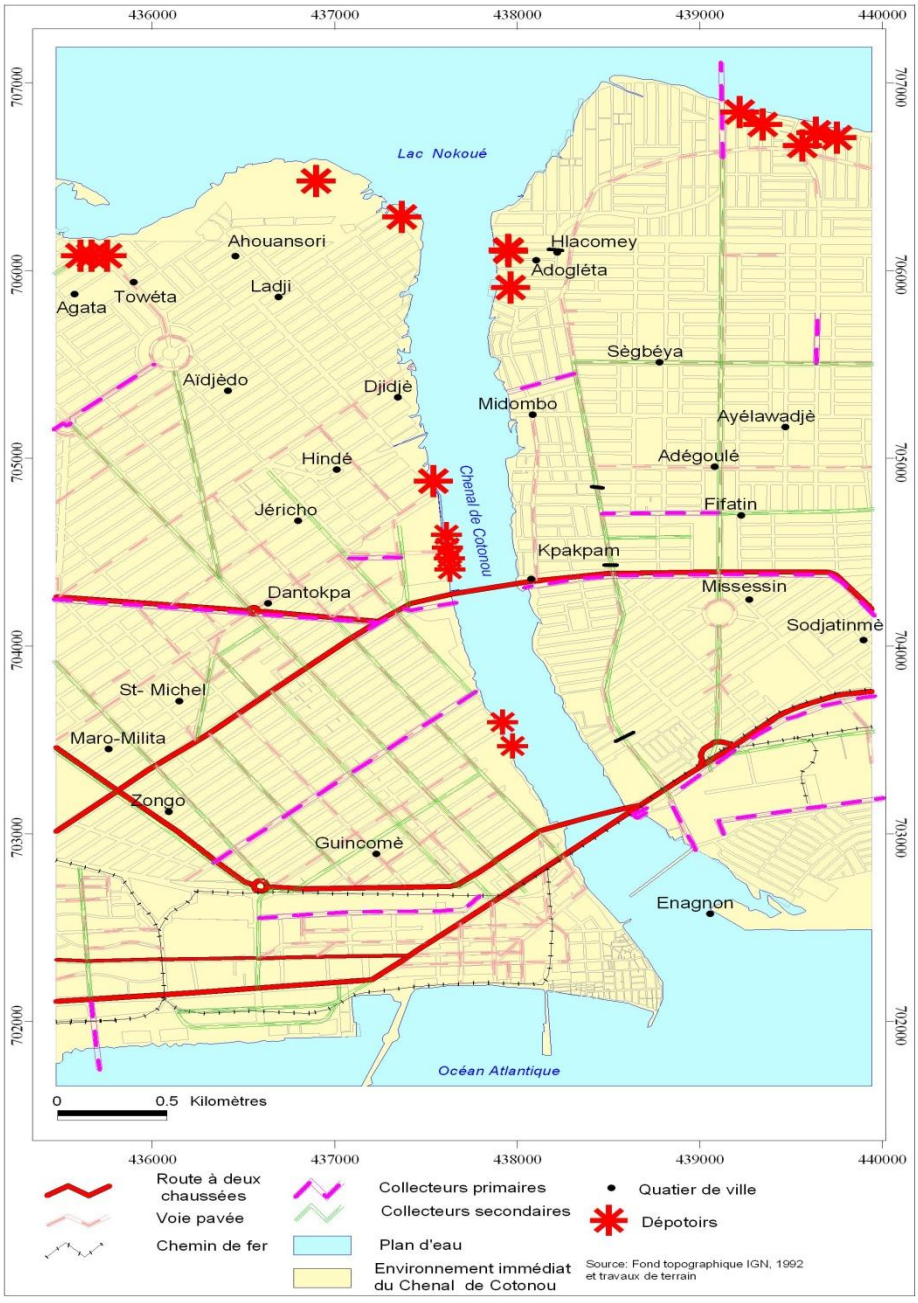


Diagram 16: *Distribution of effluents and storm-water sewer along the Cotonou Lagoon.*

59- The Emergency Project for Environment Management in Urban Area (PUGEMU) funded by the World Bank, further to the 2010 floods, for the benefit of the major

cities in Benin shows the importance of floods and among others, that the climate risks are of special concern. Of course, adaptive actions advocated in the context of this project, such as the treatment of urban waste generated from the main drain sewers of the Cotonou city before their pouring into the lagoon, are part and parcel of this project. This section will enable to avoid the spread of contaminants all over the Lagoon under the impacts of its own flows and rise and fall of the sea.

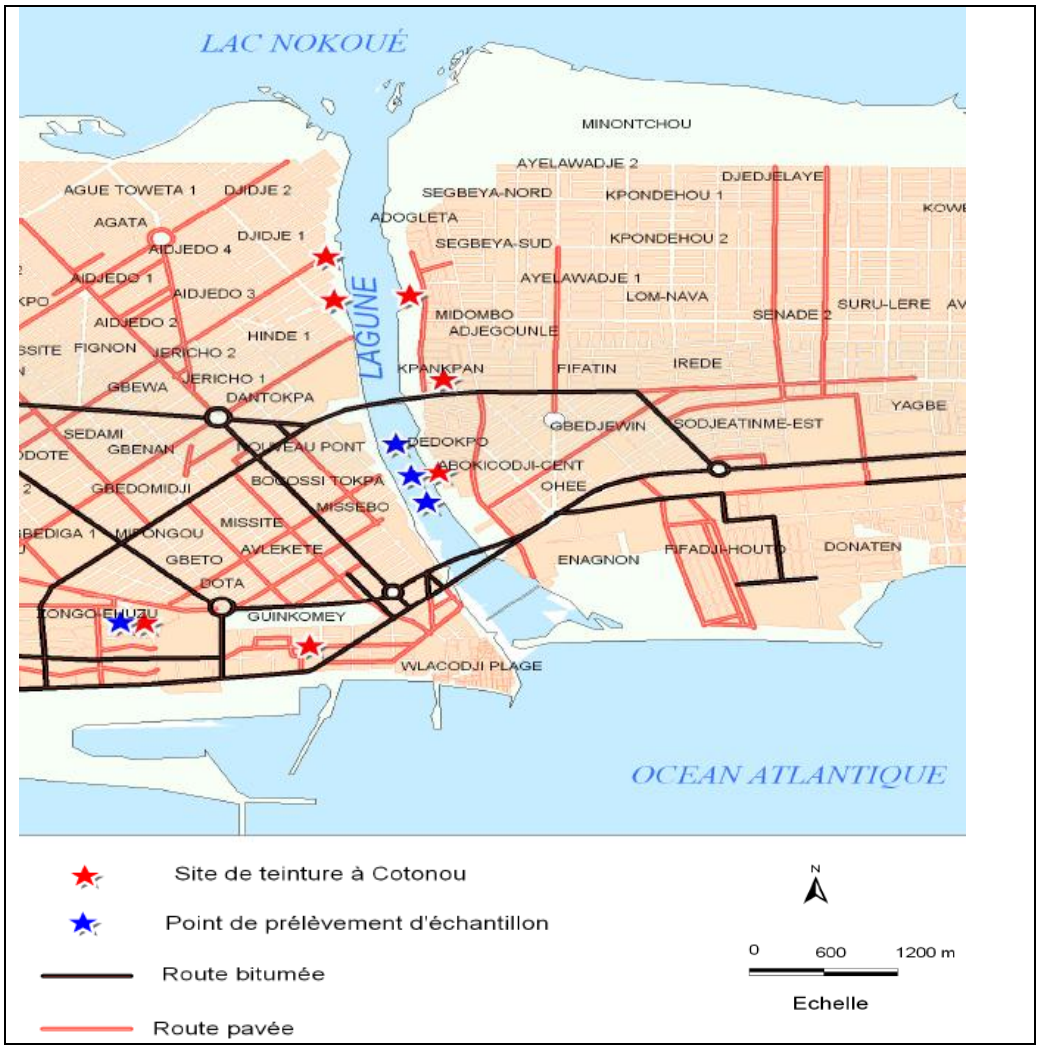


Diagram 17: Distribution of cottage-type dye works and control of the sites of waters polluted by heavy metals in Cotonou.

60- The Cotonou harbor protection groynes construction is the major cause of lack of sand at the Cotonou Lagoon mouth. The sand stopping groyne that was prolonged in 2010 protects against the sand filling of the port basin (Diagram 18). The Siafato breakwater and six (6) other groynes under constructions underway at the East of the lagoon mouth of the Lagoon have no obvious direct influence on the lagoon system.

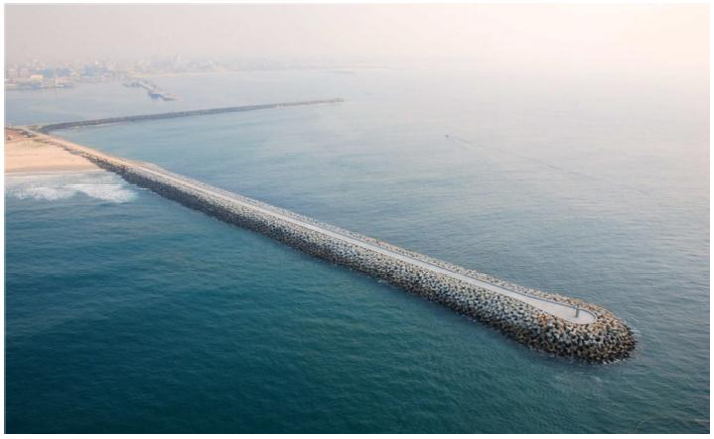


Diagram 1.12 : *Sand stopping groyne at the Cotonou sea port prolonged to 300 in 2010.*

PROJECT OBJECTIVES:

General Objective

61- The project aims to contribute to implement coastal component of Benin's National Action Program (PANA) on Adaptation to Climate Change elaborated in 2007. The overall objective is to accompany Benin Government to support local authorities and the Cotonou Lagoon riparian populations in their efforts to reduce the adverse effects of climate change on their means of livelihood and climate resilience.

Specific Objectives (SO)

62- SO1. Implement appropriate actions to protect the Cotonou lagoon banks and shores through a series of anti-erosive actions, restoration and rehabilitation of the riparian socio-community infrastructures threatened by the rise of sea water level and extreme weather vagaries (floods, violent winds, increase in sea surface temperatures, prolonged droughts), but also the anthropogenic pressure on the undeveloped banks and shores. The operation and use of community and adaptation infrastructures should enable the local communities to generate financial resources to be used for maintaining the works and the adaptation infrastructures;

63- SO2. Implement appropriate actions to fight against the pollution of the lagoon vicinity and the living environment of populations by solid and liquid wastes. The degradation and lack of maintenance of the banks and shores have fostered the invasion of such spaces by the household and industrial waste and their colonization by illegal activities of all kinds, real sources of nuisance to public health, which must be overcome.

64- SO3. Implement appropriate actions to fight against seasonal floods of banks and riparian areas of the Cotonou lagoon and promote the establishment of business operators along the developed lagoon banks. The Cotonou dam built to regulate flow exchanges between the sea and the lagoon was not functional due to lack of maintenance. This specific objective aims to restore the dam's initial function and

create economic conditions likely to secure local resources that can be mobilized for the maintenance of the dam and all adaptation infrastructures.

65- SO4. Support the review the legal instruments regulating activities on the banks and lagoon, their adaptation to the climate change-induced constraints and to the improvement of the means of livelihood within the local communities, as well as the retraining of some fishermen in the new economic activities generated by the development of the Cotonou lagoon banks. The official prohibition of fishing activities in the Lagoon and their performance tolerated by some governmental authorities for social and political purposes give room for clandestine illegal fishing activities conflicting with any technical or ecological standard. Therefore, it is necessary to mainstream here the laws and regulatory provisions taking account of climate risks, sensitize fishermen populations to that end and support some among them to shift to other economic fields.

66- SO5. Sensitize and train local communities and the technical officials on climate risks, adaptation techniques and good practices needed for protecting the ecosystem, the human communities and their own interests, and to limit the adverse impacts at a level compatible with their legitimate ambitions for an economic and social development. Graduate students may tap into the achievements of this project in writing their thesis. Such achievements will be the subject matter of a report at the end of the project at local, national and international level.

Expected Results

67- **Result 1**: The Cotonou Lagoon shores are protected against the erosion resulting from the rise of sea water level and extreme weather events and the riparian socio-community infrastructures are rehabilitated and improved.

68- **Result 2**: The lagoon and living environments of the populations are protected against solid and liquid wastes-induced pollution in order to limit the spread of pollutants through the water exchanges between the sea and Lake Nokoué, the contamination of lagoon ecosystem and the threats on the health of the riparian human communities.

69- **Result 3**: The Cotonou Lagoon shores and riparian areas are protected against seasonal floods and the environment is conducive for the establishment of business operators.

70- **Result 4**: The regulatory texts are reviewed and adapted to the climate change-induced constraints and adaptation strategies of the local communities and a support is brought for the redeployment of affected fishermen.

71- **Result 5**: The local communities and the technical officials' awareness is raised on the climatic risks: they are sensitized and trained on adaptation techniques to climate change and the best practices needed for protecting the ecosystem, human community as well as their own interests in order to limit the negative impacts to a level that is compatible with their legitimate economic and social development ambitions.

72- Those objectives and the expected results are organized in two main components dedicated respectively to the (i) material adaptation activities which consist in physical adaptation measures (installation or rehabilitation of infrastructures meant

for fighting against the forms of natural and anthropogenic degradation of banks and lagoon environment and exacerbated by the variability and climate change) and (ii) social, educational and environmental adaptation activities (sensitization and training of populations, regulation of human activities likely to worsen and debase the living environment and capitalization of project's experiences).

73- The component of activities pertaining to material adaptation will consist of civil engineering works. Those investments will enable to fight against adverse effects of climatic risks on the riparian communities and their resources. This will be the most important component in terms of cost (more than 75 % of the operational activities cost).

74- The component of social, educational and environmental activities of adaptation aims to sustainably withdraw the victim populations from the social and environmental impacts of degradations that the first component will have helped to correct. Despite the low cost of this component, it is the one that will secure the adaptation infrastructures sustainability, owing to the behavioral change among the populations.

Those components are:

1. The lagoon banks protection and the fight against seasonal floods;
2. Mainstreaming climate variability in environment management by the riparian populations and capitalizing on the project's experiences.

75- To these technical components, is added the management and administrative component and administration without which the project successful implementation cannot be a reality.

Achieved results could be deduced from one another as follows:

76- Shores' stabilization and protection against the erosion induced by flooding and the rise in sea water level, the violent winds and hurricanes (result 1) is the baseline result, which will create enabling conditions for achieving the other results.

77- Stabilized shores and banks will enable the free ebb and flow of sea and Nokoué Lake waters without draining the shores' collapsed talus which muddy the lagoon water. In the clean water, the origin of solid and liquid waste will be easily identified and controlled by the actions that will be initiated as part of the project. Hence, the quality of water, fish, shrimps and populations health will be protected (result 2)

78- Seasonal floods are due to the poor functioning of the Cotonou dam which does not facilitate the free flow of the Ouémé River and Nokoué Lake flood into the sea. The dam stabilization will enable to henceforth avoid seasonal floods and guarantee the continual performance of the business operators' activities using the water body for commercial, tourist or recreational purposes (results 3).

79- In order to ensure the Lagoon water sanitation, it is necessary to redefine the activities that will hence be carried out on the banks and along the channel in line with the subsequent review of statutory texts: the fishermen will be re-oriented and redeployed towards new job opportunities generated with the shores development or other job opportunities (result 4)

80-The socio- community infrastructures that will be rehabilitated or constructed along the banks will enable to promote the culture of adaptation to climate change impacts. The promotional activity might be prolonged by site visits, pupils and students' training activities, socio-cultural sessions organized by the riparian residents and the dissemination of experiences acquired from the project implementation (results 5).

PROJECT COMPONENTS AND FUNDING:

The project includes two operational components and one implementation and management component as presented in Table 7.

Table 7: Project components and funding

Component 1: Lagoon banks protection and fight against seasonal floods					
ACTIVITIES	**CONCRETE EXPECTED OUTPUTS**	**EXPECTED RESULTS**	**INDICATORS**	**AMOUNT (X 1,000 US$)**	
Activity 1.1: Protect the banks slope of the sandy segments of Cotonou lagoon against landslides.	**Output 1.1**: Four point three 4.3 kilometers of sand segment protected with a reinforced concrete wall along the shores.	Protected Cotonou lagoon shores talus against slumping	The shores length along which a reinforced concrete wall is put six (6) months later the completion works	2,621	6,814 Including transportations and the charges of national and international missions
Activity 1.2 : Construct pavement walkways along the embankments	**Output 1.2** : Four point three (4.3) kilometers of pedestrians road of 2 meter width paved along the shores	Upper side of the embankment slope stabilized and accessible to populations	The shores length of which paved roads remained stable six (6) months later the completion works.	3,642	
Activity 1.3: Build on both riversides and on convenience sites, landing stages for users access and for economic and tourism activities (fishing, transport, water sports, promenades by canoe and little boat, etc.)	**Output 1.3 :** Eleven (11) landing stages established along the embankments	Easier exchanges and transport of populations and goods crossing the Lagoone during floodings	Number of works fully operational six (6) months later their layout	217	
Activity 1.4 : Build environment-friendly public toilets as well as social and economic facilities alongside the banks	**Output 1.4 :** Twenty-two (22) public toilets, 86 metallic waste bins; 645 sidewalk benches; 150 light poles and 645 trees installed along the shores	Bodily needs of the users of banks satisfied in cleaned up environmental in spite of climate variability and climate change Controlled seasonal flooding in targeted area	Number of operational toilets six (6) months later their construction, number of new toilets built by private operators twelve (12) months later.	217	

Activity 1.5 : Restore the Cotonou dam	**Output 1.5** : The Cotonou dam rehabilitated and operational		The hydrological behavior of the river mouth twelve (12) months after the works	117	

Component 2: Integration of climate variability in environment management by the riparian populations and capitalization of the project experiences					
Component 2.1: Fight against water pollutants and fishes and aquatic animals contamination					
ACTIVITIES	**CONCRETE EXPECTED OUTPUTS**	**EXPECTED RESULTS**	**INDICATORS**	**AMOUNT (X 1,000 US$)**	
Activity 2.1.1: Prohibit the practice consisting in disposing household solid waste in the ground in SOGEMA markets and in the riparian areas of the lagoon	**Output 2.1.1**: The household solid waste management system improved in the riparian areas as well as Dantokpa and Gbogbanou markets; Ten waste metallic tanks available for SOGEMA and the other four riparian town sections; (Capacities building, and the NGO, Municipal and Environmental Police Units equipped; Prohibitory signs installed)	Capacity built for prohibiting the disposal of household waste on the land along the lagoon shores and for reducing waste charges in floods water Capacity built for collecting and value adding to non biodegradable waste	Lack of wild dump on the banks	72	**218 Including transportations and the fees of national and international missions**
Activity 2.1.2 : Collect and recycle non biodegradable solid waste are collected in the Dantokpa and Gbogbanou markets	**Output 2.1.2** : two hundred (200) aluminium bins and two hundred (200) baskets put at the disposal of the Dantokpa Market and Waste Recycling Women Association (AFRMD) for collecting and recycling biodegradable waste	Capacity built for collecting and value adding to biodegradable waste	Increase rate of waste volume collected by AFRMD 12 months after the material support	4	

Activity 2.1.3: Collect and recycle biodegradable solid waste are collected in the the Dantokpa and Gbogbanou markets.	**Output 2.1.3** : Two hundred (200) small pieces of composting materials put at the disposal of the Houéyiho Truck-farmers Association	Reduced risks of disposing contaminated used waters in the lagoon and the risks of waters contamination	Increase rate of the volume of compost manufactured by AMH 12 months after the material support	2	
Activity 2.1.4 : Fight against the disposal of urban waste in the rainwater sewers of Cotonou town	**Output 2.1.4**: The urban waste no longer disposed of in the rain water sewers of Cotonou town		This Component is covered in the Emergency environmental and urban area management project (PUGEMU) funded by the World Bank	PM	
Activity 2.1.5: Bring material support for the Naval Forces Unit posted date the entry of the channel in order to intensify the fight.	**Output 2.1.5:** New means of over night intervention put at the disposal of the Naval forces posted at Ladji area. Awareness programs broadcast for sensitizing the populations		The increase rate of over night missions carried out by the Naval Forces Unit six (06) months after the support	70	
Activity 2.1.6: Sensitize, train and equip the local dyers craftmen with the best practices for managing the residual waters loaded with heavy metals.	**Output 2.1.6**: The local dyers' awareness raised and they hence apply the rational techniques of residual waters management		Percentage of the local dyers that adopted the new residual water management twelve (12) months after the training	20	
Activity 2.1.7 : Promote the establishment of the business operators on the developed shores	**Output 2.1.7** : At least ten (10) business operators undertake to developing tourism promotion activities along the Cotonou lagoon.		Number of entrepreneurship files initiated on the Lagoon six (06) months after the inception of the promotion	50	

Component 2.2: Integration of the climate change-induced constraints in the legal instruments regulating activities on the shores and in the lagoon					
ACTIVITIES	**CONCRETE EXPECTED OUTPUT**	**EXPECTED RESULTS**	**INDICATORS**	**AMOUNT (X 1,000 US$)**	
Activity 2.2.1: Support the integration of the climate change-induced constraints	**Output 2.2.1**: A decree regulating activities on the Cotonou lagoon and its shores, validated,	Captured climate change and adaptation techniques-induced	Decrease in the rate of offenses noticed by the agents of the Naval forces,	40	357 Including transportations and

and adaptation strategies in the legal documents regulating activities on the lagoon and its shores	signed by the Cabinet; the riparian community sensitized on the ecosystem sustainable management standards	constraints in the legal texts regulating activities on the lagoon and its banks, and former fishermen reoriented in new economic activities generated by the channel layout	Environmental Police and National Police six (6) months after raising awareness on the modes of livelihood based on the new legal texts.		
Activity 2.2.2 : Support the means of livelihood (fishermen, fishmongers, etc.) in the new activities generated by the layout of the Cotonou lagoon	**Output 2.2.2.1**: The target communities sensitized on new business and livelihoods opportunities in the lagoon, on its banks and around		Number of persons having adopted the new economic activities three months after the awareness création	17	
	Output 2.2.2.2: Persons distributed into three (3) associations receive material supports in order to integrate the new economic activities		Number of persons kept in the new activities six (6) months after the supports	300	

Component 2.3: Sensitization and training of the grassroots communities on the climatic risks, adaptation techniques, best practices and capitalization of experiences.

ACTIVITIES	CONCRETE EXPECTED OUTPUTS	EXPECTED RESULTS	INDICATORS	AMOUNT (X 1,000 US$)	
Activity 2.3.1: Sensitize/train the local elects, Municipal Councilors, Heads of the riparian areas and technical officials on the best practices and techniques of adaptation to climate change impacts.	**Output 2.3.1**: Two (02) training sessions are organized for local elects, Municipal councilors, Heads of riparian areas and the technical officials on the best practices and techniques of adaptation to climate change impacts	Ensured sustainability of experiences and the dissemination of the project outcome by the training of communities on the climatic risks, adaptation techniques and the best practices as well as the capitalization of experiences in the form of theses and dissertation	Number of persons sensitized ans trained on the best practices and techniques of adaptation to climate change impacts one (1) year after the sessions	69	140 Including transportations and the fees of national and international missions
Activity 2.3.2: Conduct the awareness campagn and training of the riparian communities of Cotonou lagoon on the best practices and techniques of adaptation to thee climate change impacts through	**Output 2.3.2**: The grassroot communities sensitized and trained on the best practices and techniques of adaptation to climate change impacts		Number of the communities members having developed at least one adaptation measure against the major climatic risks in the coastal area a year (1) after the sessions.	12	

the Local Authorities and NGOes					
Activity 2.3.3: Receive pupils and graduate students for their graduate works in order to disseminate the project achievements and organize a project completion seminar	**Output 2.3.3:** At least ten (10) graduate theses and dissertations of Engineers defended in the vocational colleges and universities on the topics of the project; the project reports submitted to the national and international institutions involved; about fifteen (15) workshops and meetings organized with the Journalists; a project completion conference is organized .		Number of theses and dissertations defended on the Topic of the project; numbers of institutions having benefitted from the project experiences;	59	
Total for Component 2				**715,000**	
TOTAL OF COMPONENTS				**7,529,000**	
PROJECT IMPLEMENTATION COSTS (9.5%)				**715, 255**	
TOTAL COST OF THE PROJECT				**8, 244, 255**	
PROJECT CYCLE MANAGEMENT FEES (8.5%)				**669,000**	
REQUIRED FINANCING AMOUNT				**8, 913, 255**	

PROJECT TIMELINE:

Table 8: Agenda

THE STAGES	DATES PRÉVUES
Inception of the project implementation	December 1, 2013
Mid-term review (if planned)	December 1, 2015
Project/Program completion	December 30, 2017
Final Evaluation	June 30, 2018

PART II: PROJECT BACKGROUND

A. *Describe the project / programme components, by laying special emphasis on the concrete adaptation activities, and how do those activities contribute to climate resilience. In the case of a programme, show how the combination of standalone projects will contribute to reinforce the overall resilience.*

81- Focused on the Cotonou channel locally referred to as "lagoon de Cotonou", Cotonou Lagoon, this project comes in support to local authorities and riparian communities in order to implement the adaptation options identified by themselves. Most of adaptation options are based on strategies some of which have already started their implementation. The project encompasses two components as follows:

<u>Component 1:</u> **Protection of lagoon banks and fight against seasonal floods**

82- The Benin shoreline has that natural tendency to developing coastal erosion. It is characterized by an offshore bar made up of soft deposits (coarse and fine texture sands), a high shoreline sand movement from the West to the East created by the obliquity of crests, and large seasonal fluctuations characterizing the swell causing the shoreline instability. With the construction of the Cotonou seaport and its protecting breakwaters, the Eastern area of the coast is deprived of the natural nourishing sand while it still nourishes the areas located in the East with sand. The first consequences are namely the erosion of the coastal sections directly located in the Eastern region of the port, the permanent opening of Cotonou channel's mouth, the increase of the rate of ebb and flow in the channel and the erosion of the banks which moved gradually by 1.5 meters in 1885 up to about 300 meters nowadays at some places. The rise of the sea water level and the extreme weather events contribute to worsening the erosion phenomenon (0.81 meter by 2100 under A1B) In spite of the degradation situation of the Cotonou lagoon shores where erosion has has stripped the rain waters outlets or used waters' main sewers and drinking water carriage conduits, the shores populations increased at a rate of 3.4 % between 1992 and 2002 (INSAE, 2002). The most important action consists in protecting the integrity of the banks and the populations health without hindering the migrating species movements, the water flow between Atlantic Ocean and Nokoué Lake, and the fish, shrimps as well as aquatic flora and wildlife breeding grounds

Diagram 2.1 : Outlet of rain waters or waste waters' main sewer, drink water conduits *stripped by erosion in an unhealthy environment on the banks of the Cotonou lagoon*

83-The envisaged options based on the shores segments specificities, are as follows:

- protection of banks sandy segments with a reinforced concrete wall;
- layout of paved pedestrian roads of 2 meter of width on a length of 4.3 kilometers with a trees belt along the banks;
- Layout on both banks, on appropriate sites, some boat landing wharfs and set access quays for the users and economic and tourist activities (fishing, transports, nautical sports, canoes and small boat ride, etc.).
- Construction of public toilets. Their interest is to enable the users of the boat landing wharfs to meet their needs.
- rehabilitate the Cotonou dam by leveling the crest to the initially planned +0.635 meter hydro coast by re-commissioning the sea-lagoon water exchanges setting system in order to avoid the close up of the lagoon mouth.

84-The proposed measures are potential responses to the threats which become periodical realities in the vicinity of the lagoon.

85-The specific threats associated to the adaptive measures proposed by component 1 are presented in the following table 9 below.

Table 9*: Specific threats associated to the adaptive measures proposed by component 1*

Proposed adaptive measures	Associated specific threats
1 : Protect the banks sandy segments with reinforced concrete wall	The banks slope Erosion by the sea ebb and flow and the waves caused by the violent winds, canoes and power-driven canoes. The threats are aggravated by the rise of the sea level, floods (top of slope), violent winds, long drought periods (foot of slope).
2 : Build a 2 meter width and 4.3 kilometer length paved roads with trees belt for pedestrians alongside banks	The shores erosion and caving (flat parties protecting the slope) by storm waters. Threat worsened by pelting rains and floods)
3: Construct on both banks, at appropriate sites, boat landing wharfs of access for the users and economic as well as tourist activities (fishing, transports, nautical sports, canoes and boat sail, etc.)	Banks degradation by populations in order to access their legal or illegal income generating activities on the water body stretch. The gashes opened in the slopes may be enlarged by violent winds and floods and bring about the collapse of the infrastructure.
4: Build public toilets along the shores.	The lack of public toilets along the shores prompts the users to commit anti-social behaviors along the shores.
5: Rehabilitate the Cotonou dam	Obstruction of the lagoon-sea connection mouth and seasonal flood of banks

86-Reinforced concrete walls are used by some private business operators established along the channel in order to reinforce the shore with their own business assets (Hôtel du Lac, Bar restaurant Le Berlin, etc.). The right shore of the channel mouth is also reinforced with reinforced concrete walls since 1976 with the view to protecting this shore segment against the erosion provoked downstream the West Breakwater of Cotonou Port. This proposal would, without challenging the existing governing provisions, extend the protection by a hard material to all the erodible bank sections. Besides, studies are envisaged in order to re-shape the works and make them tally the technical and environmental standards.

87-The pavement technology proposed in order to stabilize the shores is the one in use in Cotonou town apart from the super-elevated unfloodable main roads. Anyway, the sustainability of the works is ensured by the cavernous coatings (pavements, pebble stones). The major benefit for laying out the pedestrian road consists in rehabilitating the economic and socially-oriented function which enhances the riparian population life, facilitate their mobility along each shore, from one shore to the other and ensure their security.

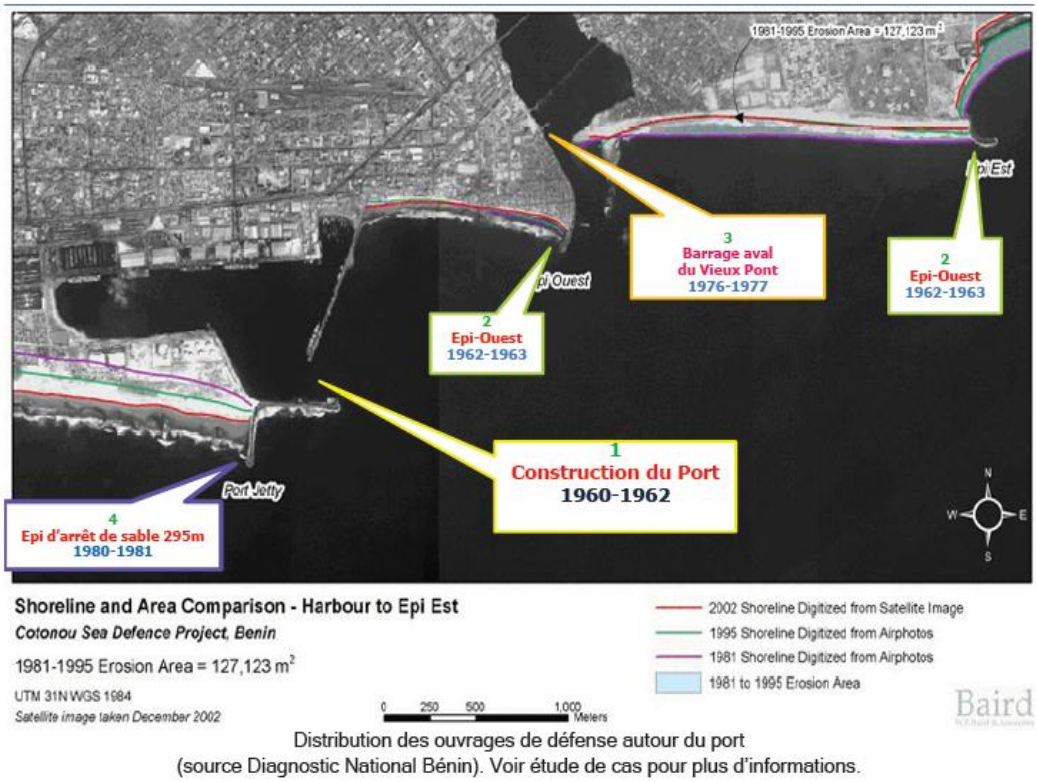
88- The proposed landing wharfs would come to rehabilitate and complement the existing works in order to facilitate the riparian populations movements in-between the two shores and vacate to their economic activities.

89-The public toilets as well as the socio-sanitary and environmental layouts will enable the users of the landing wharfs to ease themselves without harming the environment. The stakeholders proposed that those infrastructures be built close to the boat landing wharfs in order to provide the desirous business private operators to tap into the sanitized environment. The proceeds from the rent of those infrastructures could be used by the Local Authorities for the maintenance of the works and infrastructures.

90-The intervention proposed onto the Cotonou dam is a rehabilitation which should enable to re-establish the functionality of this work in terms of regulation of waters flows and floods on the lagoon shores. The dam blades are blocked by sand heap to such extent that one cannot change the orientation without using nowadays powerful cranes.

91-The choice of infrastructures was based on the result of the technical desk studies carried out by the relevant technical institutions such as the Directorate General of Urban Environment, further to a consultation with the stakeholders who made reference to the existing works. As a matter of fact, the right bank of the Cotonou channel mouth was, in 1977-1978 equipped with reinforced concrete walls prolonging the pier on the sea (West breakwater) and intended to curb the erosion provoked by the breakwater at its immediate lower reach on that shore. Against those reinforced concrete walls leans the small dam downstream of the old bridge breaking the water flow speed from Nokoué in case of floods. (Diagram 20). Those protection elements in hard materials are functional on the right shore of the mouth downstream the west gryone. The riparian populations have laid out a path on top of the reinforced concrete walls for their mobility. It is the efficiency observed with those materials

which substantiated the stakeholders' interest for that coating technology. The Technicians of the General Directorate of Urban Environment recommended the reinforced concrete wall for the other erodible sections of the channel.



Distribution des ouvrages de défense autour du port
(source Diagnostic National Bénin). Voir étude de cas pour plus d'informations.

Diagram 20: The Cotonou Port zone and channel mouth showing the downstream dam section of the old bridge leaning on the reinforced concrete wall on the right shore prolonged to the West gryone (UEMOA, 2010).

92. The bank or shore segments concerned by such measures are the ones on which a minimum consensus was reached in 2010 between municipal authorities and local leaders, i.e, the heads of Town Sections, the Heads of Areas, the development Associations (Diagram. 21). Those are also the segments the development of which was negotiated in 2011 (Diagram 22). The identification of the specific places of those works is in progress in consultation with local stakeholders.

***Diagram 21**: Bank Segment the layout of which was a matter of negotiation in 2010*

Diagram 22*: Bank Segment the layout of which was a matter of negotiation in 2011*

93 The robustness of the protection works and the zest for life they will be giving the riparian populations and the whole Cotonou dwellers should raise the populations' awareness about their capacities to resist the natural disasters should they show pre-emption through pertinent adaptation strategies.

94 Regarding the seasonal flood, we must recognize that with the opening of the channel in 1885 until the 1950s, the Cotonou Lagoon has relatively well fulfilled its mission of flood control in Cotonou town. Under the pressure emerging from the Ouémé river and Nokoué lake overflows, the sandy belt of the river mouth was yielded, causing waters drainage towards the Ocean and the lowering of the fluvio-lagoon system level. During the minimum flow period, the sea water used to flow into the channel and the coast drift provoked a sand deposit which finally closed up the river mouth until the following floods. The layout of port works in 1960 changed the lagoon hydrologic functioning. Indeed, built offshore since December 1960, the Cotonou Port is made up of a certain number of works including a Western rocky pier, with a length of 1,424 meters, and an Eastern crossing in steel-sheet piles long of 770 meters, which close the harbor area in the East while leaving an entry-pass of a width of 180 meters (Leite, 2002). The role of the Western rocky pier is to protect the harbor area against the Cotonou swell and currents impacts, in particular, the sand filling and the waves. Every year, it stops about 1 500 000 m^3 sand (Leite, 2002). One thus observes an almost total stopping of the nourishing sand contribution in the East and an accumulation of sand in the Western segment of the wharf. The impacts of this nourishing sand stoppage are the catastrophic erosion phenomenon observed on the socio economic works on Cotonou Eastern shore (Diagram 23) and the permanent opening of Cotonou channel which resulted in important hydro biological and socio economic changes (Baglo, 1980).

95 In order to limit the impacts induced by the permanent opening of Cotonou channel, a rocky dam was built in 1977 (Diagram.23) the objectives of which, according to Baglo (1980), were to:

- Reduce the recession speed in order to extend the freshwater species period of reproduction and growth;
- protect the bridges on the lagoon by reducing the currents speed;
- enable a certain flow of salty water in order to reduce the waters pollution impacts;
- avoid the flooding of Cotonou town;

Diagram 23 *: Sluice Dam at the Cotonou Channel mouth*

96 The dam was built out of a barrier of about 420 m and 6 straits of 4.5 m wide (Leite, 2002). The work comprises a setting mechanism for the sea-lagoon exchanges regulation. But the dam built is 0.32 meter higher than the envisaged work, as the

project owner had thought he was doing well by increasing the height. The flow exchanges were completely interrupted by a shoreline spit which heaped up in front of the dam, due to the significant reduction of the lagoon current, even before the end of the construction. This undesired closing made the setting mechanism handling inefficient, changed the currents trajectory at the mouth, and brought about the extension westwards of the current sand spit until completely closing the mouth on May 6, 1978, with the most catastrophic biological impacts and compelling the fishermen proceed with carrying out its damping (Roche International, 2000).

❖ ***Analysis of coastal structures impacts on the banks of the Cotonou Lagoon***

▪ *The Cotonou Port impact*

97 After the construction of the Cotonou Harbour, the bank protections works have been installed near the lagoon outlet. There are as follows:

- A breakwater referred to as West groyne rooted from the shoreline and from the extension of the western shore of the lagoon;
- A groyne of small length in the lagoon to limit the displacement of the channel westwards;
- A longitudinal defense between those two (2) works.

98 All those works were built with rocks harvested in Dan, a village which lies about 140 kilometers North of Cotonou. But only the western bank of lagoon outlet was protected. The lagoon bottom in-between the outlet, the Old Bridge and the Eastern bank still is affected by erosion up to 300 meters width at some places. The lagoon outlet into the sea has become permanent. This significantly contributed to increase the salinity in the lagoon and Nokoué Lake but bringing about disastrous impacts on the halieutic production.

99 In order to addressing the problems caused by the permanent opening of the lagoon outlet, a dam was built onto the lagoon (Diagram N° 24, 25 and 26) with as assigned role to partially close the outlet during minimum flow periods and to enable the drainage of overflows during rainy season. Between 1977 and 1984, the Lagoon outlet was artificially opened between September and October in order to drain the overflows from Ouémé and Sô, but was closed a few days after. In 1984, after several attempts to artificially open the outlet had failed, the riparian fishermen damped the dam in October 1984. Then the opening was maintained. Up to date, the outlet is never completely closed. It widens during the flood period, narrows down during minimum flows but is never completely closed.

100 In order to better address the regulation of exchanges between the sea and the lagoon, a lagoon outlet layout project was studied by SNC-LAVALIN as part of the Porto-Novo and Cotonou towns sanitation survey. Regarding the water exchanges regulation between the sea and the lagoon, the measures taken on the Lagoon during the construction of the Cotonou Port and the dam construction in 1976-1977 have enabled to limit the shores erosion. Unfortunately, problems continue to arise due, on the one hand, to floods and other extreme weather events which induce the flooding of

the shores and, on the other hand, the poor regulation of the flows exchanges between the sea and the lagoon.

101 To address these problems, LAVALIN' studies came up with the recommendation which consists in rehabilitating lagoon dam the crest of which must be leveled to + 0.635 hydro meter (+0.1 m IGN) and better resizing the sluices.

102 Those works should enable:

- a smooth drainage of the Ouémé and Sô overflows: the water level in the lake and the channel during over a decade floods shall not exceed + 1.775 hydro (+1.24 IGN)
- a perfect control of the Nokoué lake salinity during minimum flow: a salinity inferior to 7 g / L at any time and to 4 g /L during 7 out of 12 months for the entire lake, and a salinity inferior to 10 g /L in the Lake area close to the channel at any time.

103 Besides, another work seems to play a role of paramount importance in the protection of the Lagoon ecosystems, human communities as well as the shoreline located West of the East Breakwater. That is the "West" groyne built in 1962 along with the port infrastructures.

- *The Coastal Structures under construction*

104 While the West harbor Groyne had blocked port the entire shoreline transit and the coastal segment located between the port and the last coastal protection work (East gryone or Siafato groyne) having been stabilized, the expected erosion moved to the coast segment located east of the protected area (Eastern of the East gryone). From that place, occurred a disastrous erosion. At the immediate Eastern segment of the area, about a width of 600 meters of land strip was lost since 1963, that is a rate of over 12 meters per annum.

105 In order to ensure the protection of the coast on the East of East Groyne, a project was initiated by the Ministry in charge of public environment. The Works started in 2011 are currently in progress. Coastal infrastructures envisaged in that project are distributed into two (2) areas and include:

- **Area 1**: (Diagram 24)

✓ New East groyne (the former one is re-oriented) by a length of 250 meters ;
✓ Reinforced concrete wall of the beach top over 290 meters longitudinally to the coastline;
✓ Groyne 1 of a length of 160 meters with a grounding anchor of 15 meters; It has an **L** shape oriented West in order to prevent sand leakage from the compartment formed by the zone 1; it will also be strengthened at the foundation in order to prevent erosion from by-passing it on the eastern side.
✓ Sand nourishment of 340,000 m^3 of sand (Phase I)
✓ A second phase of sand nourishment is envisaged later in order to fatten more the area, if the need arises.

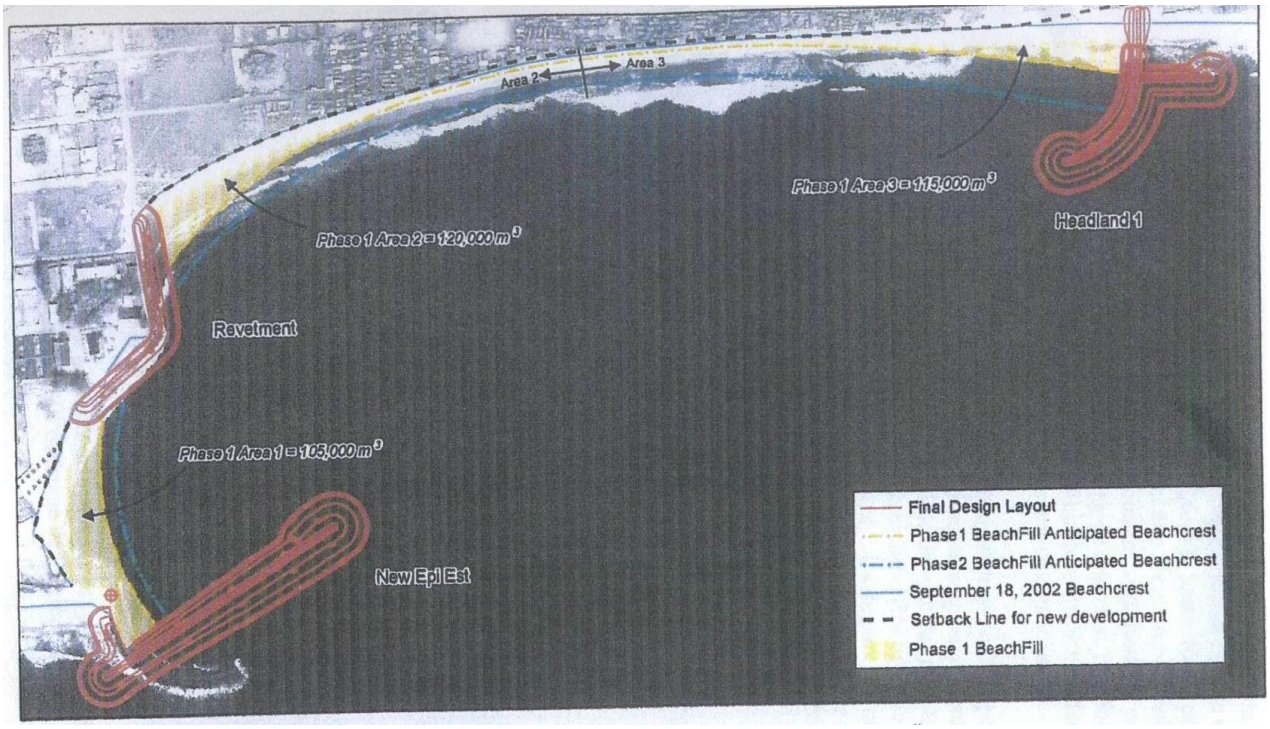


Diagram 24*: Zone 1 of implementation structures*

- **Zone 2:** (Diagram 25)

Groynes 2 to 7: The Gryones 2 through 7 make an angle of 30° with the Eastern shore in order to prevent erosion from by-passing the Eastern side. They have a length of 160 meters with a 30 meter anchor on the land; the most located Eastern of the system will have a 50 meter anchor and thus a total length of 180 meters. The space between the groynes varies between 900 meters and 1,100 meters. As much as possible, the groynes will be built in areas that will avoid the destruction of buildings existing before the beach stabilization works.

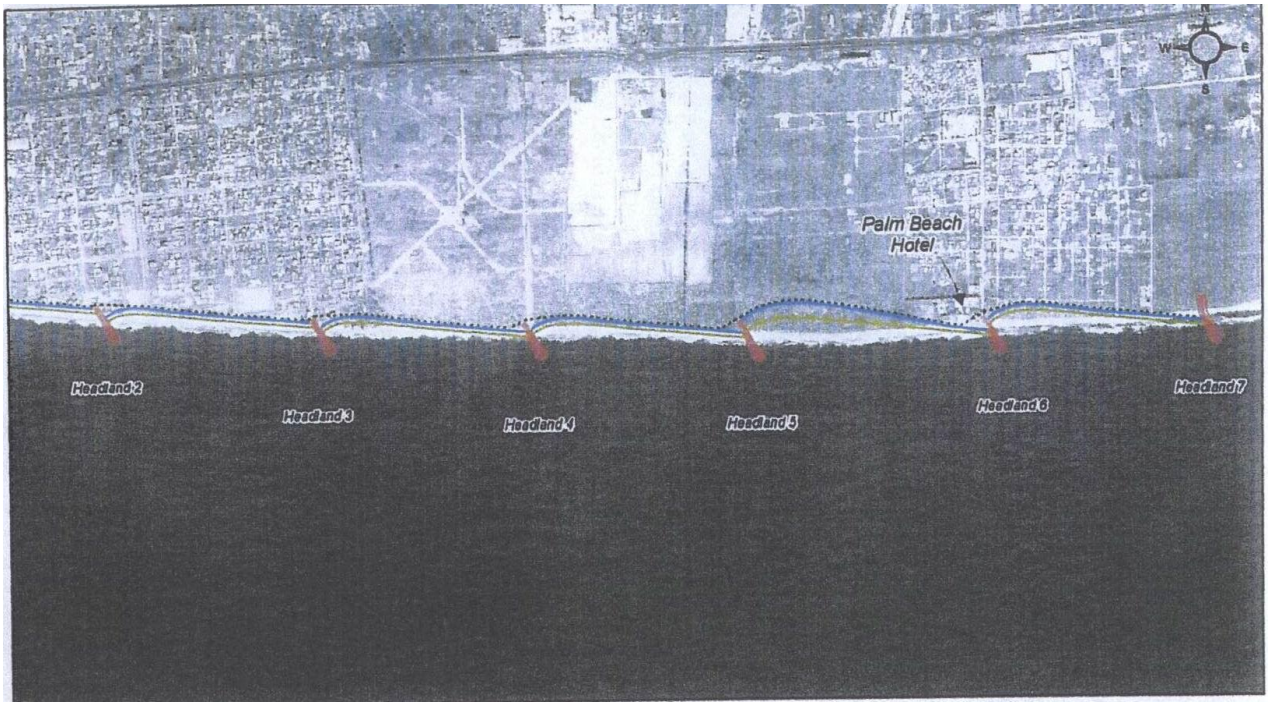


Diagram *25 : Zone 2 of implementation structures*

106 The rehabilitation of Siafato gryone along with the construction of 7 new Gryones East of Siafato, the works of which were launched on July 06, 2009, should result in stopping immediately sand losses in the Eastern segment of Cotonou port when the works will be completed in 2012. However, the risks related to the rise in sea level and extreme weather events and the efficiency of the 7 new Gryones under construction may be the cause of a nourishment phenomenon at the channel mouth level. We should then rehabilitate the Cotonou dam in leveling the crest at the +0.635 meter hydro coast initially by re-commissioning the sea-lagoon exchanges setting system, in order to avoid the obstruction of the lagoon mouth.

Component 2 : Integration of climate variability in environment management by the riparian populations and capitalization of the project experiences

107 The stabilized floods-proof lagoon shores would facilitate free ebbs and flows between the sea water and Nokoué lake, without rejecting on the shores some collapsed rockslides that would muddy the waters. The sources of solid and liquid waste could be easily identified and controlled thanks to the activities the project would have initiated. The shores layout would facilitate the destruction of the wild dump of waste provoking pollution along the shores. The improvement of the water quality will positively impact on the Lagoon ecosystem, biodiversity and the quality of fish, harvested shrimps and, the health security of the populations (component 2.1).

108 Due to the lagoon water sanitation, the currently prohibited fishing activities could be authorized by the regulatory texts that would be subsequently reviewed: the over-crowding fishermen would be directed into newly created jobs opportunities further to the shores sanitation works or other opportunities (component 2.2).

109 The socio-community infrastructure built onto the shores will provide an enhanced living environment for the riparian populations. The awareness campaign would include capacities building on climate change adaptation issues, sites visits, training activities for the pupils and students, socio-cultural sessions organized by the riparian populations and the dissemination of the project experiences (component 2.3).

Component 2.1: Fight against lagoon pollutions

The sources of pollution observed in the Cotonou Lagoon and on its shores in the riparian areas are as numerous as varied: biodegradable and non-biodegradable solid wastes (Diagram .26), various wastes and liquid products (releases of municipal rain water, household and industrial used waters, oil products, etc.). Those are at the sources of chemical contaminants which are essentially heavy metals (lead content in the bottom water deposits: 535 mg/kg) and in top waters: 0.2 to 1.6 mg/kg, cadmium, mercury, zinc, etc.) and persistent salts (phosphates, nitrates, nitrites, ammonium, etc.) and microbiological contaminants (streptococcus, fecal coliforms: 2,000 to 6,000 / 100cl in June and 1,000 to 11,200/cl in September; the total coliforms 4,000 to 6,000 / 100cl in June and 2,000 to 14,000/cl in September (Soclo, 1999) while the standard is 100/100cl in maximum, etc,) for the fish and shrimps. As a result there is a higher and higher pollution disturbing the lagoon ecosystem with son contents superior to the standards admitted by the World Health Organization (WHO, 1995).

Diagram 2.7 : Rubbish dump on the banks of Cotonou channel

The protection of waters quality requires strong measures to fight against all the sources and forms of pollution. Cotonou municipality, local authorities, all the populations involved and Non- Governmental Organizations (NGO) involved shall strive to:

- Fight against the practice consisting in dumping household refuses/wastes on the ground in riparian areas and in Cotonou international market.

The mobile waste containers that the Market Management Company: "Market Management Company" (SOGEMA) has installed on the western bank of the channel, opposite Dantokpa market, is an initiative the extension of which could be supported on both banks. The same applies to the initiatives by the Dantokpa Market waste recycling Women Association and the Houéyiho Truck-farmers Association who actively invest in non-biodegradable waste recycling and in organic waste composting into products which are used for fertilizing the truck-farming lands in Cotonou town.

- Fight against urban waste disposal in the Cotonou town rain water sewer. This component is largely covered by the Emergency Urban Environment Management Project (PUGEMU) the funding of which is already approved by the World Bank Board on April 26, 2011.

- Fight against the channel pollution by the hydrocarbons by building the material capacities of the Naval Forces Units posted at Ladji area.

110 In concrete terms, this has to do with:

1) building the capacities of the Heads of areas and SOGEMA to reduce the practice consisting in disposing household wastes on the ground;
2) building capacities in non-biodegradable wastes collection and processing by the Dantokpa Market Waste Recycling Women Associations (AFRMD);
3) building the capacities in non-biodegradable wastes collection and processing for by the Houéyiho Truck-farmers Association (AMH);
4) Fighting against the disposal of urban waste in the rain water sewers in Cotonou town;
5) Supporting the Naval Forces Unit posted at the channel entry in order to intensify the fight;
6) Sensitizing, training and equipping the local dyers on the best practices for the management of the heavy metal loaded residual waters
7) Promoting the establishment of private business operators along the developed shores. Their tourist and economic activities will maintain a permanent movement of persons on the lagoon and its shores.

The Cotonou dam and channel mouth behavior will be constantly monitored in real time as that will strengthen the early warning system to be put in place by the Navy authorities.

<u>Component 2.2</u>: Integration of the climate change-induced constraints in the legal texts regulating the activities on the lagoon and its shores.

111 The temperature and level of oxygenation of the water will be the main factors conditioning the aquatic life. Oxygenation is controlled by factors such as the saltiness and the presence of organic material in decomposition.

The temperatures recorded in the channel are between 28.5 and 30.8 °C (Bonou and Adisso 2002). The forecast mad based on relevant climatic scenarios show that the air temperatures would undergo a continuous increase in all the regions of Benin, by 2100; the highest thermal increase would be 3.27°C, in comparison to the baseline period 1971 – 2000; the lowest value would be 2.6°C in the coastal region, with impacts on the lagoon water temperature. But a e few degree increase in water temperature may be harmful to the aquatic wildlife exploitable or to other important micro-organisms in the food chain.

112 The main legal texts regulating specifically fishing activities in the Cotonou channel and on the fluvio-lagoon water bodies are: Decree N°98-522 dated November 5, 1998 and Ministerial Order N°068/MDR/DC/CC/CP/ dated March 12, 1997 stating fishing regulation on the Porto-Novo Ouémé-lagoon – Nokoué Lake' Delta complex. That Ministerial Order prohibits fishing on the Cotonou lagoon in the provisions of its article 20. The end-purpose is to enable this water body to play a role of physical and biological exchange between the sea and Nokoué Lake, favor migration of halieutic species in both directions, ensure the protection of spawning beds with a view to naturally restocking Nokoué Lake and restore the environmental equilibrium along the channel. Through this ministerial Order, the Public Authorities have expressedtehri goodwill to protect the ecosystem. But, fishermen adamantly oppose to its enforcement. In 2008, eleven (11) fishing stations, 270 fishing pirogues, 22 fish traps (acadja), 352 pilings for set nets, 28 cast nets, and 14 shrimp creels (Badahoui *et al.*, 2009) were identified along the shores and in the riparian areas.

113 The non-enforcement of the regulatory provisions governing lagoon fishery means that the ecological role of the channel and the health of halieutic products consumers cannot be really protected without an effort towards raising the fishermen awareness and without putting in place concerted measures in the consensual interest of fishermen Public Authorities. That is why it is worth taking measures to:

- support the integration of climate change-induced constraints and adaptation strategies in the legal texts governing fishing activities as well as economic and tourist activities on the shores;
- support fishermen Associations and other associations performing their activities on the lagoon and its shores in order to re-orient them into new activities to be generated by the Cotonou channel layout.

<u>Component 2.3:</u> Create awareness and train the local communities on the risks linked to climate change, adaptation practices and the best practices as well as capitalization of experiences

114 Component 2.3 presents the end-purpose of the project. It has to do with experiences with all the national and international communities through awareness-raising activities meant for the general public and focused on the climatic risks and the need to adapt and develop some resilience to its impacts at community level. This

component will also enable to take pro-graduate students measures and ensure the dissemination of the project achievements.

In summary:

115 The current location of the lagoon, at the very heart of the town, was initially occupied by indigenous populations of Cotonou who were and remain fishermen. They got reorganised in order to adapt their activities to the new situation and tap into the new opportunities granted (mining and harvesting migrant halieutic resources, use of catchment basins and banks as traffic lanes, etc.). Other populations of the countryside and natives of foreign countries came to settle the riparian areas for developing parallel or additional activities (processing fishing products for exports purposes, trading, providing social services, etc.).

116 The populations in the riparian areas are the background for the human community organised around the Cotonou Lagoon. The sandy nature of the mother rock facilitates the erosion of the lagoon shores and banks, under the effect of the flow-driven energy, the back-flow of the sea, lake waters and the waves provoked by the vessels and power-driven canoes/ boats. This phenomenon with increasing impact during the high waters period or the minimum flow period or further to extreme weather events (major floods, violent winds and prolonged droughts), is a source of insecurity for the mobility on the banks. This prompted the transformation of important segments of the lagoon shores into dumping grounds for household and industrial waste and platforms of activities for petroleum products smugglers. It was noticed for about fifteen years that after the major floods, the petroleum products smugglers try to gain space on the water body, dumping trucks of household waste on the eroded shores that they occupy. This behavior contributes increasing the vulnerability of the lagoon banks as the organic waste decomposition provokes new collapses, new erosions and the sand filling of the lagoon.

117 Based on the climatic and non-climatic scenarios established for the future evolution of the shoreline and according to the les indications provided by DIVA software, the water level on the coastal segment including Cotonou town may continuously rise to reach about 0.81 m, during the period 2000 – 2100. The expected impacts will be the worsening of the current degradations observed on the Cotonou Lagoon banks.

118 Envisaged adaptive measures as part of this project will be of two types: the material measures (installation or strengthening of infrastructures meant for fighting against the various natural or anthropogenic shores degradation types and the lagoon vicinity and exacerbated by the climate variability and change) as well as social, educational and environmental measures (sensitization and training of populations and the regulation of human activities likely to worsen and damage the living environment).

119 That is the reason why, especially:

1) In the component1, two joint adaptive measures are envisaged in order to stabilize the lagoon banks: the stabilization of the slope or of the very bank by building a Reinforced concrete wall supported by a light rocky coating (technical function) and the stabilization of the top slope of the shore by a reinforced concrete wall (technical and socio-economic function). The technical protection by rocky coating is used in Benin for protecting the coastal segments from undergoing erosion. Since the water currents are very low on the lagoon banks, the project layout proposal will be made up of a reinforced concrete plinth. On the shores, the works will consist of a flat paved coating surrounded by rainwater gutters. The paved surface will enable to avoid the shores erosion induced by the rain and will facilitate access to the socio-economic infrastructures built by the private business operators. This option will be consolidated and fine-tuned by the technical studies and the works design. The maintenance works of those infrastructures shall be jointly carried out by those promoters, the local development committees and even the municipal road networks maintenance services. Without this minimum economic function, and the resulting social development, the developed banks would be damaged due to the lack of maintenance.

2) In Component 2, two measures are planned for implementing the regulation of activities on the lagoon and its shores in compliance with the climatic variability requirements and for supporting the re-orientation of the many sources of livelihood into new economic activities which will be boosted by this project. As a matter of fact, the current regulation governing prohibits fishing activities in the Cotonou Lagoon. That prohibition has never been respected because the target populations are indigenous and native fishermen of Cotonou, the first to adapt to the situation resulting from the creation of the lagoon on their land. But during the overflow period, minimum flow, floods, violent winds or prolonged droughts, the conditions for using some fishing gears worsen the impact of disasters on the lagoon system. Since the social and political sanction measures are not easily enforceable, it would be better to raise the awareness of the populations regarding the extent of their activities. An awareness creation and education campaign should enable them to understand the need to comply the activities performed around the lagoon with the technical standards conducive to the integration of the lagoon system sustainability in the new regulatory provisions.

B. *Describe how the project / programme is economically, socially and environmentally beneficial to the most vulnerable communities and groups, including gender mainstreaming.*

120 The envisaged project aims at protecting the Cotonou town center against the risks already observed with the damages and unhealthiness as well as the potential risks of flood and worsening of the lagoon shores erosion. The beneficiary populations of the project are estimated at 370,000 inhabitants in 2012 (Cotonou Municipality, 2008). They are women and men living in the riparian town sections of the Cotonou Lagoon. The populations living in other places and whose economic activities are conducted during the day time around the lagoon vicinity are also involved. That population

mainly increases on Dantokpa market days, with the users coming from all the regions of Benin and the neighboring countries namely, Nigeria, Togo, Burkina Faso, Niger.

121. The economic, social and environmental benefits of the project will be mainly related to the sectors of trade, fishing, tourism, biodiversity protection, human health etc.

122. At economic level, the daily trading activities performed in the Cotonou international Market are estimated at F CFA One Billion in the current unhealthy conditions. The layout and enhancement of the security, health and the working environment will bring about some knock-on-effects on the national economy.

123. In the fishing sector, the majority of the harvested shrimps from the Cotonou Lagoon and Nokoué Lake were exported to Europe with some turnover of more than F CFA three Billion per annum for the exports companies like CRUSTAMER, FSG and SOBEP (Egounlety, 2005). The supplies of those companies are potential sources of direct income for the fishermen and fishmongers supplying them with their harvest. Table 11 shows that between 2001 and 2006, the employees have also earned about F CFA Five Billion. Permanent and seasonal workers also earned incomes in the forms of salaries and other social services provided. Perceived salaries between 2001 and 2006 are estimated at F CFA 390 million.

124. Benin government drew from the taxation levied on those companies some proceeds amounting about F CFA 77 million between 2001 and 2006.

125. The insalubrity and other related problems plaguing the lagoon environment led to the suspension of shrimps exports towards European Union member countries, with as consequence, a huge loss of income on the side of the stakeholders.

Table 10: Evolution of the production, imports and exports of fishing products per Metric tons / annum (Directorate of fisheries, 2010)

Years	2005	2006	2007	2008	2009
Production	38,696.88	39,614	36,396.42	37,494.587	39,691.587
Imports	45,227.99	46,466	63,479.723	77,853.562	73,471.195
Exports	136.472	114.41	12.223	6.35	0.2617

Source: (Directorate of fisheries, 2010)

126. Almost all the shrimps production is carried out in the Cotonou Lagoon at an average volume of 1,000 Metric tons per annum.

127. At the level of companies like CRUSTAMER, FSG and SOBEP, the income generated by the fishermen and fishmongers, and the income earned in the form of salaries have dropped by 80 to 90% between 2001/2002 and 2005/2006 (table 11). The variation of the income of the stakeholders of the fishing products exports sector (mainly the shrimps) before and after the suspension of exports towards the European Union

member countries illustrates the financial magnitude of this project, one of the development impacts of which will be to support the sustainable recovery of exports.

Table 11: Variation in the income of actors involved in fishing products export industry from 2001 through 2006

In FCFA million	2001	2002	2003	2004	2005	2006
Income of fishermen and fishmongers	1,516	1605	836	439	443	159
CRUSTAMER	1,034	957	494	336	405	159
FSG	481	648	343	103	38	
Income paid as salaries	74	113	84	33	55	26
CRUSTAMER	43	46	41	19	42	26
FSG	32	66	43	14	14	
Tax revenues generated by the sector	14	14	25	7	8	6
resulting tax	7	7	4	1	0	0
CRUSTAMER	7	7	4	1	0	0
FSG						
Various taxes	7	7	23	5	8	6
CRUSTAMER	5	5	21	4	4	6
FSG	2	2	2	1	4	

Source: Project to support the private sector (2007).

128. The fishing sector involves a community of about 90,000 fishermen including 45,000 intervening directly in shrimps sector. According to ATEP professional Association, the national economic statistics reveal that more than 350,000 persons earn their livelihood from fishing activities. Such financial benefits will be retrieved and improved thanks to the implementation of this project through the Component related to Pollution control. The project is of special importance for CRUSTAMER Company located an riparian area of the Cotonou lagoon. Other financial benefits are expected in particular from the new tourist activities along with the envisaged promotion.

129. It is crucial to point out that the export prohibition in question generated a partial or total unemployment to the thousand of fishermen, fishmongers and workers forced to re-orient themselves in the illegal trafficking and smuggling of petroleum products routed from neighboring Nigeria throughout the Water body. This smuggling is particularly hazardous and harmful to health and the stakeholders' lives as well as for

the water quality and the living resources of the fluvio-lagoon complex: Cases of fire in the smugglers' Canoes and camps are regularly deplored, leaving on their trail losses of human lives as well as spillage of kerosene, gasoil and fuel in the lagoon.

130. In the sub-sector of hotel industry, catering and disk library, the annual turnover is evaluated at F CFA 38 billion out of an overall F CFA 58 Billion of turnover for Benin as a whole (Dumoulin, 2008). The level f interest of the business operators on the secured and sanitized shores could enable to mobilize a fraction of such resources at the benefit of the population beneficiary of the project.

131. The enhancement of the tourist environment thanks to the project execution will also be a advantage for the whole riparian community. The shores layout and the construction of the socio-economic infrastructures will be conducive to tourism development. At social and environmental level, the project implementation will help, not only to remove the household waste dumping sites, the uncontrolled disposal of used waters generated by the dyeing industry and other sources of used waters, but also will create enabling conditions to quench for ever those sources of pollution. The populations, the local elects and the Nongovernmental Organizations will have a crucial role to play in the process of establishment and maintenance of the sustainable household and industrial waste management mechanism. The lagoon shores sanitation is profitable for the riparian populations who will henceforth face less health problems and more opportunities of income generating activities.

132. The gender sensitivity of this project appears in the fishing sector where the roles are clearly distributed between women groups and men group in Benin. The fishing activities are carried out by men while the fishmonger's ones are carried out by women. Involved in the wholesale trade of fishing products, the fishermen's wives assisted by a few men are organized in the National fishmongers and Allied Association of Benin, the umbrella organization being the National Fishermen, Fishmongers and Allied Association.

133. Since securing and sanitizing lagoon vicinity must promote the recovery and improvement of fishing products trade, women can be expected to earn substantial profits.. The project will also profitable to vulnerable women and populations working in other sectors.

134. The working sessions with the stakeholders encompassed men, women and physically-challenged persons. The role and interests of each particular group are well captured by all the stakeholders.

135. Through this project, Benin Government wishes to accompany the Cotonou Municipal Authorities, local authorities and areas communities associated in their active effort for a sustained expression of the two basic ecological functions of the Cotonou channel. At the same time, Government would like to support the pre-empting measures adopted against the risks of flooding from the sea and the consequences of which will be more catastrophic than those from generated by Ouéme River.

136. The Cotonou channel, Nokoué Lake and the riparian areas handle important sources of economic value, namely:

- Direct use value of consumed goods and services (fishing resources, in-land water transports, etc.);
- Indirect use value of current functional standards (ecological function, regulation function, etc.);
- Option value on future uses (conservation of ecological functions, production of biodiversity, etc.);
- Legacy value and existence value that the current generations should bequeath to the generations yet unborn, either for their consumption, or for maintenance purposes (endangered species, threatened ecosystems, life sustaining, etc.).

137. Those are tangible and intangible properties, tradable and non tradable goods and services, developed by the Cotonou lagoon and Nokoué Lake riparian populations, and that are under the constant threat of the climate change impacts. This project aims at mellowing down the impacts and reversing the trends, ie, regenerating the goods in decay and improving gradually the populations living conditions.

138. The economic analysis should enable to compare the economic and social cost of the enjoyment and non enjoyment of these goods for the current generations and those yet unborn under the conditions of non intervention, as well as the economic and social costs of adaptation measures as suggested by the project, together with the population involved. The additional costs ratio owing to the implementation of adaptation measures and additional benefits at ecosystems and human community level in terms of shores protection, channel and Lake restocking with endangered species and in terms of poverty alleviation, meeting foods and health needs should, for instance, enable to appreciate the efficiency of adaptation measures. The cost-effectiveness analysis is therefore adopted as the best tool. Meanwhile, one could recall that considering the situation of the poor community living in precarious hygienic and sanitation conditions along the Cotonou channel, failing to take any measure against the adverse impacts of climatic variability and extreme weather events they are observing nowadays is always more costly for the ecosystems and human communities than the adaptation measures. The United Nations Convention on Climate Change (UNCCC) Secretariat thinks that by 2030, the adaptation costs to be incurred by the developing countries would amount between28 and 67 Billion US Dollars per annum. OXFAM International (2009) thinks that the adaptation cost in the developing countries would at least amount 50 Billion US Dollars per annum, and more, should the reduction of the global emissions of greenhouse gases be doomed to failure.

139. But the governing grading schemes hardly enable to move from the data collected at the global scale to those of harvested in the narrowed areas such as the Cotonou lagoon riparian areas. In all certainty, over 30% of Cotonou population live in the most precarious conditions on unstable shores, thereby making Cotonou town contribute 64.7% to urban poverty in Benin (UNDP, 1997; Cotonou Municipality, 2010).

140. The analysis of poverty magnitudes reveals extreme poverty situations of in the areas established on the shores (Table 12)

Tableau 12: Extreme poverty distribution per Town Sections

Town Section	Remaining rich households	Number of poor households	Total of the households	Weight of poor households per Town Section
3	10,247	3,121	13,368	10,1
4	5,892	3,046	8,938	9,9
5	6,741	1,021	7,762	3,3
6	13,832	2,805	16,637	9,1
Total	**123,472**	**30,874**	**154,346**	**100**

Source: Computation run from the RGPH3 data

141. Based on the housing conditions, a census operation conducted in 2002 revealed 61,000 poor and very poor households (out of the 154,346 households living in Cotonou). The very poor households were evaluated at 30,874 according to the RGPH3. Determining poverty at Town section level enables to better identify the Town Sections with high concentration of poor households. That census targeted the proportion of very poor households (household described in line with profile 1). The use of that threshold allows distinguishing between poor households and the rich ones. Table 12 illustrates the ranking of Town Sections based on the proportion of very poor households living in precarious conditions.

142. According to this table, Town Sections 3, 4 and 6 encompass most of the poorest households and are the prioritized targets of interventions in order to enhance the households' living conditions. Indeed, 26.1% of the poor in Cotonou town are from those three town sections (that is averagely, 8.7% poor per town section); while each of the other ten town sections contribute averagely 7.39% to the Cotonou town poverty (that is a total of 73.9% poor). Those poor households are those living in isolated houses or huts untidily organized in the space, with neither toilets nor access road, displaying mobility conditions for the persons and goods, family real estate with the wall and flood in clay and the ceiling in straw. They generally fetch their drinking water from the lagoon or from the street fountains. Kerosene and the fire wood are the main source of lightening and cooking. In those households, used waters and household waste are disposed of in open air in the courtyard. In a nutshell, there is a total lack of goods and facilities with those poor households. The households living along the Town Section 5 are also part of this description. The rank displayed in table 12 is hidden by the level of wealth of the households living in the non riparian areas of the 5th Town Section.

143. The fire risk is very high with the use of kerosene in thatched houses of in the riparian areas, this is worsened by the storage of hydrocarbons. Children are not schooled as a result of the lack of interest displayed by the parents themselves. There are high risks

of pandemic spread with the lack of toilets and the drinking of dirty water. Eventually, the socio-demographic indicators show that children are not schooled. Under such circumstances, the women and their daughters who outnumber the men and their sons in the neighboring riparian areas cannot be schooled. Consequently, they do not perceive the need to go for prenatal consultations in the neighborhoods areas and most of them give birth at home, increasing the rate of mother and child mortality, along with the risk of reduction of their life expectancy. As such the social benefits will be materialized by the reduction of the mortality and morbidity rate among the riparian populations whose children are exposed to all types of poisoning and accidents along the unsecured shores.

144. Women are held responsible for the (dirty) water supply duty for drinking and for the household (risk of water-borne diseases), the purchase of firewood and the cooking of foods (risk of fire) in the thatched houses. The use of kerosene as a single source of energy for lighting worsens their level of extreme poverty, putting them in extreme poverty and total destitution. Their situation of extreme dramatic poverty increases their vulnerability to climatic risks. They as well as their daughters and boys deserve to be given a special attention.

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

145. The ultimate objective of this project is the lagoon shores protection and the enhancement of the lagoon ecosystem management. That is why Component 1 is basically a matter of special attention in terms of cost-effectiveness. As a matter of fact, it stands as the most expensive investment granted by the project. It engulfs more than 75% of the overall resources.

146. The issue of profitability of adaptation projects is always very sensitive. In this case, especially for Component 1, the options of protection of the banks and shores are technical options that seem to be the most adapted to the situation. Regarding the protection and stabilization of banks, less expensive techniques are offered by the plants engineering and the most expensive techniques are those of the sheet piles; the techniques of concrete and rocky coating is of intermediary costs. Technically speaking, the plant engineering is not applicable here because the average height of the lagoon water exceeds 3 meters (the traction forces exerted on the slopes feet exceed 100 Newtons per square meter): the plant engineering structures will not be able to resist.

147. On the shores opened to traffic, for economic reasons, the most appropriate technology which requires less maintenance is that of paved floor. Though cheaper, plant engineering technique may also be envisaged if the lagoon water was not salty, and is usable for watering the plants. The fresh water supply to the vegetal cover will be difficult in the lagoon environment and particularly expensive.

148. Normal costs in use are the average costs per linear kilometer applied by the Civil Engineering Companies operating in Benin, for similar works (construction of groynes, urban lanes and roads). The infrastructures' sizes are those proposed in table

13 (4.3 kilometers of segments of bank slope; 4.3 kilometers of pedestrian platform with 2 m of paved right-of-way).

149. Three options were proposed by stakeholders during the consultation meetings:

- paved lanes : only the pavement stones would be used to cover the lagoon shores platforms over 4.3 km linear;
- plants engineering: Only the grass planting will cover the banks platform over 4.3 km
- combination of paved lanes (30% in surface) and grass planting (70%) over 4.3km

150. The evaluation of each option is conducted by scores allocation for each criterion following the modalities described in tables 13 and 14. This evaluation is based on the stakeholders and experts' opinion due to their knowledge of the study area and of the works to be done.

151. For each option, the sum of the exclusive scores for the 3 criteria is out of 100. This ratio represents the expected value of each of the options efficiency. Eventually, the estimated costs are compared with the expected value efficiency per option. This represents the cost-effectiveness ratio for each option. The best option said to be "cost-effective" is the one representing the smallest cost-effectiveness ratio. Thereafter, the results obtained are explained and submitted for validation by the populations

Table 13: Summary of options for developing the Cotonou Lagoon bank floors

Identified measure to serve as bank floors and description	Benefits	Limits / constraints
Paved platforms: Only pavement stones will be used to cover the lagoon shores floor over 4.3 km of linear banks	Used essentially for pedestrians; Facilitate infiltration and rainwater runoff; Less constraint for the soil	No drawback per se with pedestrians use only
Vegetated Floor with grass which will be the only cover on the floor of the shores over 4.3 km	Much more cost-effective than the paved floor; Enhanced landscape value Contribution to air purification	Demand regular maintenance: cutting, needs of water and fertilization Recruitment of labor Problem of fresh and not salty water
Floor resulting from the combination Pavement stones (30 % in surface) and planted grass (70%) over 4.3 km	Idem	Idem

The initially set length of 3km; 4 km; or 4.5 km is eventually harmonized to 4.3 km for the reinforced concrete wall and the paved road in order to take on board the real configuration on the groung and the implementation facilities.

Table 14: Evaluation matrix of the options effectiveness per criterion

	Modalities (and attributed exclusive scores)		
Criteria of evaluation of options	Weakly satisfactory	Averagely satisfactory	Suitably satisfactory
Contribution to the reduction of the vulnerability to climatic risks and to the resolution of the described sanitation problems (35)	10	20	35
Easy maintenance of the option (30)	10	20	30
Environmental sustainability of the option (35)	10	20	35

The application of the cost-effectiveness analysis highlights he benefits of the paved floor (Table 15).

Table 15: Cost-effectiveness ratio estimate per option level.

Option	Unit cost (reference 2012) en F/m2	Criteria			Effectiveness expected value	Cost-effectiveness ratio
		Contribution to the reduction of the vulnerability to climatic risks and to the described problems resolution	Ease in the maintenance	Economic and environmental sustainability of the option		
Paved lanes : only the pavement stones are used to cover the shores platform over 4.3 km	12000*	35	30	20	0,85	14117,6
Vegetated floor: Only the grass planting will cover the banks platform over 4.3 km	6500**	20	10	10	0,40	16250,0
Floor resulting from the combination of paved lanes (30%) and grass planting (70%) over 4.3 km	8150**	35	10	10	0,55	14818,2

**: Excluding the costs for the construction of the sewer gutters estimated at about F CFA 100 000 / linear meter for sizes of 0,60 X 0,60*
***: Excluding maintenance costs (cost of the volumes of water for watering, cost of cutting, cost of fertilization)*

D. Describe how the project / programme is consistent with national or sub-national sustainable development strategies, mainly and where appropriate, at national and local development levels, to poverty alleviation strategies, national communications, or national action programs of adaptation, or other relevant instruments, where they exist.

152. The ratification by Benin on June 30, 1994, of the United Nations Framework Convention on Climate Change (UNFCCC) marked the starting point for the reorientation policy, strategy, plan and development program documents towards sustainable development. The framework Law on Environment dated February 12, 1999, the sector-based policy papers and national development planning tools are enshrined in the vision of sustainable development with particular provisions on concerted protection of ecosystems and their resources.

153. As such, Benin sustainable development strategies are captured in the partnership between the public and private players, based on the logic of threatened ecosystems preservation, through the Declaration of Population-oriented Policy (DEPOLIPO) in 1996, the long-term Prospect studies of Benin by 2025, the Poverty Reduction Strategy Document (DSRP 2003-2005), the National Growth for Poverty Reduction Strategy (SCRP 2007-2011 and SCRP 2011-2015).

✓ In the field of environment and sustainable development, the main policies and strategies developed and implemented by Benin are as follows:

- ✓ *the Environmental Action Plan (PAE)* adopted in June 1994 by the government and updated in 2001, and aiming at behavioral change, especially by creating awareness for all the Benin citizens, the mastery of the natural resources evolution and the better management of biodiversity as well as the improvement of living environment for all the Benin citizens ;
- ✓ *the National Agenda 21 adopted on January* 22, 1997 and the objective of which consists in adopting orientations and conditions to achieve sustainable development;
- ✓ *the Benin Long term Prospective Studies by 2025*, initiated since 1998, which integrate sustainable development issues and thereby define Benin vision: « By 2025, Benin will be a leading country, a well-governed, united and peaceful country with a prosperous and competitive economy, cultural influence and social welfare». This calls for an economically-rational management of natural resources and human community;
- ✓ *the National Orientation Scheme* 1998 – 2002 which, after identifying the first priority which consists in fighting against poverty in order to strengthen economic growth, identified in the field of environment, the deforestation, soil degradation, coastal erosion, and pollution in towns;
- ✓ *the Declaration on National Land Planning Policy (DPONAT)* adopted in 2002 and as part of which are created the National Commission of Land Planning (CNAT), the Delegation for Land Planning (DAT) and the Land Planning Intervention Funds (FIAT), responsible for ensuring the development of Land Planning Policy and the follow-up of its implementation;
- ✓ *the National Action Program to Combat Desertification (PAN/LCD),* developed in 1998 in order to identify the factors which contribute to the desertification along with the

concrete measures to be taken for combating desertification and mitigating drought impacts;

- ✓ *the National Biological Biodiversity Preservation Strategy and Action Plan adopted in* 2002 and aiming generally at Benin sustainable development and reducing poverty through the preservation, sustainable use of biological resources as well as the fair and equitable sharing of profits generated from the harvest of the said resources;
- ✓ *the National Sanitation Policy developed in* 1998 and the objective of which is to promote sanitation in order to improve the populations' living environment;
- ✓ *the National Strategy to Combat Air Pollution in Urban Area adopted in* 2001 and which draws on the development of legal, political and economic instruments likely to facilitate the anti-pollution fight and the reduction of pollutants sources and on the implementation of a strategy for households, transports sector, industrial sector, wastes and hazardous substances management, atmospheric control and international cooperation;
- ✓ *the National Strategy for Urban Mobility,* adopted by the government in 2005 and aiming amongst others at ensuring mobility conditions within cities, preventing and limiting nuisances attributable to towns development;
- ✓ *the Declaration of National Housing Policy* adopted in August 2005 and which aims at facilitating the access of the greater number of persons to a decent and cost-effective housing and, consequently, contributing to poverty reduction;
- ✓ *the Strategy for the Attainment of Goal N°7 of the MDGs* adopted in 2006 and which highlights the main challenges related to environmental degradation: (i) the stopping of deforestation and destruction of protected areas; (ii) fight against coastal erosion and soil degradation; (iii) air pollution reduction; (iv) promotion of urban transportation means; (v) taxi-moto transport improvement; (vi) free flow of traffic; and (vii) appropriate treatment of household and industrial wastes;
- ✓ *the strategic Development Orientations for 2006-2011 period which highlights the backward movement of the national forest coverage of* 70,000 ha per annum between 1990 and 2001 and advocate to reverse the trends, amongst others, the promotion of concerted and participatory management of natural resources, strengthening the legal and regulatory framework in this field and the enforcement of conventions related to environment, ratified by Benin;
- ✓ *the National Decentralization and Deconcentration Policy (PONADEC)* adopted in 2009 with three main objectives: (i) implement an harmonious and balanced land planning policy covering the whole national territory in order to attain a sustainable and equitable development, (ii) enforce good territorial governance principles through a modernized and efficient administration, (iii) reduce poverty level by enhancing access to basic services and upgrade economic potentials of the communes.

154. As by Benin's commitments, it is worth insisting on:

- ✓ *The National initial Paper on Climate Change presented during the 8th session of the Parties Conference (CoP8) on October 23, 2002 and exposing the national plans, studies and action programs on environment and sustainable development;*

- ✓ *the National Strategy for enforcing the United Nations Framework Convention on Climate Change,* adopted in 2003, which highlighted a frame and an explicit vision on climate change, the related United Nations Framework convention and their relationship with the national economy as well as development schemes, on the one hand, and the national commitments and availed opportunities as part of the Convention, on the other hand.
  - ✓ *the National Action Program for the purposes of Adaptation to climate change impacts adopted by the Government in* 2007 in which the "protection of the coastal area affected by the rise of sea water level" is highlighted among the first five national priorities a draft adaptation project document was suggested to be submitted to the International community for funding.
- ✓ *The Second National Paper of Benin on climate change adopted by the Government in November* 2011, which reaffirmed the link is established between the rise of sea water level and coastal flooding which could affect human settlements, public infrastructures, fishing activities as well as other economic activities and the coastal ecosystems biodiversity.

155. This project is part of the national dynamics aiming particularly at: (i) taking up two of the seven major challenges identified as part of the Strategy for Attaining the Goal N°7 of the MDGs in Benin – fight against coastal erosion and soil degradation and the appropriate treatment of household and industrial wastes – (ii) raising the awareness of Municipal authorities, local authorities and civil societies organizations about their responsibilities, for the implementation of measures on lagoon shores sanitation and protection against erosion, (iii) actively involve the riparian communities in the follow-up of the implementation of sanitation and rational ecosystem management measures.

156. At the local level, the project has been identified as "Lagoon shore Development project " and mainstreamed into a Cotonou Town Hall program entitled "Shores Development Program". It was envisaged for stabilizing and sanitizing both banks of the Cotonou Lagoon between "Ancien Pont" (Old Bridge) and Hindé area (in the Northern segment of Dantokpa market). The consultation sessions organized with the executives of Municipal Office of Land Affairs and the top-level Municipal Authorities revealed that the project could not be worked out and executed due to inadequate financial resources, though it remains one of the major priorities of the Cotonou Municipality.

E. Describe how the project / program tallies the national technical standards, where applicable.

157. This project proposal is developed in line with the Adaptation Funds' template and instructions as well as the Least Developed Countries group's guidelines for the development of adaptation programs. The LDCs Group' guidelines for the development of adaptation programs were used for the development of Benin National Action Program on Adaptation to climate change in 2007 and the Project of Benin Agriculture and Food Sector Adaptation to the climate change impacts the execution of which started in January 2011 under the Global Environment Facility (GEF) funding. The project also tallies the Benin national guidelines for the

development of Adaptation projects stemming from the workshop organized by the National Environment Fund (FNE), in Cotonou, on October 4 – 5, 2011.

158. Regarding the Lagoon shores development and sanitation cost evaluation, the standards used have essentially to do with the tasks specifications, the index price directory in use within the Public Administration (fourth edition) published by the Ministry of Economy and Finance in January 2011, and the prices on the market.

159. During the project implementation, the physical interventions on the field shall comply with the national and sub-regional standards in force. In particular the construction of infrastructures shall be submitted to environmental impacts studies enshrined by Law n° 98-030 dated February 12, 1999 related to the Framework Law on environment in the Republic of Benin. Suppliers and operators in charge of performing any works shall apply the normative provisions and technical specifications validated by the Benin Standardization and Quality Management Center (CEBENOR) established by decree N°97-520 dated October 17, 1997.

F. Does this project / programme overlaps with other funding sources?

160. So far, no project is implemented specifically on the theme of Cotonou Lagoon shores stabilization. Some projects are underway on the sensitization of the riparian areas community regarding environmental protection, with the support of the Cotonou Municipality. The Civil Society Organizations (CSOs) in charge of implementing those projects will be the same to be called upon for the extension of the awareness creation on issues of adaptation to climate change impacts. They will successfully highlight the anchoring point between the achievements of such projects and the adaptation of human community and lagoon ecosystem without overlapping. Indeed, the Cotonou Municipal Council and the Ministry of Environment, Housing and Town Planning have been seeking funding for this project for more than five years.

161. The Emergency Project for Environmental Management in Urban Areas (PUGEMU) the funding of which was approved by the Board of Directors of the World Bank on 26 April 2011, captured the Cotonou town used waters treatment before being disposed of into the lagoon through urban drains sewers. That is why the costs relating to those activities are not included in this project.

162. PUGEMU was initiated by Benin Government further to the catastrophic floods which affected more than 680,000 people and caused 46 victims in the country in 2010. The most affected regions included the coastal Municipalities with a trail of more than 50,000 destroyed houses; 150,000 homeless persons and 278 flooded schools.

163. All the same, the issues of sand loss issues at the Cotonou lagoon mouth should be addressed by Siafato Groyne rehabilitation project and the construction of seven (7) new rock groynes at the East of the Siafato one the inception works of which were launched on July 6, 2009 and expected to be completed in 2013. That component is therefore not included in this project's activities. Rather, It envisages the rehabilitation of the Cotonou sluice dam for a better management of the impacts to be induced by the new configuration of the river mouth.

164. Eventually, the project of "Protection of the Grand Cotonou Urban Community against Climate Change impacts" (PUCG3C) was elaborated through a partnership agreement between the Cotonou Municipal Council and the "Research and Expertise Centre for Local Development" (CREDEL) Non-Governmental Organization.

165. The proposed adaptation measures in this project will allow for the knowledge acquired from related activities of the PUGEMU. In a nutshell, the Cotonou channel has triggered many project initiatives but none of them has been implemented as presented in Table 16.

Table 16: Non-implemented Projects initiatives on the Lagoon shores

Initiatives	Objectives or lessons learnt	Areas of synergies
The Emergency Project for Environmental Management in Urban Area (PUGEMU): is a project launched in January 2012 anf funded by the World Bank for a period of four years, at an amount of 50 million US Dollars out of 55 millions.	Enhance urban environment quality as well as the living conditions of the populations of Cotonou, Porto-Novo, Sèmè Kpodji, Abomey-Calavi and Ouidah towns. The project comprises 4 technical components: (1) Improvement and rehabilitation of the drainage system, (2) Municipal management of solid waste, (3) Enhancement of used waters management and sanitation (4) preparation and management of floods-related risks	The Project envisages for Cotonou the treatment of the open-sky sewer waters before their disposal into the channel and the establishment of an early-warning system on floods. This project will tap into the outcomes of those activities to raise the awareness of the populations of the riparian areas of the lagoon banks and prompt them to put in place active areas committees in the early-warning system
Integrated Adaptation Program to control the adverse impacts of climate change on agricultural production and food security in Benin (PANA1) : project funded by the Global Environment Facility (GEF), 2010 – 2014.	The purpose of this project is to build the capacities of farmers community to adapt to Climate Change in the four agro-ecological regions of Benin. By and large, the enhancement of resilience to climate change for ensuring food security will be achieved within those pilot communities.	The project covers the four most vulnerable agro-ecological regions of Benin to Climate change, including the fisheries zone which encompasses the Lagoon environment. The pilot actions are directly focused on the Cotonou Lagoon, but their results will be of crucial interest for understanding the functioning of the lagoon system at the level of fishing resources and human

		communities' resilience capacity.
Marine and Coastal Biodiversity Community Management Project (PGCBMC) : project funded by the Global Environment Facility (GEF) for a five year period	Contribute to sustainable management of the biodiversity and ecology (of national and international interest) of the coastal wet lands and other related ecosystems of the coastal region, with a view to ensuring the sustainable development of Benin through the creation of legal, economic and technical instruments along with enabling socio-political conditions.	The project managed by the Benin Environment Agency established an enabling environment thanks to the operationalization of the Shoreline Layout Guideline. Private Business operators are sensitized to invest in the secured lagoon environment.
Project for the Grand Cotonou Urban Community's Protection against the Climate Change Impacts (PCUG3C): Project funded by the International Development Research Center (CRDI) and the British Department for International Development. (DFID), throug ACCA program (Adaptation to Climate Change in Africa), Il was implemented by the Nong governmental Organization " Centre de Recherche et d'Expertise pour le Développement Local" (CREDEL) from 2009 through 2012.	This project aims at building the Cotonou Urban Community and the surrounding populations' adaptation capacities to Floods The project is implemented in the 1st, 3rd, 6th, 9th, 12th and 13th Town Sections of Cotonou. The 3rd and 6th town sections riparian to Cotonou Lagoon have , until 2012 benefitted from the relevant activities of that project, namely by: - Identifying and evaluating the endogenous strategies of adaptation to Climate change impacts, anti-flood control and experiences sharing within the platform; - Identifying and assessing the institutional measures to combat flooding and making proposals for their integration; - developing and/or consolidating the local strategies based on the endogenous experiences and findings of research;	The Partial social results achieved by PCUG3C Project were upgraded during the consultations with the various stakeholders in order to identify the proposed technical interventions in the context of this project..

	- disseminating the lessons learnt and achievements emanating from the implementation of the strategies through differnt channels to reach the populations of the various localities and the local as well as national policy-makers.	
Capacities Building for the Local Elects form mainstreaming and implementing the adaptation to climate change impacts in Local Development Planning: project executed from 2006 through 2012 with the funding of the Netherlands Cooperation.	- Build the technical capacities of the Local elects and technical Executives of the Municipalities and decentralized governmental branches for taking on board climate change while planning local development; - Support the development of a pre-emptive plan and climate change –induced disasters management in each Municipality and raise the populations' awareness on climate change while disseminating the Project's achievements.	This project laid the foundations for a multi-risk early warning system and developed a guideline for mainstreaming adaptation to climate change impacts in Local Development Planning. Those tools are applicable in this Project area and will facilitate the Areas Development Committees' works in the project implementation.
Project of Creation of an Oceanographic Data bank at the Benin Fishing and Oceanographic Center (CRHOB). Project implementation under way.	Create and Maintain a Bank for the Regional Oceanographic Data	The historical data that will be collected on temperature, salinity, winds, currents and the satellite products to be received from the Golfe of Guinea will enable to fine-tune analyses on the water state and dynamics in the lagoon environment.
Regional Program of Physical Oceanographic in West Africa (PROPAO)	- Development of a Regional Measures Network and a Databank in Oceanography; - Finalize a close collaboration and a partnership between the various Oceanographic Laboratories within the Sub-region ; - Develop and maintain a long-term network of	Tapping into the enabling scientific environment established by the Regional Coastal defense Measures network.

	standalone coastal measures along the Northern Coast of the Golfe of Guinea.	
National Environment Management Program (PNGE)	Contribute to the sustainable economic development by reducing the environmental degradation costs and promoting employments through the promotion of the best practices of production management	Implemented in the coastal area, in the urban metropolis and soudano-sahelian region from 2006 through 2011, this program has established some environmental management tools that this Project Coordination team can tap into in order to ensure increased efficiency.
Strengthening Climatic information and the Prevention systems in West and Central Africa for a resilient development to Climate and adaptation to change change– Benin (SAP) : a project the funding of which is secured through the Global Environment Facility (GEF)for a three year duration in Benin.	The objective of the project is to build the capacities of meteorological, climatic and hydrological surveillance, the early warning systems to riposte against the Extreme weather event and planning adaptation to climate change impacts in Benin	That regional program which will be launched in Benin in the few coming weeks will share some centers of interest with this project, mainly in terms of developing and Early Warning System against floods in the lagoon environment of South Benin and in Cotonou town.

G. If applicable, describe the learning and knowledge management component in order to assess and replicate the lessons learned.

166- The project includes a learning and knowledge management component. After launching the project, training and awareness creating activities will be organized for local communities, local authorities and the large public in order to ensure the stakeholders preparedness for creating and enabling environment and the implementation of all the components.

167- Local authorities, Municipal councilors and heads of riparian Town sections of the channel will be trained on the thematic of climate change and the best practices. The Local chiefs, community intellectuals of the riparian areas, NGOs and media houses (printed media and broadcasting industry) will be associated to this training session. The training will be facilitated by national or international experts and consultants. Local elects and community intellectuals of the areas will be assigned to disseminate the lessons learnt to the grassroots communities, their community of origin with the assistance of national or international experts. The personalities attending the training will also supervise the awareness campaigns for the general public through relevant channels (local radio stations, conferences, etc.), under the aegis of Municipal authorities.

168- During the project implementation, pupils, graduate students and researchers from

technical and vocational training schools, national universities, research centers and private universities will have the opportunity to prepare and carry out their research works in the fields of urban and lagoon environment, sustainable natural resources management, adaptation of livelihoods to the current climatic variability and extreme weather events and climate change. Experiences acquired, lessons learnt and the best practices developed will be compiled in hard and soft copies and on films (photos, movies, radio and TV broadcast, etc.) and made available to the public coming to carry out field visits, exchange of visits, conferences for schools, universities and the general public, and through scientific presentations during colloquia and conferences at the national or international level. All the technical elements relating to costs, expenses and income will be capitalized and aggregated based on adaptation components and options; extreme weather events, their impacts and the costs of responses will be recognized.

169- At the project completion, a conference will be organized in order to share results with the professionals and international scientific community both on organizational and environmental outcome as well as the issue of adaptation costs on which little information is available worldwide. The results will be made available to universities, research centers and institutions involved in the management of marine and lagoon ecosystems and in the issue of sustainable development for their re-use. Component 2.3 is devoted to the capitalization and dissemination of the lessons learnt.

H. Describe the consultative process and include the list of stakeholders consulted, during project preparation.

170- The General Directorate of Environment under the supervision of the Ministry of Environment, Housing and Town Planning, the Department Technical services and the Municipal Office of Land Affairs of Cotonou are jointly responsible for the technical implementation of the project in partnership with non-governmental organizations, local bodies of town sections and areas riparian to the water body as well as fishing products exports companies established in those areas. All the stakeholders are involved in the development of the project, from the grassroots to the summit.

Project Concept Stage

171- The major stakeholders consulted are:

- ✓ heads of the areas riparian to the Cotonou lagoon, Heads of town sections;
- ✓ Leaders of Development associations in the riparian areas and Town sections;
- ✓ managers of lagoon fishing products exports companies;
- ✓ NGOs dealing in the field of environment protection and the sustainable natural resources management (Research and Expertise Centre for Local Development (CREDEL), Dantokpa Market Waste Recycling Women Association (AFRMD), Houéyiho Truck-Farmers Association (AMH), Waste Management and Sanitation Coordination NGOs (COGEDA);
- ✓ heads of riparian Town Sections: 3rd, 4th, 5th, and 6th;
- ✓ Technical Executive of the Cotonou Municipality;

- ✓ Executives of the national technical institutions involved in the issue of sustainable development (General Directorate of Environment, General Directorate of Forestry and Natural Resources, Beninese Environment Agency, University of Abomey-Calavi, University of Parakou, private university centers, Fish and Oceanographic Research Center of Benin, etc.);
- ✓ the Ministry of Environment, Housing and Town Planning, the Ministry of Agriculture, Animal Husbandry and Fishery, and the Ministry of Energy, Oil and Mining Research, Water and Renewables, the Ministry of the Youth, Sports and Leisure, the Ministry in charge of Maritime Economy and Port Facilities, the Ministry of Communication and Information and Communication Technologies, the Ministry of Culture, Literacy, Handicraft and Tourism;
- ✓ the National Assembly;

Project Development Stage

172- During project development stage, the staffs of the above-mentioned institutions and establishments were involved in the consultations. The consultation approach used varies according to the stakeholders.

173- For the private business operators (hotel managers, restaurant owners, fishing and exports companies, etc.), and communities affected directly by the harmful impacts of climate variability and extreme weather events, the consultation approach is based on the concerted evaluation of vulnerability; organized on the workplace or in the meeting room of heads of riparian areas. Those sessions enabled to reach consensus on the end purpose and the operational approaches of the project (Diagrams 27 and 28).

Fig.2.9 A working session with the fishermen (February 26th, 2013)

Fig.2.10 Working session with the wholesale fish merchants women (February 26th, 2013)

174- Supportive, accompanying or institutional stakeholders are called upon to play crucial roles in the project implementation in terms of control, monitoring, evaluation, upgrading and reuse of the results. The consultation approach used with them is that of free discussions on the national interest and the project objectives, the mode of intervention of stakeholders and the specific role assigned to each group of stakeholders. Representatives of Government and National Assembly are sensitized on the enabling conditions to be created through legislative and / or regulatory channels with a view to ensuring sustainability and protecting the ecological functions of fluvio-lagoon

ecosystems jointly threatened by anthropogenic actions, the rise in sea water level and extreme weatherevents.

175- The outcomes of the consultations with the private sector are as follows:

Relationships, powers and stakeholders' influence

176- **The possible compromises**. According to the fishermen and fishmongers, their rights must be imperatively restored. As, they said, they were born in the lagoon shores and have tremendous knowledge of the lagoon-related problems. They request to be associated to any issues related to the lagoon management. They also wish they could be recognized as such and enjoy their location on the lagoon. They think that the Toffins and the Xwla ethnic groups should live and stay along the Lagoon in order to identify the period of passage of the fish school so as to better organize the fishery activities in appropriate time.

177- **Dependency relationship upon one another.** The Fish and shrimps Women Sellers Associations depend on the fishermen associations because those are the people who supply them with fishing products that they retail at Cotonou market.

178- **Influence on the organizations.** The organizations under consideration are influenced by MEHU, la SOGEMA, Cotonou Municipality and the Ministry of Agriculture, Animal Husbandry and Fishing in terms of Lagoon shores upgrading. The level of influence and power relationship (importance) of each stakeholder is summarized under Tables 17, 18 and 19.

179- Women fishmongers and the fishermen appear as low-power continuum stakeholders with high potential. Therefore, they must be involved and their interests should be protected all along with the project (Table 17). The project management should cooperate with the Municipal authorities, professional women associations, fishermen associations, managers of hotels and restaurants as well as recreational places established along the lagoon. However, the group of Traders, and sellers of various items and goods who are in majority market women are excluded. The Lagoon sand Mining Dealers associations, dyers and others should be monitored.

180- **Identification of stakeholders with the capacity to bring sustainable contribution.** The groups of fishermen and women associations could significantly contribute to ensuring the technical sustainability of the project as that will have enhanced the living conditions of the riparian populations. The private business operators that will settle will witness business prosperity and will thereby be able to contribute to raising the financial resources needed for keeping the shores tidy.

Table 17: Acronyms and relationships among the stakeholders

Main stakeholders	Acronyms	Impact on the project	Importance vis- à- vis of the project
Fishermen,	A	4	2
Fishmongers	B	4	1

Lagoon mined sand dealers	C	2	1
Dyers,	D	1	1
Municipality Authority	E	5	5
Hotels and Restaurants Managers	F	5	4
Association of Traders and dealers in various products	G	2	2
Dantokpa market Traders and dealers,	H	2	1
Fishermen Associations	I	4	3
Fishmongers Association	J	4	2
Lagoon mined sand dealers Association,	K	2	2
SOGEMA	L	5	3

Source: analysis carried out based on data collected on the field, January 2013.

Legend

Importance	Influence
I=Unknown 1= Less / no importance 2=Less importance 3= Moderate Importance 4=Very Important 5=Key Player	I =Unknown 1= Less / no influence 2=Less influence 3= Moderate Influence 4= Significant Influence 5=Very influential

181- Strategies to be implemented for the management of the relationship among the stakeholders are as indicated in Table 18.

Table 18: Strategies for the management of relationships among stakeholders

Stakeholders' Power // Potential	High potential	Low potential
High power	Collaborate with	Mitigate the impact, champion against
Poor power	Involve, build capacities and protect interests	Monitor or ignore

Source: analysis carried out based on data collected on the field in January 2013

❖ *Identification of conflicts and challenge*

- **Conflicts in the lagoon environment affecting stakeholders groups**

182- **Conflict between fishermen and central authorities**. Fishermen revealed having been imprisoned for taking the initiative of reducing the height of reinforced concrete blocks used as dam though the authorities appreciated the change induced by their intervention.

183- **Conflicts between riparian communities and the ministry of Environment** relating to their driving away beyond the 25 meters.

184- **Conflicts between fishermen and the Ministry of Agriculture, Animal Husbandry and**

Fishery (MAEP) about the stipulations of the Decree prohibiting fishing in the channel and the Ministerial Order dated December 2008 preventing them from catching prawns.

185- **Conflict between fishmongers and the SOGEMA** about the fishmongers' location in Dantokpa market. SOGEMA, being the market administrative Authority nearly denied the fishmongers to occupy a non-built place. They contributed money to build some bungalows that SOGEMA destroyed while driving them away.

186- **Conflicts between SOGEMA and the Ministry in charge Environment** about the layout of the Gbogbanou domain.

Table 19: Summary of the power relationship and influence of the stakeholders

Stakeholders	Major interest	project Impact on the benefits	Impact on the project	Importance vis à vis of the project
Primary				
Fishermen,	Fish all the year long Expansion of their activity Increase of income	+ + +	4	2
Fishmongers	Expansion of their activity Increase of income	+ +	4	1
Lagoon mined sand dealers	Halt of sand selling	-	2	1
Dyers,	Movement Institution Capacity building	- +	1	1
Municipality Authorities	Improvement of the riparian communities living conditions Sanitation of lagoon shores Restocking of the Channel	+ + +	5	5
Hotels and Restaurants Managers	Attracting lagoon shores Affluence of clients and tourists Increase of profit Infrastructures are less damaged	+ + + +	5	4
Association of traders and dealers in various products.	Institution Capacity building Awareness of rights and duties	+	2	2
Dantokpa market Traders and dealers	More adjoining location Clean and attracting lagoon shores Purchase/sales of several kinds of goods	- + +	2	1
Fishermen Associations	Participation in the project management Institution Capacity building Awareness of rights and duties	+ + +	4	3
Fishmongers Association	Institution Capacity building Awareness of rights and duties	+ +	4	2
Association of Lagoon mined sand dealers,	Institution Capacity building Awareness of rights and duties	+ +	2	2
Secondary				
SOGEMA	Conflicts dispute with the project Conflicts with the Ministry for Environment, Housing and Town Planning Conflicts with fishmongers associations	- - -	5	3

I. Account for the requested funding by focusing on the overall adaptation cost.

187- Benin is member of the 48 least developed countries (LDCs) in the world. Its development index of 0.427 ranks it 167th out of 187 countries evaluated (UNDP, 2011). In that position, the country's equity resources do not enable it to respond to the climatic chocks undergone by the populations, physical as well as biological resources upon which their lives depend. That is the case of 30% of the Cotonou population stacked all along the lagoon stretching over 4.50 linear kilometers with a width of 300 meters. That is also the case, in a minor extent, of 100,000 traders and craftsmen who spend their days in the Cotonou international market, on the unhealthy banks of the lagoon welcoming there 500,000 customers coming from the other areas of Cotonou, all the regions of Benin and from the neighboring countries. The continual lagoon environment degradation compromises not only the business and health of part one layer of the society without any alternative solutions, but also the fluvio-lagoon ecosystem sustainability exposed to the incessant ebb and flows of sea water and river water which is incompatible with the physical equilibrium of the water body, harmful to the biology of migrant species and to the profitability of human establishments, eventually worsened by the rise of sea water level and extreme weather events.

188- The Adaptation Fund is an opportunity to rescue those natural ecosystems and human community from the harmful impacts of climate change against which the concerned populations cannot develop in an autonomous way standalone adaptation strategies up to the needs.

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

189- The rationale behind activities 1.3 and 1.5 is to help local populations to generate the resources needed for a sustainable adaptation; it is a self-maintained adaptation drawing on the resources generated due to the enabling environment created through regular adaptive activities. Creating conditions for the ecologically-rational upgrading of the Cotonou lagoon environment for economic purposes (activity 1.3) and raising the awareness of the private business operators for the effective development of economic activities (activity 2.1.7) seem to be a possible way for securing the resources required for adaptation infrastructures maintenance.

190- As a matter of fact, activities targeted under items 1.3 and 2.1.7 are not new to the Cotonou lagoon environment. Some boat landing wharfs are functional, but in inadequate number considering the future evolution of the human community's needs. Activities 1.3 and 2.1.7 proposed in the project aim at ensuring the promotion of local initiatives likely to financially support the infrastructures that the project will have put in place. Without such activities, governmental or municipal authorities will have to see to the maintenance of adaptation infrastructures by using public funds, which could negatively affect quickness and regularity.

191- In summary, the economic activities fostered by the installations proposed in this

project, will provide the riparian populations with the resources usable to ensure adaptation infrastructures sustainability. In this regards, some mechanisms have proven efficient in Benin in the sector of hotel industry where a CFA francs 500 tax levied per night will enable to maintain the tourist infrastructures of general interest. A similar mechanism will be negotiated with private business operators who intervene in the lagoon environment (exporters of fishing products, restaurant managers, etc.). The principle was admitted during the dialogue meetings organized with the stakeholders from January 24th through February 4th, 2013. The practical modalities of implementation will be defined during the project inception.

PART III: EXECUTORY PROVISIONS

A. *Describe the arrangements for project / programme implementation.*

192. Four Town Sections in Cotonou town are riparian to the lagoon vicinity; those are 3rd, 4th, 5th and 6th Town Sections. A Town Section is a subdivision of the Cotonou Municipality administered by a Town Section or District council chaired by a Deputy Mayor who bears the title of Head of Town Section (CA). The Head of Town Section is appointed by the Municipal Council among municipal councilors elected on the list of the concerned Town Section. The Town Section council is made up of all the heads of area, each head of area having been chosen by his/her area council and appointed by the Cotonou Mayor. Thus, the 3rd, 4th, 5th and 6th Town Sections are the democratic territorial and social entities which are the most directly affected by the Cotonou lagoon problems. The Town Section councils in charge of administering the Town Section under the leadership of the mayor are the authentic representatives of grassroots communities faced with problems related to the deterioration of the lagoon and its environment.

193. This project will be implemented in the field by four horizontal entities: they are the Town Section councils of the 3rd, 4th, 5th and 6th Districts, which encompass for each Town Section, one representative of the Area Development Committee, one representative of the association of women of the Town Section, one representative of youth association of the Town Section, one representative of NGOs working actively in the field of environment on the territory of the Town Section, one representative of fishing and/or export companies running their business in the Town Section, one representative of the Land and Environmental Affairs Bureau from the Cotonou Town Council, one representative of the Regional Directorate of Environment, Housing and Town Planning of Atlantic/Littoral region, one representative of the General Directorate of Environment. The broadened Town Section Councils will be assigned the implementation and the monitoring of the layout works on their respective segments of lagoon bank. A permanent consultation framework between the chairpersons of Town Section Councils will help to harmonize the approaches and sort out relevant and adequate solutions to the common problems.

194. The national implementing institution (National Environment Fund) will enter into a management agreement with the General Directorate of Environment (DGE). DGE will set up a coordination team composed of one Coordinator appointed by the Director General of Environment, a Deputy-Coordinator appointed by the Cotonou

Mayor, a Monitoring and Evaluation officer and an administrative assistant. The Coordinator will be accountable to the Director General of Environment who is his direct line supervisor.

195. A Steering Committee chaired by the representative of the Minister of Environment at National level; the vice-chair will be the representative of the Cotonou Mayor. The Steering Committee will include such members as the General Directorate of Environment (DGE), the National Environment Fund (FNE), the Directorates in charge of Lands Tenure, Environment and technical services of Cotonou Municipality, the Benin Environment Agency, the Directorate of Fisheries, the Water Supply Authority, the Directorates in charge of Housing and/or Town Planning, the Directorate in charge of Public Works, a representative of the universities of Benin, a representative of the Benin Scientific and Technical Research Center and the Chairpersons of Town Sections Councils of the 3rd, 4th, 5th and 6th Districts, the Focal Point for Climate Change, the Coordinator and the Deputy Coordinator of the project.

196. A Technical Committee will assigned to develop the terms of reference of the different activities of the project, evaluate and ascertain the quality of technical proposals submitted by the service providing Companies and NGOs, and prepare the Steering Committee meetings. This Committee will be made up of the Chairpersons of Town Section Councils of the 3rd, 4th, 5th and 5th Districts, the Directorates in charge of Lands and Environment and technical units of the Cotonou Municipality, the General Directorate of Environment, the Directorates in charge of Housing and Town Planning, the Directorate in charge of Public Works, a representative of the universities of Benin, the Directorate for Fisheries, the Benin Fishery and Oceanographic Research Center, the Directorate in charge of port facilities, a representative of the Benin Naval Forces, a representative of the Directorate in charge of Public Security, a representative of the Chamber of Commerce and Industry of Benin (CCIB), the Directorate in charge of Sanitation, the Directorate of Pollution Prevention and Environmental Police (DPPPE), the Directorate of Environmental risks Management, the Directorate in charge of Legislation, the Focal Point for Climate Change, the Directorates in charge of Handicraft and Tourism, the Monitoring and Evaluation Officer, the Project Coordinator and the Deputy Coordinator.

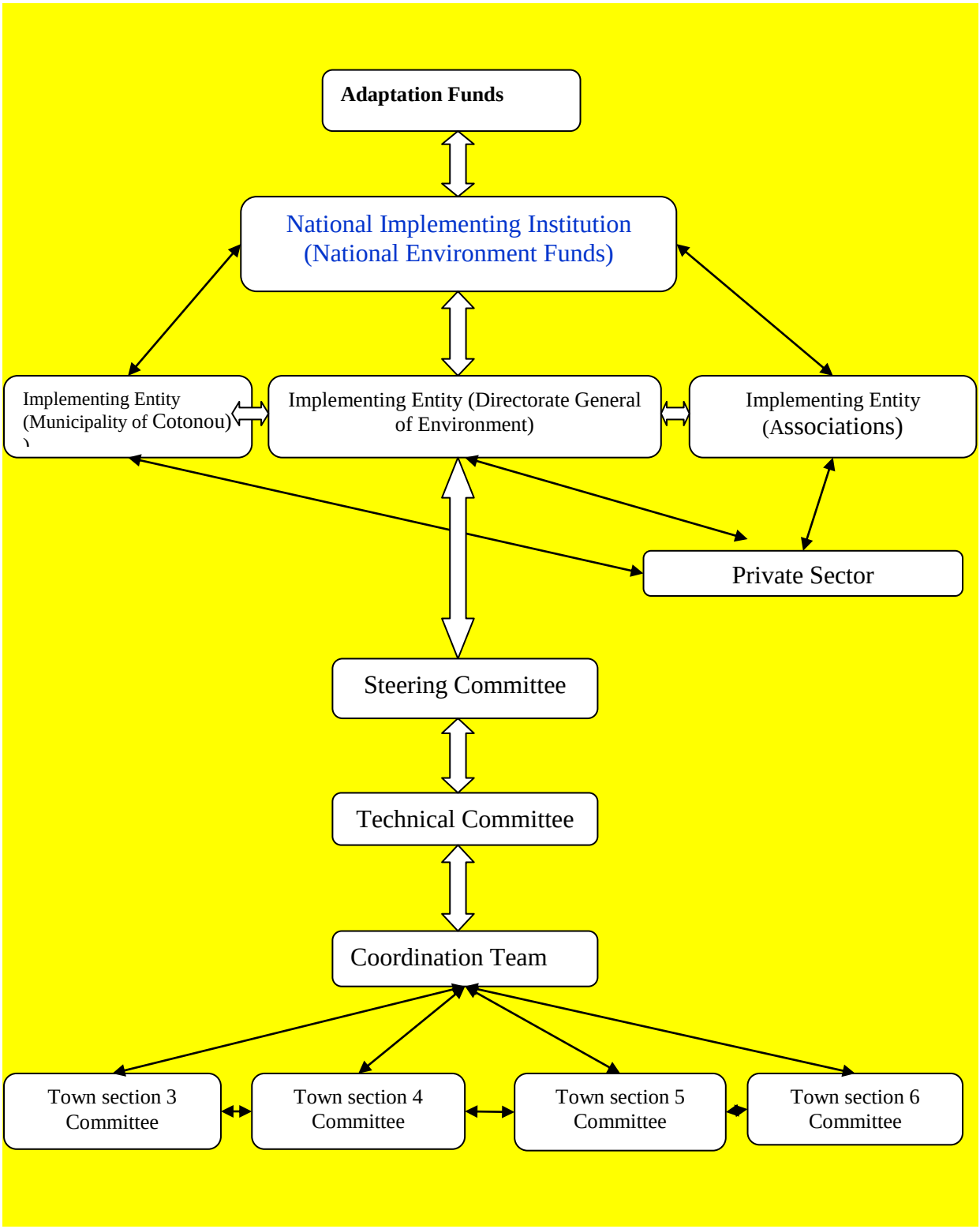
197. All the implementing contracts will be signed by the Director General of Environment further to the approval of the Director General of the National Environment Funds.

198. The project coordination team will be hired through a call for bidders based on the competences required for each technical, administrative or accounting position (Coordinator, Deputy-Coordinator, Monitoring and Evaluation Officer, Administrative Assistant and Accountant).

199. All the administrative or accounting operations shall comply with the provisions of the manual of procedure to be elaborated and validated by the Steering Committee upon proposal by the national implementing institution. Compliance with the technical, administrative and accounting standards must be absolute during the project implementation.

200. The FNE is accountable for the project implementation before the Adaptation Funds. As such, it shall strictly follow up all the procedures and activities induced by the project implementation and shall secure the quality of the results. Upon the Directorate General of Environment (DGE)'s request, the FNE shall release the funds needed for the project implementation to the Coordination Team acting on behalf of the DGE, the Cotonou Municipality and Associations playing a role on the field. The DGE shall be accountable and submit its management report to the FNE pursuant to the to be modalities specified in a procedures manual and in a management agreement signed between the National Implementing Institution and the Main Management Entity. Those documents should be validated by the Steering Committee which is the supreme and umbrella management body of the Project before they could enter in force. The FNE is entitled to have an eye on the bodies and units involved in the project. It should ensure the monitoring of all activities and see to limit the risk sources which can affect the project.

201. In the procedures manual, the functions of the bodies and units, administrative management, technical and financial standards along with the implementation details, the rules for writing financial reports should be specified.


Adaptation Funds
National Implementing Institution (National Environment Funds)
Implementing Entity (Municipality of Cotonou)
Implementing Entity (Directorate General of Environment)
Implementing Entity (Associations)
Private Sector
Steering Committee
Technical Committee
Coordination Team
Town section 3 Committee
Town section 4 Committee
Town section 5 Committee
Town section 6 Committee

The activities of the main stakeholders are presented in Table 20.
Diagram 30: Institutional organizational Chart of the Project Implementation

Table 20: Activities of the main stakeholders of the project

Components	Activities	Responsible Organizations	Contractors
1. Banks protection, and fight against seasonal flooding	**Activity 1.1:** Protect the banks slope of the sandy segments of Cotonou lagoon against landslides.	DGE Cotonou Municipality	Public Works ompanies
	Activity 1.2: Construct pavement walkways along the embankments		Public Works Companies and NGOs
	Activity 1.3: Build on both riversides and on convenience sites, landing stages for users access and for economic and tourism activities (fishing, transport, water sports, promenades by canoe and little boat, etc.)	Municipality of Cotonou Town Section Councils	Public Works companies
	Activity 1.4: Build environment-friendly public toilets as well as social and economic facilities alongside the banks		
	Activity 1.5: Restore the Cotonou dam	Directorate of Port Facilities	Public Works companies
2.1: Fight against pollution of the lagoon	**Activity 2.1.1:** Prohibit the practice consisting in disposing household solid waste in the ground in SOGEMA markets and in the riparian areas of the lagoon	DGE Municipality of Cotonou	NGOs
	Activity 2.1.2: Collect and recycle non biodegradable solid waste are collected in the Dantokpa and Gbogbanou markets		NGOs
	Activity 2.1.3: Collect and recycle biodegradable solid waste are collected in the Dantokpa and Gbogbanou markets.		NGOs
	Activity 2.1.4: Fight against urban waste disposal in the Cotonou town rain water sewers		NGOs Directorate of Sanitation
	Activity 2.1.5: Bring material support for the Naval Forces Unit posted date the entry of the channel in order to intensify the fight.		PM
	Activity 2.1.6: Sensitize, train and equip the local dyers craftmen with the best practices for managing the residual waters loaded with heavy metals.		NGOs Directorate of Sanitation
	Activity 2.1.7: Promote the establishment of the private business operators along the developed lagoon shores.		NGOs

2.2: Integration of the climate change-induced constraints in the legal texts regulating activities on the lagoon and its shores.	**Activity 2.2.1** : Support the integration of the climate change-induced constraints and adaptation strategies in the legal documents regulating activities on the lagoon and its shores	DGE Directorate of Fisheries Municipality of Cotonou	Directorate of Legislation NGOs
	Activity 2.2.2 : To support fishermen concerned by the regulation for their retraining in the new activities generated by the development of Cotonou channel		NGOs
2.3: Create awareness and train the local communities on climatic risks, adaptation techniques, best practices, and capitalization of experiences	**Activity 2.3.1**: Sensitize/train the local elects, Municipal Councilors, Heads of the riparian areas and technical officials on the best practices and techniques of adaptation to climate change impacts.	DGE	NGOs
	Activity 2.3.2 : Conduct the awareness campagn and training of the riparian communities of Cotonou lagoon on the best practices and techniques of adaptation to thee climate change impacts through the Local Authorities and NGOes	DGE	NGOs
	Activity 2.3.3 :Receive pupils and students for their works of end of training in order to disseminate the project experiences and achievements and organize a Project completion seminar.	DGE Municipality of Cotonou	NGOs, schools, Universities

B. *Describe the measures meant for financial and project / programme risk management.*

202- The National Environment Fund (FNE) could open a special bank account in which advance payments received remitted by the Adaptation Fund will be deposited for this project. This measure will ensure the transparency of the accounting management system at the level of the national implementing institution. All the same, each implementing body will be required to open a bank account in order to secure the payments and ensure the reliability of the accounting system. Periodic financial reports submitted to the Board of the Adaptation Fund will testify the robustness of the management system.

203- Project risks could emanate from unexpected events, situations or abnormalities which may arise during the implementation period of the project. Instructions will be given to all the stakeholders for the immediate conveyance of the information to the coordination team, the Director General of Environment (DGE) and the National Environment Fund (FNE). If satisfactory responses can be identified and applied to address the risk, it would be proper nevertheless to notify project managers. Important risks should be handled by FNE and the Steering Committee (CP). The Board of the Adaptation Fund will be kept abreast of all the risks and solutions applied. Anyway, a

list of risks experienced (financial risks and project risks) and solutions brought will be drawn up and documented by the coordination team. It will be part and parcel of the project outcome to be capitalized on and used in the same way as the regularly expected results.

Table 21: Potential project risks and reduction strategies

Risks	Level of impact	Probability of occurrence	Reduction strategies
Change of the national strategy relating to climate change subsequent to Beninese cabinet reshuffle which removed responsible stakeholders	Low	Low	The components of sensitization of the project could be activated for new government officials on the basis of international commitments and the relevant documents already adopted by the Beninese government and parliament
Low effectiveness of the alleviation of the non-climatic factors of the deterioration of ecosystems: wastewater-caused pollution, solid waste, oil products, etc.	Average	Low	The increased accountability of nuisance offenders and local monitoring committees through sensitization, training pedagogy and the mobilization of umbrella organizations (associations, development committee, etc.) should contribute to limit that risk.
Lack of synergy between the implementation bodies on the ground	Average	Low	The strengthening of the consultation framework between heads of Town Sections and chairpersons of extended Town Section Councils will help to boost the synergy.
High reliance of the project on subcontracting	Low	Low	The project will use quality control to check services provided and providers should accept this. Intermediate evaluations will be organized for that purpose.
Poorly designed budget estimates, under-evaluation or over-evaluation of allowances for some budget lines	Average	Average	Transfers of credits between budget lines and the exploitation of "miscellaneous" items up to 5% integrated in the budget of components will induce the flexibility needed for the smooth performance of the project.

C. *Describe the monitoring - evaluation mechanisms, mainly the budgeted Monitoring & Evaluation Scheme.*

204- Monitoring and evaluation of the project implementation will be carried out in two stages: the classical and traditional evaluation which is appropriate for any projects and the outcome of which are meant in priority fot the financial and technical partners and Policy-makers ; and the second stage using the participatory methods open to the populations beneficiary of the project.

205- The project coordination team will prepare annual technical and financial reports to be Submitted to the Steering Committee and the Board of the Adaptation Fund, based on the expected results and indicators. The awareness campaign to the populations on the best behaviors in terms of a streamlined utilization of ecosystems and the human communities in the vicinity of the lagoon environment should be based on the results of diagnosis and evaluation acquired in the field, in order to establish the motivation of stakeholders over a period of inferior to one year. That is why the monitoring and evaluation scheme can be defined as follows:

- The project team will ensure daily monitoring by referring to the provisions of the annual work plan and specific indicators;
- The extended Town Section Councils will be meeting every month to assess the works progress on the ground, to visit the sites and identify the community supports needed for the works progress;
- The permanent consultation framework of heads of Town Sections will ensure the daily supervision and monitoring of works on the field and report discrepancies and problems identified to the General Directorate of Environment and the Cotonou Municipality;
- The Local Management Committee shall be meeting every month to assess the works progress level at local level;
- The Technical Committee will be meeting every quarter in ordinary session to appreciate the scheduled works progress and identify intermediate achievements that can be harnessed for raising awareness of local populations, with site visits;
- The Steering Committee will be meeting every quarter in ordinary session in order to assess progress reports and financial reports and to adopt the work plans and draft budgets; two external independent. Two external independent evaluations will be organized:
  - Mid-term evaluation;
  - Final evaluation three months prior to the project completion, aiming particularly at the sustainability and impact of results.

Table 22: Monitoring and Evaluation (M&E) Plan

M&E Activities	Persons in charge	Costs (US$)[1]	Periods
Inception workshop	Coordinator FNE	4,000	Within the first quarter after the signing the management agreement
Methodological scoping workshop to review indicators with beneficiaries	Coordinator Monitoring officer	5,000	Within two months after the inception workshop
Steering Committee Session	Project team	10,000	Within three months after the inception workshop, then quarterly
Technical Committee Meeting	Coordinator	20,000	Quarterly
Local Management Committee Meeting	Coordinator	0	Monthly
Meeting of the broadened Town Councils	Coordinator	4,000	Monthly
Consultation with the Heads of Town Sections	Coordinator	5,000	Permanent
Development of the works plan and annual budget as well as technical and financial reports	Project team	0	Annual
Elaboration of the quarterly progress reports	Project team	0	Quarterly
Mid-term review	FNE Project team Consultants	20,000	Mid-term
Audit	FNE Consultant	20,000	Annual
Project completion seminar	FNE Project team	20,000	Before final evaluation
Final evaluation	FNE Project team Consultants	20,000	Three months before the end of the project
TOTAL		164,000	

[1] Not included the project personnel time and coordination needs

D. *Include a result framework for the project proposal, including mainly milestones, results-based objectives and the indicators.*

206- The Project logical Framework is as follow (table 23).

Table 23: Project Logical Framework

EXPECTED RESULTS	INDICATORS	BASELINE DATA	TARGETS	DATA SOURCES AND COLLECTION METHODS	FREQUENCY	RESPONSABILIY
Project Objective : Help the riparian populations of the Lagoon of Cotonou in their efforts to reduce climate change adverse impact on their livelihoods and increase their resilience.	Number of households vulnerable to floods and other adverse effects of climate variability and climate change	The exact number of households is unknown	At the end of the project, 75% of the most vulnerable households will have benefited from the main actions taken	Fieldwork The baseline will be determined during the first year of studies	Annual	Project implementation Committee
Outcome 1.1 : Protected Cotonou lagoon shores talus against slumping	Percentage of soft bank slope protected.	Some bank segments are protected with rock fill in the outlet in the sea	100% of soft segments are protected at the end of the second year of project implementation	Field observations	Continues	Project team
Output 1.1 : Four point three 4.3 kilometers of sand segment are protected with a reinforced concrete wall along the shores.						
Activity 1.1.1 : Protect the banks slope of the sandy segments of Cotonou lagoon against landslides.	Length of soft bank slope is protected.	No such a type of protection do exist along the banks	4, 3 kilometer of soft segments are protected at the end of the second year of project implementation	Field observations	Continues	Project team
Outcome 1.2 : Upper side of the embankment slope stabilized and accessible to populations	Percentage of upper side of the bank slope stabilized and accessible to populations	All the upper sides of slopes are congested with refuse	100% of the upper side of the slopes get stabilized at the end of the third year of project implement	Field observations	Continues	Project team
	Number of population coming and going on the embankment of the	Almost totality of the quay is sprinkled with filth, unhealthy	At least 1000 populations will pass on the quay a day at the end of the project	Field observations and inquiries	Quarterly in the fourth year	Project team

	lagoon	and frequently flooded; the populations do not circulate there				
Output 1.2 : Four point three (4.3) kilometers of pedestrians road of 2 meter width are paved along the shores						
Activity 1.2.1 : Construct pavement walkways along the embankments	Length of the upper side of embankments get stabilized	No such upper side slopes stabilization along the embankment does exist	4,3 kilometers of upper side of slope get stabilized at the end of the third year of project implement	Field observations	Continues	Project team
Outcome 1.3 : Easier exchanges and transport of populations and goods crossing the Lagoon during flooding	The rate of population crossing the lagoon	The rate is unknown	50% of riparian residents crossing the lagoon will be using the transport facilities provided for at the end of the project.	Fieldwork	Quarterly during the fourth year	Project team
Output 1.3 : Eleven (11) landing stages are established along the embankments						
Activity 1.3: Build on both riversides and on convenience sites, landing stages for users access and for economic and tourism activities (fishing, transport, water sports, promenades by canoe and little boat, etc.).	Number of land stages built	Two old crossing stations are being operated between the embankments	11 landing stages are built at the end of the project	Field observations	Continues	Project team
Outcome 1.4 : Bodily needs of the users of banks satisfied in cleaned up environmental in spite of climate variability and climate change	Attendance rate of toilet and rate of exploitation(of the installations	Some latrines are being built alongside the lagoon	75% of users in need run the toilets and the social and sanitary facilities	Fieldwork and inquiries	Quarterly in the fourth year	Project team
Output 1.4 : Twenty-two (22) public toilets, 86 metallic waste bins; 645 sidewalk benches; 150 light poles and 645 trees are installed along the shores						
Activity 1.4:: Build environment-friendly public toilets as well as social and economic facilities alongside the banks	Number of equipment put in place	Some latrines are being built alongside the lagoon	Twenty-two (22) public toilets, 86 iron dust-bins, 645 public benches, 150 street lamps and 645 are put in place at the end of the project	Field observations	Continues	Project team
Outcome 1.5 :	Number of critical	All the critical	There should be no	Field observations	Continues	Project team

Controlled seasonal flooding in targeted area	flooding in a year Percentage of household affected by flooding	flooding of Ouémé river lead to the flooding of the lagoon area	critical flooding as from the third year of project implementation Less than 10% of populations are affected by flooding at the end of the project	and inquiries		
Output 1.5 : The Cotonou dam rehabilitated and operational						
Activity 1.5: Restore the Cotonou dam	Work implementation rate	The dam is not operational	The dam should be become fully operational at the end of the second year of project implementation	Field observations	Continues	Project team
Outcome 2.1: Capacity built for prohibiting the disposal of household waste on the land along the lagoon shores and for reducing waste charges in floods water.	percentage of solid waste dump on the floor	No information currently	The rate of solid waste dump of the ground should reduce below 10 % of the baseline	Fieldwork. The benchmark unhealthiness rate should be determined on the inception of the project	Continues	Project team
Output 2.1.1 : The household solid waste management system improved in the riparian areas as well as Dantokpa and Gbogbanou markets; Ten waste metallic tanks available for SOGEMA and the other four riparian town sections; (Capacities building, and the NGO, Municipal and Environmental Police Units equipped; Prohibitory signs installed)						
Activity 2.1.1: Prohibit the practice consisting in disposing household solid waste in the ground in SOGEMA markets and in the riparian areas of the lagoon	Number of functioning equipment in markets and in riparian neighborhoods	Three refuse trays are functioning now	10 Refuse trays are functioning and the second year of project implementation	Field observations	Continues	Project team
Outcome 2.1.2 : Capacity built for collecting and value adding to non biodegradable waste	Growth rate of non-biodegradable waste collected and recycled	The collection and recycling efficiency of non-biodegradable waste is yet to be known.	The growth rate of non-biodegradable waste collected will reached 50% of the benchmark situation at the end of the project	Field work	Every three months as from the third year of project implementation	Project team
Output 2.1.2 : two hundred (200) aluminium bins and two hundred (200) baskets put at the disposal of the Dantokpa Market and Waste Recycling Women Association (AFRMD) for collecting and recycling biodegradable waste						
Activity 2.1.2 :	Number of	OXFAM QUEBEC	The total of equipment	Field observations	Continues	Project team

Collect and recycle non biodegradable solid waste are collected in the Dantokpa and Gbogbanou markets	equipment made available to Women Association	NGO supported the women until 2011	shall be made available to the Association of women during the second year of project implementation			
Outcome 2.1.3 : Capacity built for collecting and value adding to biodegradable waste usable by vulnerable household	Growth rate of biodegradable waste collected and recycled	The collection and recycling efficiency of biodegradable waste is yet to be known.	The growth rate of biodegradable solid waste collected will reached 50% of the benchmark situation at the end of the project	Fieldwork	Every three months as from the third year of project implementation	Project team
Output 2.1.3 : Two hundred (200) small pieces of composting materials put at the disposal of the Houéyiho Truck-farmers Association						
Activity 2.1.3 : Collect and recycle biodegradable solid waste are collected in the the Dantokpa and Gbogbanou markets.	Number of equipments provided for the Truck-farmers Association	The Truck-farmers Association did not benefit from any special support	The total equipments availed for the Women Association during the second year of the project implementation	Field Observations de	Continues	Project Team
Outcome 2.1.4 to 2.1.7 : Reduced risks of disposing contaminated used waters in the lagoon and the risks of waters contamination	Rate of contamination of the lagoon waters Morbidity rate due to water-born risks among the riparian community	The contaminants have rendered the waters and fishing resources unfit for consumption Morbidity rate unknown to the vulnerable population	At the end of the project, the water and fishing resources contamination rate should comply with the WHO and FAO standards	Field study and survey	Quarterly from the fourth year of the project implementation	Project team
Output 2.1.4 to 2.1.7 : The urban liquid waste are no longer disposed of in the Cotonou town rain water sewers – New night intervention means are availed to the Naval Forces Units in faction at Ladji area – Awareness campaign programs are broadcast – Local Dyers raise their awareness and apply the rational residual used waters management techniques – Private business operators undertake to upgrade tourist activities on the lagoon						
Activities 2.1.4 through 2.1.6 : Fight against water pollution and contamination of fish and aquatic animals (additional segment to activities 2.1.1 through 2.1.3)	Rate of lagoon waters contamination Morbidity rate due to water-born risks within the riparian	The contaminants have rendered the waters and fishing resources unfit	At the end of the project, the water and fishing resources contamination rate should comply with the WHO and FAO	Field study and survey	Quarterly from the fourth year of the project implementation	Project team

	community	for consumption Morbidity rate unknown to the vulnerable population	standards			
Outcome 2.2.1 – 2.2.2 Captured climate change and adaptation techniques-induced constraints in the legal texts regulating activities on the lagoon and its banks, and former fishermen reoriented in new economic activities generated by the channel layout	Number of regulatory texts capturing climate change impacts in the lagoon environment and favoring the job creation Number of Lagoon Environment targeted households who got a sustainable employment	All the existing legal texts prohibit economic activities in the lagoon	All the legal texts comply with the environment standards and capture resilience to climate change at the end of the project The stakeholders will be reoriented in the promising activities sector	Survey	Continues	Steering Committee
Output 2.2.1 et 2.2.2: A decree regulating activities on the Cotonou lagoon and its shores, validated, signed by the Cabinet; the riparian community sensitized on the ecosystem sustainable management standards						
Activity 2.2.1 et 2.2.2: Mainstreame the climate change-induced constraints in the legal texts regulating activities on the lagoon banks.	Number the regulatory texts integrating the climate change in lagoon environment Number of Lagoon Environment specialists who got a sustainable employment	All the existing legal texts prohibit economic activities in the lagoon	All the legal texts are in compliance with the environment standards and capture resilience to climate change at the end of the project The stakeholders will be re-oriented into promising sectors of activity	Survey	Continues	Steering Committee
Outcome 2.3 : Ensured sustainability of experiences and the dissemination of the project outcome by the training of communities on the climatic risks, adaptation techniques and the best practices as well as the	Number of staff, local elects, professional organizations, local elects and households who initiated adaptation measures in the riparian areas..	Unknown baseline situation	At the project completion, the stakeholders should be able to initiate adaptation measures to climate change in variable numbers in accordance with the	Field survey	Continues	Steering Committee

capitalization of experiences in the form of theses and dissertation			social position; those measures should be identified right from the inception workshop.			
Output 2.3.1 to 2.3.3 : two (02) training sessions are organized for the local elects, municipal councilors, heads of riparian areas and technical officials on the best practices and techniques of adaptation to climate change impacts – Grassroots communities have been sensitized and trained on the best practices and adaptation techniques to climate change – At least ten (10) theses and dissertations are defended in the professional colleges and universities on the Project themes; the Project Reports are submitted to the relevant national and international institutions; about fifteen (15) workshops, meetings are organized with the journalist; a completion conference is organized.						
Activities 2.3.1 to 2.3.3 : Sensitize and train local communities on the climatic risks, adaptation techniques and the best practices as well as capitalize the experiences	Number of households, professional organizations and local elects who have initiated adaptation measures in their areas Number of theses and dissertations defended on the Project thematic	Unknown baseline situation	At the project completion the stakeholders should be able to initiate adaptation measures to climate change in variable numbers in accordance with the social position and which should be defined right from the inception workshop. 10 theses or dissertation at the end of the project.	Field surveys	Continues	Steering Committee

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

Table 24: Project Budget and Timeline

Investment category	Activities	Year 1	Year 2	Year 3	Year 4	Total (US$)
Component 1 : Protection of lagoon banks, fight against seasonal floods and catering for socio-community infrastructures	**Activity 1.1:** Protect the banks slope of the sandy segments of Cotonou lagoon against landslides.					
	1, Negotiation of contracts with companies					
	2, Waste collection	222,000				222,000
	3, Reinforced concrete works	1,000,000	1,399,000			2,399,000
	Activity 1.2 : Construct pavement walkways along the embankments					
	1, Excavation of erodible land, evacuation, supply of embankment materials	975,625	996,039	247,505		2,219,169
	2, Manufacturing and laying of pavements		697,227			697,227
	3, Installation of reinforced concrete parapet wall and stainless metallic pipes		478,099	247,505		725,604
	Activity 1.3 : Build on both riversides and on convenience sites, landing stages for users access and for economic and tourism activities (fishing, transport, water sports, promenades by canoe and little boat, etc.)					
	1, Negotiation of the contracts with companies					
	2, Construction of landing wharfs			217,000		217,000
	Activity 1.4 : Built environment-friendly public toilets as well as social and economic facilities alongside the banks					
	1, Negotiation of the contracts with companies					
	2, Construction of the public toilets along the banks			217,000		217,000
	Activity 1.5 : Restore the Cotonou dam					
	1, Negotiation of the contracts with companies					
	2, Rehabilitation of the dam		117,000			117,000
Total component 1		**2,197,625**	**3,687,365**	**929,010**	**0**	**6,814,000**
	2,1 Fight against Lagoon pollution					

Investment category	Activities	Year 1	Year 2	Year 3	Year 4	Total (US$)
Component 2 : Integration of climate variability in environment management by the waterside populations and capitalization of the project experiences	**2.1.1** : Build the capacities of heads of area and SOGEMA to prohibit the practice of household waste disposal and dumping in the ground		40,000	32.000		72,000
	2.1.2 : Build capacities of the Dantokpa Market Waste recycling Women Association (AFRMD)in biodegradable waste collection and recycling		4,000			4,000
	2.1.3 : Build capacities of the Houéyiho Truck-farmers Association in recycling and upgrading biodegradable waste		2,000			2,000
	2.1.4 :Fight against the disposal of urban liquid waste in the Cotonou town rain water sewers			0		0
	2.1.5: Bring support to the Naval Forces Units posted in faction at the entry of the Channel in order to intensify the fight.			70.000		70000
	2.1.6 : Raise awareness, train and equip the local Dyers on the best practices in managing the Heavy metals-loaded residual used waters			20,000		20,000
	2.1.7 :Promote the establishment of private business operators along the sanitized and developed banks				50.000	50,000
	2,2Mainstreaming the climate change-induced constraints in the legal texts regulating fishing activities on the lagoon and its shores					
	2.2.1 : Support the capturing of climate change-induced constraints and adaptation strategies in the laws regulating fishing activities				40,000	40,000
	2.2.2 : Support fishermen affected by the regulation by re-orienting them into in new activities generated by the Cotonou channel development				317,000	317,000
	2.3: Awareness raising and training local communities on climatic risks, adaptation techniques and the best practices as well as the capitalization of experiences					

Investment category	Activities	Year 1	Year 2	Year 3	Year 4	Total (US$)
	2.3.1 : Raise awareness and train the local elects, town councilors, heads of riparian areas and technical executives on the best practices and adaptation techniques to climate change impacts		69,000			69,000
	2.3.2-Local Authorities and NGOs should ensure the awareness raising and training of the Cotonou lagoon riparian community on the best practices and techniques of adaptation to climate			12,000		12,000
	2.3.3 :Receive pupils and students for their research works in order to disseminate the achievements of the project and organize a Project Completion Seminar.			25,000	34,000	59,000
Total component 2		0	115,000	159,000	441,000	715,000
Total component 1 & 2		2,197,625	3,802,365	1,088,010	441,000	7,529,000
Project Execution Cost		214, 077	234,498	148,150	118,530	715,255
Project Cycle Management Fee charged by the Implementing Entity		210,000	190,000	130,000	139,000	669,000
TOTAL BUDGET		**2,621,702**	**4,226, 863**	**1,366,160**	**698,530**	**8,913,255**

	Expenditure related to the sub component	Unit	Unit cost (USD)	Num-ber of units	Year 1	Year 2	Year 3	Year 4	Total cost	See Budget Note:
Component 1- Lagoon shores protection, seasonal floods control and restoration /rehabilitation of the socio-community infrastructures										
C1	Sub-Component 1 – Lagoon banks stabilization for the high priority sites with a reinforced concrete wall									
C1.1	National consultants									
C1.1.1	Study of the physical characteristics of the lagoon banks soil, the dynamics of waters exchange between the Ocean and Nokoué Lake as well as the mode of occupation of the banks by the riparian populations; (2 consultants)	Per day	250	120					30,000	C1.1
C1.1.2	Study of social and environmental impacts	Per day	250	120					30.000	C1.1
C1.1.3	Satndard study of the reinforced concrete to secure at least 100 year sustainability for the retaining banks walls (02 consultants)	Per day	250	60					15,000	C1.1
C1.1.4	Drawing up of technical tender documents for shores flow stabilization (01 consultant)	Per day	250	20					5,000	C1.1
C1.1.5	Workshop (preparation & moderation)	Per day	250	24					6,000	C1.1
C1.1.6	Quality control	Per day	250	156					39,000	C1.1
	Subtotal 1.1				110,000	15,000			**125,000**	C1.1
C1.2	Local transportation									C1.2
	Subtotal 1.2				25,000	20,000			**45,000**	
C1.3	Workshops		1,500	04						C1.3
	Subtotal 1.3				3,000	3,000			**6,000**	C1.3
C1.4	Services Equipment & Supplies									C1.4
	Subtotal 1.4				1,084,000	1,361,000			**2,445,000**	C1.4
	Total 1				**1,222,000**	**1,399,000**			**2,621,000**	
C2	Sub-Component 2 – Implementation of pedestrian paved roads along the banks									
C2.1	National consultants									
C2.1.1	Study of the lagoon banks land uses (02 consultants)	Per day	250	120					30,000	C2.1
C2.1.2	Elaboration of a participatory development plan for the Lagoon banks (04 consultants)	Per day	250	240					60,000	C2.1
C2.1.3	Workshop (preparation & moderation)	Per day	250	36					9,000	C2.1
C2.1.4	Quality control	Per day	250	156					39,000	C2.1

	Subtotal 2.1				94,875	27,865	15260		**138,000**	C2.1
C2.2	Local transportation									C2.2
	Subtotal 2.2				20,000	20,000	5,000		**45,000**	C2.2
C2.3	Workshops			06						C2.3
	Subtotal 2.3				3,000	3,000	3,000		**9,000**	C2.3
C2.4	Services Equipment & Supplies									C2.4
	Subtotal 2.4				857,750	2,120,500	471750		**3,450,000**	
	Total 2				975,625	2,171,365	495,010		3,642,000	
C3	**Sub-Component 3 –Construction of landing wharfs along the banks**									
C3.1	National consultants									
C3.1.1	Workshop (preparation & moderation)	Per day	250	12					3,000	C3.1
C3.1.2	Quality control	Per day	250	52					13,000	C3.1
	Subtotal 3.1						16,000		**16,000**	C3.1
C3.2	Local transportation									C3.2
	Subtotal 3.2						6,000		**6,000**	C3.2
C3.3	Workshops		1,500	02						C3.3
	Subtotal 3.3						3,000		**3,000**	C3.3
C3.4	Services Equipment & Supplies									C3.4
	Subtotal 3.4						192,000		**192,000**	C3.4
	Total 3						**217,000**		**217,000**	
C4	**Sub-Component 4 – Construction of public toilets**									
C4.1	National consultants									
C4.1.1	Workshop (preparation & moderation)	Per day	250	12					3,000	C4.1
C4.1.2	Quality control	Per day	250	52					13,000	C4.1
	Subtotal 4.1						16,000		**16,000**	C4.1
C4.2	Local transportation									C4.2
	Subtotal 4.2						6,000		**6,000**	
C4.3	Workshops	Workshop	1,500	02						C4.3
	Subtotal 4.3						3,000		**3,000**	C4.3
C4.4	Services Equipment & Supplies									C4.4

	Subtotal 4.4						192,000		**192,000**	C4.4
	Total 4						**217,000**		**217,000**	
C5	**Sub-Component 5 – Rehabilitation of the Cotonou dam**									
C5.1	National consultants									
C5.1.1	Workshop (preparation & moderation)	Per day	250	12					3,000	C5.1
C5.1.2	Quality control	Per day	250	52					13,000	C5.1
	Subtotal 5.1					16,000			**16,000**	C5.1
C5.2	Local transportation									C5.2
	Subtotal 5.2					6,000			**6,000**	C5.2
C5.3	Workshops		1,500	03						C5.3
	Subtotal 5.3					3,000			**3,000**	C5.3
C5.4	Services Equipment & Supplies									C5.4
	Subtotal 5.4					92,000			**92,000**	C5.4
	Total 5					**117,000**			**117,000**	
	TOTAL COMPONENT 1				**2,197,625**	**3,687,500**	**928,875**	**0**	**6,814,000**	
Component 2: Mainstreaming climatic variability in Environment management by the riparian populations and capitalization of the Project experience										
C6	**Sub- Component 6 – Lagoon water pollution control**									
C6.1	National consultants									
C6.1.1	Workshop (preparation & moderation)	Per day	250	54					13,500	C6.1
C6.1.2	Quality control	Per day	250	52					13,000	C6.1
	Subtotal 6.1					4,500	19,000	3,000	**26,500**	C6.1
C6.2	Local transportation									C6.2
	Subtotal 6.2					6,000	8,000	4,000	**18,000**	C6.2
C6.3	Workshops			03						C6.3
	Subtotal 6.3					4,500	6,000	4,000	**14,500**	C6.3
C6.4	Services Equipment & Supplies									C6.4
	Subtotal 6.4					31,000	89,000	39,000	**159,000**	C6.4
	Total 6					**46,000**	**122,000**	**50,000**	**218,000**	
C7	**Sub-Component 7 – Mainstreaming the climate change-induced constraints in the legal texts regulating to climate variability in texts regulating fishing in the lagoon and support for viable and sustainable alternative livelihoods for affected fishermen/women**									

C7.1	National consultants									
C7.1.1	Study of integration of climate change and adaptation strategies constraints in the law on fishery (02 consultants)	Per day	250	80					20,000	C7.1
C7.1.2	Workshop (preparation & moderation)	Per day	250	116					29,000	C7.2
	Subtotal 7.1							49,000	**49,000**	C7.1
C7.2	Local transportation									C7.2
	Subtotal 7.2							20,000	**20,000**	C7.2
C7.3	Workshops			19						C7.3
	Subtotal 7.3							60,000	**60,000**	C7.3
C7.4	Services Equipment & Supplies									C7.4
	Subtotal 7.4							48,000	**48,000**	C7.4
C7.5	**Training courses**									C7.5
	Subtotal 7.5							30,000	**30,000**	C7.5
C7.6	**Initial grants**									C7.6
	Subtotal 7.6							150,000	**150,000**	C7.6
	Total 7							**357,000**	**357,000**	
C8	**Sub-Component 8 – Awareness raising and training local communities on climatic risks, adaptation techniques as well as best practices, and capitalization of experiences**									
C8.1	National consultants									
C8.1.1	Workshop (preparation & moderation), creation of a website	Per day	250	199					49,750	C8.1
	Subtotal 8.1					40,750	5,250	3,750	**49,750**	C8.1
C8.2	Local transportation									C8.2
	Subtotal 8.2					2,000	5,000	5,000	**12,000**	C8.2
C8.3	Workshops			10						C8.3
	Subtotal 8.3					5,000	6,000	6,000	**17,000**	C8.3
C8.4	Services Equipment & Supplies									C8.4
	Subtotal 8.4					21,250	20,750	19,250	**61,250**	C8.4
	Total 8					**69,000**	**37,000**	**34,000**	**140,000**	
	TOTAL COMPONENT 2				**0**	**115,000**	**159,000**	**441,000**	**715,000**	

207. C1.1: A consultancy Firm made up of Experts will be assigned the studies of the soils structure, the land uses, the stream flow, the topography of the lagoon and the banks as well as the drafting of the Technical Tender Documents for the design and the implementation of the Banks protection. Experts members of this Consultancy firm shall be: Pedologist, Geologist, Hydrologist, Sociologist, Environmentalist, Economist, etc. The resulting document will be submitted to a validation workshop while seven other workshops should be organized for the Stakeholders of Monitoring&Evaluation of the lagoon shore protection activities. The quality control of the works will be assumed by the Licensed Consultant.

208. C1.2: transportation costs for monitoring and data collection in the field as well as transportation fees for the participation in consultation workshops.

209. C1.3: This allocation will cover costs for organizing 7 workshops at US$1,500 each, inclusive of venue, meals and refreshments for validation of the tenders documents and for monitoring and evaluation of the Lagoon banks protection activities by the stakeholders.

210. C.1.4: This allocation covers the cost associated to service contracts entered into with local companies for clearing off the dumping sites created on the banks (US$ 200,000 in Year 1), and for supplying the water bodies bank stabilization rocks (US$ 884.000 and 1 361 000 US $ for Year 1 and Year 2 respectively).

211. C2.1: The national consultants will study the lagoon banks occupation mode in all four riparian Districts and elaborate a participative development plan of Lagoon. They will moderate for the stakeholders, the validation, dissemination and Minitoring-Evaluation workshops of the pavement laying works works for the stakeholders. The quality control of the works will be assumed by a Quality Control Bureau of a specialized Institution carrying out this assignment twice per week.

212. C2.2: Costs associated to the transport for monitoring data collection on the field and participation in the consultation workshops.

213. C2.3: This allocation will cover costs associated to the workshops, including venue hiring, meals and refreshments for validation of the tender document and for the monitoring & evaluation of Lagoon banks protection activities by the stakeholders.

214. C.2.4: This allocation covers the costs of audio-visual equipments, supplies, and informational materials to facilitate community mobilization and planning activities as well as the cost of service contracts with local companies in the first year for clearing and leveling of banks and the construction of paved road in cement ($2,547,500). This allocation also covers for the second year the costs associated with manufacturing of the reinforced concrete wall and laying of pavements

215. C3.1: Those fees will be used to fund the consultations sessions that the consultants will have with the stakeholders as well as the fees for the monitoring evaluation of the Landing wharfs construction. The control of the Construction works will be carried out by a licensed Consultant Bureau.

216. C3.2: This allocation covers the cost related to the surveillance, data collection and participation in the consultation workshops.

217. C3.3: This allocation will cover the costs associated with workshops, inclusive of venue hiring, meals and refreshments for monitoring and evaluation of landing wharfs construction by the stakeholders.

218. C.3.4: This allocation ($192,000) covers the cost of services contracts signed with national or international companies in the 3rd year for construction of landing wharfs

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219. C4.1: These fees are intended for the organization of the dissemination session and monitoring-evaluation of the Public Toilets construction works for the stakeholders. The Quality Control of the works will be carried out by a licensed Control Firm, at an average of twice per week.

220. C4.2: Costs associated with transportation for data collection monitoring, participation in the various consultation workshops.

221. C4.3: This allocation will cover expenditure related to the organization of three workshops (1,500 US $), including venue hiring and catering.

222. C.4.4: This allocation $192,000) covers the cost of construction services contracts signed with local companies during the 3rd year for the construction of 22 publics toilets.

223. C5.1: The allocated funds will be used for organizing the debriefing and monitoring-evaluation workshops on the Cotonou Dam Rehabilitation works for the stakeholders. The Quality control will be carried out by a licensed Quality Control Bureau at an average of twice a week.

224. C5.2: Costs associated with transport for monitoring and data collection on the field, attending consultation workshops.

225. C5.3: This allocation will cover costs associated with workshop sessions, inclusive of venue, meals and refreshments.

226. C.5.4: This allocation covers the costs of service contracts with local companies in the 2nd year for the Cotonou Dam rehabilitation

227. C6.1: National consultants will moderate workshops for raising awareness on pollution caused by heavy metals, ecological sanitation and promoting economic activities on Lagoon banks. The quality control of the construction of improved public latrines will be assumed by the National Center of Research for the Public Works.

228. C6.2: Costs associated with transport for monitoring and Data collection on the field, attending consultations workshops.

229. C6.3: This allocation will cover costs associated with workshop sessions.

230. C6.4: This allocation will cover costs associated with building technical capacities of heads of the area and SOGEMA to ecological sanitation.

231. C7.1: The national consultants will study the modalities of integration of climate change and strategies of adaptation constraints the laws regulating Fishery. They will moderate validation and feedback workshops for stakeholders.

132. C7.2**:** Costs associated with transport for monitoring and Data collection on the field, attending consultation workshops.

233. C7.3: This allocation covers workshop sessions, inclusive of venue, meals and refreshments.

234. C7.4: This allocation covers the associated costs of informational materials and supplies to facilitate community mobilization

235. C7.5: Existing training Centers will be approached for building relevant individual capacities of those livelihoods affected. The average cost per person is about US$ 400 per module for a total of 75 persons to be selected per livelihood. Each module is autonomous and the cost includes support for professional integration.

236. C7.6**:** This allocation will cover associated costs of basic supports for the fishermen/women who will opt for alternative livelihoods**.** Average cost per person is approximately US$2,000 for 75 persons in total

The list of potential activities proposed is as follows:

- Reconversion of (livelihood) fishermen in aquaculturists through the layout of some wetland in some fish rearing catchment basins (for instance, the wetland of Akogbato in the 12th Town section which15 km; Vossa in the 6th Town section which covers at least 2 km ; Zogbo, Fifadji and Mènontin in the 9th and Yénawa in the 3rd town section;
- reconversion of fishermen into truck-farmers likewise the Women and Men Groupings in Mono Region and in the South-West Benin who were formerly involved in fishing activities due to the depletion of fishing products;
- reconversion into agricultural activities (agriculture, breeding);
- Reconversion into fish processing and drying activities (Men and Women fishmongers) with support means;
- Reconversion fishermen in inland water transports.

The funds allocated for those activities will not be handed over to the beneficiaries; rather the financial resources will be used for:

- The acquisition of materials (walk-behind tractors, moto-pumps, hoes, cutlaces, ovens for fish drying, etc.);
- The implementation of the works and technical equipments (construction of fish ponds, water impoundment, breeding enclosure, drinking bowls for the livestock etc.);
- Acquisition of raw materials (frys, cockerel chicks, porcinse, cattle, goats, sheps, fertilizers, insecticides and pesticides, fish and animals foods, etc.);
- Technical expertise support (support-counseling and training in the field of fish farming, truck-farming, breeding and fish drying, etc.).

237. C8.1: The National consultants will develop a communication strategic plan on the climatic risks, adaptation technique and the best practices. They shall coordinate and facilitate the strategic planning process for the livelihood network. They will moderate awareness raising and training workshops on the best practices and adaptation techniques to climate change impacts for the local communities, municipal councilors, heads of riparian areas, the communities and technical officials. Later, the moderation of the workshop in the town section will be ensured by Municipal Authorities and the NGOs. Besides, a Website and internet designers will develop the project platform which will be hosted on the National Environment Fund Website and update it all along the four years of the project.
238. C8.2: The costs associated with the transportation for partaking in the workshops and forum on the best practices.

239. C8.3: This allocation covers a series of awareness creating and training workshops gathering the Stakeholders on the best practices and adaptation techniques to climate change.

240. C8.4: This allocation covers the cost associated with the organization of field visits for the students, their participation in a 2-day symposium on the best practices, including poster exhibition, seminars and workshops, a project completion seminar, the acquisition of communication material in order to increase the communities' resilience capacity to climate change, the ecosystems and economic sectors concerned should be coverd.

Table 25: Activities schedule

Activities	Schedule															
	Year 1				Year 2				Year 3				Year 4			
Activity 1.1: Protect the banks slope of the sandy segments of Cotonou lagoon against landslides.																
Activity 1.2: Construct pavement walkways along the embankments																
Activity 1.3: Build on both riversides and on convenience sites, landing stages for users access and for economic and tourism activities (fishing, transport, water sports, promenades by canoe and little boat, etc.)																
Activity 1.4: Build environment-friendly public toilets as well as social and economic facilities alongside the banks																
Activity 1.5: Restore the Cotonou dam																
Activity 2.1.1: Prohibit the practice consisting in disposing household solid waste in the ground in SOGEMA markets and in the riparian areas of the lagoon																
Activity 2.1.2: Collect and recycle non biodegradable solid waste are collected in the the Dantokpa and Gbogbanou markets																
Activity 2.1.3: Collect and recycle biodegradable solid waste are collected in the the Dantokpa and Gbogbanou markets.																
Activity 2.1.4: Fight against the disposal of urban waste in the rainwater sewers of Cotonou town	Activities of the Emergency Project for Environmental Management in Urban Areas (PUGEMU) funded by the World Bank															
Activity 2.1.5: Bring material support for the Naval Forces Unit posted date the entry of the channel in order to intensify the fight.																
Activity 2.1.6: Sensitize, train and equip the local dyers craftmen with the best practices for managing the residual waters loaded with heavy metals.																
Activity 2.1.7: Promote the establishment of the business operators on the developed shores																
Activity 2.2.1: Support the integration of the climate change-induced constraints and adaptation strategies in the legal documents regulating activities on the lagoon and its shores																
Activity 2.2.2: Support the means of livelihood (fishermen, fishmongers, etc.) in the new activities generated by the layout of the Cotonou lagoon																
Activity 2.3.1: Sensitize/train the local elects, Municipal Councilors, Heads of the riparian areas and technical officials on the best practices and techniques of adaptation to climate change impacts.																
Activity 2.3.2: Conduct the awareness campagn and training of the riparian communities of Cotonou lagoon on the best practices and techniques of adaptation to thee																

climate change impacts through the Local Authorities and NGOes																
Activity 2.3.3 :Receive pupils and students for their works of end of training, spread the acquired experiences by the project and organize a seminar of the end of project																
Activity 3.1: To ensure the technical coordination of project activities																
Activity 3.2: To carry out internal management and monitoring and evaluation activities																
Activity 3.3: To carry out external evaluation activities																

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

Tables 26 and 27 show the execution cost and the Budget breakdown of the Implementing Entity Fee

Table 26: Execution cost (x1000US$)

Expenditure	One Year after Project inception	Year 2	Year 3	Year 4	Total
Project Manager	34,792	34,792	34,792	34,792	139, 168
Assistant manager	21,223	21,223	21,223	21,223	84, 892
Senior Technical Officer	18,062	18,062	18,062	18,062	72, 248
Administrative Assistant	9,843	9,843	9,843	9,843	39, 372
Social Security	3,724	3,724	3,724	3,724	14, 896
Equipment and furniture	67,732	22,577	13,546	0	103,855
Supplies, products, communication	6,321	6,321	6,321	6,321	25, 284
Support for the waterside Districts2	7,225	7,225	7,225	7,225	28,900
Cost of outsourcing of the technical support3	45,155	110,731	33,414	17,340	206, 640
Total	214,077	234,498	148,150	118530	715 255

[3] On grounds of efficiency, the Shareholders Network to be established for the monitoring of the activities as well as the project benefit on the field shall be decentralized in the 3rd, 4th, 5th and 6th watershed districts of the Lagoon. The Heads of those districts shall be saddled with the responsibility of ensuring the Network close support in terms of the material aspect of its mission: availability of meeting, processing and photocopy of document, etc. This support will continue beyond the end of the Project. The resources allocations provided for, are meant to acquire minor equipment and pay for the service needed by Heads of District in order for the Network not to suffer from any equipment issues.

[4] In order to develop the terms of reference for the extensive works, an expertise budget is notably provided, for example. Other works for documents preparations or real-time appreciation work on the quality of the intermediary results of some activities of the project and for which the coordinating team lacks required competences should be submitted to the technical Committee or to the Steering Committee for validation. Relevant external technical supports to help management bodies to take timely sound decisions for the attainment of the results should be provided. This budget allocation is provided for these kinds of situations, instead of formal assessments making to realize the achievement of unacceptable outcomes

Table 27: Budget breakdown of the Implementing Entity Fee (x1000US$)

Expenditure	Total Staff person-days	Year 1 (x1000US$)	Year 2 (x1000 US$)	Year 3 (x1000US$)	Year 4 (x1000US$	Total Cost (x1000US$
Technical assistance on environmental, legal and social safeguards	200	29	8	8	8	53
Legal support	100	8	4	4		16
Review of service contracts	150	6	6	6	6	24
Advise in the finances, in the budget	100	4	4	4	0	12
Resource management for Adaptation Fund through an appropriate Investment trust	250	13	13	13	14	53
Human resources management (capacity building and possible recruitment)	400	16	16	16	16	64
Assistance to the project, technical support and supervision missions	200	45	40	0	0	85
Support service of implementation	400	24	16	16	8	64
Technical support for screening and management of financial risks and selection of indicators and criteria of risks and performance	200	12	10	10	10	42
Management of the supply and diverse purchases of goods and services	150	6	6	6	6	24
Support for the information and telecommunication, including the maintenance of management systems of the information and databases for the follow-up of the implementation of the project	400	15	15	15	15	60
Technical support regarding	310	12	12	12	12	48

methodologies, validation of terms of reference, experts' identification, validation of results and quality assurance						
Assurance of the conformity of the practices of financial management with the requirements of Adaptation Fund and support of the required shares of audit	500	20	10	10	10	50
Assurance of the conformity of financial statements with the standards of National Fund for Environment and Adaptation Fund	150	0	10	10	14	34
Assurance of the identification and valuation of learnt lessons			20			20
Mid Term Review					20	20
Total	3510	210	190	130	139	669

Table 28: Disbursement Matrix

	Upon Agreement signing	One Year after Project Start	Year 2	Year 3	Total
Scheduled Date	02/12/2013	1/12/2014	1/12/2015	1/12/2016	
Project Funds	2,411, 702	4,036,863	1,236,160	559,530	8,244,255
Implementing Entity Fee	210,000	190,000	130,000	139,000	669,000
	2,621,702	4,226, 863	1,366,160	698,530	8,913,255

Annex A: Alignment of Project Objectives/Outcomes with Adaptation Fund Results Framework.

Project Objective	Project Objective Indicator(s)	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
Help the riparian populations of the Lagoon of Cotonou in their efforts to reduce climate change adverse impact on their livelihoods and increase their resilience.	Number of households vulnerable to floods and other adverse effects of climate variability and climate change	**Outcome 4:** Increased adaptive capacity within relevant development and natural resource sectors	4.2. Physical infrastructure improved to withstand climate change and variability-induced stress	**7.529.000**
Project Outcome(s)	**Project Outcome Indicator(s)**	**Fund Output**	**Fund Output Indicator**	**Grant Amount (USD)**
Outcome 1.1 : Protected Cotonou lagoon shores talus against slumping	Percentage of soft bank slope is protected.	***Output 4:*** Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	**2.621.000**
Outcome 1.2 : Upper side of the embankment slope stabilized and accessible to populations	Percentage of the upper side of the bank slope gets stabilized and accessible to populations Number of populations coming and going on the embankment of the lagoon	***Output 4:*** Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	**3.642.000**
Outcome 1.3 : Easier exchanges and transport of populations and goods crossing the Lagoone during floodings	The rate of population crossing the Lagoon	***Output 4:*** Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	**217.000**
Outcome 1.4: Bodily needs of the users of banks satisfied in cleaned up environmental in spite of climate variability and climate change	Attendance rate of toilet and exploitation rate of the installations Percentage of household affected by faecal diseases	***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[2] social infrastructure developed or modified to respond to new conditions resulting from climate variability and	**217.000**

			change (by type)	
Outcome 1.5 : Controlled seasonal flooding in targeted area	Number of critical floodings in a year Percentage of household affected by floodings	***Output 4:*** Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	**117.000**
Outcome 2.1.1: Capacity built for prohibiting the disposal of household waste on the land along the lagoon shores and for reducing waste charges in floods water.	Percentage of solid waste dump on the ground	***Output 4:*** Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	**72.000**
Outcome 2.1.2 : Capacity built for collecting and value adding to non biodegradable waste	Growth rate of non-biodegradable waste collected and recycled	***Output 4:*** Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	**4.000**
Outcome 2.1.3: Capacity built for collecting and value adding to biodegradable waste usable by vulnerable household	Growth rate of biodegradable waste collected and recycled	***Output 4:*** Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	**2.000**
Outcome 2.1.4 to 2.1.6 : Reduced risks of disposing contaminated used waters in the lagoon and the risks of waters contamination	Rate of contamination of the lagoon waters Morbidity rate due to water-born risks among the riparian community	***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[2] social infrastructure developed or modified to respond to new conditions resulting from climate variability and change (by type)	**140.000**
Outcome 2.2: Captured climate change and adaptation techniques-induced constraints in the legal texts regulating activities on the lagoon and	Number of regulatory texts capturing climate change impacts in the lagoon environment and favoring the job creation Number of Lagoon	***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 6.1.2. Type of income	**357.000**

its banks, and former fishermen reoriented in new economic activities generated by the channel layout	Environment targeted households who got a sustainable employment		sources for households generated under climate change scenario	
Outcome 2.3 : Ensured sustainability of experiences and the dissemination of the project outcome by the training of communities on the climatic risks, adaptation techniques and the best practices as well as the capitalization of experiences in the form of theses and dissertation	Number of staff, local elects, professional organizations, local elects and households who initiated adaptation measures in the riparian areas.	***Output 2.2:*** Targeted population groups covered by adequate risk reduction systems	2.1.2. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	**131.000**

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

A. RECORD OF ENDORSEMENT ON BEHALF OF THE GOVERNMENT[1] *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:*

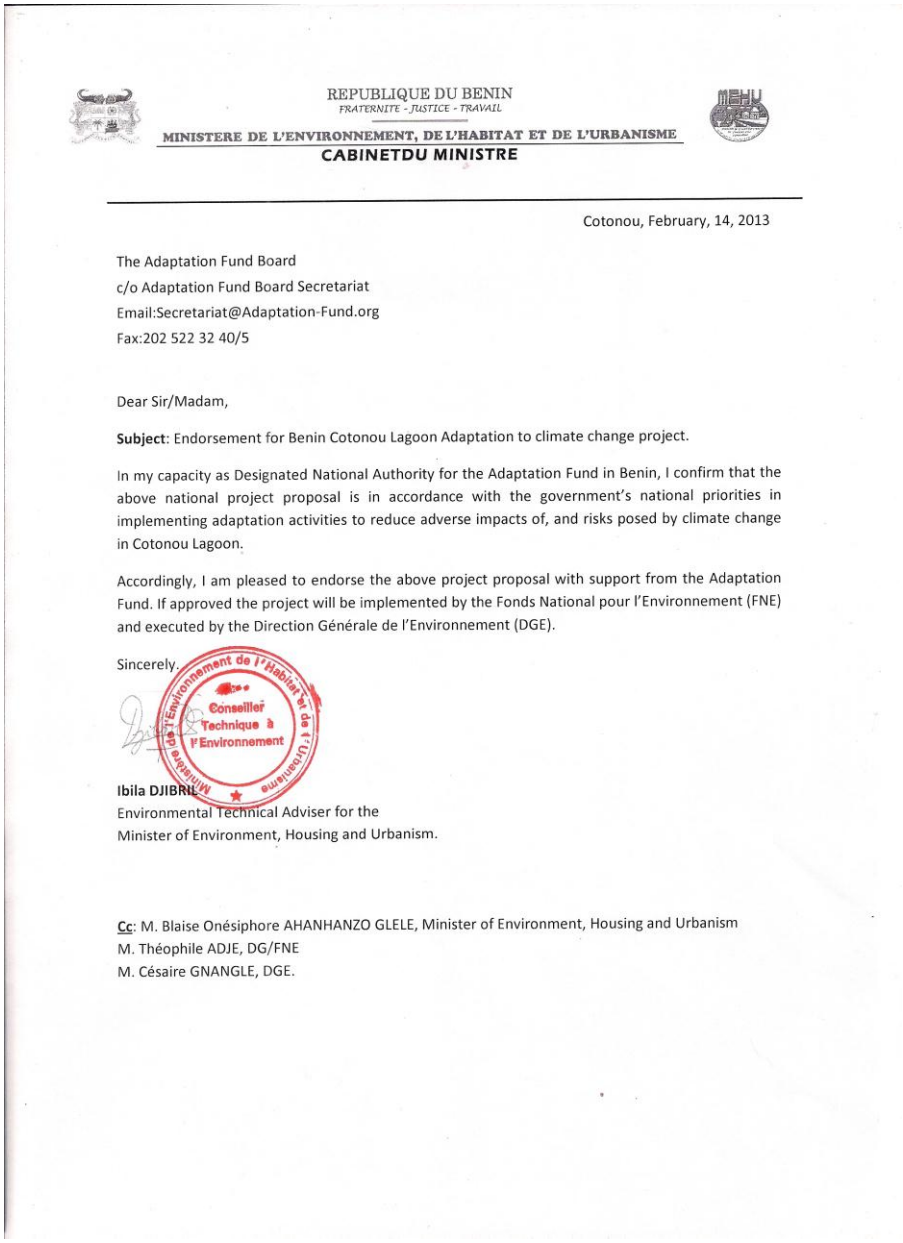
Ibila DJIBRIL, Environmental Technical Adviser for The Minister of Environment, Housing and Urbanism, UNFCCC National Focal Point Cotonou, Bénin. Tél. +229 21 31 55 96 Mobile : +229 97 98 84 38 Fax : +229 21 31 50 81	Cotonou, February 14, 2013  **Ibila DJIBRIL**

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 (Declaration of Population Policy, Horizon 2025, National Strategy of Growth for Poverty Reduction 2011-2015, National Adaptation Program of Action (NAPA), Second National Communication on Climate Change) and subject to the approval by the Adaptation Fund Board, understands that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.	
Théophile ADJE *Managing Director / FNE* Implementing Entity Coordinator	
Date: *February 14, 2013*	Tel. and email☹(229) 95189999 adjphile@yahoo.fr
Project Contact Person: ***Mathieu Biaou,*** Environmental Specialist/FNE	
Tel. And Email: (229) 97608219 – biaoumathieu@yahoo.fr	

[6] 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.

Annex C. Endorsement Letter by Mr. Ibila DJIBRIL, Environmental Technical Adviser to The Minister of Environment, Housing and Town Planning, UNFCCC National Focal Point, Cotonou, Bénin



REPUBLIQUE DU BENIN
FRATERNITE - JUSTICE - TRAVAIL

MINISTERE DE L'ENVIRONNEMENT, DE L'HABITAT ET DE L'URBANISME
CABINETDU MINISTRE

Cotonou, February, 14, 2013

The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email:Secretariat@Adaptation-Fund.org
Fax:202 522 32 40/5

Dear Sir/Madam,

Subject: Endorsement for Benin Cotonou Lagoon Adaptation to climate change project.

In my capacity as Designated National Authority for the Adaptation Fund in Benin, I confirm that the above national 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 Cotonou Lagoon.

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved the project will be implemented by the Fonds National pour l'Environnement (FNE) and executed by the Direction Générale de l'Environnement (DGE).

Sincerely.

Ministère de l'Environnement de l'Habitat et de l'Urbanisme
Conseiller Technique à l'Environnement

Ibila DJIBRIL
Environmental Technical Adviser for the
Minister of Environment, Housing and Urbanism.

Cc: M. Blaise Onésiphore AHANHANZO GLELE, Minister of Environment, Housing and Urbanism
M. Théophile ADJE, DG/FNE
M. Césaire GNANGLE, DGE.

ANNEDX D:

Annex D: Attendance sheet of some Stakeholders

Annex E: letters of Intent by some Stakeholders (1)

Annex F: letters of intent by some stakeholders (2)

Annex G: letters of intent by some stakeholders (3)

Annex H: List of acronyms

Acronyms	French version	EnglishVersion
ABE	Agence Béninoise pour l'Environnement	Beninese Environment Agency,
ACCA	Adaptation aux Changements Climatiques en Afrique	Adaptation to Climate Change in Africa
AFRMD	Association des Femmes Récupératrices du Marché Dantokpa	Dantokpa Market Waste Recycling Women Associations
AMH	Association des Maraichers de Houéyiho	Houéyiho Truck-farmers Association
CA	Chef d'Arrondissement ;	Head of Town Section
CCIB	Chambre de Commerce et d'Industrie du Bénin	Chamber of Commerce and Industry of Benin
CNAT	Commission Nationale de l'Aménagement du Territoire ;	National Commission of Land Planning
CCNUCC :	Convention-cadre des Nations Unies sur les Changements Climatiques ;	United Nations Framework Convention on Climate Change
CEBENOR	Centre Béninois de Normalisation et de Gestion de la Qualité	Benin Standardization and Quality Management Center
COP	Conférence des Parties ;	Parties Conference
CP	Comité de Pilotage ;	Steering Committee chaired
CREDEL	Centre de Recherche et d'Expertise pour le Développement Local	Research and Expertise Centre for Local Development
CRDI	Centre de Recherche pour le Développement International	International Development Research Center
CRHOB :	Centre de Recherches Halieutiques et Océanologiques du Bénin	Project of Creation of an Oceanographic Data bank at the Benin Fishing and Oceanographic Center
DAT :	Délégation à l'Aménagement du Territoire ;	Delegation for Land Planning and the Land Planning Intervention Funds (FIAT),
DCN	Deuxième Communication Nationale du Bénin sur les Changements Climatiques ;	Second National Paper of Benin on climate change
DPONAT	Déclaration de Politique Nationale d'Aménagement du Territoire ;	Declaration on National Land Planning Policy
DEPOLIPO :	Déclaration de Politique de Population ;	Declaration of Populationoriented Policy
DGFRN	Direction Générale des Forêts et des Ressources Naturelles	General Directorate of Forestry and Natural Resources
DGE	Direction Générale de l'Environnement	General Directorate of Environment,
DGRE	Direction de Gestion des Risques Environnementaux	Directorate of Environmental risks Management

DPPPE	Direction de la Prévention des Pollutions et de la Police Environnementale	Directorate of Pollution Prevention and Environmental Police
DSRP	Document de Stratégie de Réduction de la Pauvreté ;	Poverty Reduction Strategy Document
EEM	Evaluation des Ecosystèmes du Millénaire ;	Millennium Ecosystems Evaluation
EES	Evaluation Environnementale Stratégique ;	Strategic Environmental Evaluation
EMICoV	Enquête Modulaire Intégrée sur les Conditions de Vie des Ménages ;	Module Survey on the households living conditions
FADeC	Fonds d'Appui au Développement des Communes ;	Local Government Development Support Funds)
FEM	Fonds pour l'Environnement Mondial ;	Global Environment Facility funding
FNE	Fonds National pour l'Environnement ;	National Environment Fund
FIAT	Fonds d'Intervention à l'Aménagement du Territoire	Land Planning Intervention Funds
GIEC/IPCC	Groupe d'Experts Intergouvernemental sur l'Evolution du Climat ;	Intergovernmental Panel on Climate Change
MAEP:	Ministère de l'Agriculture, de l'Elevage et de la Pêche	Ministry of Agriculture, Animal Husbandry and Fishery
MCGAO	Modèles de Circulation Générale Atmosphère Océan	Atmospheric Ocean General Circulation Model (AOGCM)
MEHU	Ministère de l'Environnement, de l'Habitat et de l'Urbanisme	Ministry of Environment, Housing and Town Planning
OMD	Objectifs du Millénaire pour le Développement	Millennium Development Goals
ONG	Organisation Non Gouvernementale	Non Governmental Organizations
OSC:	Organisations de la Société Civile	Civil Society Organizations
PAE	Plan d'Action Environnemental ;	Environmental Action Plan
PAN/LCD	Programme d'action National de Lutte contre la Désertification	National Action Program to Combat Desertification
PANA :	Programme d'Action National aux fins de l'Adaptation aux Changements Climatiques	National Action Program on Adaptation to climate change
PCUG3C :	Projet de Protection de la Communauté Urbaine du Grand Cotonou ;	Protection of the Grand Cotonou Urban Community against Climate Change

		impacts
PGCBMC	Projet de Gestion Communautaire de la Biodiversité Marine et Côtière:	Marine and Coastal Biodiversity Community Management Project (PGCBMC) : project
PNGE	Programme National de Gestion de l'Environnement	National Environment Management Program
PONADEC	Politique Nationale de Décentralisation et Déconcentration ;	National Decentralization and Devolution Policy
PROPAO	Programme Régional d'Océanographie Physique en Afrique de l'Ouest ;	Regional Program of Physical Oceanographic in West Africa
PUGEMU	Projet d'Urgence pour la Gestion Environnementale en Milieu Urbain ;	Emergency Project for Environment Management
SCRP	Stratégie Nationale de Croissance pour la Réduction de la Pauvreté ;	National Growth for Poverty Reduction Strategy
SOGEMA :	Société de Gestion des Marchés;	Market Management Company
TSM	Température de Surface de la Mer ;	Sea Surface Temperature

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