REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE ADAPTATION FUND

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

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

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

Complete documentation should be sent to:

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

Contents

List of Abbreviations

AoC	Agreement of Cooperation
C	Celsius (temperature)
CCVA	Climate Change Vulnerability Assessment
CFI	Climate Investment Fund
CRPD	Convention on the Rights of Persons with Disabilities
CSO	Central Statistical Office of Yemen
DEM	Digital Elevation Map
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Risk Management Plan
ESP	Environmental and Social Policy
GP	Gender Policy
HNO	Humanitarian Needs Overview
IDP	Internally Displaced Person
ILO	The International Labour Organization
INDC	Intended Nationally Determined Contribution
IRG	Internationally Recognized Government of Yemen
IWRM	Integrated Water Resource Management
LC	Local Council
LDC	Least Developed Country
LWC	Local Water Corporation
LWSC	Lahj Water and Sanitation Corporation
MCM	Million Cubic Meter
M&E	Monitoring and Evaluation
MENA	Middle East and North Africa
MoA	Ministry of Agriculture
MoWI	Ministry of Water and Irrigation
MoWE	Ministry of Water and Environment
MIE	Multilateral Implementing Entity
MoU	Memorandum of Understanding
NARWP	National Authority for Rural Water Projects
NWRA	Natural Water Resources Authority
NWSA	National Water and Sanitation Authority
PEU	Project Execution Unit
PPP	Purchasing Power Parity
PPR	Project Performance Report
PSC	Project Steering Committee
RCP	Representative Concentration Pathway
SDG	Sustainable Development Goals
SPI	Standard Precipitation Index
TAC	Technical Advisory Committee
TNC	The Nature Conservancy
TNA	Technology Needs Assessment
UNDIS	United Nations Disabilities Inclusion Strategy
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UN-Habitat	United Nations Human Settlement Programme
UNHCR	United Nations High Commissioner for Refugees
US$	United States Dollar (currency)
WWTP	Wastewater Treatment Plant
Yr	Year

List of tables

List of Figures

ADAPTATION FUND

PROJECT/PROGRAMME PROPOSAL TO THE ADAPTATION FUND

PART I: PROJECT/PROGRAMME INFORMATION

Project Category:	Regular
Country:	Yemen
Title of Project/Programme:	Increase the Climate Change Resilience to Water Scarcity and Flooding in theTuban Delta
Type of Implementing Entity:	Multilateral Implementing Entity
Implementing Entity:	United Nations Human Settlements Programme (UN-Habitat)
Executing Entities:	Ministry of Water and Environment; Ministry of Agriculture and Irrigation; Cooperative and Agricultural Credit Bank
Amount of Financing Requested:	USD 9,998,560

1.1. PROJECT / PROGRAMME BACKGROUND AND CONTEXT

Country Context: Main Issues and Needs

Yemen faces serious risks from climate change that further threaten the already fragile state of the country.[1] Climate change, rapid population growth, damaged infrastructure and lack of natural resource management put more and more pressure on critical resources, especially water, and leave communities vulnerable to water insecurity, drought and flooding.

Yemen is highly vulnerable to climate change-related risks and impacts such as drought, extreme flooding, disease outbreaks, changes of rainfall patterns, increased storm frequency/severity and sea level rise. The population of the city of Aden, located in the Tuban Delta, has grown from 589,419 in 2004 to an estimated 1,051,000 in 2021. This is almost a doubling of the population in 17 years for the second largest city in Yemen. Despite this large-scale urban growth, agriculture remains the sector with the highest demand for water. As a result, Yemen experiences extreme water scarcity due to its climate and overexploitation of groundwater.

These are serious concerns as Yemen's economy largely depends on its rural natural resources (particularly access to water in rural areas). Moreover, more than 75 percent of the population is residing in rural areas engaging in farming and pastoralism, and hence highly reliant on favourable climatic conditions for their livelihoods.

Due to the armed conflict, which started in 2014 and is still active, Yemen is increasingly suffering from severe food insecurity and water scarcity, worsening inequality between women and men, widespread poverty (more than half of Yemen's population live below the poverty line) and a lack of economic growth.

Geography and Current Climate

Yemen is a Middle Eastern country located at the southern end of the Arabian Peninsula. It is bordered to the north by Saudi Arabia, to the East by Oman, and to the South and West by a 2,200 km coastline along the Gulf of Aden, the Arabian Sea and the Red Sea.

Yemen has a semi-arid-to-arid tropical climate with significant variations due to topographical differences (see Figure 1~~Figure 1~~). It features five agri-ecological zones (see Figure 2), of which the two sea areas are considered one zone.

The t**emperature** in Yemen is generally high, with an annual average of 21 degree C. Yet, temperatures vary by location and season. The southern coastal areas are hot and dry, further characterized by limited rainfall (50 mm per year) but, if heavy, can result in catastrophic flash floods. Northern regions and Wadi Hadhramawt are hot and dry throughout the year. Rainfall in the temperate highlands varies from 400 mm to 800 mm per year. Moreover, in the highlands there is

Formatted: Font: 10 pt

[1] USAID (2016)Climate Change Risk Profile: Yemen. Available at: https://www.climatelinks.org/resources/climate-change-risk-profile-yemen

more seasonal variety: winter can be cold, with temperatures below 0 degree C, while the summers are temperate and rainy.

Figure 1. Map of Yemen's Geography and Topography

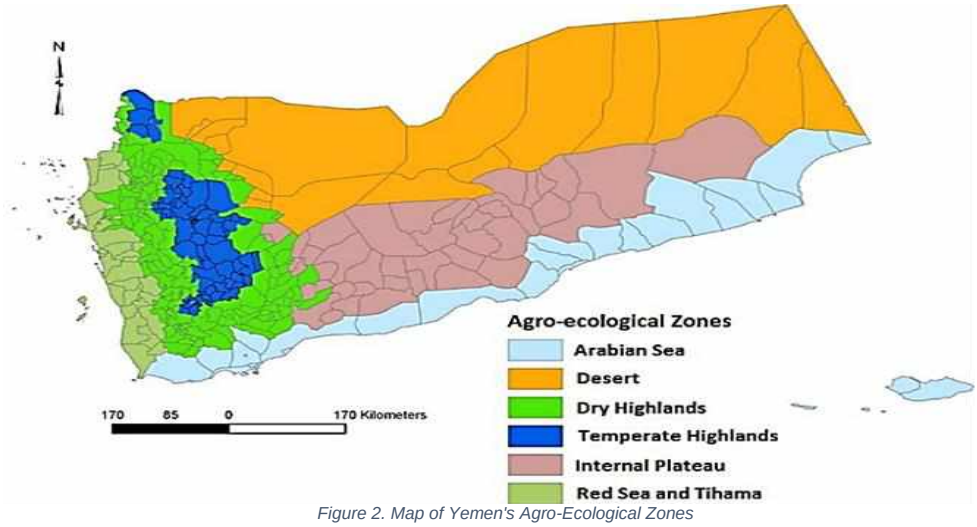


Figure 2. Map of Yemen's Agro-Ecological Zones

Environmental Context

Yemen has a total land area of 527,970 km2, of which 410,842 km2 (79.3%) is classified as desert with an estimated desertification rate of 3-5% annually.

Yemen experiences extreme water scarcity due to its climate and overexploitation of groundwater. In coastal zones this leads to saltwater intrusion, especially in combination with sea level rise. Climate change is expected to increase temperatures, variability of rainfall and heavy precipitation events. This may shorten growing seasons, especially in the north. Water scarcity, saltwater intrusion and shorter growing seasons threaten food security, and competition for dwindling natural resources could further fuel conflict. On-going conflict, a lack of adequate natural resources management, weak governance as well as other factors evidently hinder Yemen's ability to address the current and future impact of climate change.

The water sector in Yemen faces formidable challenges, including decreased agriculture productivity and related reduced food security, increased conflict over resources and accelerated land degradation, and increased livelihood

vulnerability. With the current, weak adaptive and institutional capacity, climate change associated risks and impacts will push livelihood vulnerability of the poor into further decline, leading to further environmental resource degradation, increased ecological scarcities, and hardship, and hence increased poverty.[2]

Between 1981 and 2022, 56 weather related hazards have been reported in Yemen, of which 43 hazards are related to floods (77%), 8 to storms (14%) and 5 to landslides (9%). Overall, the number of weather-related hazards has increased over time. While 15 hazards have been observed between 1981 and 2000, a total of 36 hazards have been reported between 2001 and 2020.

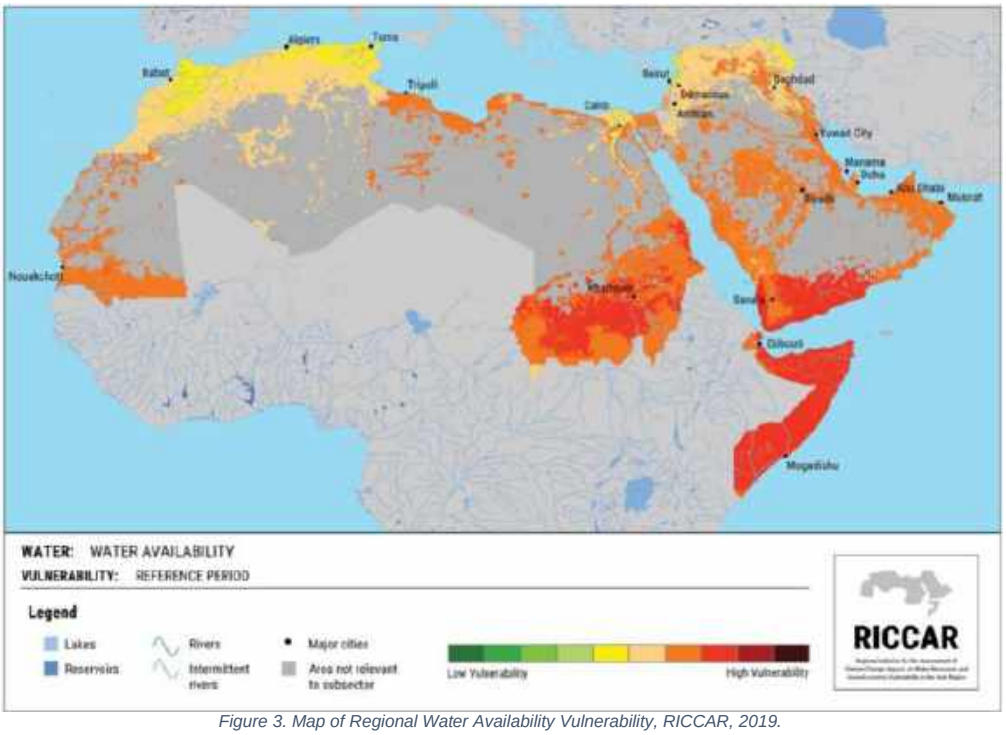


Figure 3. Map of Regional Water Availability Vulnerability, RICCAR, 2019.

Yemen's **water availability** per capita is currently the lowest in the world[3] and mid-century water availability vulnerability is expected to be very high (see Figure 4). Groundwater extraction has exceeded the level of replenishment capacity, causing water depletion. Since Yemen over-extracts an estimated 0.9 billion cubic meter of water each year from its deep aquifers, groundwater aquifers are declining one to seven meters each year.[4] It is anticipated that climate change combined with high population growth, inadequate agricultural development and policies, qat growth, and a lack of law enforcement to regulate water will put continuing pressure on Yemen's water resources and contribute to its water crisis.[5]

Socio-economic context

Yemen currently ranks as the most Fragile State in the world. [6] Prior to the current conflict Yemen was the poorest country in the Middle East. It was estimated that up to 43 percent of its people were living in chronic poverty with 32 percent of the population being food insecure.[7] Notwithstanding the current conflict, given the country's historically high levels of food import dependency, food insecurity, and poverty, both global and local climate change impacts are likely to significantly influence its prospects. Currently, according to the UN, Yemen is suffering among the worst humanitarian

[2] http://www.undp.org/content/dam/yemen/E&E/Docs/UNDP-YEM-Governance%20of%20Climate%20Change%20in%20Yemen.pdf
[3] Glass, N. (2010): *The Water Crisis in Yemen: Causes, Consequences and Solutions, Global Majority E-Journal 1(1).*
[4] USAID (2016).
[5] Glass, N. (2010): *The Water Crisis in Yemen: Causes, Consequences and Solutions, Global Majority E-Journal 1(1).*
[6] https://fragilestatesindex.org/data/
[7] Wiebelt et al. (2011).

crisis in the world. In 2020, the UN estimated 24.3 million people—80 percent of the population—were "at risk" of hunger and disease, of whom roughly 14.4 million were in acute need of assistance.[8] Four years later, in 2024, these figures have not changed. On the contrary, they appear to have increased with over 18 million people in need for humanitarian assistance and over 4.5 million individuals remaining internally displaced.[9]

Key facts:

☐ GDP (PPP) per capita (2022):[10]	USD 650
☐ Population (November 2022):[11]	33,696,614 (2.28% growth rate)
☐ Population Aden (2023):[12]	1,082,942
☐ Projected population (2050):[13]	48 304,000
☐ Human Development Index (2020):[14]	177 out of 188 countries
☐ Gender Inequality Index (2020):[15]	0.834
☐ Fragile States Index (2023):[16]	2 out of 178 countries
☐ Groundwater depletion:[17]	1.5 billion m3 (170%) per year; 2-7 meters annually
☐ Per capita water availability	120 m^3 per year in 2016
☐ *Wastewater treatment / access[18]:*	28% of the total population (2022)
☐ Share agriculture employment:[19]	33.1%

National employment figures from before the conflict from The International Labour Organization (ILO) showed an unemployment rate of 17.2%, relatively evenly split between men and women however labor force participation rates are much higher for men at 60.4% and only 5.1% for women in 2023.[20] In terms of employment by sector, "services" was the leading sector with over 50% followed by "industry" (29.2%) and "agriculture" (22.7%). According to World Bank data for the national level, agricultural employment has declined steadily since the early 1990s from 47% to 27% of male employment and from 85% to 42% for female employment.[21] It is important to note that while women make up a smaller portion of the labor force participation, agriculture and services employ almost equal percentages of women. The figure above shows these pre-conflict figures, including the very high rate of employment in the informal sector.

Women and girls face challenges including underrepresentation in education, participation in formal labor markets, lack of legal frameworks setting the minimum age for marriage, divorce, inheritance and child custody, and lack of maternal healthcare.[22] The women's focus group for this project also highlighted that women are marginalized because they are not involved in decision-making.

Moreover, there are more than 4.5 million internally displaced persons (IDPs) across the country due to the years of conflict, many of whom are settled in cities and small towns as well as camp sites.[23]

Historically, Yemen is dependent on imported food. Prior to the conflict, it imported 70-90 percent of its grain and was a net importer of many other food items as well. Maize, millet, sorghum, and wheat are cultivated in Yemen, yet mainly for household or village level consumption. There is concern that the ancient terraces designed to be flood- irrigated will become high risk with changes in climate as seeds can germinate and then die due to lack of water.[24] Losses are mainly incurred in the Desert zone, where grain production is limited to wheat, which is considered to be the most vulnerable crop. The Red Sea/Tihama area however is expected to benefit from climate change. This is because sorghum and millet experience high yield increase and at the same time account for a larger share of agricultural value-addition than in any other zone, whereas the grains with declining yields (maize and wheat) are hardly produced.

[8] World Bank (2020) http://www.worldbank.org/en/country/yemen
[9] OCHA, Humanitarian Needs Overview (HNO) 2024, 2024.
[10] World Bank Data – GDP per capita, PPP. http://data.worldbank.org/ indicator/NY.GDP.PCAP.PP.CD
[11] World Population Review – Yemen, http://worldpopulationreview.com/countries/yemen-population/
[12] Statistics provided by the government.
[13] UNDESA (2017): *World Population Prospects: The 2017 Revision, Key Findings and Advance Tables.* Working Paper No. ESA/P/WP/248. https://esa.un.org/unpd/wpp/Publications/Files/WPP2017_KeyFindings.pdf
[14] http://hdr.undp.org/
[15] Ibid.
[16] https://fragilestatesindex.org/data/
[17] CSO, 2010 World Bank 2016.
[18] https://www.sdg6data.org/en/country-or-area/Yemen
[19] National Agriculture sector strategy (2012).
[20] https://genderdata.worldbank.org/en/economies/yemen-rep
[21] https://data.worldbank.org/country/yemen-rep
[22] UN-Habitat (2020) Aden City Profile.
[23] OCHA, HNO 2024, 2024.
[24] World Bank; UN; EU; Islamic Development Bank (IDB), 2012: Joint Social and Economic Assessment for the Republic of Yemen, https://openknowledge.worldbank.org/bitstream/handle/10986/11920/693880ESW0P1300sment0pub08031012web.pdf?sequence=1

Climate Change projections, impacts and vulnerabilities at the national level

Climate change risks are projected to not only impede the national capacity to achieve sustainable development but also to reverse the economic development that occurred prior to the conflict.

Future climate projections show a potential **temperature increases** of as high as +3.5 to +4.0ºC along the Red Sea and Arabian Sea coastline by the end-century (2070-2099). Further models show an increase of 30 additional hot days (>40ºC) per year (yr.) by mid-century under a medium emission scenario (RCP 7).[25] This will **increase evapotranspiration**, thereby decreasing water supply for households and agriculture while potentially increasing water demand as a coping mechanism to the heat simultaneously.

In addition, the number of dry days per year is expected to increase along the western Arabian Sea coastline as well as towards the Highlands by approximately 2 to 6 additional days/yr. under the low-emission scenario (Representative Concentration Pathway [RCP] 2.6) and by 8 to 14 days/yr. under the high emission scenario (RCP 8.5.).[26] The lower Tuban Delta region, which includes the city of Aden, is likely to have more **drought periods** than the rest of the Tuban Delta.

Precipitation projections vary by emission scenario and by region, although most models show an annual precipitation reduction of -20 to -40mm under RCP 8.5 along the Red Sea coastline and Highlands. Days with **heavy rainfall** are likely to increase in most regions**. Serious and severe flooding** in all regions of the Tuban Delta is likely to increase from 2040 under both medium and high emission scenarios.[27]

Sea-level rise (30 cm by mid-century and up to 77 cm by the late 21st century) will continue to exacerbate shoreline erosion, as well as accelerate **saltwater intrusion** into groundwater which is already being observed due to increased water demand and drought years.

In the future, major climatic hazards include (i) higher intensity and frequency of floods, (ii) prolonged droughts due to increasingly erratic rainfall and temperature rise droughts which may contribute to further desertification, land degradation and barren land, (iii) increasing water stresses due to higher evapotranspiration rates and increasing pressure on water resources. Lastly, (iv) sea level rise (from storm surges and global warming) is becoming a major climate threat in coastal areas that must be addressed to avoid large-scale casualties in the future.

The impact of climate change on the most vulnerable groups (rural poor, women) include increased exposure to extreme weather events in combination with decreased financial resources available for reconstruction and preparedness due to lower (agricultural) income. Yemen's population growth is currently at 2.28 percent, which increases the vulnerable position of the country by raising the demand for food, water, and other natural resources.

The climate hazards cited above can have severe implications for key ecosystems and sectors (water, crop production, livestock rearing, fisheries, public health) as well as livelihoods (rural, costal, and urban). Key national sectors such as water, agriculture and health as well as dependent livelihoods are exposed and vulnerable to climate change across Yemen.

Prior to the current conflict, over 90 percent of water consumption was used for irrigation. Climate change may decrease the frequency and amount of rainfall, thereby reducing the country's agricultural production. This would not only result in a water crisis, but also in food and economic crises. The severity of the crisis is expressed in the projection that Sana'a is the only capital city in the world that may run out of fresh water within the next decade.[28]

The following provides a summary[29] of major impacts of climate change in Yemen which represents priority areas of interventions for building resilience:

- ☐ Increased water scarcity and reduced water quality – leading to increased hardship on rural livelihoods;
- ☐ Increased drought frequency, increased temperatures, and changes in precipitation patterns – leading to degradation of agricultural lands, soils and terraces;
- ☐ Deterioration of habitats and biodiversity – leading to expansion of desertification;
- ☐ Reduced agricultural productivity – leading to increased food insecurity and reduced income generating activities;
- ☐ Increased sea levels – leading to deterioration of wetlands, coastal mangrove migration, erosion, infrastructure damage, and seawater groundwater intrusion;
- ☐ Increased climatic variability – leading to the possibility of spread and growth of vector borne and water borne diseases; and

[25] GCF Country Programme Yemen 2023 (in draft).
[26] Ibid.
[27] UN-Habitat (2023) Hydrology Study of the Tuban Delta.
[28] Glass, N. (2010): *The Water Crisis in Yemen: Causes, Consequences and Solutions, Global Majority E-Journal 1(1)*
[29] INDC (2015)

- Impacts on coastal zones – leading to a loss of future tourism activity due to sea level rise including loss of beaches.

Project Target Area: The Tuban Delta – Aden and Lahj Governorate

Geography

The Tuban Delta is the downstream area of the Wadi Tuban basin. The Wadi Tuban has a total area of 7,360 Km^2 and consists of seven sub-basins.[30] The Tuban Delta is located between 44.65° - 45.1° E and 12.7° -13.3° N, its topography ranges from 10 below sea level to about 800 above sea level. Based on consultations in country, the Delta was divided into three regions: the Upper Region, the Middle Region, and the Lower Region, represented in Figure 4. The division was chosen because of different physical characteristics, pressures and issues being faced by each region.

The project target area is particularly vulnerable to:
- Aquifer depletion, affecting agricultural yields and water availability for human consumption, settlements and industry;
- Aquifer pollution, and salty water intrusion in coastal areas;
- Loss of agricultural land diminished yield;
- Extreme weather events.

This area has been selected because of:
- High vulnerability to climate change as established through a vulnerability assessment conducted for the Aden Coastal Area, also presented in the Second National Communication;
- Challenges that need urgent response;
- Government priority;
- Relative stability and accessibility.

Environmental Context

Figure 4. Map of Tuban Delta Regions with Contours and Streams delineated, UN-Habitat Hydrology Report for the Tuban Delta, 2023.

In the Tuban Delta, surface water and groundwater are experiencing several challenges, including overuse, increased evapotranspiration, and a lack of a sustainable water management strategy. These issues have an impact on the growing population, land use, water quality, water quantity, and agricultural systems. Furthermore, the development of several dams and other rainwater harvesting techniques in the upper section of the Tuban watershed (upstream) have decreased the availability of surface water in the Tuban Delta (downstream). As a result, limited water reaches the lower region and no water reaches the ocean, which forces people and farmers to depend mainly on groundwater. The demand for water in the region is due to both domestic and agricultural uses, with total demand in 2022 estimated at 136.4 MCM (Million Cubic Meters) in demand (comprised of 45.5 and 91.9 MCM, for domestic and agriculture, respectively). The estimated water supply is however only 53 MCM, resulting in a **total current water deficit of 84.4 MCM.** This deficit will accelerate in the future due to climate change impact and population growth to be about 90 MCM in 2025 and 147 MCM in 2050.[31]

The sensitivity to water insecurity is high not only due to water shortage but also due to water intensive crops being cultivated such as sorghum, cotton and vegetables, and that some households in the region are not linked to the water grid (up to 25% in Aden and 40% in Al-Hawtah).

There is also an impact on natural ecosystems with the water withdrawal level being so high; the environmental demand is unmet and no water flows to the ocean, disrupting the natural hydrological cycle.

[30] Saleh et al., 2012.
[31] UN-habitat (to be published) Hydrology study of the Tuban delta

Lower Region of the Tuban Delta: Aden and surrounding area

The Lower Region of the Tuban Delta includes both the Aden Governorate and the city of Aden as well as part of the Lahj Governorate south of Al Hawtah extending to the border of the governorates. This area covers 1,030 km^2 with a population of 1,133,013 (524,106 females; 608,906 males), the majority of people (1,082,942) residing in the Aden Governorate. The Lower Region of the Tuban Delta is the largest of the three in terms of land area and population. According to figures provided by the Aden Governorate, the population has grown from 589,419 in 2004 to an estimated 1,051,000 in 2021. Aden is the interim capital of the Internationally Recognized Government (IRG) of Yemen. Daily administration of the city and its eight districts is undertaken by Local Councils (LC). According to an analysis conducted as part of UN-Habitat Aden City Profile exercise, the main sources of revenue for the city are building permits and rehabilitation fees, municipal taxes and levies, fines for building violations, direct investments and parking fees. Revenue has declined since 2015 due to the decline of the oil industry. LCs lack the authority to set a budget to cover their operations and rely on financial support from the central government.

Figure 45. Cities, towns and villages of the Tuban Delta, UN-Habitat (2023) Hydrology report for the Tuban Delta

According to the United Nations High Commissioner for Refugees (UNHCR), there is a total of 95,224 IDPs in the Aden Governorate and 28,345 refugees and asylum seekers, the second largest community in the country.[32] According to the Central Statistical Office of Yemen (CSO) projected numbers for 2018, the age and breakdown of women and men IDPs are as follows: 21% are men, 23% are women, 28% are boys and 27% are girls. In the city of Aden, IDPs are in higher density in some neighborhoods than others.

Aden is the largest city in southern Yemen and host to a major seaport in one of the world's largest natural harbors. Aden has a long history as an economic hub in the region, connecting the interior of the country with an active international port. Although the Lower Region still shows significant agricultural activity, the local economy of Aden is different from much of Yemen. Business and commerce have been a major portion of the economy and contributed to the emergence of a substantial middle class and has a large share of three major economic activities: mining and quarrying, transportation and storage, and real estate.[33]

Prior to the conflict, most of the port cargo consisted of oil, representing 75 percent of the government's revenue and 90% of export revenue.[34] However, oil and gas production has decreased significantly due to the conflict.

[32] https://data.unhcr.org/en/country/yem#_ga=2.51079209.1447391314.1679905938-1498650503.1679905938
[33] UN-Habitat (2020) Aden City Profile
[34] USAID, Property Rights and Resource Governance: Yemen, USAID Country Profile, 2010, https://www.land-links.org/wp-content/uploads/2016/09/USAID_Land_Tenure_Yemen_Profile-1.pdf

National policy has encouraged investments in the fisheries sector, which is dominated by small-scale enterprises. Fisheries was the largest export earner after oil and gas, employing 1.5 percent of the national labor force and being critical to meet food needs in the area. Unfortunately, fishing, like agricultural production, has decreased from pre-conflict levels resulting in the displacement of many fishermen.[35]

In the Tuban District of the Lahj Governorate in the Lower Region, 70 percent of the population is employed in agriculture, highlighting that they generate 25 percent of their income from other informal and irregular daily work. This is in stark contrast to Aden where 7 percent work in the agriculture sector.

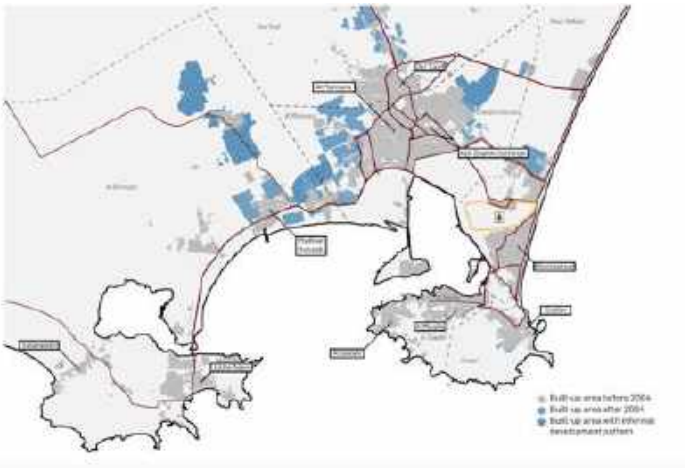


Figure 56. Urban expansion in Aden, UN-Habitat (2020) Aden City Profile

Historically, Aden has consisted of urban centers or clusters of similar size. The urban growth in the past 15 years has mostly been low density urban development, some of which has been planned and some unplanned.[36] Demand for housing due to urbanization, demographic pressure and high inflation has resulted in overcrowding in many households in Aden.

The water supply grid is approximately 1,111 km long and consists of 34 reservoirs and water towers, three water sterilization facilities, eight water pumping stations and 116 water wells.[37] The main source for obtaining water are ground wells, yet water supply is limited, at least in part due to lack of electricity. The UN-Habitat urban profile for Aden found that in half of the city's districts (Al Buraiqeh, Al Mansura, Attawahi and Crater), the water is only available on average between 0-4 hours. In five districts (Dar Sad, Craiter, Khur Maksar, Al Mualla and Attawahi) there is a sinigificant lack of water for cooking, bathing, laundry and personal hygiene, reported being the top priorities in need of attention.[38]

There are issues with energy and electricity supply in Aden, exacerbated by the damage the grid has suffered as a result of the conflict. Overall, the condition of roads is poor throughout the city. The road network is completely damaged in four districts (Al Buraiqeh, Al Mualla, Ash Shaikh Outhamn and Dar Sad), which limits the mobility and contributes to traffic congestion across the city. Regional connectivity is also affected by damaged roads, notably the road connecting Aden and Taiz.[39]

Internet and mobile network services are available in all districts of Aden, however it can be limited and network coverage is poor in most districts with the exception of Al Mualla and Craiter. In terms of health services, there is a lack of health facilities as well as medical personnel throughout the city. Both emergency and major surgeries are not available in most districts, highlighting that the quality of healthcare services was already sub-standard prior to the conflict, with people travelling abroad to receive treatment if affordable. In 2014, the enrollment rate for basic education in Aden was estimated to be 77percent (79 percent male and 75 percent female), of which 63 percent attended public and 14 percent private institutions.[40] According to the Joint Education Needs Assessment, an estimated 20 percent of children were out of school in Aden in 2016.

The Lower Region of the Tuban Delta includes ranges from more arid lands in the northern part to wetlands, coastal ecosystems and the natural harbor in Aden as well as a dormant volcano which is now a major residential area. The wetlands in Aden include lagoons, salt plains, mudflats, marshes and beaches that are habitats for many bird species.[41]

[35] UN-Habitat (2020) Aden City Profile
[36] Ibid
[37] *Dorsch International Consultants GmbH, Yemen Water Sector Damage Assessment Report of Twelve Water Supply and Sanitation Local Corporations (LCs) and their Affiliated Branch Offices and Utilities, Annex 2 – Technical Assessment Report for LC Aden; (Bonn and Eschborn: GIZ, September 2018).*
[38] UN-Habitat (2020) Aden City Profile
[39] Ibid
[40] *Save the Children, Yemen Education Cluster, Joint Education Needs Assessment Report, Aden – Yemen, (2016).*
[41] https://www.equatorinitiative.org/wp-content/uploads/2017/05/Al-Heswa-Yemen.pdf

There are many pressures on wetland ecosystems in the Aden area, including development encroachment, withdrawal of water for irrigation and contamination from oil pipelines and untreated wastewater. The marine ecosystems are also affected by the untreated wastewater which affects marine life and has resulted in a decline in fishing stocks.[42] There have been two reserves established in the Aden Governorate: Al-Heswah Wetlands Reserve and a Nature Reserve for Swans.

Wetland degradation has been observed across the country, in part because of climate change and limited water resources, but also due to repurposing of land without policies and law enforcement to protect the areas, which has led to uncontrolled construction and the establishment of illegal dumping sites. In particular the wetlands in Aden have shrunk significantly over the past years. The loss of wetlands is a concern both to the biodiversity as well as the wetlands' ability to absorb pollution and floods, and recharge aquifers.[43]

To address this, conservation efforts have focused on the establishment of protection areas. For example, the Aden Wetlands Protection Initiative was officially declared in 2006 by the "Prime Minister's decree" No. 304. In addition to protecting the habitat for migratory birds, the protection sites were important to maintaining several plant and aquatic animal species.

In Aden, sand beaches forming large and scattered areas along the coastline are considered to be of great ecological importance for different marine organisms. For instance, some of the beaches are nesting sites for sea turtles. The Aziz Island west of Aden is considered an important site for nesting Hawksbill turtles along the coastline of the Gulf of Aden.

Middle Region of Tuban Delta: Al Hawtah, Lahj and surrounding area

The Middle Region of the Tuban Delta is located in the Lahj Governorate. The area covers 570 km^2 and has a population of 85,954 (41,371 females; 44,583 males), its capital city Al-Hawtah accounting for almost half of the population. The city of Al-Hawtah has been growing at a yearly rate of about 2.52 percent since 2004 with the population projected to reach over 50,000 by 2030.

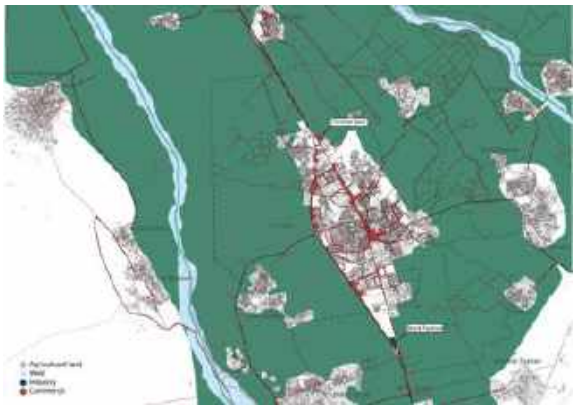


Figure 67. Al-Hawtah city and surrounding land uses, UN-Habitat (2020) Al-Hawtah city profile

According to UNHCR, there is a total of 79,163 IDPs in the Lahj Governorate, however this is not broken down by the three regions[44]. The Humanitarian Needs Overview (HNO) conducted in 2019 found that there are 7,356 IDPs in Al Hawtah, out of which 4,620 are from the district. The HNO estimated 21.1 percent of the total estimated population being displaced whereas the CFP survey by UN-Habitat estimated it to be 25 percent of the population. The Yemen Shelter Cluster report from 2017 found that 32 percent of IDPs are women aged 18-60 years and 12 percent being girls aged 0-17.

The hydrology study conducted for this project found that the middle region has a land use breakdown of 86.6 percent pastureland, 11.1 percent Agricultural Land and 2.3 percent populated land. Figure 7was produced for the Al Hawtah city profile and shows the populated areas in the district, including industry and commerce as well as the wadi and surrounding agricultural land.

Most structures are built using mud bricks with thick walls and are used because they tend to lock cool air inside the building which helps in an area with high temperatures. Mud is also widely abundant and cheaper than concrete and wood. However, these homes are extremely vulnerable to heavy rains and floods. In addition, an estimated 60 percent of Al Hawtah's building exhibit signs of structural damage much of a direct result of the war.

There is a lack of housing in the city as a result of the destruction of many buildings combined with the rapid influx of IDPs in the face of only a limited number of rental units. The Yemen Shelter Cluster report found that, as of 2018, 75.1 percent of prospective tenants are IDPs.

Informal settlements, known locally as "Ashwaiyat", are found throughout the city, although many of them are quite small and not exceeding a few meters. Some of them are home to many IDPs who lost their homes in the district or were displaced from other cities.

[42] UN-Habitat (2020) Aden City Profile
[43] Afrah Saad Al-mahfadi and Mohamed Dakki, "Causes and Effects of Coastal Wetlands Degradation in Yemen," *Iioab Journal*, no. October, 2016.
[44] https://data.unhcr.org/en/country/yem#_ga=2.51079209.1447391314.1679905938-1498650503.1679905938

The World Bank estimates that 44 percent of the urban population lives in slums based on the international definition which would amount to almost 18,000 people in Al Hawtah living in informal settlements.

Al Hawtah is also home to substantial cultural heritage sites including palaces, shrines, and ancient water wells. Unfortunately, cultural heritage sites have also suffered damage during the conflict, given their fragile condition being in need of maintenance, preservation and protection. Given the housing situation, the Sultan's Palace "Al Abdali" is being used by IDP families as shelter, IDPs providing maintenance works to the building and grounds in exchange of residing there.

The water supply infrastructure in Al Hawtah sustained extensive damage during the conflict including reservoirs, pumping stations, and wells. Water for drinking purposes is not readily available, and most households have trouble accessing enough water to drink, the affordability of water further being problematic.

Sewage and wastewater management issues are also reported as a key issue throughout the Tuban region. Lahj Water and Sanitation Corporation (LWSC) is the body responsible for managing the water services in Al Hawtah and Tuban districts.[45] The LWSC water infrastructure includes 20 water reservoirs and water towers, with a capacity of 28,800 m3, one water sterilization facility and 89 km of the supply network. The LWCS has seven fuel generators to operate the water supply system but there are no operation and maintenance vehicles, as these have been damaged or stolen during the conflict.

The Tuban Delta used to be known for the purity of its water and gardens of jasmine trees and roses.[46] However the focus group discussions conducted for this project noted poor water quality and that water used to be more plentiful but now wells needed to be dug deeper with high likelihood that no water would be found. It was also noted that some wells have become polluted by sewage water. The conducted hydrology study estimates water availability being at 84 mm from rainfall for the Middle Region in 2022 and 25.5 MCM calculated as available runoff water for the Middle Region.

Irrigation systems have been built around floodplains to take advantage of seasonal rainwater from the north, however seasonal rainwater often washes away parts of agricultural lands.[47] The irrigation methods used in the Middle region are predominately check basin irrigation (55 percent) and spate irrigation (40 percent) with modern irrigation only accounting for 5 percent. The region is also well known for an abundance of clay minerals which have been used manufacturing cement and bricks.

One of the main challenges in the region is poverty, as Lahj represents the second poorest governorate in Yemen based on CSO data from 2014 which estimates the poverty rate as 69.1 percent.[48] Further, data from 2005-2006 showed that the rural poverty rate was higher in the Lahj Governorate at 49.5 percent compared to urban poverty at a rate of 22.9 percent, however both were higher than the national average.[49] Given the large youth population in the region, youth unemployment is a major concern; estimates from 2016 showed the youth unemployment rate at approximately 30 percent in urban areas.

The UN-Habitat Al Hawtah City Profile showed the importance of informal employment opportunities with 54 percent of the primary source of income coming from these informal employment income-generating activities.

Although not representing the highest share of employment, agriculture is the sector with the highest economic productivity, with the main crops in the Middle Region by hectares as sorghum, millet, cotton, and vegetables.

Education services have been disrupted in recent years due to the conflict and influx of IDPs. While there was an increase of children due to the arrival of IDPs, the number of education facilities in the Tuban district has not increased. IDPs face particular challenges in accessing services from WASH to health and infrastructure. Most IDPs in Al Hawtah have problems accessing water. Surveys from UNHCR showed that approximately two-thirds of IDP children were not enrolled in school in 2015.[50]

Disputes over lands are an on-going issue in the region and land dispute resolution mechanisms are not functioning well, deeply inhibited in Yemen's DNA reflecting the country's dysfunctional land sector, hence forcing Yemenis to resolve disputes through customary and religious means, which creates further tensions that reach across generations and prevent constructive peacebuilding and social reconciliation.

In tribal areas in Lahj, Tribal Sheikhs are occupying a prominent role in dispute resolution and conflict mediation within their local communities.[51]

Upper Region of Tuban Delta: Upstream highlands area in Lahj

[45]GIZ (2018), Damage Assessment Report of Twelve Water Supply and Sanitation Local Corporations (LCs), (Bonn and Eschborn, Germany: GIZ, 2018).
[46] UN-Habitat (2020) Al Hawtah City Profile
[47] Ibid
[48] Ibid
[49] Ibid
[50] Ibid
[51] UN-Habitat (2020) Al Hawtah City Profile

The Upper Region of the Tuban Delta is located in the Lahj Governorate. The area covers 450 km2 and has a population of 36,921. The region has predominately small to medium sized villages with the largest being home to over 5,000 people, the majority of these villages however being inhabited by a few thousands or several hundreds. There are no IDP camps existing in the Upper Region, however there are likely to be some IDPs living in the area and renting homes.

The hydrology study conducted for this project found that the Upper Region has a land use breakdown of 91.4 percent pastureland, 7.1 percent Agricultural Land and 1.6 percent populated land. The study also found that there are 3,180 hectares of agricultural land and 2,830 hectares of cultivated land. The main crops found are fodder and sorghum, followed by millet and to a lesser extent sesame, vegetables and melons.

The climate is semi-tropical and arid, the elevation varying from 200 meters above sea level to 500 meters above sea level, and the region having several streams.

The focus group discussions identified an asphalt plant, a cement plant, and a Coca-Cola plant as key infrastructure in the region. The Al-Anad Water Supply Station and the Dar Al-Araes Palance are the two key infrastructure assets identified in the hydrology study.

On water services, the Al-Hawtah City Profile found that for the Tuban District as a whole, only 50 percent of the population has sufficient water for drinking, cooking, bathing and to do laundry.

Climate Change and the Tuban Delta

Climate Change Hazards: Increased Temperatures, Variable Precipitation, Sea Level Rise

The mean annual temperature is expected to increase by 1.2-3.3 degree C by 2060 and by 1.6-5.1 degree C by the end of this century. Models predict a strong increase in the duration of heat waves, as well as a strong reduction in duration of cold spells. Temperature increase is more rapid in the interior regions than in areas close to the coast. This increase of temperature will increase evapotranspiration rates and water scarcity in the Tuban Delta, thus reducing agriculture production (food security) and domestic water supply. Consequently, this will pose severe risks to people's lives. In cities (see Table 1), temperature increase is further exacerbated by heat resources emitted from buildings (and air conditioning), asphalt roads, and limited vegetation, building up urban heat islands which in turn cause damage to asphalt roads and other infrastructure, hence affecting people's lives.

Average temperature increase	2016-2035		2046-2065		2081-2100	
City	**RCP45**	**RCP85**	**RCP45**	**RCP85**	**RCP45**	**RCP85**
Al Hawtah	0.8	0.9	1.6	2.3	2.1	4.3
Sa'ada	0.8	1.0	1.6	2.3	2.0	4.2
Ibb	0.8	0.9	1.5	2.1	2.0	4.1
Aden	0.8	0.9	1.6	2.2	2.0	4.0
Al Hodeidah	0.8	0.9	1.5	2.1	2.0	4.0
Sana'a	0.7	0.9	1.5	2.1	1.9	3.9
Mareb	0.7	0.8	1.4	2.0	1.8	3.7
Ta'iz	0.8	0.8	1.4	2.0	1.8	3.7

Table 1. Average temperature increase in Yemen cities[52]

Projections for precipitation are more variable across different scenarios. While some scenarios show an increase in average rainfall in a specific region, other scenarios state a decrease in average rainfall. There is, however, concurrence that there will be an increase in one-day precipitation with more extreme rainfall events, which could contribute to severe flash floods.

[52] Change in Annual Temperature (RCM Ensemble for near-,mid-,end-century, extracted from data www.riccar.org. Ensemble of 3 bias-corrected RCM projections using daily data from 3 different GCMs (CNRM-CM5, EC-EARTH, and GDFL-ESM2M). Data over the 20-year period is averaged to obtain the ensemble.

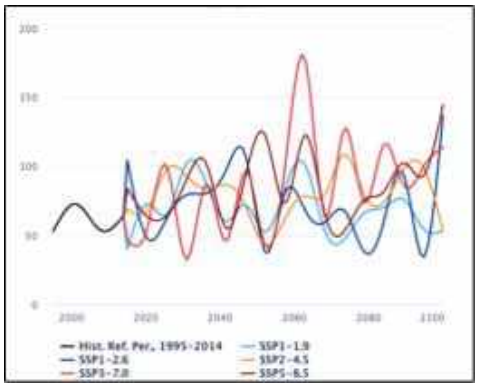


Figure 8. Projected Annual Precipitation in Aden (mm)

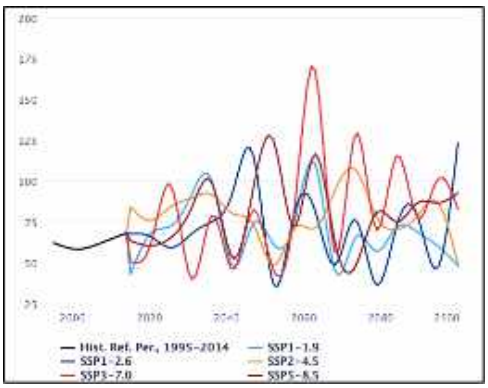


Figure 9. Projected Annual Precipitation in Lahj (mm)

Years	SSP3 /RCP 7	SSP5/RCP 8.5	SSP3 /RCP 7	SSP5/RCP 8.5	SSP3 /RCP 7	SSP5/RCP 8.5
	Lower Region		Middle Region		Upper Region	
Baseline (2022)	51		84		118	
2023-2040	69.8	82.3	69.4	79.9	76.3	87.8
2041-2060	76.4	89.6	68.3	90.0	75.1	99.0
2061-2080	110.4	77.7	106.2	74.8	116.8	82.3
2081-2100	100.5	97.2	94.9	84.3	104.4	92.7

Table 2. Average Annual Rainfall Projections (mm) under SSP3 and SSP5. Source: UN-Habitat (2023)

As demonstrated in the map below, the larger watershed of the Tuban Delta contributes to the potential of flash flooding in the three regions.

Figure 7~~11~~. Map of the Main Streams and Infrastructure Assets in the Tuban Delta

Figure ~~8~~10. Map of the boundaries of the Tuban Delta Watershed that Contribute to Flash Flood in Tuban Delta, Source: UN-Habitat (2023)

The hydrology study also mapped the assets throughout the Tuban Delta alongside the major streams to understand which assets are at highest risk to flash flooding.

The water security of the three regions is affected by the occurrence of drought combined with an imbalance of water resources. In addition, saltwater intrusion into groundwater has an adverse impact on water supply in the lower region and thus affects water security of the region. The hydrology study assessed the drought index by region, as shown in map 12 below, it is clear that the lower region has an extremely dry rating over the majority of the region.

Sea level rise is projected to affect the coastline along Aden with impacts on major infrastructure areas and buildings at low elevation area which includes the international airport which is located at 0m to –10m below sea level. The maps below show the risk to the coastal area by 2100 based on RCP 8.5, the high emission scenario, further highlighting that sea level rise also increases saltwater intrusion into many wells in Aden, which affects the already limited water supply.

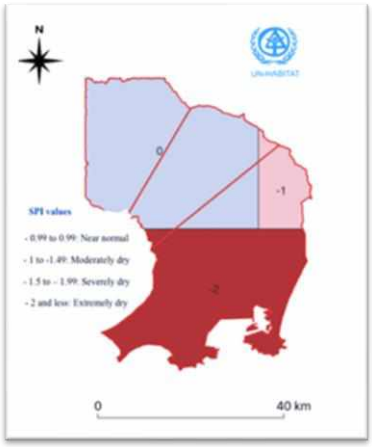


Figure 12. SPI drought index by region

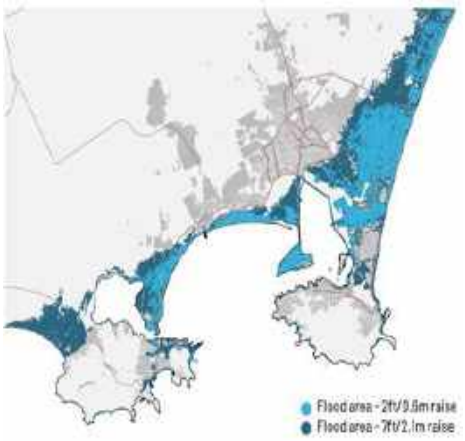


Figure 13. Map of Aden's Sea Level Rise

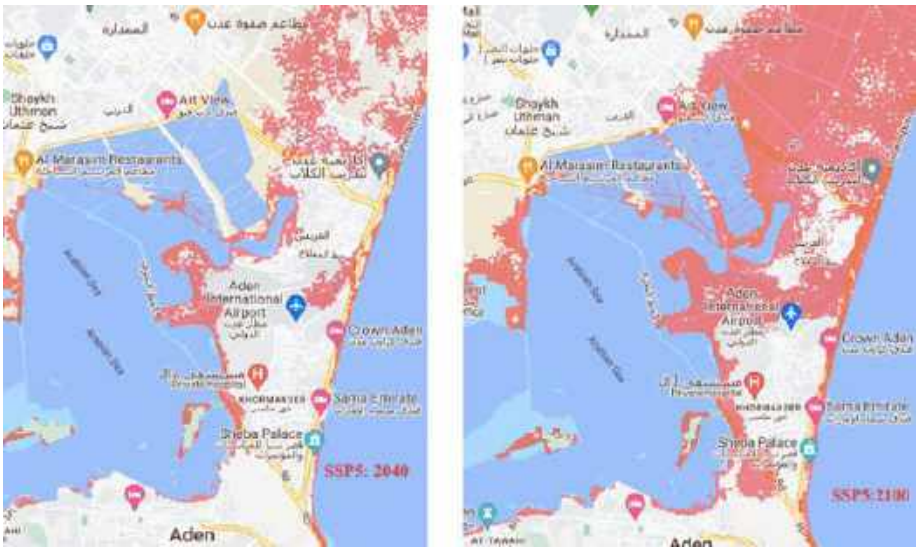


Figure 914. Map of Aden's Projected Sea Level Rise Impact

Rising sea levels will have severe impact on coastal cities, for instance through the infiltration of groundwater aquifers. Sea level rise projections modelled on Digital Elevation Maps (DEM) by the Climate Central[53] show that even a one-meter sea level raise will submerge parts of Aden, Al Hodeidah, and Al Mukalla (see Figure 7). In Aden, large parts of central economic and residential districts will be fully submerged, including the airport, cutting the connection to the Aden peninsula hosting essential port facilities. A number of cities, towns and villages along the main road stretching from Aden, through Zinjibar and Al Mukalla, and further into Oman, as well as urban settlements located along the Red Sea coast to the west up towards Al Hodeidah, are similarly located on low lying planes that will be severely affected by sea level rise.

Yemen is a disaster-prone country that faces **natural hazards** every year with floods as the most important and recurring form of disaster. While *regular* flooding has historically been beneficial for agriculture in Yemen, *high-magnitude* flooding often leads to losses of cropland, uprooting of fruit trees, death of animals caught in high floodwater surges, and destruction of infrastructure, such as irrigation facilities and rural roads. The damages done by floods tend to be exacerbated by ongoing desertification processes and land degradation, partly caused by climate change. In addition, several models project higher rainfall levels for Yemen, thus potentially increasing the frequency and severity of floods.[54] Rising sea levels are expected to accelerate coastal erosion, damage key infrastructure, force community relocations, and threaten marine ecosystems and low-lying coastal wetlands. Greater variability in rainfall patterns will reduce food security due to the increasing severity of droughts and floods.[55]

Climate Change Risks and Vulnerability Analysis for the Tuban Delta

Greater rainfall variability could increase drought periods and diminish water supplies more rapidly while increased temperatures could lead to higher evapotranspiration rates, further slowing the replenishment of water sources.[56] The overexploitation of groundwater resources and the rising sea level due to climate change will result in increased salt water intrusion, especially in coastal aquifers.

Projections suggest that aquifers such as **Abyan, Tuban**, and Sa'adah will be depleted by 2025. Depletion of the **Tuban aquifer** is the most rapid (2015, versus 2019 for Abyan) because of a greater reliance on groundwater relative to discharge in the Tuban sub-basin.

[53] Climate Central, "Risk Zone Map," 2020, https://ss2.climatecentral.org/#9/13.5445/44.2831?show=satellite&projections=0-K14_RCP85-SLR&level=1&unit=meters&pois=hide.
[54] Wiebelt, M.; Breisinger, C.; Ecker, O.; Al-Riffai, P.; Robertson, R.; Thiele, R., (2011): *Climate Change and Floods In Yemen: Impacts on Food Security and Options for Adaptation* (IFPRI Discussion Paper 01139)
http://cdm15738.contentdm.oclc.org/utils/getfile/collection/p15738coll2/id/126748/filename/126959.pdf
[55] Climate Investment Funds (2012): *Pilot Programme for Climate Resilience.*
[56] USAID (2016)

The hydrology study conducted by UN-Habitat found that, due to limited surface water availability in the Tuban Delta's Lower Region, groundwater recharge has been diminished, forcing farmers to increase groundwater extraction. Consequently, as well as due to internal migration, population expansion, and climate change, groundwater levels have decreased, saltwater intrusion has grown, soil qualities have changed, and desertification has worsened. If the imbalance between groundwater recharge and discharge persists, groundwater levels will fall further, and saltwater intrusion will rise. As a result, fresh groundwater of the lower region may endure no more than 35 years. The water balance was examined based on the gathered data and current conditions, taking into account future forecasts under RCP 8.5 and RCP 7, along with three alternative demand scenarios, to provide a comprehensive picture of the current and future water situation. According to the findings, the lower area would have the most severe water shortage as of the next decade, while the middle area may face a water crisis as of 2040.

An analysis of regional climate change impact on agriculture in Yemen shows a mixed pattern, with production increases in the highlands (from Sa'adah to Taiz) due to higher temperatures. Significant yield reductions are expected in some lower and hotter areas such as around Raymah in the west, **Abyan-Aden** in the south, and in the eastern half of the country.[57] Annual desertification of cultivated land is 3-5 percent,[58] which negatively affects food production and decreases overall availability of arable land. The countrywide food insecurity impact of floods is minor; however, there are substantial severe consequences, especially in areas directly affected by floods. Within agricultural subsectors, fruits are the hardest hit by floods, followed by sesame and tomatoes.[59]

Rainfall in the coastal and desert cities is rare, with only a few rainy days per year. Data from 2016 shows as little as 22-mm rainfall in Aden. Rainfall usually happens during short and localised deluge, often accommodated by heavy thunderstorms. Precipitation generally decreases towards the east, as the region is considered a transitional zone between the wetter western highlands and the dry Rub Al-Khali desert. Several cities have repeatedly been affected by heavy rainfall resulting from persistent deep land atmosphere depressions and cyclonic storms, which in turn occasionally cause urban flash flooding.

Heavy rainfall was experienced both in June 2019 and April 2020. For instance, in April 2020 Aden, Sana'a and Ma'rib were severely affected by flooding where an estimated 148,680 people were affected across 13 governorates,[60] leaving 15 dead and 89 injured by the end of April.[61] The floods caused severe disruptions of services and damage to housing and infrastructure such as roads, bridges and the electricity grid, as well as contaminated water supplies. In Aden, IDP shelters for 1,812 families were damaged.[62] From January to April, around 110,000 cases of cholera were recorded.[63]

Aden's typology with the characteristic slopes encapsulating the city is conducive to debris slides being carried by flash floods. This has caused severe damages to people and physical assets, particularly on informal settlements constructed on the hillsides of the city. In the lowland areas of Aden, these floods create swamps and pools that stay unevaporated for several days. This is causing electricity outages, as well as contributing to health stresses such as cholera and malaria. The current city plans are not adjusted to prevent and adapt to such impacts.

A climate change vulnerability assessment of the three regions for two key hydrological climate change impacts, flooding and water security, was undertaken. The three regions were scored based on indicators for exposure, sensitivity and adaptive capacity for flooding and water security. This scoring system yielded a score for each region to classify them as high, medium-high, medium, medium-low or low risk. For more details, including indicators and data used, see annex 1.

As for the link between climate change scenarios and the performance of potential adaptation measures needed in the Tuban delta, under RCP 7 and RCP 8.5, the delta may face years of drought / water scarcity and other years of flooding due to increased drought and rainfall events. Rehabilitating / upgrading irrigation systems with improved water intake structures can address both extremes and provide socio-economic and environmental benefits by controlling excess water, collecting and retaining seasonal rainfall to protect crops and urban areas from floods. These anticipated benefits / outcomes will also be supported by the proposed stone-gabions to be installed / constructed and integrated and inclusive natural resource and climate change risk management. The upgrading of WWTPs to treat wastewater for use in irrigation and modern irrigation techniques and systems will also have the benefit of sustained irrigation in years of drought / water scarcity.

The Lower Region has high vulnerability to both water security and flooding which is largely due to the higher number of people and assets exposed and sensitive to these hazards as well as sea-level rise . The Middle Region has a high vulnerability to water security due in large part to the large agricultural production in the area and a medium-high

[57] World Bank (2010): Y*emen: Assessing the Impacts of Climate Change and Variability on the Water and Agricultural Sectors and the Policy Implications.*
[58] Climate Investment Funds (2012): *Pilot Programme for Climate Resilience.*
[59] Wiebelt et al. (2011)
[60] OCHA, "Yemen : Flash Floods - Flash Update No. 3," *OCHA*, no. April, 2020.
[61] ACAPS, "Yemen - Heavy Rainfall and Flash Floods," *ACAPS Yemen Analysis Hub*, 2020.
[62] Ibid.
[63] OCHA, "Yemen : Flash Floods - Flash Update No. 3."

vulnerability to flooding as it has less assets and people exposed to flooding yet there remain sensitivities and a lack of adaptive capacity. The Upper Region, in part due to less assets and people present, shows a medium level of vulnerability. However, due to reliance on agriculture for livelihoods, there is a medium-high vulnerability for water security.

	Upper Region	Middle Region	Lower Region
Water Scarcity	Medium-High	High	High
Flooding	Medium	Medium-High	High

Table 3. Summary of Water Scarcity and Flood Risks in Tuban Delta Regions

With respect to water security, climate change indicators include temperature, precipitation and sea level rise which correlate to the hazards of heat, drought and saltwater intrusion. Regarding flooding, the climate change indicators are precipitation and sea level rise which correlate to the hazards of both coastal and inland flooding.

Exposure	**Sensitivity**	**Adaptive Capacity**
Infrastructure Assets: 24	Airport, hospitals, power stations, water supply stations, wastewater treatment plant, waste landfills, roads, museum	Local Knowledge of CC: Medium-Low
Population size Females: 524,106 Males: 608,906 Total: 1,133,013	IDP camps: 71 People living in Informal Settlements/Floodplains	Water Distribution Plan: 1 Agriculture plan (previously): 1
Ecosystems: 2	Wetlands Reserve Nature Reserve Encroachment and Degradation	Access to Financial Assistance: Cooperative Agricultural Credit Bank

Table 4. Flood Risk Indicators – Lower Region

Utilizing the scoring system, the Lower Region has a high vulnerability to flooding with a score of 23.

	Exposure	Sensitivity	Adaptive Capacity	
Infrastructure	3	3	3	Knowledge
People	3	3	1	Plans
Ecosystems	2	3	2	Financial Assistance
Total	8	9	6	23

Table 5. Lower Region's Vulnerability to Flooding

The table below represents water security risk indicators in the Lower Region.

Exposure (Quantitative)	**Sensitivity (Qualitative)**	**Adaptive Capacity**
Hectares of Agricultural Land 2948 ha	Types of crops Mix of high and low Water Intensive Crops: Sorghum, Cotton, Vegetables	Irrigation Methods 5% Modern Irrigation
Population size Females: 524,106 Males: 608,906 Total: 1,133,013	25% of households not linked to water grid	Relevant Plans (Water Management, Climate Change) Water Distribution Plan: 1 Agriculture plan (previously): 1
Water Supply: 25.5 MCM Renewable Water	Water differential (between supply and demand) 2022 -84.3 (MCM)	Access to Financial Assistance Cooperative Agricultural Credit Bank

Table 6. Water Scarcity Risk Indicators for Lower Region

Utilizing the scoring system, the Lower Region has a high vulnerability of water security with a score of 20.

	Exposure	Sensitivity	Adaptive Capacity	
Agriculture	2	2	3	Irrigation Method
People	3	2	1	Plans
Water	2	3	2	Financial Assistance
Total	7	7	6	20

Table 7. Lower Region Water Security Vulnerability Score

The Middle Region of the Tuban Delta is in the Lahj Governorate and includes the capital city of Al Hawtah. Outlined below are the flooding indicators:

Exposure	**Sensitivity**	**Adaptive Capacity**
Infrastructure Assets: 7	Hospital, Power Station, water supply station, wastewater treatment plant, palaces	Local Knowledge of CC: Medium-Low
Population size Females: 41,371 Males: 44,583 Total: 85,954	IDP camps: 20 People living in Informal Settlements/Floodplains	Rainwater Management and irrigation plan: 1
Ecosystems: 1	Natural channel Encroachment and Degradation	Access to Financial Assistance: International organizations for farmers, banks Less assistance for women reported

Table 8. Flood Risk Indicators for Middle Region

The UN-Habitat's City profile for Al Hawtah also noted the extreme vulnerability of the city to heavy rains and flooding, especially for buildings made of mud brick.

The Middle Region has a medium-high vulnerability to flooding with a score of 19.

	Exposure	Sensitivity	Adaptive Capacity	
Infrastructure	2	2	3	Knowledge
People	1	3	2	Plans
Ecosystems	2	2	2	Financial Assistance
Total	5	7	7	19

Table 9. Middle Region's Flooding Vulnerability Score

The following table outlines the data for water security indicators in the Middle Region:

Exposure (Quantitative)	**Sensitivity (Qualitative)**	**Adaptive Capacity**
Hectares of Agricultural Land 4398 ha	Types of crop Mix of High and Low Water Intensive Crops: Sorghum, Cotton, Vegetables	Irrigation Methods 5% Modern Irrigation
Population size Females: 41,371 Males: 44,583 Total: 85,954	40% of households not linked to water grid	Rainwater Management and Irrigation Plan: 1
Water Supply: 22 MCM Renewable Water	Water differential (between supply and demand) in 2022 8.8 MCM	Access to Financial Assistance Cooperative Agricultural Credit Bank

Table 10. Middle Region's Water Scarcity Risk Indicators

The Middle Region has a high vulnerability for water security with a score of 21.

	Exposure	Sensitivity	Adaptive Capacity	
Agriculture	3	2	3	Irrigation Method
People	1	3	2	Plans
Water	3	2	2	Financial Assistance
Total	7	8	7	21

Table 11. Middle Region's Water Scarcity Vulnerability Scarcity

Upper Region Tuban Delta CCVA

The Upper Region of the Tuban Delta is the least densely populated and most rural part of the three regions, located at the highest altitude.

Outlined below is the data for the indicators for flooding vulnerability:

Exposure	**Sensitivity**	**Adaptive Capacity**
Infrastructure Assets: 2	Water Supply Station, palace	Local Knowledge of CC: Medium-Low
Population size Females: 17,796 Males: 19,125 Total: 36,921	IDP camps: 4 People living in Informal Settlements/Floodplains	Water Management Plan: 1 Land Use Plan: 1
Critical Ecosystems: 0	N/A	Access to Financial Assistance for men and women: Cooperative and Agricultural Credit (CAC) Bank

Table 12. Flood Risk Indicators for the Upper Region

Utilizing the scoring system, this yields a vulnerability to flooding level of Medium, with a score of 15.

	Exposure	Sensitivity	Adaptive Capacity	
Infrastructure	1	2	3	Knowledge
People	1	2	2	Plans
Ecosystems	1	1	2	Financial Assistance
Total	3	5	7	15

Table 13. Upper Region's Flooding Vulnerability Score

For Water Security in the Upper Region, the data can be found below:

Exposure (Quantitative)	**Sensitivity (Qualitative)**	**Adaptive Capacity**
Hectares of Agricultural Land 2830 ha	Types of crops Low Water Intensive Crops: Sorghum and Millet	Irrigation Methods 10% Modern Irrigation
Population size Females: 17,796 Males: 19,125 Total: 36,921	40% of households not linked to water grid	Water Management Plan: 1 Land Use Plan: 1
Water Supply: 24 MCM Renewable Water	Water differential (between supply and demand) in 2022 +38.6 MCM	Access to Financial Assistance Cooperative Agricultural Credit Bank

Table 14. Water Scarcity Indicators for the Upper Region

The vulnerability of the Upper Region for Water Security is Medium-High with a score of 18.

	Exposure	Sensitivity	Adaptive Capacity	
Agriculture	2	1	2	Irrigation Method
People	1	3	2	Plans
Water	3	2	2	Financial Assistance
Total	6	6	6	18

Table 15. Upper Region's Water Scarcity Vulnerability Score

The overall key points derived from the climate change vulnerability assessment for the Tuban Delta include:

- ✓ The Upper and Middle Region have higher vulnerability to water insecurity than flood.
- ✓ The Lower Region has the highest vulnerability of the three regions to water insecurity and flooding, largely due to the higher number of people and assets present.
- ✓ Adaptive Capacity is low across regions due to lack of management plans and lack of widespread knowledge on climate change.
- ✓ Sensitivity is high for all regions for water insecurity and for the Middle and Lower Region for flooding.
- ✓ Exposure is highest in the Lower Region for flooding due to the size of population in Aden, but exposure is high across all three regions for water insecurity because of the importance of agriculture across the regions.
- ✓ Impacts are likely to be exacerbated for many vulnerable groups such as women, youth/children, elderly, and IDPs.

The hydrology study further recommended that, to cope with climate change and water scarcity challenges in the Tuban Delta, the following measures are recommended:

1. The Lower Region requires additional water resources, which can be provided by a solar-powered desalination plant.
2. Wastewater treatment plants need rehabilitation, monitoring, and appropriate plans to reuse the treated water for irrigation or for groundwater recharge.
3. Irrigation channels should be maintained, and modern irrigation methods should be applied.
4. A disaster management plan should be developed coupled with an early warning system to cope with flooding and drought.
5. Groundwater discharge should be monitored to control groundwater depletion and saltwater intrusion in the Lower Region.
6. Continuous capacity building programs are needed addressing hydrological modeling, water use efficiency, water allocation and climate change adaptation.
7. The above-mentioned measures can be fostered by developing an Integrated Water Resource Management (IWRM) plan/strategy for the Tuban Delta.

The outcomes of the Climate Change Vulnerability Assessment (CCVA) and hydrology study were reviewed by stakeholders in the Tuban Delta who then carried out an exercise to discuss possible adaptation measures for each of the regions, considering different time periods and both urban and rural solutions. The following table reflects the outcomes of the possible adaptation measures:

Regions	Short-term options (1-3 years)	Medium-term options (4-6 years)	Long-term options (6+ years)
Upper Tuban region	**Urban:** Flood protection measures; Early Warning System. **Rural:** Raising awareness; Improve irrigation efficiency	**Urban:** Disaster risk management plan; Early Warning system **Rural:** Water Harvesting; Irrigation technologies; Greywater reuse	Urban: Sustainable water use management; Flood risk management; Tree Planting **Rural:** Water barriers; Irrigation Technologies
Middle Tuban region	**Urban:** Flood protection measures; awareness-raising in water usage rationalization **Rural:** Raising awareness; Improve irrigation efficiency	**Urban:** Greywater reuse; Water harvesting/storage; wastewater treatment and reuse **Rural:** Drought-tolerant crops; Salt-tolerant crops	**Urban:** Sustainable water use management. **Rural:** Sustainable water use management;
Lower Tuban region	**Urban:** Awareness-raising in water usage rationalization **Rural:** Raising awareness; Improve irrigation efficiency	**Urban:** Greywater reuse; Water harvesting/storage; wastewater treatment and reuse **Rural:** Drought-tolerant crops; salt-tolerant crops	**Urban:** Seawater desalination; sustainable water use management: Rehabilitation of Al-Tawelah Tanks **Rural:** Sustainable water use management; Tree Planting; Mangrove cultivation

Table 16. Overview of Potential Adaptation Options in the Tuban Delta

Based on this consultation and further discussion with the IRG, further considering additional analyses of priorities and the data and information, the following adaption measures were identified:

1. New desalination plant to cover the increasing drinking water demands in Aden (to be covered by GCF).
2. Greywater reuse from mosques and schools in agriculture/creation areas (low priority communities).
3. Rehabilitation of existing wastewater treatment plants and reusage of treated wastewater in agriculture/creation areas (low priority communities).
4. Development of early warning systems & risk management plans (low priority communities).
5. Re-utilization of desalinated water from Al-Hswah Thermal Power Plant (screened-out by the MoWE).
6. Rehabilitation and protection of irrigation system of Tuban Delta for effective water delivery and to reduce flood risks.

A pre-feasibility study was conducted accordingly, with the following project components and objectives identified to suggest for proposal. The pre-feasibility study recommends a focus on the following concrete interventions:

1. Rehabilitation and protection of irrigation system of Tuban Delta for effective water delivery and to reduce flood risks.
2. Rehabilitation of the existing wastewater treatment plants and reusage of treated wastewater in agriculture/creation areas.

These concrete interventions were chosen in part as they were deemed to be no regrets and would be successful in future precipitation scenarios under RCP 7 or 8.5. As outlined above, it is likely that there will be both drought and flooding events under these scenarios. Upgrading irrigation systems can address both extremes and provide socio-economic and environmental benefits by:

- Controlling excess water and protecting crops from floods,
- Collecting and retaining seasonal rainfall,
- Improving soil structure and reducing insect populations, and
- Sustaining the biodiversity of regional ecosystems.

1.2. PROJECT / PROGRAMME OBJECTIVES:

Overall objective
The proposed project has the overall objective to **'increase the climate change resilience of people and water resource systems in the Tuban Delta.**

Intended impact
The proposed project intends to have the following impact: '**increased resilience of people and the water sector in the Tuban delta to cope with climate variability and change.'**

Adaptation Fund Objectives/ Outcomes Supported by the Project
The propose project has four outcomes to achieve the overall objective and impact:

Outcome 1: Enhanced capacities of national and sub-national government institutions, communities and vulnerable groups to manage natural resources (focused on water and land) and respond to climate change risks in the Tuban Delta efficiently, sustainably and in a resilient way.

This is in line with the following AF outcomes:
- ☐ Outcome 2: Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses.
- ☐ Outcome 7: Improved policies and regulations that promote and enforce resilience measures.

Outcome 2: Increased adaptive capacity of the water sector through rehabilitation and protection of irrigation systems in the Tuban Delta.

This is in line with the AF outcomes:
- ☐ Outcome 4: Increased adaptive capacity within relevant development sector services and infrastructure assets.

Outcome 3: Increased innovative, efficient, sustainable and climate change resilient practices to improve the water supply systems for urban and agriculture purposes.

This is in line with the AF outcomes:

- ☐ Outcome 8: Support the development and diffusion of innovative adaptation practices, tools and technologies.

Outcome 4: Improved ownership and capacities at local level to respond to climate change, including operating, maintain and replicating resilient water and irrigation systems.

This is in line with the AF outcomes:

- ☐ Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level.

1.3. PROJECT / PROGRAMME COMPONENTS AND FINANCING

Project Components	Expected Outcomes	Expected Concrete Outputs	Amount (USD)
I. Integrated and inclusive natural resource management for climate-resilient water systems	1. Enhanced capacities of national and sub-national government institutions, communities and vulnerable groups to manage natural resources (focused on water and land) and respond to climate change risks in the Tuban Delta efficiently, sustainably and in a resilient way (in line with AF Outcomes 2 and 7)	1.1 Government capacity strengthened at national and sub-national level on increasing climate change resilience and effective water management	188,800
		1.2 Establishment of laboratory for wastewater quality testing and water supply quality testing.	299,720
		1.3 Integrated and inclusive natural resource (focused on water and land) and climate change risk management process and plan	422,440
		Total Component II	910,960
II. Increased adaptive capacity of the water sector	2. Increased adaptive capacity of the water sector through rehabilitation and protection of irrigation systems in the Tuban Delta (in line with AF Outcome 4)	2.1. Assessment and verification / technical specification and engineering studies, including surveys required, for improved irrigation canals and water intake systems.	60,000
		2.2. Rehabilitated irrigation canals to improve water access for agricultural purposes in the Tuban.	1,665,216
		2.3. Improved water intake structures to increase water supply in the irrigation canals.	88,500
		2.4. Stone-gabions constructed (where feasible with hybrid greening option) to reinforce canals and protect agriculture lands and Al-what city from flashing floods (where feasible with hybrid greening option)	1,572,350
		Total Component II	3,386,067
III. Innovative adaptation practices for water supply systems	3. Increased innovative, efficient, sustainable and climate change resilient practices to improve the water supply systems for urban and agriculture purposes. (in line with AF Outcome ~~4 and~~ 8)	3.1 Assessment and verification / technical specification and engineering studies, including surveys required, for water supply alternatives options outlined below	45,000
		3.2 Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah, Saber cities and surrounding villages	1,569,400
		3.3 Upgrade Tahror WWTP to treat wastewater for use in irrigation	400,020
		3.4 Upgrade Saber WWTP to treat wastewater for use in irrigation.	360,490
		Total Component III	2,374,910
IV. Improved ownership and capacities at local level to respond to climate change	4. Improved ownership and capacities at local level to respond to climate change, including to operate, maintain and replicate resilient water and irrigation systems. (in line with AF Outcome 3)	4.1 Support farmers' with modern irrigation techniques and systems (Urban and Rural Areas).	854,721
		4.2 Develop maintenance plans for canals, irrigation system	155,760
		4.3 Strengthen water users associations for improved monitoring, maintenance and dissemination of information on irrigation techniques and skills development.	292,640
		4.4 Skills development with women and youth on water management and climate change adaptation.	141,600
		4.5 Capacity development for communities with a focus on women and youth civil society organizations on integrated and inclusive natural resource management plans.	94,400
		4.6 Awareness raising with local communities on water conservation and climate change in Aden and the Tuban Delta.	129,000
		Total Component IV	1,668,121
V.	Total All components		8,340,057

VI.	Project/Programme Execution cost (9.5%)[64]	875,426
VII.	Total Project/Programme Cost	9,215,483
VIII.	Project/Programme Cycle Management Fee charged by the Implementing Entity (if applicable) (8.5%)[65]	783,077
Amount of Financing Requested		9,998,560

Table 17. Project /Programme Components and Financing Required

1.4. PROJECTED CALENDAR

Milestones	Expected Dates
Start of Project/Programme Implementation	Jan 2024
Project/Programme Closing	Dec 2027
Terminal Evaluation	September 2027
Duration	3,5 years

Table 18. Projected Calendar

[64] Max according to Adaptation Fund guidelines
[65] Max according to Adaptation Fund guidelines

PART II: PROJECT / PROGRAMME JUSTIFICATION

A. PROJECT / PROGRAMME COMPONENTS

To achieve the overall project objective to "Increase the climate change resilience to water scarcity and flooding in the Tuban Delta", the project aims at implementing a set of concrete 'core' adaptation actions (components 2 and 3). Around two thirds of the components' budget will be allocated to these concrete interventions, which will further directly benefit the populations living in the target area. Component 1 will consist of capacity building support and the development of a concrete plan to manage natural resources in the Tuban delta area efficiently, sustainably and climate change-resiliently through vertical and horizontal cooperation. This does particularly include water management, spatial planning and climate change. Component 1 will also include an inclusive process to bring together diverse stakeholders, with focus on women and youth (trained under Component 4) to identify natural resource management and climate priorities as well as other investment needs in the water sector in the Tuban Delta, and more widely throughout Yemen.

Component 1: Integrated and inclusive natural resource management for climate-resilient water systems

Outcome 1: Enhanced capacities of national and sub-national government institutions, communities and vulnerable groups to manage natural resources (focused on water and land) and respond to climate change risks in the Tuban Delta efficiently, sustainably and in a resilient way

In line with AF outcomes 2 and 7 and the priorities of the government of Yemen (see part II.D), this component will focus on strengthening the capacities of national and sub-national government institutions and build an inclusive process for the sustainable and climate resilient management of natural resources to ensure benefits to communities and vulnerable groups in the Tuban Delta through the following **outputs and corresponding activities**:

Output 1.1 Government capacity strengthened at national and sub-national level on increasing climate change resilience and effective water management

Activities: Sixteen trainings with national and sub-national government officials, spread out over years 1, 2 and 3 of the project, with a focus on the capacities and skills needed to increase climate change resilience and effective water management in the Tuban Delta and nationally. The trainings will also cover the capacity building needed to operate and manage the laboratory established under Output 1.2; Twenty workshops, spread across all four years that will focus on a collaborative process for mainstreaming climate change resilience and effective water management bringing together national and sub-national officials; The technical support under this output will include a training needs assessment to determine the exact focus on the trainings and workshops and this will be adapted based on the implementation and lessons learned as the project is on-going.

Output 1.2 Establishment of laboratory for wastewater quality testing and water supply quality testing.

Activities: Develop the technical specifications of the laboratory needed to test wastewater and water supply; Design the lab based on the technical specifications; Populate the lab with equipment and tools and begin testing water and wastewater.

Output 1.3 Integrated and inclusive natural resource (focused on water and land) and climate change risk management process and plan

Activities: Field workshops with Water Users Associations, community organizations, women's and youth groups (receiving capacity building under Component 4) to discuss and provide inputs into plans for the management of natural resources and climate change risk; Workshops bringing together community representatives from the field workshops and national and sub-national government officials to develop plans for the management of natural resources and climate change risk

As identified during the project's preparation phase, there are numerous potential interventions to increase water security for the Tuban Delta; it is critical that all future investments are coordinated to ensure synergies and that the best possible interventions are selected. To reach this, the national and sub-national government requires substantial capacity with regards to climate change resilience, effective water management and the development of integrated and inclusive natural resource management plans.

Although there is some capacity present in the government on water management and climate change resilience, this is generally found, however very selectively in certain areas of expertise and mandate of the ministry and its departments. A more integrated and comprehensive approach will help to ensure a coordinated approach for land and water resources for urban and agricultural uses that better reflects a landscape approach. In addition, additional data is

required to ensure water quality, identify hotspots of degradation and poor water quality, assure the public of the quality of water sourcing from innovative methods employed in this project (especially under Component 3), and build a solid foundation for future interventions. Also, critically for a country with many vulnerable people and substantial development challenges, it is important that concrete plans for climate change resilience and natural resource management are developed in an inclusive manner , further including the needs of diverse stakeholders from local communities such as farmers, women, youth, and migrants; hence, the integration of a specific output for stakeholder engagement in this component.

Component 2: Increased adaptive capacity of the water sector

In line with AF outcome 4 and the priorities of the government of Yemen (see part II.D), this component's outcome is to "*Increase the adaptive capacity of the water sector through rehabilitation and protection of irrigation systems in the Tuban Delta".*

To reach this outcome, there are four outputs focused on improving the irrigation canals and water intake systems in order to build the adaptive capacity of the water sector to reduced water supply and flooding, the following **outputs and activities:**

Output 2.1 Assessment and verification / technical specification and engineering studies, including surveys required, for improved irrigation canals and water intake system

Activities: Technical study for the rehabilitation of irrigation canals; Technical study for the improved water intake structures; Technical study for the designof the stone-gabios to reinforce canals

Output 2.2 Rehabilitated irrigation canals to improve water access for agricultural purposes in the Tuban Delta

Activities: Concrete works for canal intake structure, diversions, small box culvert and protection works; Install lifting system + steel gates for intakes of main canals and diversions; Repair the lifting system and steel gates and steel handrails over the intakes of canals; Removal of deposited soil from canal intake structure and along the canal and earth works

Output 2.3 Improved water intake structures to increase water supply in the irrigation canals

Activities: Construct, supply and install automatic wadi flow gauging station at Dukeim

Output 2.4 Stone-gabions constructed (where feasible with hybrid greening option) to reinforce canals and protect agriculture lands and Al-what city from flashing floods.

Activities: Construction of stone-gabions works for protection of irrigation canals, agriculture lands and Al-what city from flashing floods.

The canal system in the Tuban Delta is critical for providing water for irrigation as well as to prevent flooding. The Tuban Delta has an extensive canal system servicing agricultural areas, yet numerous canals require rehabilitation and enhancement. Furthermore, water intake structures require improvement to increase water supply to the canals. This outcome will be initiated by focusing on the development of necessary assessments including engineering studies to define technical specifications of rehabilitations, improvements and enhancements. The rehabilitation of the canals will cover 7 km of the (over) 61 km system, while output 2.3 will improve water intake systems. In addition, under output 2.4, the remaining 54km of the canal system will be reinforced with stone-gabions (where feasible with hybrid greening option) to protect agricultural lands and Al-What city from flooding. The locations for all these works are identified in the map below.

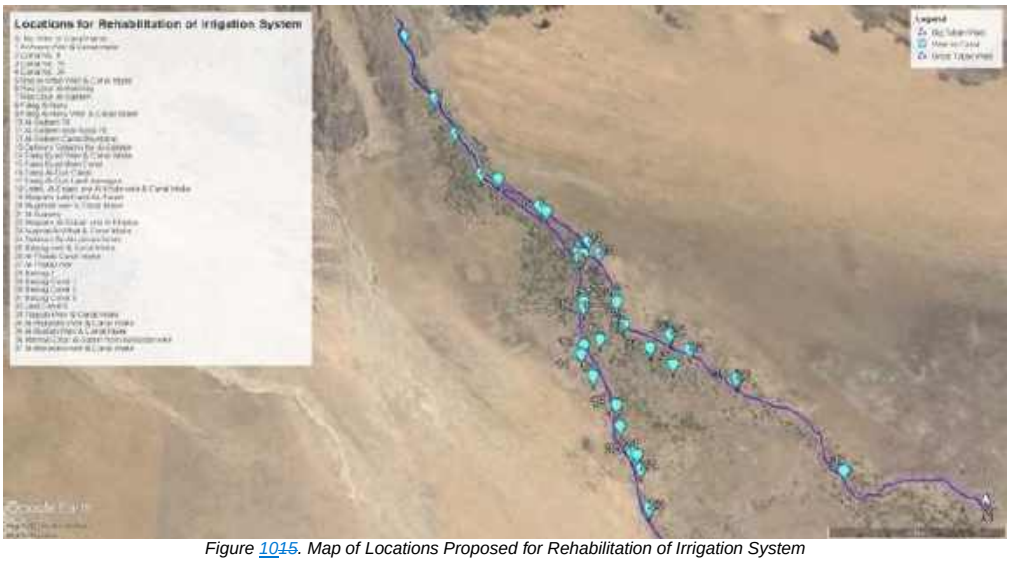


Figure 1015. Map of Locations Proposed for Rehabilitation of Irrigation System

Component 3: Innovative adaptation practices for water supply systems

In line with AF outcome 8 and the priorities of the government of Yemen (see part II.D), this component will focus on developing and scaling up innovative technologies for Yemen on wastewater treatment for irrigation and developing efficient urban water systems for Al-What city. The overall outcome of this component will be to "*increase innovative, efficient, sustainable and climate change resilient practices to improve the water supply systems for urban and agriculture purposes".*

This will be accomplished through the following **4 outputs and corresponding activities**:

Output 3.1 Assessment and verification / technical specification and engineering studies, including surveys required, for water supply alternatives options outlined below

Activities: Technical study on the efficient and safe water supply alternatives for Al-What, Al-Hawtah and Saber cities; Technical study on upgrading Tahror WWTP; Technical study on Saber WWTP

Output 3.2 Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah, Saber cities and surrounding villages

Activities: Rehabilitation of buildings and accessories of the pumping station for Al-Waht City; Construction of Ground Tank made of RCC/stone masonry with capacity of 2000 m3, including the pipings and pups and solar energy; Supply and install seven vertical pumping units for re-pumping station (Magrs nagy wellfield to Al-Hwtah) with all required accessories; Supply and install PV system (33 KwH)

Output 3.3 Upgrade Tahror WWTP to treat wastewater for use in irrigation

Activities: Remove the sludge and tress from the ponds and the plant; Install flow measuring device a the inlet channel to the plant; Install emergency pumping unit; Install steel coated mesh fence around the plant including concrete foundation, steel columns and main steel floor; Construct ground tank; Connect pipes and irrigation channels

Output 3.4 Upgrade Saber WWTP to treat wastewater for use in irrigation

Activities: Remove the sludge and tress from the ponds and the plant; Install flow measuring device a the inlet channel to the plant; Install emergency pumping unit; Install steel coated mesh fence around the plant including concrete foundation, steel columns and main steel floor; Construct ground tank; Connect pipes and irrigation channels

The first concrete output is to develop efficient and safe water supply systems for Al-What, Al Hawtah and Saber cities. Currently, residents in the cities rely on water trucking and illegal wells, highlighting that both sources cannot guarantee safe water and are rife with exploitation in terms of expensive water tariffs and unregulated extraction of water. This intervention will therefore increase the provision of water from certified wells into safe water storage units which can

then be distributed fairly and equitably to residents, ensuring fair tariffs and reducing overexploitation of groundwater resources. This will involve the installation of vertical pumping units in the sanctioned Magrs nagy wellfield. To ensure adequate water quality, sediment units and filters will be utilized in the water collection and chlorination units before the distribution of water. The system will provide 330,000 m^3 of water per year for approximately 9,000 residents of Al-What, 50% of whom are women and approximately 1/3 are youth.

Figure 16. Map of Al-Hawtah City and Location of Supply Station

To improve the urban water systems for Al-Hawtah and Saber city, improved pumping units need to be installed in the Magrs Nagy wellfield, which is connected to the Al-Hawtah water supply and provides water to Saber city and surrounding villages. This system will utilize solar energy for water pumping to increase reliability and reduce the carbon footprint of the system to zero. To ensure adequate water quality, sediment units and filters will be utilized in the water collection and chlorination units before the distribution of water. The system will provide 2,200,000 m^3 of water per year for the 80,000 residents of Al-Hawtah and Saber cities, 50% of whom are women and approximately 1/3 are children and youth. The current station is pictured in the figure below.

Figure 17. Tabor Wastewater Treatment Plant (WWTP) and Agriculture Land to Serve

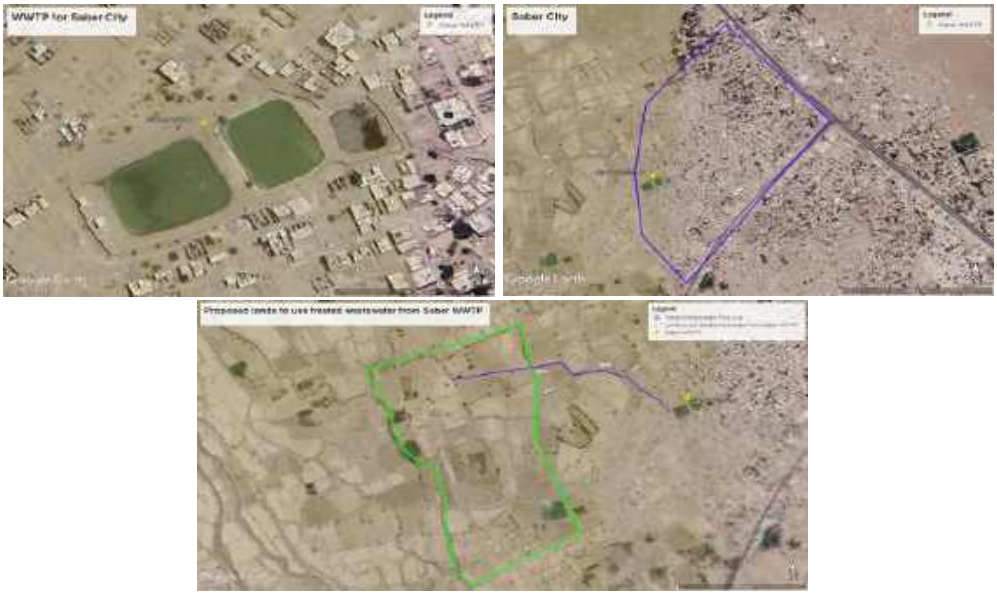


Figure 18.. Saber WWTP, Saber City and Agricultural Land to be Served

The second concrete intervention will be the upgrading of wastewater treatment plants (WWTP) for the usage of irrigation. Tahror WWTP outside of Al-Hawtah city and Saber WWTP next to a small city of the same name in the Lahj Governorate have been identified. Tahror WWTP treats wastewater of 26,830 people from Al-Hawtah City and Al-Duba village. With the upgraded design, the plant could convert 3,800 m^3 of water per day that can be utilized for agricultural use. This will provide water for 75 hectares of agricultural land.

Saber WWTP treats wastewater of Saber city and surrounding villages. With the upgraded design the plant could convert 900 m^3 of water per day that can be utilized for agricultural use. This will provide water for 40 hectares of surrounding agricultural lands.

Component 4: Improved ownership and capacities at local level to respond to climate change

The final component will ensure sufficient capacities and ownership at the local level, with focus on marginalized groups (women and youth), for sustainable and long-lasting change. The outcome will "*improve ownership and capacities at local level to respond to climate change, including to operate, maintain and replicate resilient water and irrigation systems".* This will be attained through six outputs **with corresponding activities**:

Output 4.1 Support farmers' with modern irrigation techniques and systems (Urban and Rural Areas)
Activities: Support farmers' with modern irrigation techniques and systems of bubbler irrigation techniques

Output 4.2 Develop maintenance plans for measures
Activities: Workshops about the maintenance of canals, irrigation system and wastewater treatment; Develop guidelines and knowledge management materials on the maintenance of canals, irrigation systems and wastewater treatment plants for ongoing sustainability as well as uptake in other areas

Output 4.3 Strengthen water users associations for improved monitoring, maintenance and dissemination of information on irrigation techniques and skills development
Activities: Trainings for water users associations on monitoring, maintenance and irrigation techniques: Workshops on irrigation techniques

Output 4.4 Skills development with women and youth on water management and climate change adaptation
Activities: Training needs assessment to determine the skills focus based on need of women and youth; Trainings provided to women and youth on water management and climate change adaptation

Output 4.5 Capacity development for communities with a focus on women and youth civil society organizations on integrated and inclusive natural resource management plans
Activities: Trainings and workshops for women and youth civil society organizations on natural resource management plans and climate change in order to contribute to the process in Outcome 1

Output 4.6 Awareness raising with local communities on water conservation and climate change in Aden and the Tuban Delta
Activities: Development of communications product to spread awareness about the impact of climate change on water supply and how to reduce water demand to improve conservation; Visits to local communities where the project is implemented to raise awareness about the efforts to adapt to climate change.

The first output will ensure that farmers in the target areas receive training on modern irrigation techniques and related equipment for implementation. In sum, 350 farmers will benefit directly from the modern irrigation training and associated equipment. This will ensure the efficient use of water provided through components 2 and 3 in agricultural systems to help reduce water demand and improve the resilience of the water sector. The second output is focused on developing the maintenance plans for the continued operation of the canals and irrigation system of component 2 with co-management between local government and the community to ensure joint ownership and the continued operation beyond the funding cycle. Complementarily, 4.3 focuses on strengthening water users associations. In some cases, water user associations already exist but do not have sufficient skills or have become inactive. In other cases, the water user association needs to formed. In total, there will be 23 water user associations to cover the target areas, with the project aiming at at least 6 women-headed associations.

The fourth output centres on skills development for women and youth on water management and climate change adaptation. This intends to improve the chances of women and youth to secure jobs in the water sector, and to improve water utilization in their current jobs and/or in their households. It is to note that building the capacity of water utility professionals may further be part of this output, depending on the need. A further output will focus on capacity

development for communities on integrated water resource management plans as part of a participatory and inclusive approach to complement Outcome 1. The final output will focus on awareness raising activities for local communities to ensure community-wide efforts on water conservation as well as to improve understanding of the impact of climate change on water security in the Tuban Delta. It aims at encouraging further community ownership over the interventions and potential future intervention. Age and disability aspects will strongly be taken into consideration during all activities across the project.

Theory of Change

The Theory of Change diagram displayed below shows how the components work together to support each other as well as the barriers, risks and assumptions associated with the project. The overall project impact is to *reduce vulnerability and increase the adaptive capacity of people and water resource systems in the Tuban Delta to respond to the impacts of climate change at local and landscapes levels.* All four of the project components support this project goal by focusing on building the capacities and concrete interventions needed to reduce vulnerability in the water sector and increase the adaptive capacity of people, including the most vulnerable, and the government, at both national and sub-national level, to respond to climate change. As outlined in previous sections, the water sector and people in the Tuban Delta are vulnerable to climate change due to current water imbalances, lack of plans and knowledge about climate change combined with high levels of poverty and on-going conflicts resulting in instability. The majority of the families in the region derive their livelihoods from agriculture and agriculture remains the main use of water so targeting interventions in this sector can help to improve liveilhoods while also reducing water demand. In addition, the infrastructure for the water sector is severely degraded due to the conflict further reducing the adaptive capacity of the sector. Components 1 and 4 primarily focus on addressing these gaps in terms of knowledge, capacity and planning while Components 2 and 3 focus on water supply as relates to the agriculture sector. Component 1 focuses on integrated and inclusive natural resource management for climate resilient systems. This component supports components 2 and 3 where improved irrigation and water systems will be implemented. Components 2 and 3 are also supported by the strengthening of Water Users Associations in Component 4. Component 2 specifically is supported by the support for modern irrigation techniques and the development of long-term maintenance and operation plans which will be developed in Component 4.

Components 1 and 4 have a strong relationship as the training of women, youth and Water Users Associations (under Component 4) will be integrated into the inclusive process for developing natural resource and climate change risk management being convened under Component 1.

The risks outlined were identified in the project development phase and these have been considered in the design of the interventions and the implementation arrangements. The main risks identified are related to data and capacity at the national and sub-national level which is why Components 1 and 4 aim to strengthen these gaps. There are also risks related to the behavior change or non-adoption of measures required under Components 2 and 4 but it is intended that the awareness raising, skills development of women and youth as well as strengthening the role of water user associations is aimed to mitigate this risk.

There are also several key assumptions, mainly that the trainings will build the requisite skills and that the measures undertaken will adequately improve irrigation, provide more water for irrigation and reduce flooding risk. Regular monitoring as part of the project will ensure that these key assumptions are met and changes will be adopted as necessary in the course of the project.

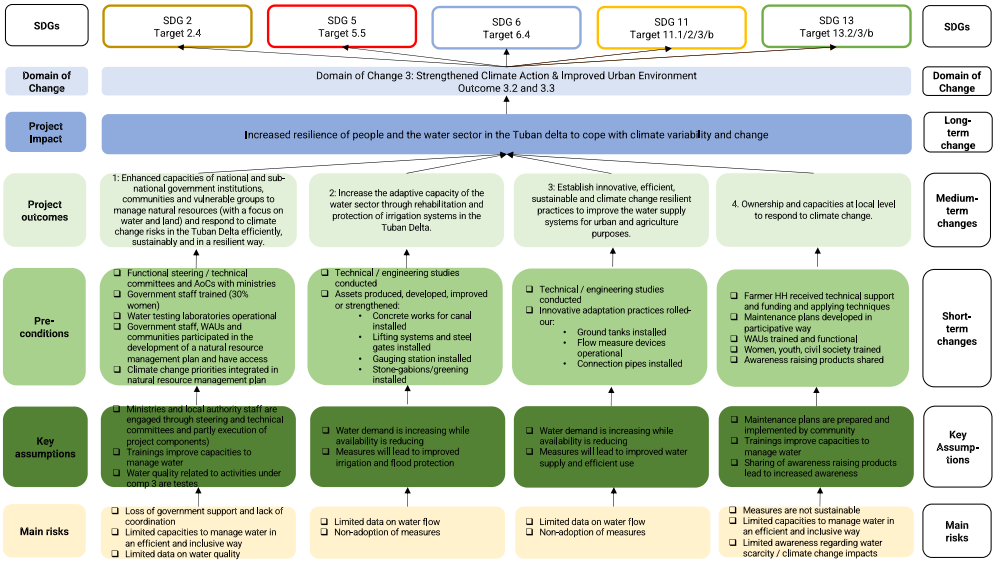


Figure 19. Theory of Change Diagram

B. ECONOMIC, SOCIAL AND ENVIRONMENTAL BENEFITS OF THE PROPOSED PROJECT / PROGRAMME

The proposed project aims to maximize benefits in the extremely vulnerable context of Yemen with an aim to maximize benefits for the most vulnerable groups, including women and youth. The number of direct beneficiaries for Component 2 are 73,317 people, of which 72,000 people will benefit from the irrigation systems, the majority of farming activities are carried out by women and youth, who either work on their own farms or as laborers on others' farms. Additionally, internally displaced persons (IDPs) will have the opportunity to participate in agricultural activities, which will help boost their families' income, while1,245 people will be protected from floods, 50% of these people are women and approximately 1/3 are youth. Protecting more land will create suitable spaces for agricultural activities. Many IDP camps are situated in flood-prone areas, so safeguarding these regions can help protect the lives of internally displaced persons (IDPs).. Under Component 3, Output 3.2 for the safe and efficient water supply will have 85,000 beneficiaries in Al-What, Al-Hawtah and Saber cities and surrounding villages, 50% of these people are women and approximately 1/3 are youth. Providing accessible water at home will protect children from the risks associated with fetching water from distant sources, such as open wells or lakes. Many children are forced to leave school to assist their families in collecting water, but having water readily available at home will allow them to return to their studies. Additionally, ensuring access to clean water will help reduce health issues, particularly among women and children. Many families in the targeted cities are currently spending a significant portion of their income on purchasing water from trucks at a high cost. Outputs 3.3 and 3.4, treating wastewater for use in irrigation will benefit 33,730 people 50% of these people are women and approximately 1/3 are youth. Well-treated wastewater can provide additional water for irrigation, creating more opportunities for women and youth to engage in agricultural activities. This will also help reduce the depletion of groundwater resources. Proper wastewater treatment will improve environmental conditions, particularly benefiting women and children. Also, the additional water will help poor farmers rehabilitate their land, especially with easy access to water and no need for capital to dig a well or buy a pump. Component 4 will support 78 poor small-holder farmer households with drip irrigation systems, of which 30% will be women. It will also provide skills development for 100 women and youth on water management and climate change adaptation. Component 1 will benefit all 1,255,888 of the population of the Tuban Delta, 583,273 of whom are women, through improved planning for the resilience of natural resources management.

Type of benefit	Baseline	With/after project
Economic	Climate change is already leading to economic and livelihood losses, especially caused by less rain, droughts and water evaporation, leading to water scarcity issues. Water dependent livelihoods, especially in the agriculture sector, are especially threatened.	- The agriculture sector in target areas will be more climate change / drought resilient, leading to improved livelihood security, benefitting especially farmers and communities that depend on it for food security with more secure / higher income. Reduced costs for irrigation and water supply will also result in better financial outcomes for farmers. - The reinforcement of the canals will reduce the economic loss of farmlands and the cost of rebuilding in the case of extreme precipitation events. These avoided losses have a significant economic benefit for communities struggle to rebuild in the face of conflict in the region. - The more efficient water systems will reduce water costs for residents in Al-What and Al-Hawtah helping to reduce the household budget for water purchase. - Skills development for women and youth will also support these populations to obtain income-generating activities that can help to supplement household incomes. - Rehabilitation of canals can increase land value by an estimated 20-30 percent. - Improving irrigation systems can help reduce the reliance on rain-fed agriculture, making farming more predictable and stable, and could encouraging farmers to keep their farms. - The project will increase employment opportunities during construction and maintenance phases, in addition to the farming opportunities.
Social	Climate change is already leading to social issues, especially caused by tensions from scarce water resources. There are also negative health implications from the lack of safe and treated water and risks to food and water security. Finally, women and youth have been marginalized in processes for integrated and inclusive natural resource management.	- **Women and Youth:** Participatory assessments, planning and decision-making processes over scarce water resources, involving women and youth, will enhance social cohesion and build community ownership of natural resource management and equitable access to resources. - **Women and Youth:** Climate change-resilient livelihood skills building activities, including operation and sustainability, will benefit the most vulnerable. - **Children:** Improved or new climate-resilient and sustainable water systems will contribute to social well-being and health outcomes, especially for children. - **Families:** Improving water supply and distribution could lead to an increase of 20-30 percent in food production, which could contribute to food security by increasing the availability of food crops and reducing the need for food imports, potentially lowering food prices.
Environmental	In addition to overexploitation of natural resources / water, climate change is already leading to negative environmental impacts, especially land / soil degradation, desertification, saltwater intrusion and lack of a natural water cycle.	- The government, at different levels, will be able to better assess, plan and manage natural resources / water, also considering environmental sustainability and climate change risks. - Water resources such as wells and water dependent livelihoods (i.e. agriculture) could be protected from overuse / droughts. This will mostly benefit the most vulnerable/poor groups dependent on these resources and women and youth. - Currently, due to the overexploitation of water, there is insufficient water balance for water returning to the natural environment. Through increased water efficiency it is hoped that the negative water balance will be reduced and there will be water returning to wetlands, improving a functioning ecosystem.

Table 18. Project's Potential Economic, Social and Environmental Benefits

C. COST-EFFECTIVENESS OF THE PROPOSED PROJECT / PROGRAMME

Through the proposal development phase, several options for building resilience of the water sector were discussed by the project team, government and stakeholders. To support the prioritization and selection of adaptation options, a cost-effectiveness analysis of the concrete interventions was included in the pre-feasibility study, which covers components 2 and 3 and Output 4.1, with details in the table below.

While over 1 million people live in the Tuban Delta, a sharp increase in population numbers is expected due to high urbanization rates. Developing capacities and supporting an inclusive approach to natural resource management will

ensure a more climate-resilient and sustainable future for the region. It will help building adaptive capacity, identify future vulnerabilities, and manage natural resources accordingly.

Alternatively, in scenarios where the aforementioned capacity is not built and natural resource management is disregarded, interventions will continue to be ad-hoc and will not result in sustainable resource management. These ad-hoc interventions could also fail to adequately account for climate change, water balance and vulnerable communities and assets.

In addition, if the process disregards inclusiveness and is not informed by data from the laboratory, there is a risk that the effectiveness of natural resource management planning is decreased. This is because it would not consider the crucial inputs of marginalized stakeholders and would thus fail to account for up-to-date information on water quality and water levels.

Adaptation Measure	**Total intervention cost (USD)**	**Beneficiaries**		**Cost-effectiveness (Total Cost/Beneficiaries in USD)**		**Alternative Solutions**	**Justification**
		Direct	**Indirect**	**Direct**	**Indirect**		
2.2 Rehabilitated irrigation canals to improve water access for agricultural purposes in the Tuban Delta 2.3 Improved water intake structures to increase water supply in the irrigation canals	1,665.216	72,000	1.183.888	23	1	Alternative 1: Digging additional wells	1. There is evident proliferation of unauthorized wells in the Tuban Delta area, which has resulted in overextraction of groundwater. In many places, it is now necessary to dig wells deeper to access water with visible desalination of the wells. 2. The irrigation canals are existing structures that have been utilized for a long time, with decrased efficiency due to degradation and capacity decrease of the water intake structures. Utilizing the existing structures is cost-effective and reduces the environmental impact of creating new structures.
2.4 Stone-gabions constructed to reinforce canals and protect agriculture lands and Al-what city from flashing floods	1,572.350	50,140		31		(1) Reinforce housing and infrastructure to protect against flooding (2) Early Warning System	1. This solution takes advantage of the existing canals instead of creating new structures and causing disruptions within urban areas. It provides widescale to urban areas and agricultural lands instead of just reinforcing individual property and infrastructures. 2. An Early Warning System would be an important complimentary solution however while it could help reduce the loss of life, it would not necessarily help to protect against the loss of property and disruption of agricultural livelihoods and food security in the region.
3.2 Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah, Saber	1.569.400	89.000[66]		17		(1) Desalination plant (2) Rainwater harvesting	1. The cost of a new desalination plant for medium-sized cities in Lahj is expensive and there are high environmental risks for relaunching a system from scratch. 2. Unfortunately,

[66] Inhabitants of Al What and Al-Hawtah and Saber cities

cities and surrounding villages							rainwater harvesting is not feasible given the low levels of rainfall in the area.
3.3 Upgrade Tahror WWTP to treat wastewater for use in irrigation	400.020	525	26.830[67]	761	14	Digging additional wells	1. There is evident proliferation of unauthorized wells in the Tuban Delta area, which has resulted in overextraction of groundwater. In many places, it is now necessary to dig wells deeper to access water with visible desalination of wells. 2. The WWTP represent existing structures and supplement water supply without having to utilize more groundwater. Utilizing the existing structures is cost-effective and reduces the environmental impact when creating new structures.
3.4 Upgrade Saber WWTP to treat wastewater for use in irrigation	360.490	280	6.900[68]	1287	52	Digging additional wells	
4.1. Support farmers' with modern irrigation techniques and system	854.721	514[69]	26.830[70]	1662	29	Using more water by surface irrigation	1. There is evident proliferation of unauthorized wells in the Tuban Delta area which has resulted in overextraction of groundwater. In many places, it is now necessary to dig wells deeper to access water with visible desalination of the wells. (2) Farmers are eager and interested to use modern irrigation techniques.

Table 19. Proposed Project's Cost-Effectiveness Rationale

With regards to water use for irrigation, both direct and indirect beneficiary numbers were calculated based on one farmer's presence per hectare, each with an average family size of six (direct beneficiaries). Indirect beneficiaries for irrigation are those benefitting from increased food security as a result of the reliable yields are estimated as 10 people per hectare.

Regarding more efficient urban water systems (output 2.2), the total population of the three cities are considered direct beneficiaries. The indirect beneficiaries are the remaining population connected to the water network in Aden.

In general, the rehabilitation costs for project components 2.2 and 2.3 of irrigation systems in Yemen are lower than those in its neighbors, Oman and Saudi Arabia. However, due to the critical conditions resulting from 15 years of instability, these costs have increased, as described below:

Country	Costs USD/Km	Description
Yemen	27000[71]	The irrigation system is old, some parts needs reconstruction to serve flood protection, which has increased the rehabilitation costs.
Oman	10,000-25,000[72]	This reflects a mix of traditional and modern irrigation practices.
Saudia Arabia	20,000 - 50,000[73]	This includes advanced technologies such as drip irrigation and automated systems.

[67] Inhabitants of Al-Hwtah City and Al-Duba village
[68] Inhabitants of western part of Saber City
[69] 78 farmers with an average Household size of 6.6. Asuming average plot size small-holder farmers of 1.5 ha.
[70] Inhabitants of Al What and Al-Hawtah and Saber cities
[71] Based on this propsal 2.2 costs 1.665 M$ covering 61 Km.
[72] https://www.muscatdaily.com/2024/09/02/mafwr-restoring-100-aflaj-in-dhahirah/
[73] https://doi.org/10.3390/su152014674

Altogether, the project's cost efficiency will be ensured as follows:

- Avoiding future costs associated with damage and loss due to climate change impacts (especially droughts) and to ensure the interventions are sustainable;
- Efficient project operations by resorting to 'in-house' technical support options and capacity building expertise, and due to direct partnerships with communities;
- Selected technical options based on cost-feasibility and resilience/sustainability criteria

The avoided climate costs compared to total cost of the activities for three project components are presented in the table below:

Project Components	Total Costs $	Climate damages	Damage / loss due to climate change	Avoided costs $/year
II. Increased adaptive capacity of the water sector	3.386.067	Flooding might impact (72000+ 50140 = 122140[74]) people and destroy 2830 ha of the agricultural lands.	Average floods can lead to 25 USD/person losses. However, significant flooding events might lead to emergency relief efforts of 200 USD/person	3.053.500 24.428.000
III. 3.2 Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah, Saber cities and surrounding villages	1.569.400	The lack of efficient water supply leads people to buy water from private tankers / well owners.	Water insecurity for 89000 people.	9.000.000[75]
		This will also lead to increased illegal groundwater abstraction, resulting in groundwater depletion	Food insecurity[76]	4.450.000
IV. Improved ownership and capacities at local level to respond to climate change	1.668.000	The component will support 514 people (87 farmers) directly and more than 28000 indirectly	Unemployment: (87*12*500 = 522000 $)	0.522.000
			Food insecurity:	1.400.000

D. ALIGNMENT WITH NATIONAL AND SUB-NATIONAL STRATEGIES

The proposed project is designed to be consistent with international, national and sub-national development strategies, plans and goals. The project will directly support several Sustainable Development Goals (SDG) 2 (target 2.4), SDG 5 (5.5), SDG 6 (6.4), SDG 11 (11.1/2/3/b), and SDG 13 (13.2/3/b). In addition to climate change-, urban-, water-, hunger- and gender-related goals, the project will also indirectly contribute to SDG 1, 3, 9, 10, 15 and 16. The project is also to in line with the United Nations Disabilities Inclusion Strategy (UNDIS) and the Convention on the Rights of Persons with Disabilities (CRPD).

Yemen has been party to the UN Framework Convention on Climate Change (UNFCCC) since 1996 and to the Kyoto Protocol since 2008 as non–Annex I Party. The Environmental Protection Authority is the national focal point for the implementation of the UNFCCC Convention and Kyoto protocol. To meet its commitments under the Convention, Yemen has initiated a process to establishing legislation, institutional and policy frameworks to fulfil the requirements of the Convention and the Protocol with support from international development partners including the United Nations Development Programme (UNDP), the Global Environment Facility (GEF), the World Bank, and the Government of Netherland.

Yemen has established the Inter-Ministerial Committee on Climate Change (IMCCC) in Yemen in 2009 to strengthen institutional coordination capacity and enhance climate change political leadership in the country.

Most relevant climate change strategies are in Yemen include the Intended Nationally Determined Contribution (INDC) 2015, The Nature Conservancy (TNC) 2018 and a Technology Needs Assessment (TNA) 2023. These publications found that agriculture, water and coast areas are among the top vulnerable sectors.

[74] According to Table 19
[75] 0.3 $ per day per person leads to 9.000.000$ annual cost
[76] People might pay double the price for the same products, which may increase annual food expenditure by 50$

Policy / Document	Year submitted / ratified	Mapped relevant priorities
Climate Change strategies / plans		
National Adaptation Programme of Action (NAPA)	2008	- Focus sectors: water, agriculture and coastal vulnerability to sea-level-rise - Priority projects: **Project # 1:** Develop and Implement Integrated Coastal Zone Management (ICZM). **Project # 2**: Water conservation through reuse of treated waste water and grey **Project #5:** Planting and re-planting of mangroves and palms for adaptation to sea level rise. **Project # 7:** Rainwater harvesting through various techniques including traditional methods**.** **Project # 9:** Promotion of research on drought, heat and salinity tolerant varieties
Initial National Communication INC)	2001	- Adaptation measures include; water (national water strategy, priority adaptive measures for Abyan delta), Agriculture (policy options for adaptations in agriculture, additional adjustments for crops studies), coastal zone (policy adaptations options, adaptation measures for city areas) - Vulnerability and adaptation assessments conducted for water (Wadi Surdud), coastal zone (Aden Governorate), Agriculture (Sorghum and Wheat)
Second National Communication (SNC)	2013	
Intended National Designated Contribution (INDC)	2015	- Focus sectors: water, agriculture and coastal vulnerability to sea-level-rise - Adaptation Priorities: o Promotion and scale-up of rainwater harvesting to reduce climate induced water shortage; o Promoting agriculture drought management as well as sustainable crop and livestock management; o Plan and implement proper land resources management programs. o Livelihood approaches for integrating natural resources management and preservation of sensitive ecosystems; o Disaster risk management including flood and drought management. o Capacity Building for integrated coastal zones and marine resources management. o Capacity building and awareness raising; and o Institutional capacity for building resilience climate change including planning, programming, monitoring and resources mobilization.
Third National Communication (TNC)	2018	- Focus sectors: water, agriculture and coastal vulnerability to sea-level-rise - Adaptation Priorities o Improved water irrigation efficiency: This involved the transition to the use of high- efficiency drip irrigation; o Reduced evapotranspiration: This involved the installation of enclosed conduits in place of open channels; o Reduced water losses: This involved the rehabilitation of traditional irrigation channels to reduce water infiltration to the underlying soil; and o Alternative cropping schemes: This involved changes to the type of crop cultivated through upstream and downstream areas.
Technology Needs Assessment (TNA)	2023	Water Sector Adaptation Technology Priorities identified by stakeholders; - Monitoring the Quality of Drinking Water, including fixed and mobile laboratories - Wastewater Recycling and Reuse - Desalination of Saline Water
National Adaptation Plan (NAP)	Forthcoming	Coordinate with UNDP
Fourth National Communication	Forthcoming	Coordinate with UNDP
Nationally Determined Contributions	Forthcoming	By UN-Habitat (GCF readiness project)
National Development strategies / plans		
The 4th Socio-Economic Development Plan for Poverty Reduction	2002	- Create income-generating opportunities and expand economic opportunities for the poor. - Enhance the capabilities of the poor and increase the return on their assets. - Reduce the suffering and vulnerability of the poor. - Develop potential economic sectors - Enhance human and capital assets of the poor. - Expand economic opportunities for the poor in the agriculture sector and in rural areas. - Improve and upgrade infrastructure

		- Rationalize water use - Combat desertification and environment degradation - Support measures that address issues limiting women's access to economic opportunities - Review and amend legislation to ensure consistency with the poverty reduction strategy and policies, with special emphasis that legislation can and will be implemented - Citizens participation and involvement of civil society institutions.
Environmental strategies / plans		
National Environmental Action Plan (NEAP)	2005	- Development and Implementation of an Integrated Coastal Zone Management - Essential Measures for the Conservation of Agro biodiversity in Yemen - Reviving Traditional and Indigenous Knowledge in Natural Resource
National Strategy for Environmental Sustainability (NSES)	2005	Focus sectors: a) water, b) land resources, c) biological diversity and coastal and marine environment, d) waste management. NSES aims to link the effect of environmental degradation with poverty
Sectoral strategies / plans, especially related to water		
National water sector Strategy and investment programme	2004	Proposes a set of institutional, financial and other measures, which are aimed at addressing discrepancies in five identified sub-sectors (water resources, urban water supply and sanitation, rural water supply and sanitation, irrigation and watershed management and environmental aspects of water) in order to protect the interests of all stakeholders in the resources
National Food Security Strategy	2010	Includes recommendation for investment in expanding the drinking water supply and water sector reform
National Agriculture Sector Strategy (NASS) 2012-2016	2012	Seeks to provide a comprehensive guide to the development of the agriculture sector, including to address food security issues, climate change, water resources challenges, and the role of government in developing the agriculture sector.
National Action Plan to Combat Desertification	2000	Includes options for water management and coastal zone management
National Biodiversity Strategy and Action Plan (NBSAP)	2017	- Biodiversity and ecosystem conservation - Conservation of natural resources - Sustainable use of natural resources - Integrating biodiversity and poverty into sectoral development plans - Focus on water management, including wastewater treatment and desalination
Yemen's Sixth National Report To Convention On Biological Diversity (CBD)	2019	- Aim to integrate / mainstream biodiversity values into national and local development and poverty reduction strategies and planning processes.
Sub-national / target area plans		
Yemen Aden Master Plan	2005-2025	- At present some 54,550 m3/day is available for consumers, which is insufficient to meet the current water demands. The need to identify additional resources as well as reduce unaccounted for water loss, which is very high, is therefore an imperative. - More effective use of the treated sewage effluent will be a priority in the future in order to maximize the utilisation of scarce water resources. - Low levels of rainfall mean that there is no specific provision for dealing with storm water run-off except in a limited number of locations, notably in Crater and at Wadi Kabir and Wadi Saghir.

Table 20.Project's Alignment with National and Sub-National Priorities

E. Project / programme compliance with relevant national technical standards

Each proposed project activity, including components 1.2, 2.2, 2.3, 2.4, 3.2, 3.3, and 4.1, will undergo an Environmental and Social Impact Assessment (ESIA) study to identify potential environmental risks during the planning stages, prior to implementation. This will ensure that the activities comply with relevant laws. Once the environmental risks for each project activity are identified, appropriate environmental measures will be implemented during the execution phase. These measures should be incorporated into the procurement documents for each project activity.

Expected concrete output / intervention	Relevant rules, regulations, standards and procedures (to comply to AF principle 1)	Project alignment with standard	Process / steps to comply	Authorizing offices
Project Output 1.2: Establishment of laboratory for wastewater quality testing and water supply quality testing	- Environment protection law no. (26) of 1995: Art. 58.2 on monitoring (chapter 6) specifies that the Environmental Protection Council shall make sure that competent bodies operating in environmental monitoring networks are capable of recording and observe climate and weather conditions in Yemen	The establishment of the laboratory will help compliance with ensuring that the government has environmental monitoring capacities.	Coordinate with related Authorizing Offices	- Environmental Protection Authority - Local Corporation Water and Sanitation - National Water & Resources Authority – NWRA -
Project Output 3.3: Upgrade Tahror WWTP to treat wastewater for use in irrigation; Project Output 3.4 Upgrade Saber WWTP to treat wastewater for use in irrigation	- Environment protection law no. (26) of 1995 - Law No. 33 of 2002 regarding water - Law No. (41) of 2006 AD amending some materials of Law No. 33 of 2002 regarding water - Yemen standards for water, water used for irrigation 1999	-The project will ensure the protection of the natural environment in order to be aligned with the environment protection law no. (26) In article No (8) which states that “Protecting and promoting the environmental components and properties and preserving the natural balance and preventing, mitigating or control their deterioration or conservation and rationalization of natural resources consumption and protection of the living organisms and creatures, especially those listed as endangered and endemic species” In addition to article No (11) which states “ The rational and wise management of the renewable and non- renewable resources which include the good use and rational exploitation and utilization and to maintain and conserve its sustainability and continuity of its productive capacity for the present and future generation” -The project will follow Article (23) of Law No. (41) which states that [T]he following shall be compliant with standards and specifications set forth by the Authority and approved by Council of Ministers: (3) Uses of treated sewerage water treated for irrigation or for other purposes.	Coordinate with related Authorizing Offices	- Environmental Protection Authority - Local Corporation Water and Sanitation - National Water & Resources Authority – NWRA
Outputs 2.2, 2.3 and 4.1 as relate to Water efficient irrigation (e.g. drip) and closed conduits	- Environment protection law no. (26) of 1995 - Law No. 33 of 2002 regarding water - Law No. (41) of 2006 AD amending some materials of Law No. 33 of 2002 regarding water	-The project will ensure the protection of the natural environment in order to be aligned with the environment protection law no. (26) In article No (8) which states that “Protecting and promoting the environmental components and properties and preserving the natural balance and preventing, mitigating or control their deterioration or conservation and rationalization of natural resources	Coordinate with related Authorizing Offices	- Environmental Protection Authority - Ministry of Agriculture & Irrigation - General Administration of Irrigation - General Authority for Agricultural

	- Yemen standards for water, water used for irrigation 1999	consumption and protection of the living organisms and creatures, especially those listed as endangered and endemic species" In addition to article No (11) which states " The rational and wise management of the renewable and non- renewable resources which include the good use and rational exploitation and utilization and to maintain and conserve its sustainability and continuity of its productive capacity for the present and future generation" -The project will follow Article (23) of Law No. (41) which states that [T]he following shall be compliant with standards and specifications set forth by the Authority and approved by Council of Ministers: (2) Water used for animal drinking, irrigation, tourism, service and medication purposes.		Research and Extension - Agricultural Research Centre - AlKood – Abyan - General Ruler water Authority
Output 1.3 Develop and implement integrated and inclusive natural resource management plans	- Environment protection law no. (26) of 1995	-Ensure that the development of the natural resource management plan protects the natural environment and supports Yemen to fulfil is international obligations as delineated by the law no. (26)	Coordinate with related Authorizing Offices	- Environmental Protection Authority - National Water & Resources Authority – NWRA - Agricultural Research Centre - AlKood - Abyan - Abyan Governorate - Aden Governorate - Lahj Governorate

Table 21. Project's Compliance with Relevant Technical Standards

Safeguarding / Environmental Impact Assessment requirements

In Yemen, the following mechanism is in place to obtain environmental approval for projects:

1. Screening (list all positive and negative impacts); If the negative impacts are not serious, no need to continue.
2. Scoping (optional): This step should be based on consultations with the local people and national experts after listing the impacts.
3. Impact assessment
4. Develop possible mitigation measures (for the negative impacts)
5. Writing all in an Environmental Impact Assessment (EIA) report
6. Send the EIA report to EPA to be approved.

For the proposed project and interventions under the project, all above six steps have been taken and covered in the ESIA-ESMP presented in annex 2. The ESIA-ESMP has been approved by the Ministry of Water and Environment. As described in section IIK, the project has been categorized as Category B (for moderate risk) in compliance with the risks categories in the AF's Environmental and Social Policy (ESP).

F. COMPLEMENTARITY WITH OTHER INTERVENTIONS

This project aims to build from the experiences of other projects on adaptation and water in the region, Yemen more broadly and within the Tuban Delta.

There were six projects identified with the same geographical focus of the Tuban Delta. Of those projects, one was a precursor to this project which provided the CCVA and hydrology study which was been utilized in this proposal. As it was a readiness project from GCF, the funding was limited and it is intended that the additional benefits of this project is to provide concrete benefits for vulnerable communities in the Tuban Delta. Three of the other projects are focused on Aden, which is within the Tuban Delta but has very different built environment characteristics from the communities in Lahj, however as they are within the same watershed, it is important that the projects are coordinated in approach. Therefore this project has the additional benefits of extending to other vulnerable communities beyond Aden. The UNDP project in the region is in the Upper Tuban Delta and the UNICEF project is only for 6 wells in the region so this project is an opportunity to scale up further.

There were eight relevant projects identified in the wider Yemen context, however some of these have closed and the majority did not have any implementation in the Tuban Delta. They have valuable lessons for strengthening Water User Associations and the implementation of technologies related to irrigation and water harvesting. The additional benefits of this project will be to apply more integrated and innovate water approaches in the Tuban Delta, which despite being home to the second largest city in the country, has not been able to mobilize sufficient investment.

Relevant projects and focus	Relevant focus and interventions / activities	Lessons learned	Complimentary potential and non-duplication (see also consultation section)
MENA region			
UN-Habitat – with AF funding – Increasing the climate change resilience of communities in Eastern Ghouta in Rural Damascus to water scarcity challenges through integrated natural resource management and immediate adaptation interventions – USD 10 million	- Integrated water and land resource management - The protection of water resources (and prevent contamination of surface and groundwater resources / wells) - The reduction of water losses; - The increase of water use efficiency, supporting water harvesting projects and using high efficiency irrigation methods; - The promotion of use of non-conventional water resources (e.g. treated wastewater) and: - Improved agricultural production practices (e.g. drought tolerant crops).	- Use lessons from wastewater treatment and reuse by coordinating with Syria office	Complementary - Align approach and lessons learned throughout project preparation and implementation (by ROAS) Non-Duplication - In Syria
Jordan government - with AF funding - Increasing the resilience of poor and vulnerable communities to climate change impacts in Jordan through Implementing Innovative projects in water and agriculture in support of adaptation to climate change (2015-2018) – USD 9,2 million	- Wastewater treatment plant + monitoring quality - Irrigation study - Rain/flood water harvesting dam / basin (400.000 m3) with solar panels to reduce evaporation - Permaculture – adaptation + ecosystem management in demonstration sites -	- According to manager Permaculture has promising results for adaptation, reducing pollution and protecting ecosystem - Water user associations / cooperation can be used to reach farmers and administer water	Complementary - Use permaculture concept in real farms and in urban context - Use similar approach for water harvesting basins at farms and in urban areas - Water user associations / cooperation can be used UN-Habitat is already in touch with manager and specialists (see also II.I) Non-Duplication - In Jordan Valley
Yemen			

Integrated Water Harvesting Technologies to Adapt to Climate Change Induced Water Shortage LDCF (USD 5 million); 2013	- Introduction and rehabilitate traditional water harvesting methods; - Introduction innovative water harvesting methods - Train local communities in maintenance and construction of these techniques - Promote awareness of the socioeconomic benefits of water harvesting. - Strengthen WUAs, increase the capacity of the SFD Engineering Unit and promote financial incentives to local communities for water harvesting	- Lessons related to strengthening WUAs and how to promote ownership of project activities by local community	Complementary - Rain harvesting Non-Duplication - Not in target area
Rural Adaptation in Yemen LDCF (USD 5 million); 2013	- Capacity strengthening of community associations on land planning and sustainable adaptive management of natural resources with a focus on climate-smart water and soil conservation. - Awareness programme on mainstreaming climate adaptation knowledge in decision making and planning processes - Programme on climate change adaptation and risk management in farming practices developed and implemented, targeting rural households in all target watersheds. - Education programme on climate change adaptation and the sustainable use of natural resources developed and implemented, targeting students and youth in all target watersheds - Four Community Action Plans (CAP) at the watershed level produced that are gender balanced and climate change smart, with focus on innovative and sustainable land and water management measures. - Water harvesting and storage improved through the implementation of a mix of measures combining innovative technology and traditional knowledge - Water efficiency in agriculture irrigation and domestic use improved - Action plans developed and implemented to restore and upgrade traditional terrace systems - Pilot actions implemented to stop/reverse soil erosion and loss of fertility, integrating agriculture, rangeland, and forest restoration	- Lessons related to how to run a successful awareness raising programme and the focus of capacity strengthening on community associations and natural resource management	Complementary - Complement approach in the Tuban Delta Non-Duplication - One of the watersheds involves the Turban delta. Overlap will be avoided through coordination
Pilot Programme for Climate and Resilience (PPCR): CIF/PPCR For 3 focal areas) 2013	- Climate Information System and Pilot Program for Climate Resilience (CISPPCR) - Climate Services - (budget:US$19 Million); - Integrated Coastal Zone Management (budget: US$ 20 Million)	- Information utilized to better understand climate context in the country	Complementary - Use data produced Non-Duplication - Not in target area
Promote and build climate resilience to reduce vulnerability in Wadis and coastal areas; UNDP / GEF	- The aim is to explore the relevance of NWSSIP II under changing climate. In addition, this note is also grounded on a deliberate review of relevant climate change policy and thematic studies particularly on the water sector in Yemen	- Information utilized to better understand climate context in the country	Complementary - Use data produced Non-Duplication - Not in target area
The Enhancing Rural Resilience in Yemen Joint Programme (ERRY JP) funded by the EU (USD 40 million)	- Enhance the resilience and self-reliance of crisis affected rural communities through support to rehabilitation of community infrastructure, livelihoods stabilization and recovery, social cohesion and local governance and improved access to sustainable energy	- Lessons related to issues of social cohesion and local governance	Complementary - Use lessons and complement the approach is possible Non-Duplication - Not in target area

UNDP, FAO, ILO and WFP in collaboration with a range of Implementing Partners			
Sanaa Basin Project in Yemen FAO Dutch-funded (2014-2017) Water sustainability for farmers while empowering women	- Construction of wells through a cash-for-work formula for farmers to use for agricultural production. All Water User Associations choose their board members through elections and 30 percent of the seats are designated for women.	- Water association and women only access to water can be used as a water management system to reduce conflict between tribes	Complementary - Consider building upon lessons from Water association and women only access to water approach and cash-for-work formula for farmers to use for agricultural production. ROAS to contact FAO Non-Duplication - Not in target area
World Bank Climate information system and pilot program for climate resilience – USD 19 million	- The SPCR focuses on longer-term interventions aimed at enhancing climate resilience in Yemen. The SPCR cannot address all of the key risks that have been identified but aims to address the highest priority risks identified during the preparation process and through consultation with vulnerable communities. Four interrelated SPCR investments are proposed, each addressing a key risk related to climate change: - Climate Information System and PPCR Program Coordination - Improving the Climate Resilience of the Water Sector - Improving Rural Livelihood through Adaptation in Rain-fed Agriculture Project - Climate-Resilient Integrated Coastal Zone Management"	- Lessons learned on long-term interventions and prioritizing interventions to address highest risk	Complementary - Use lessons and complement the approach is possible Non-Duplication - Not in target area
Resilience Programme in the Irrigation and Agricultural Sector project Funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) through German Development Bank (KfW) Implemented by FAO and UNDP	- The overall objective of the project is to enhance livelihood resilience and sustainable peace in Yemen through sustainable water management. Specifically, the project aims to i) improve agricultural production and resilience to water scarcity, ii) enhance livelihood opportunities, iii) reduce water-related conflict and improve water management through awareness-raising and disaster preparedness at the local level. - Implemented in Abyan, Hadhramout and Dhamar governorates	- Lessons learned on engaging with WUAs and the importance of improving irrigation efficiency	Complementary - Use lessons and complement the approach is possible Non-Duplication Not in target area
In target area			
Netherlands Yemen NCAP Project	- Using an MCA analysis among local stakeholders, the highest priority initiative was identified in each area (Sanaa basin, Saada Basin, Aden), as an input to future planning efforts. The scoping effort included a sequenced plan for implementation and monitoring of the initiative as well as a cost estimate for required materials and labour	- Aden City: The implementation of drip irrigation was identified as the best strategy in terms of water savings both in terms of distribution and application of water on farmlands. This strategy was preferred by stakeholders over others, but is	Complementary - Recommendations to be adopted Non-Duplication - None

		more expensive. As the majority of farmers are poor and barely coping with existing living costs, subsidization or donor support would be needed for implementation	
Aden water and sanitation project	- Prevention of Water Borne Disease Outbreak through Emergency Repair and Upgrade of Damaged Water and Waste Water Facilities in Aden City- Yemen aims at reducing the Cholera outbreaks and other water-borne diseases to mitigate the current situation in the higher risk plagued areas through infrastructures (water, sanitation, drainage), and public health awareness	- Incorporated data and findings from the project into community profile for the area - Continuing to check with lessons learned related to activities	Complementary - Provides UN-Habitat access and knowledge, plus valuable government and stakeholder access Non-Duplication - It aims to urban public health through infrastructure improvement and public awareness, not CC related
Yemen Integrated Urban Services Emergency Project World Bank and United Nations Office for Project Services	- Improving and repairing urban infrastructure including water and sanitation infrastructure, rainwater drainage, and rehabilitation of public parks in Aden (as well as other cities) - Improve Yemen's response capacity in the event of an emergency	- Improved understanding of effective upgrades to urban infrastructure and potential challenges, including timing of implementation	Complementary - Knowledge and information on current status of critical infrastructure in Aden and helps to provide accurate cost estimates Non-Duplication - Focused on existing urban infrastructure but limited to Aden so does not include the medium-sized cities in the rest of the Tuban Delta where this project primarily focuses
UNICEF supporting solar water pumps in Tuban Delta	- UNICEF is supporting solar water pumping systems for 6 wells that are under the control of LAWSC Lahj, as of 2023, they were at the stage of evaluating bids	- Discussion with team about need for coordination and water testing capacities in the region	Complementary - Interest in coordinating approaches Non-Duplication -The solar pumping systems for wells is part of the diversified approach for increased water security and does not conflict with or duplicate this project's efforts
Green Climate Fund (GCF) Readiness project 'Strengthen the capacities of sub-national authorities and key actors in the water sector to adapt to climate change in the Tuban delta' Implemented by UN-Habitat	- Undertook a CCVA and hydrology study which were utilized to develop this proposal - Undertook consultations at sub-national and national level which were utilised to determine the adaptation priorities developed in this proposal	- Adaptation priorities in the area	Complementary - The AF proposal builds on the outcomes (field assessment, planning process and consultations) from the GCF readiness project Non-Duplication -Project closed
Integrated Water Resource Management to Enhance Resilience of Agriculture (ERA) and Food Security Implemented by UNDP	- Undertook inception workshops at Tuban district in Lahj to gather information about the potential interventions including rehabilitation of water diversion infrastructure, irrigation canals, sub-surface dams, soil erosion and flood protection works. - Will develop a hydrological study with a focus on hydrological process and flow patterns in the whole catchment area.	- UNDP will provide equipment for water infrastructure maintenance, which can also be used for this project	Complementary - Coordination underway to compliment interventions and avoid overlap Non-Duplication -In upper Tuban delta, avoiding geographical overlap

Table 22. Complementarity with other Initiatives – Information and Lessons Learned

G. LEARNING AND KNOWLEDGE MANAGEMENT COMPONENT TO CAPTURE AND DISSEMINATE LESSONS LEARNED

The alarming rate of water scarcity in Yemen as well as current approaches, methods and techniques to manage natural resources / water efficiently, sustainably and in a climate change-resilient manner need to be urgently tackled for throughout the country. Capacities of government institutions and officials will need to be strengthened for replication. The Ministry of Water & Environment or Environment Protection Authority are required to capture lessons and share these among ministries, sub-national government bodies and the wider public (including masterplans and social media channels).

Lessons will be relevant beyond the Yemeni context. Therefore, the project team will also share findings at international events, with relevant climate change bodies such as the UNFCCC and other UN agencies and relevant entities, especially in the Middle East and North Africa (MENA) region. UN-Habitat Yemen Programme will coordinate with the UN-Habitat's Regional Office for the Arab State (ROAS) to share knowledge, lessons learned and success stories with other agencies' regional fofice, utilizing different regional forums including the Regional Coordination on the Issue-Based Coalition Theme on Climate Change. The focal point for knowledge management and communications at UN-Habitat's regional level will support learning and knowledge management -related matters of the project. Moreover, regular coordination with UN-Habitat's headquarter level will contribute to sharing project results, lessons and recommendations on a wider (global) scale.

At the national level, learning and knowledge will be managed and promoted through UN-Habitat working in coordination with other UN agencies and with the government. This will be done through Steering Community and UN Country Team meetings. All documents produced by the project will be hosted on the UN-Habitat website.

At the sub-national level, UN-Habitat will work closely with the Lahj Governorate, universities and executing entities to ensure all lessons learned and knowledge products are accessible to stakeholders both online and with physical copies. Given the issues with internet accessibility, printing of materials in Arabic will be important to ensure that they are accessible.

At the community level, project beneficiaries will be involved in trainings, and capacity and skills building to operate, maintain and replicate the proposed concrete adaptation techniques being developed under components 2 and 3. Moreover, capacities of government officials, mostly at the municipal level, but also at the national level, will be strengthened to operate, maintain techniques and replicate these, as well as approaches.

Knowledge sharing tools to be used include websites, including existing platforms, social media streams (e.g. Facebook), outreach and information sessions, presentations as well as produced strategies, plans and guidelines will be available in Arabic.

Lessons learned, especially what worked and what did not, will be captured through monitoring of all project sub-interventions, also to identify what worked and what not. This would then feed into replication and upscaling guidelines, which will be developed for all concrete interventions. Field visits will also promote discussion of what worked and what will not.

Expected Concrete Outputs	Learning objectives (lo) & indicators (i)	Knowledge product
1.1. Government capacity strengthened at national and sub-national level on increasing climate change resilience and effective water management 1.2. Establishment of laboratory for wastewater quality testing and water supply quality testing. 1.3. Integrated and inclusive natural resource (focused on water and land) and climate change risk management process and plan	(lo): To strengthen capacities of national sub-national government institutions, communities and vulnerable groups to manage natural resources / water in an efficient, coordinated, sustainable and climate resilient way, and to replicate the approach in other areas, to capture and share lessons and to mainstream these in strategies and regulations (i): capacity development program on climate change resilience with a focus on natural resource management and the development of integrated management plans	• Training / education package • Guidelines and methodologies for the establishment and running of the laboratory for water quality testing • Studies and assessments developed related to natural resource management planning • Lessons learned and guidance for conducting an inclusive process, bringing in women, youth and water users associations into the development of plans to mainstream climate change adaptation and manage natural resources • The English and Arabic versions of the studies and assessment results will be published on the relevant ministries' websites, as well as on

		the Habitat website, to ensure easy access for partners and experts. Lessons learned and guidance will be shared with stakeholders, beneficiaries, water user associations, and local authorities through awareness, capacity building, and learning sessions.
2.1. Assessment and verification / technical specification and engineering studies, including surveys required, for improved irrigation canals and water intake systems 2.2. Rehabilitated irrigation canals to improve water access for agricultural purposes in the Tuban Delta 2.3. Improved water intake structures to increase water supply in the irrigation canals 2.4. Stone-gabions constructed to reinforce canals and protect agriculture lands and Al-what city from flashing floods.	(lo): collect and share information on effective rehabilitation of irrigation canals and reinforcement of canals to reduce flood risk (i): Number of techniques showcased and identification of lessons and recommendations in knowledge products in the column on the right	• Showcased models of successfully completed works • Guidelines / education materials for replication
3.1. Assessment and verification / technical specification and engineering studies, including surveys required, for water supply alternatives options outlined below 3.2. Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah, Saber cities and surrounding villages 3.3. Upgrade Tahror WWTP to treat wastewater for use in irrigation 3.4. Upgrade Saber WWTP to treat wastewater for use in irrigation	(lo) collect and share information on best practice low-cost and replicable innovative techniques on efficient urban water supply systems, the utilization of wastewater for irrigation (i): Number of techniques showcased and identification of lessons and recommendations in knowledge products in the column on the right	• Showcased models of the urban water systems, utilization of wastewater for irrigation • Guidelines / education materials for replication
4.1 Support farmers' with modern irrigation techniques and systems (Urban and Rural Areas) 4.2 Develop maintenance plans for canals, irrigation system 4.3 Strengthen water users associations for improved monitoring, maintenance and dissemination of information on irrigation techniques and skills development 4.4 Skills development with women and youth on water management and climate change adaptation 4.5 Capacity development for communities with a focus on women and youth civil society organizations on integrated and inclusive natural resource management plans 4.6 Awareness raising with local communities on water conservation and climate change in Aden and the Tuban Delta	(lo) To build capacities of farmers, water users associations, women, and youth on water management and climate change. (lo) To raise awareness on water conservation and climate change in the Tuban Delta (i) Number of farmers, water users associations, women and youth trained on water management and climate change (i) Number of communications products developed to share information on water management and climate change with local communities in the Tuban Delta	• Training programs / education materials for farmers, water users associations, women and youth • Communications products utilizing print materials, radio, and social media to share information about how climate change affects water security and individual measures which can be taken to reduce vulnerability and increase resilience

Table 23. Learning and Knowledge Management throughout the Project

H. CONSULTATIVE PROCESS

The proposed project has been designed based on input from key stakeholders in Yemen and project beneficiary groups. During project preparation, four types of consultations were conducted:

1. Consultations to align with national and local priorities, most and foremost with the EPA.

2. Consultations to avoid duplication with other projects (government, UN agencies, etc.).
3. Consultations to identify needs of target communities and vulnerable groups.
4. Consultations to identify potential environmental and social risks and impact, in line with AF's policies.

In summary, the following actors have been consulted (the purpose of consultations shown through numbers, corresponding to consultation types defined above).

- ☐ Environmental Protection Authority Aden and Sana's (1, 2, 3, 4)
- ☐ Ministry of Water and Environment Aden and Sana's (1, 2, 3)
- ☐ Ministry of Agriculture & Irrigation (1, 2, 3)
- ☐ Ministry of Planning & International Cooperation (1, 2)
- ☐ Aden and Lahj governorate authorities (1, 2, 3)
- ☐ Ministry of Works and Highway (1, 2, 3)
- ☐ Local Water & Sanitation Corporation (1, 2, 3)
- ☐ General Authority of Water Resources (1, 2, 3)
- ☐ General Rular Water Authority (1, 2, 3)
- ☐ Social Development Fund – Aden and Sana`a (1, 2, 3)
- ☐ Water & Environment Centre - Aden and Sana's Universities (1, 2, 3)
- ☐ Estidamah Foundation for Capacity Development (1, 2, 3, 4)
- ☐ UNDP (2, 3)
- ☐ FAO (2, 3)
- ☐ UNOPS (2, 3)

Table 24 Overview of consultations conducted

Date	Location	Consultation Objective	Specific Methods Used	Key Outcomes and Feedback provided	Key Stakeholders Consulted	Total Number of male and female participants
17-18 July 2023	Aden, Yemen	Identify, assess and prioritize adaptation measures	Consultation meeting with government and non-governmental technical specialists	The group developed a long list of adaptation measures for consideration to further development into proposals and recommendation to conduct vulnerability assessment splitting the three regions to have more nuanced data.	EPA, Water Authority, NWRA, Al-Houtah district, Tuban District, Agriculture Authority, Irrigation office, Lahj and Aden Universities, Water Users, Ministry of Planning and International Cooperation, CAMA,	Total Number: 42 Men: 32 Women: 10
16/Mar/2023	Aden, Yemen	Workshop to present, discuss and verify the initial results / outcomes of the CCVA and hydro study	Capacity building workshop	The initial results of the CCVA and hydrological study were presented and verified by the participants. Feedback was provided which identified data sources utilized in the assessment and proposal development	EPA, Water Authority, NWRA, Al-Houtah district, Tuban District, Agriculture Authority, Irrigation office, Lahj and Aden Universities, Water Users, Ministry of Planning and International Cooperation, CAMA.	Total number: 33 Men:25 Women:8
31/ Jan – 14/ Feb/2023	Al-Waht, Lahj, Yemen	Focus Group Discussion in Lower Region To discuss with stakeholders in the Lower Region about their perspective on	Focus Group discussions with four groups: 1. Local Authorities 2. Farmers 3. Men 4. Women	Qualitative information on economic development, jobs, water usage, marginalized groups, available financial assistance, communication methods, and crops which were integrated into the hydrology and CCVA studies and	Local Authorities, Farmers, Water Users, Men and Women	Total: 86 Men:62 Women:24 Breakdown by Focus Group: Local Authorities/Water Users: 29

Date	Location	Consultation Objective	Specific Methods Used	Key Outcomes and Feedback provided	Key Stakeholders Consulted	Total Number of male and female participants
		climate change, water, key issues in the region and key priorities in order to inform the hydrology and CCVA studies.		informed the selection of adaptation options. This information helped to inform the critical needs of stakeholder groups to identify key activities.		Farmers: 14 Women's Group: 13 Men's Group: 14
31/ Jan – 14/ Feb/2023	Al-Hawtah, Lahj, Yemen	Focus Group Discussion in Middle Region To discuss with stakeholders in the Middle Region about their perspective on climate change, water, key issues in the region and key priorities in order to inform the hydrology and CCVA studies.	Focus Group discussions with four groups: 1. Local Authorities 2. Farmers 3. Men 4. Women	Qualitative information on economic development, jobs, water usage, marginalized groups, available financial assistance, communication methods, and crops which were integrated into the hydrology and CCVA studies and informed the selection of adaptation options. This information helped to inform the critical needs of stakeholder groups to identify key activities.	Local Authorities, Farmers, Water Users, Men and Women	Total: 87 Men: 64 Women: 23 Breakdown by Focus Group: Local Authorities/Water Users: 28 Farmers: 15 Women's Group: 14 Men's Group: 15
31/ Jan – 14/ Feb/2023	Al-Anad, Lahj, Yemen	Focus Group Discussion in Upper Region To discuss with stakeholders in the Upper Region about their perspective on climate change, water, key issues in the region and key priorities to inform the hydrology and CCVA studies.	Focus Group discussions with four groups: 1. Local Authorities 2. Farmers 3. Men 4. Women	Qualitative information on economic development, jobs, water usage, marginalized groups, available financial assistance, communication methods, and crops which were integrated into the hydrology and CCVA studies and informed the selection of adaptation options. This information helped to inform the critical needs of stakeholder groups to identify key activities.	Local Authorities, Farmers, Water Users, Men and Women	Upper Region:89 Men:67 Women:22 Breakdown by Focus Group: Local Authorities/Water Users: 30 Farmers: 15 Women's Group: 12 Men's Group: 15
26-29 Nov 2023	Saber, Lahj, Yemen	Field Consultations for rehabilitation of irrigation system. Consultations / workshops with project beneficiaries per proposed intervention to identify possible concerns, specific needs and potential environmental and social risks and impacts.	Field Consultations	The following was identified per beneficiary group: - Possible concerns regarding proposed intervention - Proposed solution to concerns - Specific needs for group regarding the proposed intervention - potential environmental and social risks and impacts regarding the proposed intervention This informed the design of specific interventions and the safeguards assessment.	- Irrigation Department-Lahj. Communities that will benefit from project interventions. - Farmers associations - Women farmers group - Youth farmers group - Vulnerable and IDPs farmers group	Total: 38 Men: 27 Women: 11
3-5 Dec 2023	Al-Hawtah, Lahj, Yemen	Field Consultations for rehabilitation of wastewater treatment plants. Consultations / workshops with project beneficiaries per proposed intervention to identify possible	Field consultations	The following was identified per beneficiary group: - Possible concerns regarding proposed intervention - Proposed solution to concerns - Specific needs for group regarding the proposed intervention - potential environmental and social risks and impacts regarding the proposed intervention	- Water and Sanitation Corporation-Lahj Communities that will benefit from project interventions. - Men group - Women group - Youth group - Vulnerable and IDPs group.	Total: 40 Men: 28 Women: 12

Date	Location	Consultation Objective	Specific Methods Used	Key Outcomes and Feedback provided	Key Stakeholders Consulted	Total Number of male and female participants
		concerns, specific needs and potential environmental and social risks and impacts.		This informed the design of specific interventions and the safeguards assessment.		

Table 25. Overview of Consultations Conducted during Design Stage of the Project

Further consultations were held with international partners to determine synergies, avoid overlaps and document lessons learned. A summary of these consultations are in the table below:

Stakeholder	Consultation objective	Outcome	Conclusion	Evidence
UN Women **Jumana Albayaa** *Programme Analyst Women Economic Empowerment (WEE) & Climate Change* **Paola Foschiatto** Programme Management Specialist - Gender Equality and Women's Empowerment (GEWE), Women Peace and Security (WPS)	Identify challenges and opportunities for women involvement and empowerment in AF project activities in Yemen	- Shared latest gender analysis for Yemen. - Shared National government women focal points. - Suggest increasing share / % of women in project committees. - Suggest targeting existing community structures, including for women and other vulnerable groups (and mapping of women and youth leaders organizations and networks) - Suggest ensuring social cohesion (and piece building) by engaging both host communities, IDPs, and vulnerable groups, while also engaging Engage elders / community leaders / religious leaders. - Suggest not using the term gender but Participation / social cohesion / inclusive instead	- Target share of women in project committees to be agreed with government focal point but at least 20 % - Women and youth groups and networks have been mapped and will be engaged. - Community-level planning and management of water will include women and youth groups, as well as community leaders, religious leaders and IDPS. - Using the term gender will be avoided during engagement at national and local level	Date: 29 November 2023 Technique: a call
UNICEF **Khaled Ahmed Mohammed Ali Mushara** WASH Officer, UNICEF Aden **Patrick Sijenyi** WASH Officer, UNICEF **Farida Elmashgary** WASH Specialist, UNICEF **Robert Odong** WASH Specialist, UNICEF	Identify synergies and potential overlap on work on water and climate change as well as lessons learned from projects	- UNICEF shared their planned interventions for the Tuban Delta to support solar water pumping systems for 6 wells that are under control of LAWSC Lahj, currently they are at bid evaluation stage. - A map and exact location of wells was shared by email - Discussed that the beneficiaries are those who live directly around the well - Discussed how water quality is measured and UNICEF shared that they use ad hoc, random sampling but they would like to expand capacity building on collection - UNICEF expressed interest in further collaboration on a system to analyse and collect data on water, including water quality	- There is a gap on systematic water quality monitoring and surveillance in the region and a need for this to be better integrated into water supply interventions -	Date: 14 November 2023 Technique: call Email exchange with map and coordinates of wells
IOM **ALKALADI Abdulmageed** Senior Emergency Operation Assistant **TEFERA Fantahun Getachew** WASH Programme Officer	Identify synergies and potential overlap on work on water and climate change as well as lessons learned from projects; Identify challenges and opportunities for building resilience of migrants	- IOM shared that they are working in Lahj on irrigation and WASH with the local Lahj office, including the rehabilitation of wadis and channels. - They have also reactivated several water users' associations, including re-registration with local authorities and they also provide them with capacity buildings and trainings, and they are working with water users associations on maintenance - They have also provided some farmers with solar systems for the irrigation, working with Ministry of Agriculture – who were responsible for selecting the farms which need the solar systems. - They are also working on the sewage system in Al-Hawtah city.	- On-going discussions with IOM would be beneficial to continue learning from their experiences with water users associations and rehabilitation of wadis - Lesson learned on identification of beneficiaries which happened through working with the Ministry of Agriculture	Date: 26 October 2023 Technique: call

Stakeholder	Consultation objective	Outcome	Conclusion	Evidence
		- On gender empowerment, they discussed that the number of women in water users' associations vary based on the locality. - They clarified that there work with migrants is mostly on helping them to receive humanitarian ais because there is a lack of land ownership for migrants		
WFP **Sergio Fernandez** Environmental and Social Safeguards Specialist **Abdulhafeed Alameri** **Angela Santucci** External Partnerships, Regional Office in Cairo **Aymeric Faure** External Partnerships **Doaa Bahubaish** **James Mercer** **Kira Paulemon** External Partnerships **Lauren Lepage** **Matthew Hochbrueckner** **Shahida Akhter** **Shiho Akamatsu** Livelihoods Expert	Identify synergies and potential overlap on work on water and climate change as well as lessons learned from projects	- WFP shared the work that they are doing in Lahj and the Tuban Delta, including work on irrigation, water gabions and cash for work and food programmes in insecure communities. - WFP also shared that there is a WASH cluster for UN agencies with UNICEF as a focal point and a water and sanitation coordination group organized by GIZ and UNDP	- Contacts for the WASH cluster and coordination group were shared by email - Plans were made for a follow-up meeting in person	Date: 29 November 2023 Technique: call
World Bank **Marcus Wishart** Regional water specialist, based in Amman **Naif Mohammed Abu-Lohom** Water programme lead for Yemen, based in Amman **Elvira Cusiqoyllor Broeks Motta** Water specialist **Shambhavi Priyam** Economist working with water team in Amman	Identify synergies and potential overlap on work on water and climate change as well as lessons learned from projects	- The World Bank is currently undertaking a rapid water security diagnostic and a Country Climate and Development Report. - They also have on-going programmes in the water sector including rehabilitation of water supply infrastructure in Aden, implemented with UNOPS. - Also working with UNICEF and WHO on WASH emergency response but they are looking at transitioning from emergency response to development aid. - The research on the water sector has included what are the investment opportunities and some of the challenges with water tariff pricing and developing the business model for long-term operation and maintenance	- The studies under development from the World Bank can be useful for informing the business model for water sector interventions - World Bank can help to convene potential donors	Date: 11 December 2023 Technique: call

Table 25. Consultations Held with International Organizations during Project's Design Stage

Picture1.. Consultation with Women's Group in Tuban Delta

Picture 2.. Consultation with Focus Groups in the Tuban Delta

Picture 3..Workshop to Share Initial Findings of CCVA and Hydrology Studies

Picture 4.. Workshop to Review GCF and AF Proposal Packages

Picture 5. Identification and Prioritization of Adaptation Measures - Workshop

I. JUSTIFICATION FOR FUNDING REQUEST

The proposed project components, outcomes and outputs fully align with national and local government / institutional priorities and gaps identified (with a clear and direct response to needs in natural resource / water management identified in the national strategies mentioned in Part II.D).

The project is also in line with the needs of identified communities and vulnerable groups, and with the Adaptation Fund's strategic outcomes. This alignment has resulted in the design of a comprehensive approach to address climate change-related water scarcity and coastal issues.

Due to the crisis, government capacity, both in terms of human resources and financing, is reduced compared to pre-crisis levels. As such, Yemen depends to a large extent on external financial support and assistance from the UN and humanitarian agencies.

The Yemeni economy faces multiple challenges, with the protracted armed conflict resulting in loss of life, destruction of property and an a severe food security crisis. Yemen's Gross Domestic Product (GDP) is calculated by the International Monetary Fund (IMF) standing at $21 billion dollars which represents a per capita GDP of $617. Yemen is listed as "Least Developed Country" (LDC) with high poverty rates and persisting conflicts. There is a lack of confidence in the local currency (Yemeni Rial) and a scarcity of US dollars and other international currencies in the market. The Yemeni economy suffers from hyperinflation, available information showing costs for food and other essentials having increased by as much as 76% in some governorates.

Hence, limited financial resources in Yemen are prioritized for emergency response efforts, which leaves no room for available budget to addressing climate change adaptation and mitigation measures. While local governments rely on the federal government to cover the majority of their budgets, there are only limited resources available for small and medium-sized cities such as Al-Hawtah and Al-What.

Given its current situation and overall exposure and sensitivity to climate change risks, Yemen is highly dependent on closely collaborating with international multilateral climate finance donors such as the GCF, the AF, and the CFI to mobilize urgent funds. However, access to multilateral climate finance mechanisms remains a challenge for Yemen. As of January 2022, the Climate Funds Update database, which collates information from 27 multilateral climate funds, listed only 19 single-country projects in Iraq, Syria and Yemen that have been approved for funding, with the amount disbursed totaling only US$ 20.6 million – less than 0.5% of the money disbursed for climate projects worldwide. To date, Yemen has received approximately US$ 2 million from the GCF through GCF Readiness projects.

A detailed climate finance needs assessment of Yemen is currently under implementation and will be available in 2024. Even though the climate finance needs assessment is not yet available, current financial availability for climate action in Yemen is not sufficient to induce a paradigm shift towards low carbon, climate-resilient and sustainable socio-economic development.

Vast amounts of concessional climate finance is urgently needed from bilateral and multilateral donors to support imperative capacity development of key stakeholders and the implementation of large-scale climate change projects and programmes across Yemen.

At least two-thirds of the proposed project's funding will be allocated to components 2 and 3, which are concrete adaptation activities. These were selected and prioritized based on parameters including cost-effectiveness / high impact and sustainability criteria. Table 26 provides a justification for funding requested, focusing on the full cost of adaptation reasoning by showcasing the impact of AF funding compared to no funding (baseline), further related to expected project outcomes.

Rationale for financing for outputs related to existing vulnerabilities

The climate change vulnerability assessment for the region found that there was low adaptive capacity as the result of low levels of knowledge of climate change, irrigation methods and relevant plans on climate change and land use. As a result, Outcomes 1 and 4 were designed to build adaptive capacity with outputs to strengthen government capacity (output 1.1), improve knowledge about the impact of climate change on water supply with the establishment of a laboratory (output 1.2), and improve integrated natural resource and climate change risk management processes and plans (output 1.3). Outcome 4 is also intended to build skills and capacities of the community on climate change adaptation and natural resource management planning (outputs 4.4 and 4.5) and build awareness with local communities to increase their knowledge about climate change (output 4.6). Output 4.1 addresses the lack of modern irrigation methods reducing farmers' adaptive capacity by supporting farmers with the techniques and systems to apply modern irrigation methods.

In terms of sensitivity, the vulnerability assessment found that the water differential (between supply and demand) was severely out of balance and that more needed to be done to either increase the supply of water or reduce the demand, Therefore this project aims to sustainable increase the supply of water and access to this water through the rehabilitation of irrigation canals (outputs 2.2 and 2.3), improving urban water systems (output 3.2) and treating wastewater to be used for irrigation (outputs 3.3 and 3.4).

Project outcomes	Baseline (without AF)	Additional (with AF)	Comment and alternative adaptation scenario's
Enhanced capacities of national and sub-national government institutions, communities and vulnerable groups to manage natural resources (focused on water and land) and respond to climate change risks in the Tuban Delta efficiently, sustainably and in a resilient way	Lack of climate change-related water security and risk of flooding are major hindrances to sustainable development in the country. However, due to the crisis, both human and financial resources are so limited that governments and communities are not able to respond. Moreover, in Yemen, water is usually managed at local scale and not by looking at larger systems (delta / watersheds), which leads to inefficient and unsustainable management.	The activities related to this outcome will allow government institutions to assess, plan and manage natural resources in the Tiban delta an inclusive, efficient, sustainable and resilient way. The activities related to this outcome will enable communities and vulnerable groups to participate in the planning for natural resource management and sustain natural resource systems	Without sustainable and climate change resilient water management approaches (considering larger water systems and techniques to reduce water consumption), target areas will become even more water scarce, which will be disastrous. Alternatives are to only manage water more locally, but this would not improve the overall efficiency of the system and could have negative impacts downstream
Increased adaptive capacity of the water sector through rehabilitation and protection of irrigation systems in the Tuban Delta	Target communities have very limited options (capacity – skills and technically - and financial resources) to adapt to climate change-related water scarcity and flooding. Traditional irrigation is not efficient and drought tolerant crops and livestock limited.	The activities related to this outcome will build the adaptive capacity of target communities to adapt to water scarcity and flooding through concrete interventions which will also benefit irrigation and subsequently food production	The alternatives currently being sought by communities and farmers are digging additional wells, but given the limited groundwater resources, this is not a sustainable option for maintaining irrigation levels to improve crop production. This will also further decrease the water balance.
Increased innovative, efficient, sustainable and climate change resilient practices to improve the water supply systems for urban and agriculture purposes	Target communities have limited access to innovative and efficient practices to increase the resilience of urban and agricultural water systems	The activities related to this outcome will allow communities to improve efficiencies of water systems through utilizing innovative sources for water as well as improving system functioning to benefit both urban water users and agricultural uses.	Currently utilized alternatives are to dig additional wells, but given the limited groundwater resources, this is not a sustainable option for maintaining irrigation levels to improve crop production. This will also further decrease the water balance. Another option is large-scale desalination, but this is beyond the scope of this project.
Improved ownership and capacities at local level to respond to climate change, including to operate, maintain and replicate resilient water and irrigation systems	Target communities do not have the ownership, skills, capacities and information to change their inefficient water use practices, manage water resources or participate meaningfully in inclusive natural resource planning processes.	The activities related to this outcome will build the capacity of target communities to utilize modern irrigation techniques, sustainably manage water resources and the maintenance and operations of resilient water interventions as well as participate in holistic and inclusive natural resource planning processes.	The alternative would be to have a top-down, centralized planning and management processes that does not build ownership and capacity at the local level, with target communities.

Table 26 Impact of AF funding Compared to No Funding Scenario (Baseline), Related to Expected Project Outcomes

J. SUSTAINABILITY OF THE PROJECT/PROGRAMME

Investing in an increased resilience of vulnerable assets and livelihoods represents a sustainable economic approach. It will not only reduce future costs related to climate change and disaster impact, but it will also enhance livelihood opportunities and improve the health and security of targeted communities.

By engaging communities and vulnerable groups in project activities including assessments, planning and decision-making processes, the project aims to build communities' awareness and capacities, and furthermore promote ownership and leadership in the areas of natural resources / water management. Emphasis will be placed on strengthening community capacity to operate and maintain systems, further contributing to the network of Water Users Associations. Farmers, women and youth will also be targeted for skills development and to ensure inclusive planning for sustainable and climate resilience natural resources management.

With all components, the project aims to support sustainable development in Yemen, hence contributing to transitioning out of a humanitarian approach.

Proposed outputs	Maintenance measures and responsible authorities	Replication and upscaling arrangements and mechanisms to support this + exit strategy
1.1 Government capacity strengthened at national and sub-national level on increasing climate change resilience and effective water management 1.2 Establishment of laboratory for wastewater quality testing and water supply quality testing. 1.3 Integrated and inclusive natural resource (focused on water and land) and climate change risk management process and plan	Monitoring and updating of strategies and plans and the laboratory for testing Responsible: - Ministry of Ministry of Water & Environment - General Authority of Water Resources	Approach and lessons learned captured from the inclusive planning natural resource management process for replication in other basins in Yemen, including building capacities of other ministries, municipalities and local communities to extend beyond the Tuban, Aden and Abyan Basins Responsible: - Ministry of Water & Environment - General Authority of Water Resources - Local Corporation of Water & Sanitation How: identify responsibilities, coordinate with municipalities, local communities and allocate required budget to develop new plans
2.1. Assessment and verification / technical specification and engineering studies, including surveys required, for improved irrigation canals and water intake systems 2.2. Rehabilitated irrigation canals to improve water access for agricultural purposes in the Tuban 2.3. Improved water intake structures to increase water supply in the irrigation canals 2.4. Stone-gabions constructed to reinforce canals and protect agriculture lands and Al-what city from flashing floods.	Operation and Maintenance plans for the canals will be developed under Component 4 by the Ministry of Agriculture. This will also include longer term maintenance plans beyond the life of the project. The training of farmers and water users associations under Component 4 will also support the maintenance of activities under this component. Responsible: - Ministry of Agriculture & Irrigation working with the Ministry of Water and Environment and the, General Authority of Water Resources - Local Corporation of Water & Sanitation	Approach and lessons learned captured for replication in other regions in Yemen, including building ministry and municipalities, local communities capacities to do so and guidelines Responsible: - Ministry of Water & Environment - Ministry of Agriculture and Irrigation - General Authority of Water Resources - Local Corporation of Water & Sanitation
3.1. Assessment and verification / technical specification and engineering studies, including surveys required, for water supply alternatives options outlined below 3.2. Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah, Saber cities and surrounding villages 3.3. Upgrade Tahror WWTP to treat wastewater for use in irrigation 3.4. Upgrade Saber WWTP to treat wastewater for use in irrigation	Operations and Maintenance plans will be developed as part of this component for each of the concrete interventions to ensure continuity of operations Responsible: - Ministry of Water and Environment working with the Local Corporation of Water & Sanitation	Approach and lessons learned captured for replication in other regions in Yemen, including building ministry and municipalities, local communities capacities to do so and guidelines Responsible: - Ministry of Water & Environment - General Authority of Water Resources - Local Corporation of Water & Sanitation
4.1 Support farmers' with modern irrigation techniques and systems (Urban and Rural Areas) 4.2 Develop maintenance plans for canals, irrigation system 4.3 Strengthen water users associations for improved monitoring, maintenance and dissemination of information on irrigation techniques and skills development 4.4 Skills development with women and youth on water management and climate change adaptation	All of the activities in this component support maintenance and sustainability of the previous three components, especially the emphasis on strengthening water users associations so that they are involved with monitoring, maintenance and dissemination of information. Responsible: - Ministry of Agriculture & Irrigation	The awareness raising can be replicated to other cities and regions in Yemen to further spread messaging on water conservation and climate change. The materials for capacity development and skills development can be utilized in other areas in Yemen. Lessons learned from strengthening of water users and supporting farmers with modern irrigation techniques can support replication throughout Yemen.

4.5 Capacity development for communities with a focus on women and youth civil society organizations on integrated and inclusive natural resource management plans 4.6 Awareness raising with local communities on water conservation and climate change in Aden and the Tuban Delta	- Ministry of Water and Environment - General Authority of Water Resources - Local Corporation of Water & Sanitation	Responsible: - Ministry of Agriculture & Irrigation - Ministry of Water and Environment - General Authority of Water Resources - Local Corporation of Water & Sanitation

Table 27 Proposed Arrangements to Sustain and Maintain, Replicate and Upscale Project Activities and Supporting Mechanisms

The MoWE and its departments in the governorates, including the LWC of Aden and Lahj, are responsible for water management. These institutions have a mechanism to manage, monitor and maintain the proposed water-related project activities in the target areas, based on national requirements and compliance with Environmental and Social Impact Assessment (ESIA) policies. Through the ministries' related departments and LWCs, participatory processes will be initiated with local community representatives and beneficiary groups, including water user associations and municipalities, e.g., through meetings and training sessions to assure sustainability and quality of the interventions.

The Ministry of Agriculture (MoA) with respective departments present in the governorates of Aden and Lahj are responsible for agricultural and irrigation activities. In line with their national and sub-national strategies, they are to define the type of climate resilient crops, etc. Water use / farmer associations will participate in the process to identify the most efficient irrigation options and innovative farming systems, but also to identity maintenance needs and arrangements, and options for replication.

If water user association are not operational in the target areas, new ones will be installed. Their main responsibilities will be to 'equally' distribute available water resources among farmers according to the developed irrigation schedule and to operate and maintain the rehabilitated / installed irrigation system.

Social sustainability: By strengthening the water user associations and undertaking skills and capacity development with women and youth, they will have the capacity and mandate to be engaged with the project throughout implementation and to work to full engage community members more broadly in project activities. These skills for women and youth and strengthened water user associations will benefit the communities long after the close of the project and can be a basis for further activities. The awareness raising activities will also increase understanding in local communities about pressure on the water systems and risks from climate change to further long-lasting awareness in the community.

Economic sustainability: Investing in increasing the resilience of vulnerable assets is a sustainable economic approach. It will avoid future costs related to drought / water scarcity and loss and damage from flood, especially on the vulnerable agriculture sector.

Environmental Sustainability: The proposed project interventions support long-term environmental sustainability by reducing the use overextraction of groundwater resources and reduce pollution of water and soil from untreated wastewater.

Financial sustainability: The proposed interventions are fully aligned with national and sub-national priorities and programmes and therefore, the government actively supports the project and interventions, including anchoring it to existing programmes and monitoring frameworks.

Technical sustainability: The techniques employed are innovative in the target areas but through operation and maintenance plans developed as part of the project, the sustainability of these technical improvements will be ensured.

Institutional sustainability: The project paves the way for national and sub-national governments in Yemen to replicate and up-scale the project through the development of guidelines for replication for the upgrading of the wastewater treatment plants and irrigation canals and guidelines and methodologies for the establishment and running of the laboratory for water quality testing. Trainings of government staff, especially at the sub-national level, will be conducted to strengthen relevant government capacities to deliver and sustain project activities as well as on climate change resilience and effective water management. The training package developed as part of component 1 on climate change resilience and effective water management will be updated throughout the course of the project to incorporate learnings from the project implementation. This training package can then be utilized for future skills development in other regions and districts. As Yemen works on its National Adaptation Plan (NAP), these trainings will also be beneficial for ensuring

an understanding between the connection of water and natural resource management and climate resilience is well integrated into the NAP. The NAP process will also provide an on-going opportunity for stakeholder engagement on adaptation and a chance for the water users associations engaged in this project to share knowledge with other communities.

K. OVERVIEW OF THE ENVIRONMENTAL AND SOCIAL IMPACT, AND RISKS IDENTIFIED RELEVANT TO THE PROJECT / PROGRAMME

The proposed project is fully in line with the Adaptation Fund's Environmental and Social Policy (ESP) with its 15 safeguard areas and the AF Gender Policy (GP). An Environmental and Social Impact Assessment has been conducted and an Environmental and Social risks Management Plan (ESIA-ESMP) was developed – see annex 2 on page 124~~126~~). The ESIA-ESMP has been approved by the ministry of Water and Environment (as per the letter shared in section IIE. (**Error! Reference source not found.**~~Figure 21~~) and in annex 2). After As for potential financial and management risks and how to manage these, this is presented in section III.B with details in the table called '**Error! Reference source not found.**.'~~Table 27~~ a summary of the ESIA-ESMP is provided. For detailed information on how the project complies to the AF ESP and how the project will manage any potential risks and impacts, see annex 2.

Formatted: Do not check spelling or grammar

A social inclusion (gender) assessment has been conducted, and a work plan developed, as presented in annex 3 on page 190~~159~~. Annex 3 shows in detail how the project complies to the AF GP and how women and youth and other vulnerable groups will be engaged in project activities, while under annex 2 mitigation measures are proposed to reduce / avoid any risks related to gender equality and women's empowerment. Below **Error! Reference source not found.**~~*Table 28*~~ provides a summary of the social inclusion / gender plan. For specific mitigation measures related to ESP 5, please see annex 2.

As shown in Section II.H, consultations have been conducted to identify potential environmental and social risks and impacts and to identify specific group's needs and possible concerns. Based on the screening against the 15 AF principles and impacts, the project has been categorized as a category B project for moderate risk in terms of the environmental and social risks it poses. As long as the proposed follow-up actions mentioned in the ESIA-ESMP are taken, and the main proposed risks mitigation measures are fully implemented, any potential environmental and social risks and impacts will small and site-specific and localized.

Activities under components 1 and 4 will develop strategies, raise awareness and strengthen capacities of national, sub-national and local actors. The project will ensure relevant actors and beneficiary groups will be equally represented and that equally benefit from project activities.

Activities under Components 2 and 3 are 'concrete' adaptation actions. Given the scope of the proposed localized activities, potential direct risks and their impact will be minimal. Transboundary impacts are highly unlikely, because the target delta is not close to a boarder. Hence, cumulative impact is unlikely, too.

The project is designed to generate positive economic, social and environmental impact applying input from vulnerable groups in target communities and by incorporating best practices from other projects.

As for potential financial and management risks and how to manage these, this is presented in section III.B with details in the table called '**Error! Reference source not found.**~~Overview of financial and management risks and measures to mitigate these~~.'

Checklist of environmental and social principles	No further assessment required for compliance (during project implementation)	Potential impacts and risks – further assessment and management required for compliance
1. *Compliance with the Law*	X	
2. *Access and Equity*		X
3. *Marginalized and Vulnerable Groups*		X
4. *Human Rights*	X	
5. *Gender Equality and Women's Empowerment*	X	
6. *Core Labour Rights*		X
7. *Indigenous Peoples*	X	
8. *Involuntary Resettlement*	X	
9. *Protection of Natural Habitats*	X	
10. *Conservation of Biological Diversity*	X	
11. *Climate Change*	X	
12. *Pollution Prevention and Resource Efficiency*		X
13. *Public Health*		X
14. *Physical and Cultural Heritage*	X	

15. Lands and Soil Conservation	X	

Table 28 Overview of environmental and social impacts and risks for which further assessments and management are required.

Risks screening and impacts assessments have been conducted in detail for concrete project interventions, namely:

- ☐ Rehabilitation of the irrigation system activities (outputs 2.1.; 2.2.; 2.3.) and modern irrigation system (output 4.1)
- ☐ Activities related to (re)use of (treated) (waste)water (outputs 3.1.; 3.2.; 3.3.; 3.4)

Activities related to awareness raising, capacity strengthening and planning have been screened as well in the ESIA-ESMP in annex 2

Below tables provide a summary of the outcomes of a risks screening and impact assessment conducted as per Yemen requirements

Positive impacts	Potential environmental and social risks categories	Item	Impact assessment	Mitigation measures
- Increase agricultural productivity: farmers will gain access to a reliable and efficient water supply for their crops leading to increased agricultural productivity and higher crop yields. - Water Conservation: The measure will minimize water losses through leaks or evaporation, leading to more efficient water use and conservation of this valuable resource. - Enhanced Water Distribution and Equity: These upgrades help ensure more equitable water distribution among farmers, reducing disparities in access to water resources. - Environmental Benefits: Efficient water use reduces the strain on the depleted groundwater, helps control soil erosion and reduces sediment runoff into the streams. - Rehabilitating irrigation systems will lead to increased agricultural production (food security),	Protection of the environment	Emissions and dust	Some activities may release dust and emission, which impact labour and neighbouring communities	- Use to the extent possible, vehicles in appropriate technical conditions. - Ensure that vehicle engines and equipment on site are not left running unnecessarily. - Best practice to ensure minimization of dust emissions during dry and windy conditions (e.g. proper stockpiling, watering etc.). - Exact project-related energy use to be determined during project inception phase. 'Extra' energy use to be compensated through installation of solar PV
		Noise and vibrations	Some activities may release noise and vibrations, which impact labour and neighbouring communities	- Avoid operations and vehicle movements at night. - Set traffic speed limits for construction and operation-related traffic - Position equipment as far as possible from sensitive areas (neighboring communities)
		Waste management	The activities might produce some solid wastes	- Identify waste management facilities and ensure disposal through treatment/removal/recycling of each of the waste types. - Ensure that all wastes produced are properly collected, segregated, stored, transported and treated - Minimize the waste production to the extent possible. - Document all waste related operations (type of wastes, quantities produced etc.). - Appropriate and safe storage of fuels, construction materials, wastes and any materials that can cause spills (e.g. batteries from energy generators).
		Land uses (land degradation)	Some activities where machineries are used may lead to soil / land degradation in the area around the canals	- The contractor will fix any degradation after rehabilitating the canals for example, no trees should be cut, and no soil should be removed. Trees will be replanted.
		Biodiversity	Machineries and rehabilitation work might impact the local habitat and vegetation	- In cooperation with local authorities, the activities will be planned to avoid sensitive periods for breeding or migration of wildlife and any affected native vegetation will be replanted in new locations. Moreover, low-impact construction techniques and equipment will be used to minimize soil erosion, habitat destruction, and noise disturbance.
	Worker health and safety	Occupational Health and Safety Plan	In addition to noise, CO2 and dust emission, workers might be exposed to work-related health and safety risks	Develop an Occupational Health and Safety (H & S) Plan
		Incident reporting		Ensure all H&S related incidents (e.g. observations, accidents) on site are recorded and followed up properly.
		Personal protective equipment		Ensure the provision of Personal Protective Equipment (PPE) for workers (hardhats, masks, safety glasses, safety boots etc. depending on project type).

stimulating economic growth and development. It creates job opportunities in farming, processing, and related industries, contributing to rural livelihoods and overall economic well-being. - Rehabilitating irrigation systems can help farmers adapt to the impacts of climate variability and protect the local communities and the infrastructure from flooding.		UXO/ Damaged structure clearance		Ensure UXO clearance/damaged structure clearance obtained prior to start of works
		First-aid		Provide one trained first aiders per 50 employees and adequate amount of first aid kits on site.
		Access to health care		- Ensure the workforce has access to primary healthcare on site, providing prescriptions and vaccinations where necessary/applicable - In case more than 35 workers are present on site, ensure that a hospital, medical clinic or a health centre can be reached within a period of 45 minutes.
	Community health and safety	Vulnerable Groups	Due to lack of funding, only poor farmers will install modern irrigation. This might raise questions regarding inequity and reduce the trust in the authorities.	- Ensure all vulnerable groups are consulted during inception phase and continually throughout project cycle to verify and further identify all specific needs, limitations and constraints. Final decisions on who will benefit will be made with communities and water-user associations

Table Risks screening of rehabilitation of the irrigation system activities (outputs 2.1.; 2.2.; 2.3.) and modern irrigation system (output 4.1)

Positive impacts	Potential environmental and social risks categories		Impact assessment	Mitigation measures
- Water Conservation: Reusing treated wastewater for irrigation, will conserve groundwater resources (efficient water use). - By utilizing treated wastewater, farmers have access to a reliable water source, even during periods of water scarcity. - Using treated wastewater for irrigation leads to recycling nutrients, thus reducing the need for synthetic fertilizers, and minimizing the environmental impact associated with their production and use - Treated wastewater often contains organic matter and beneficial microorganisms that can enhance soil fertility and improve its structure, which will lead to increased crop productivity and	Protection of the environment	Emissions and dust	Some activities may release dust and emission, which impact labour and neighbouring communities	- Use to the extent possible, vehicles in appropriate technical conditions. - Ensure that vehicle engines and equipment on site are not left running unnecessarily. - Best practice to ensure minimization of dust emissions during dry and windy conditions (e.g. proper stockpiling, watering etc.).
		Noise and vibrations	Some activities may release noise and vibrations, which impact labour and neighbouring communities	- Avoid operations and vehicle movements at night. - Set traffic speed limits for construction and operation-related traffic - Position equipment as far as possible from sensitive areas (neighboring communities)
		Waste management	The activities might produce some solid wastes	- Identify waste management facilities and ensure disposal through treatment/removal/recycling of each of the waste types. - Ensure that all wastes produced are properly collected, segregated, stored, transported and treated - Minimize the waste production to the extent possible. - Document all waste related operations (type of wastes, quantities produced etc.). - Appropriate and safe storage of fuels, construction materials, wastes and any materials that can cause spills (e.g. batteries from energy generators).
		Pollution prevention	If wastewater is not treated well, this will lead to negative impacts on human health and the ecosystem.	- Ensure all works carried out minimize pollution risk (e.g. liquid effluents, air quality and emissions, noise and vibration management, vehicle and equipment maintenance and selection, fuel, oil and chemical storage and handling) including the whole duration of the Project. - The local authorities and the wastewater companies will monitor the quality of the outflow to be used for irrigation
			Contaminant Residues in Soil and Crops; Treated wastewater may contain residual contaminants such as heavy metals, pharmaceuticals, pathogens, and other pollutants. Continued	- A comprehensive water quality monitoring program to assess the content of nutrients, heavy metals, pathogens, and other contaminants in the treated wastewater.

better soil sustainability. - Reusing treated wastewater offers cost savings for farmers and municipalities including cost-effective irrigation and wastewater disposal. - Treating wastewater removes harmful pollutants and contaminants thus, protecting the environment and public health. - Reusing treated wastewater for irrigation can enhance the resilience of agricultural systems to climate-related challenges.			irrigation with wastewater can lead to the accumulation of these contaminants in the soil, affecting soil quality and potentially entering the food chain through crops.	
			Soil Salinity and Sodicity; Treated wastewater may have elevated levels of salts, which can contribute to soil salinity and sodicity over time. High salinity can degrade soil structure, reduce water infiltration, and negatively impact plant growth by affecting water uptake.	- Regular soil testing to monitor nutrient levels, salinity, and other soil parameters should be conducted. - Implement appropriate soil management practices, such as the addition of organic matter, to maintain soil fertility and structure.
		Effluents	Effluent at site can lead to health risks	Ensure appropriate containment and storage of construction wastewater, including sanitary water. No untreated effluent is discharged.
	Worker health and safety	Occupational Health and Safety Plan	In addition to noise, CO2 and dust emission, workers might be exposed to work-related health and safety risks	Develop an Occupational Health and Safety (H & S) Plan
		Incident reporting		Ensure all H&S related incidents (e.g. observations, accidents) on site are recorded and followed up properly.
		Personal protective equipment		Ensure the provision of Personal Protective Equipment (PPE) for workers (hardhats, masks, safety glasses, safety boots etc. depending on project type).
		UXO/ Damaged structure clearance		Ensure UXO clearance/damaged structure clearance obtained prior to start of works
		First-aid		Provide one trained first aiders per 50 employees and adequate amount of first aid kits on site.
		Access to health care		- Ensure the workforce has access to primary healthcare on site, providing prescriptions and vaccinations where necessary/applicable - In case more than 35 workers are present on site, ensure that a hospital, medical clinic or a health centre can be reached within a period of 45 minutes.
	Community health and safety	Vulnerable Groups	Due to lack of funding, only poor farmers will install modern irrigation. This might raise questions regarding inequity and reduce the trust in the authorities.	Ensure all vulnerable groups are consulted during inception phase and continually throughout project cycle to verify and further identify all specific needs, limitations and constraints. Final decisions on who will benefit will be made with communities and water-user associations

Table 29~~27~~ Risks screening of activities related to (re)use of (treated) wastewater (outputs 3.1.; 3.2.; 3.3.; 3.4)

Below table provides a summary of the outcomes of a risks screening and impact assessment conducted as per AF requirements

ESP principle	Initial environmental or social risks present Y/N	Potential risks	Explanation	Impact assessment	Mitigation measures to avoid / reduce any potential risks	Monitoring indicators and verification	Responsible and frequency
1.Compliance with the Law	NO	No risk has been identified but 'standard' mitigation measures will be put in place to ensure compliance of project activities with relevant standards and regulations	Relevant national laws and standards and project compliance with these have been identified. A risks screening and impact assessment for proposed project interventions has been conducted and an ESIA-ESMP prepared and approved by the ministry of water and environment 		❑ Standard clause / references to laws and standards to which project activities need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. ❑ Ensure the ESIA-ESMP is implemented, including guiding executing entities to do so *Responsible: UN-Habitat *Budget: as part of project activities / assignment project consultants and staff	- Standard clauses in contracts - Executing entities reporting on ESIA-ESMP implementation	UN-Habitat Executing entities Every contract and as part of annual monitoring
2.Access and Equity	YES	Some concerns were raised regarding: ☐ Unequal distribution of irrigated water (to small-holder farmers, women farmers, farmers which have not received support	Project beneficiaries (i.e., population; groups) have been mapped. Community consultations and focus groups discussions have been conducted per beneficiary group to identify possible rivals, disputants and concerns related to equal access of project benefits.	Potential disputes if water is irrigated unequally. This may affect farmers in 22 water user associations, including small-holder farmers and women farmers	❑ Final agreement on proposed project interventions during project inception phase between: ▪ Women organizations: 15 ▪ Youth organizations: 7 ▪ Water user associations: 22 ▪ Community organizations (leaders): 13 ▪ Religious leaders	☐ Consultation / workshop report and final agreement ☐ Work plan and / or check measures to avoid disruption of irrigation.	UN-Habitat and executing entities c

		previously and other vulnerable groups) ☐ That interventions may take place during the agriculture season, which may hinder irrigation. ☐ Disruption of gate control mechanism			▪ Representative displaced persons ▪ Agriculture office ☐ Implement interventions during November – February and / or ensure irrigation is not disrupted due to project interventions. ☐ Develop control method or close the gates managed only by the irrigation department. ☐ Quotas and a targeting strategy will be applied for meetings, workshops and trainings *Responsible: UN-Habitat and executing entities *Budget: as part of project activities / assignment project consultants and staff	☐ Check gate management protocol / method / plan with irrigation department ☐ Check targeting strategy and attendance sheets and workshop / training reports	
3.Marginalized and Vulnerable Groups	YES	There is a small potential risk that needs and concerns of groups have changed once the project starts.	Project beneficiaries (i.e., population; groups) have been mapped. Community consultations and focus groups discussions have been conducted per beneficiary group to identify needs and possible concerns	This could lead to dissatisfaction about project interventions of project beneficiaries	❑ All project beneficiary groups will be consulted again during the inception phase to verify and further identify all specific needs and concerns of groups (see also above) ❑ Strictly apply the Grievance and Redress Mechanism ❑ The project will ensure equal opportunities in participation and decision-making of women, youth and other vulnerable groups by using quotas and by agreeing on representation in decision-making processes using ToRs, agreements, etc. ❑ Quotas and a targeting strategy will be applied for meetings, workshops and trainings *Responsible: UN-Habitat and executing entities *Budget: as part of project activities / assignment project consultants and staff	❑ Verification report of needs and potential concerns of project beneficiaries ❑ Grievance and Redress mechanism in place - Check targeting strategy and attendance sheets and workshop / training reports	UN-Habitat and executing entities Every contract and as part of annual monitoring
4.Human Rights	NO	No risk has been identified but 'standard' mitigation measures will be put in place to no Human rights will be violated	Any Human right treaties not ratified or citing of the host country in a Human Rights Council Special Procedures has been identified. Although some Human right treaties are not ratified in Yemen, risks related to these are manageable as the project does not foresee works leading to any resettlement and will prevent this.		☐ Standard clause / references to relevant Humans rights declarations to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. ☐ Develop Security and Human Rights Management Procedure		UN-Habitat

					that is in alignment with UNDSS and the Voluntary Principles of Human Rights ☐ Share information on human rights with project beneficiary groups at the inception phase of the project and during implementation ☐ Share information on the grievance and Redress mechanism and human rights at every meeting *Responsible: UN-Habitat and executing entities *Budget: as part of assignment project consultants and staff		
5.Gender Equity and Women's Empowerment	NO	No risk has been identified but 'standard' mitigation measures will be put in place avoid any risk	The legal and regulatory context with respect to gender equality and women's empowerment been analyzed, as well as the cultural, traditional, religious, or any other grounds that might result in differential allocation of benefits between men and women. Based on this a social assessment and inclusion /gender plan has been developed		☐ Reference to the social inclusion plan to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. ☐ Implement the project social inclusion /gender plan, including guiding executing entities to do so *Responsible: UN-Habitat *Budget: as part of project activities / assignment project consultants and staff	☐ Standard clauses in contracts ☐ Executing entities reporting on social inclusion plan	UN-Habitat Executing entities
6.Core Labour Rights	YES	There is a small risk of core labour standards not being respected by contractors, especially related to standards for safety and health and labour inspection.	In the ESMP it has been described how executing entities will comply with the core labour standards	Dissatisfaction among workers and employees in the project	The project follows ILO core labor standards. Looking at the conventions and protocols not ratified, the project will be particularly attentive to any health and safety and inspections. ❑ Employment and working conditions following core labour standards to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. ❑ Regular inspections will be conducted. ❑ Strictly apply the Grievance and Redress Mechanism *Responsible: UN-Habitat	❑ Check agreements for relevant clauses ❑ Inspection reports - Grievance and Redress mechanism in place	UN-Habitat Every contract and as part of annual monitoring

					*Budget: as part of project activities / assignment project consultants and staff		
7.Indigenous Peoples	NO	No risk has been identified	No indigenous people have bene identified in the project target area				
8.Involuntary Resettlement	NO	No risk has been identified but 'standard' mitigation measures will be put in place avoid any risk	Resettlement because of project activities will be always avoided.It is not foreseen that land other than public land will be targeted under this project. The project determined that no physical or economic displacement will take place due to the project. This has been determined by mapping project target sites land ownership (private, public) and land use, also informally, and through consulting communities / users on the possible risk of resettlement and to get agreement on proposed interventions (i.e., no interventions will take place without the consent of inhabitants in the targeted areas). Any agreement / contract for project works signed will include a clause mentioning that project activities will not result in any resettlement.		☐ Standard clause / references to relevant Humans rights declarations to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. ☐ Develop Security and Human Rights Management Procedure that is in alignment with UNDSS and the Voluntary Principles of Human Rights *Responsible: UN-Habitat *Budget: as part of project activities / assignment project consultants and staff	☐ Standard clauses in contracts	UN-Habitat Every contract and as part of annual monitoring
9.Protection of Natural Habitats	NO	No risk has been identified	The project ensures that no unjustified conversion or degradation of critical natural habitats will take place because of project activities. The proposed project interventions are not planned in or close to natural habitats and indirect or cumulative impacts are not expected as environmental impacts should be positive rather than. Negative. During project preparation, it has been checked if any critical natural habitats exist in the target location, including their location, characteristics and critical value (i.e., legal protection status, common knowledge or traditional knowledge), as well as possible negative impacts on these due to project activities.				
10.Conservation of Biological Diversity	NO	No risk has been identified	The project ensures that any significant or unjustified reduction or loss of biological diversity because of project activities will be avoided. The proposed project interventions are not planned in or close to critical biodiversity and indirect or cumulative impacts are not expected as environmental impacts should be positive rather than. Negative. During project preparation, it has been checked if any important biodiversity exists in the target location, including their protection status and other recognised inventories as well as possible negative impacts on these due to project activities.				
11.Climate Change	NO	No risk has been identified but 'standard' mitigation measures will	Any additional energy use due to project activities have been identified and will be compensated by renewable energy sources installed		☐ Exact project-related energy use to be verified through engineering studies and to be compensated through installation of solar PV	Report on exact project-related energy use by the project	UN-Habitat During studies and

		be put in place avoid any risk			*Responsible: UN-Habitat *Budget: as part of project activities / assignment project consultants and staff		as part of annual monitoring
12.Pollution Prevention and Resource Efficiency	YES	There is a risk that waste (mostly construction materials, deposits from the canals and sludge will not properly be managed / recycled. Besides, the treated wastewater will still have some pollutants, only suitable for certain crops. Although farmers are aware of the suitability of the use of treated wastewater (for fodders), there is still a risk that treated wastewater will be used inappropriately and that farmers are not using enough health and safety equipment.	The main wastes are construction materials, the deposits from the canals and sludge. These wastes will be removed and processed in coordination with EPA and local authority. Treated wastewater is already used for irrigation. The treated wastewater will still have some pollutants, only suitable for certain crops. Although farmers are aware of the suitability of the use of treated wastewater (for fodders)	Waste may be dumped / processed inappropriately with potential negative environmental impacts. Although waste is not expected to be hazardous, it should not be dumped on unappropriated sites Crops (115 ha) may get contaminated, and farmers may get sick. This may also have a secondary negative effect on consumers of the crops Treated water for drinking will be mixed into the water supply network, serving the whole of Aden	❑ A waste management plan will be prepared. ❑ Reference to the waste management plan to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. ❑ Ensure treated wastewater is only used for appropriate crops (through coordination with farmer/water user associations and authorities and related monitoring) ❑ Comply with (international) standards for water quality. ❑ Ensure farmers are aware of the risks and wear appropriate shoes and gloves (as part of awareness campaign and trainings planned) *Responsible: UN-Habitat *Budget: as part of project activities / assignment project consultants and staff	❑ Check waste management plan ❑ Check agreements for relevant clauses ❑ Regular wastewater quality check ❑ Conduct inspections. ❑ Check if is part of the awareness raising campaign and trainings	UN-Habitat and executing entities Every contract and as part of annual monitoring
13.Public Health	YES	There is a risk that treated wastewater will be used inappropriately and that farmers are not using enough health and safety equipment.	Treated wastewater is already used for irrigation. The treated wastewater will still have some pollutants, only suitable for certain crops. Although farmers are aware of the suitability of the use of treated wastewater (for fodders)	Crops (115 ha) may get contaminated, and farmers may get sick. This may also have a secondary negative effect on consumers of the crops	❑ References to relevant ICSC international health and safety standards to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. ❑ Ensure treated wastewater is only used for appropriate crops (through coordination with farmer/water user associations and authorities and related monitoring) ❑ Comply with (international) standards for water quality. ❑ Ensure farmers are aware of the risks and wear appropriate shoes and gloves (as part of awareness campaign and trainings planned)	❑ Regular water quality check ❑ Conduct inspections ❑ Check if is part of the awareness raising campaign and trainings	UN-Habitat Every contract and as part of annual monitoring

14.Physical and Cultural Heritage	NO	No risk has been identified but 'standard' mitigation measures will be put in place avoid any risk	There are no heritage sites acknowledged by UNESCO[77] in the Tuban delta. Also, according to government information, no heritage sites will be affected by the project		☐ Reference to a heritage chance find procedure to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. *Responsible: UN-Habitat *Budget: as part of project activities / assignment project consultants and staff		UN-Habitat
15.Lands and Soil Conservation	NO	No risk has been identified	No loss of soil is expected. On the contrary, project activities aim to reduce any movement of soil				

Table Summary environmental and social risks management plan

Project outputs	Specific barriers / issues	Key needs (to improve equality)	Entry points (to integrate considerations / empower women / youth)	Additional activities needed to ensure women perspective, incl. potential risk mitigation measures	Specific Indicator / targets (% women)
1.1. Capacity development with national and sub-national authorities on climate change resilience, effective water management, including project oversight, development and implementation of integrated management plans	Lack of representation of women in the political / leadership sphere and lack of capacity building of women	Ensure women's representation in decision making bodies (committees) and ensure women benefit from capacity building activities	Agree on ToR steering and technical committee, targeting strategy and use of quotas; Trainings to be tailored	Ensure buy-in from the highest political level	Project steering committee: 10% Project steering committee: 30% Workshops and trainings: 30 %
1.2. Establishment of laboratory for wastewater quality testing and water supply quality testing	N/A				
1.3. Integrated and inclusive natural resource and climate change risk management process convened bringing together government and community stakeholders	Lack of women engagement in development process and lack of women responsiveness / mainstreaming Women-headed households and girls are at higher risk of food / water insecurity. Less than 1 per cent of agricultural landholders in Yemen are female. However, women have a major role in agriculture, providing 60 per cent of labour in crop farming, 90 per cent in livestock farming and 10 per cent of wage labour;	Ensure women are engaged through the development process and that the plan is women responsive / mainstreamed	Targeting strategy and use of quotas;	Disaggregated data / assessment and expertise required	Workshops: 30 % Women-specific vulnerabilities and actions benefitting women identified in plan
1. Assessment and verification / technical specification and engineering studies, including surveys required for improved irrigation canals and water intake systems	N/A				
2. Rehabilitated irrigation canals to improve water access for agricultural purposes in the Tuban	Women restrictions in mobility	Ensure executing entities use	ESMP has measures in place to ensure this	Awareness raising / capacity building of	

[77] https://whc.unesco.org/en/statesparties/ye

3. Improved water intake structures to increase water supply in the irrigation canals	Unequal work opportunities and safety issues Women-headed households and girls are at higher risk of food / water insecurity. Less than 1 per cent of agricultural landholders in Yemen are female. However, women have a major role in agriculture, providing 60 per cent of labour in crop farming, 90 per cent in livestock farming and 10 per cent of wage labour; Women, girls and boys are the primary carriers of water in rural areas.	procurement and contracting processes providing equal opportunities to all people, while ensuring safety and mobility needed		executing entities and sub-contractors on compliance with the ESMP (as proposed in the ESMP)	Check % of women contracting for labour. No target as this may be challenging for construction work; 23,000 of people protected by reinforced canals are women/girls
4. Stone-gabions constructed to reinforce canals and protect agriculture lands and Al-what city from flashing floods.					
o Assessment and verification / technical specification and engineering studies, including surveys required for improved irrigation canals and water intake systems	N/A				
o Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah, Saber cities and surrounding villages	Women restrictions in mobility Unequal work opportunities and safety issues Women-headed households and girls are at higher risk of food / water insecurity. Less than 1 per cent of agricultural landholders in Yemen are female. However, women have a major role in agriculture, providing 60 per cent of labour in crop farming, 90 per cent in livestock farming and 10 per cent of wage labour; Women, girls and boys are the primary carriers of water in rural areas.	Ensure executing entities use procurement and contracting processes providing equal opportunities to all people, while ensuring safety	ESMP has measures in place to ensure this	Awareness raising / capacity building of executing entities and sub-contractors on compliance with the ESMP (as proposed in the ESMP)	Check % of women contracting for labour. No target as this may be challenging for construction work; At least 40,000 women and girls benefit from increased access to treated drinking water
o Upgrade Tahror WWTP to treat wastewater for use in irrigation					
o Upgrade Saber WWTP to treat wastewater for use in irrigation					
4.1. Support farmers with modern irrigation techniques and systems (Urban and Rural Areas)		Ensure female headed households are prioritized	Targeting strategy and use of quotas;	Ensure safety. Mobility, etc. covered by the ESMP	30% of farmers applying modern irrigation techniques are women
4.1. Develop maintenance plans for canals, irrigation system	N/A				
4.2. Strengthen water users associations for improved monitoring, maintenance and dissemination of information on irrigation techniques and skills development	Lack of representation of women in the political / leadership sphere Less than 1 per cent of agricultural landholders in Yemen are female. However, women have a major role in agriculture, providing 60 per cent of labour in crop farming, 90 per cent in livestock farming and 10 per cent of wage labour; Women, girls and boys are the primary carriers of water in rural areas.	Ensure wome are represented in water user associations Prioritize women-led water user Association	Targeting strategy and use of quotas;	Ensure safety. Mobility, etc. covered by the ESMP Capacity building tailored to specific needs if relevant	At least 6 strengthened water user associations are women-led
4.3. Skills development with women and youth on water management and climate change adaptation	Unequal access to information, technology, markets and work and related capacity building	Ensure relevant skills on water management and adaptation are built.	Capacity building activities / trainings specifically designed for this purpose.	Disaggregated data / assessment and expertise required	100 women are trained in skills development on water management and CCA
4.4. Capacity development for communities with a focus on women and youth civil society organizations on					50 women receive capacity development on integrated natural resource plans

integrated and inclusive natural resource management plan			Targeting strategy and use of quotas;		
4.5. Awareness raising with local communities on water conservation and climate change in Aden and the Tuban Delta		Ensure awareness raising also targets and reaches women	Targeting strategy and awareness raising materials		30% of women in the area are aware of predicted adverse impacts of climate change

Table 30 Summary Social inclusion / gender plan

*Where 'women' is mentioned, youth, elderly, disabled and any other vulnerable or marginalized groups will also be considered. Target for youth engagement is 10 per cent.

PART III: IMPLEMENTATION ARRANGEMENTS

A. ARRANGEMENTS FOR PROJECT/PROGRAMME IMPLEMENTATION.

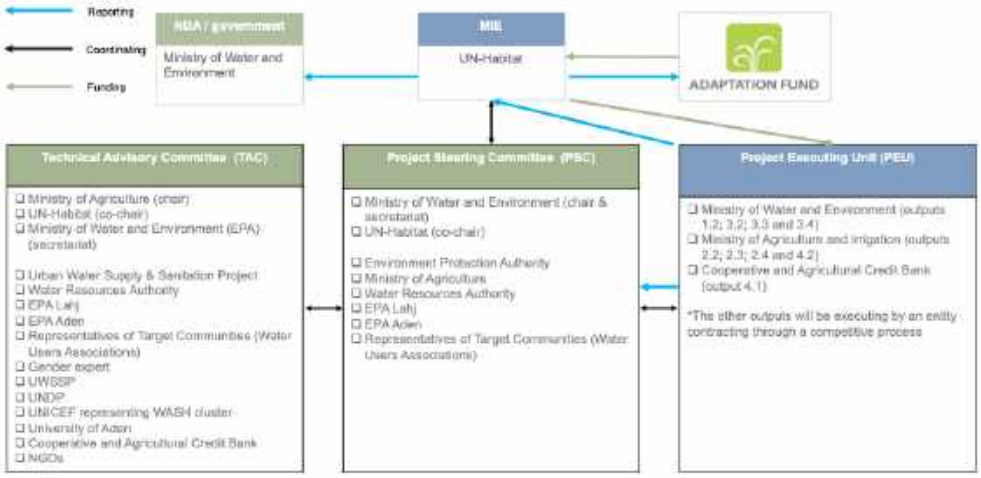


Figure 20. Project organigram

Representing the Multilateral Implementing Entity (MIE) of the project, UN-Habitat will be responsible for contracting the executing entities and reporting to the AF. UN-Habitat's Yemen Country Office will not only coordinate the intervention with its headquarters and regional office to ensure project compliance with both AF and internal policies (including reporting / M&E requirements and safeguarding system), but it will also be in close partnership with the Yemeni MoWE.

The MoWE and UN-Habitat will chair and co-chair the Project Steering Committee (PSC) whereas the MoA will chair the Technical Advisory Committee (TAC) with UN-Habitat being the co-chair. The PSC will supervise and ensure the smooth implementation of the project from start to completion, and review plans and reports. The target governorates and municipalities will also be represented through the PSC. 30% female representation in both the TAC and PSC is aimed at.

Stakeholder /Committee	Roles and responsibilities
UN-Habitat	☐ Multilateral Implementing Entity ☐ Project coordination with UN-H HQ and regional office (ROAS) and government actors ☐ Ensuring project compliance with AF and UN-H policies and reporting / M&E requirements, incl. safeguarding system ☐ Contracting and coordination with execution partners and Ministry of Water and Environment ☐ Co-chair Project Steering Committee ☐ Co-chair Technical Advisory Committee
Ministry of Water and Environment (& Environment Protection Authority)	☐ Adaptation Fund Designated Authority ☐ Coordinate with UN-Habitat and PSC, including on hiring / procurement processes. ☐ Chair of Project Steering Committee ☐ Recommend the additional expert advisory members to the PSC when needed to ensure project compliance with the National laws and plans. ☐ Technical and financial guidance for all activities and implementing stages of the project.
Project Steering Committee (PSC)	☐ Supervision on smooth implementation of the project from start to completion, including ensuring alignment with the agreed upon timetable and compliance with the National laws and plans. ☐ Review any deviations and consider amendments to work plans and contractual arrangements ☐ Review work progress reports for the activities to be executed by Executing Entities for each component. ☐ Conduct meetings regularly with the Technical Advisory Committee and review related reports and comments.
Technical Advisory Committee (TAC)	☐ Review technical outputs and provide input and feedback as necessary. ☐ Provide updates about relevant and complementary work undertaken in Yemen. ☐ Make recommendations to the Project Steering Committee

Project Execution Unit (PEU)	☐ Ministry of Water and Environment (outputs 1.2; 3.2; 3.3 and 3.4) ☐ Ministry of Agriculture and Irrigation (outputs 2.2; 2.3; 2.4 and 4.2) ☐ Cooperative and Agricultural Credit Bank (output 4.1) *The other outputs will be executing by an entity contracting through a competitive process ☐ Provide periodic reports / plans to the TAC and PSC ☐ Provide required work progress reports to UN-Habitat / Ministry of Water and Environment to release further disbursements. ☐ Report on each problem delay / amendment on work plan/contractual arrangement /time deficit or problem to PSC ☐ Implement ESIA-ESMP and social inclusion / gender plan

Table 29. Key Stakeholders and Committees' Roles and Responsibilities

Legal and financial arrangements

UN-Habitat and the MoWE will sign a joint Memorandum of Understanding (MoU) to which this Project Document will be attached. This will ensure that all partners are committed to the project.

UN-Habitat will contract Project Execution Entities through MoUs or Agreements of Cooperation (AoC), which are legally binding financial tools. Contracts will be negotiated by UN-Habitat's Project Team and cleared by UN-Habitat's regional office and headquarters, respectively. Any service will require a competitive procurement process, which will follow procedures of the United Nations to ensure open and fair processes.

UN-Habitat will develop an operational manual outlining the roles and responsibilities of key project stakeholders. The manual will contain all necessary tools, forms and templates required to administer the project. It will be shared with the entities of the PEU for feedback and comments. All contractors will be required to conduct 'external' audits of their budgets. Contractors are further required to support the independent final evaluation.

Roles and responsibilities for environmental and social risks management / AF ESP and GP compliance

The PEU will be responsible for implementing the project's ESIA-ESMP. Guidelines on the AF's ESP and GP will be developed with all execution entities, which will also be guided on processes including monitoring, policy and reporting compliance, and safeguarding system compliance. Experts will be part of the project team (for details, refer to budget section). The PEU will be backstopped by UN-Habitat's HQ, with experts on climate change, human rights, environmental and social risks management and gender policies.

Government stakeholders responsible for compliance to national environmental and social policies and standards, as well as government women focal points, will be part of the PSC.

All project-related ToRs and contracts will include clauses binding contractors to comply to AF's ESP, especially principles 1 (law), 4 (human rights), 5 (gender/women), 6 (core labour standards) 8 (involuntary resettlement), 11 (GHG emissions), 12 (waste and pollution), 13 (health and safety) and 14 (heritage sites), and to the AF's GP.

Adaptive management: required changes in project activities or additional activities are required will need to undergo an anew risks screening and impact assessment process in compliance with AF, UN-habitat and national policies and standards. This process will be led by the UN-Habitat's Project Team while the PSC will approve changes, if all requirements are met.

Launch of the project

To launch the project, an inception workshop with members of the PSC, TAC, executing partners and other key stakeholders will be organized. The project approach and the proposed outputs and outcomes of the project will be presented and discussed with the purpose of soliciting feedback and inputs in a participatory manner. Comments and feedback will be incorporated in project frameworks and workplans. The Inception Workshop aims to:

(i) Enhance participants' understanding of the project objectives and activities and take ownership of the project
(ii) Discuss and confirm the organizational structure of the project, including roles and responsibilities
(iii) Confirm / agree on project's monitoring framework and workplan
(iv) Confirm / agree on project's risks management framework
(v) Discuss and agree on project's knowledge management framework and plan
(vi) Confirm / agree on the project's Environmental and Social Risks Management Plan
(vii) Agree on the annual work plan for year one of the project

The inception workshop will be organized within three months after signing the project agreement between the AF and UN-Habitat.

B. MEASURES FOR FINANCIAL AND PROJECT/PROGRAMME RISK MANAGEMENT

Throughout the project period, under guidance of the Regional Programme Manager and supported by the national Project Coordinator and Monitoring and Evaluation Officers, potential financial and project management risks will be monitored and escalated if needed. Monitoring including those measures required to avoid, minimise and mitigate

these risks, throughout the project. The table below indicates potential risks, likelihood, impact, mitigation measures, indicators and responsibilities. Potential risks will be reassessed in line with annual monitoring / reporting (discussed under section III.D)

Potential Issues	Likelihood (1-5)	Impact (1-5)	Mitigation Measures	Indicator to verify	Monitoring frequency, responsibility and escalation process (and contingency if relevant)
Institutional					
1. Delay of project start-up because critical staff is not in place and/ or lengthy contracting process, incl. negotiations with execution entities	3 – medium	3 – medium	1.1 UN-Habitat appointed critical staff at UN-H ROAS and Yemen to start the process required to start the project. 1.2 Proposed project activities and budgets have mostly been agreed upon with Executing Entities 1.3. The inception workshop will be organized within three months of the signed project agreement between UN-Habitat the AF	The inception workshop is organized within three months after the signed project agreement between UN-Habitat; Execution entities to execute activities in the 1st project year are contracted within six months after the inception workshop	Monthly during the initial six months Responsible: UN-Habitat Escalation process: Escalate to Project steering committee, Yemen programme manager, and if needed UN-H HQ
2. Loss of Government support for programme, project and activities due to elections and related functions due to lack of prioritisation of AF project activities or different pace of execution of activities	1 – Low	3 – medium	2.1 Technical staff at execution level in sector ministries and local governments to be engaged in all aspects of programme development and implementation	Confirming steering committee and technical committee members and roles and responsibilities during inception workshop including ToRs within 6 months six months after the inception workshop	Monthly during the initial six months Responsible: UN-Habitat Escalation process: appoint new focal points if needed; Escalate to Yemen programme manager, and if needed UN-H HQ;
3. Lack of coordination between and within national government Ministries and Departments and municipalities.	2 – Low	4 – medium	3.1 Project Steering Committee to address coordination of sector ministries towards enhanced collaboration to achieve expected accomplishments. 3.2 Representatives from the target municipalities are members of the PSC. 3.3 Should UN-Habitat observe coordination problems, the agency will try to resolve issues directly with government focal point and / or concerned parties	Terms of Reference for Steering Committee outline coordination mechanisms and indicate mitigation measures	Every six months Responsible: UN-Habitat Escalation process: Escalate to Yemen programme manager, and if needed UN-H HQ;
4. Capacity constraints of executing entities, local institutions, communities and the private sector may limit the effective implementation of interventions	3 – Medium	3 - Medium	4.1 The project has a strong capacity building and training component designed to operate, maintain, sustain and replicate project activities, esp. at the community and sub-national level. 4.2 UN-Habitat will have dedicated project staff with expertise in climate change, community organization and technical design, M&E and safeguards to ensure quality control from UN-Habitat side.	Capacity indicators to execute project interventions and ESIA-ESMO established as part of monitoring plan Critical staff as mentioned included under project cycle management section	Every six months Responsible: UN-Habitat Escalation process: If capacities are lacking to execute project activities or implement the ESIA-ESMO; Escalate to Yemen programme and project steering committee
5. Communities may not adopt activities during or after the AF project, including infrastructure maintenance	2 – Low	4 – High	5.1 A strong participatory approach at the community level is used and will be used (component 4) during project implementation to ensure ownership and support of communities to the realized interventions in the targeted project areas. 5.2 Capacity building and training of communities, with a focus on water users associations, will be undertaken to improve awareness and understanding of the benefits of the activities, including long-term maintenance (component 4).	Capacity indicators to operate and maintain the project activities Operation and maintenance plans and guidelines	Every year Responsible: UN-Habitat Escalation process and contingency: If capacities are lacking to operate or maintain the project activities (these capacities need to be built before end of the project Escalate to Yemen programme and

					project steering committee
Financial management and Requisite Institutional Capacity					
6. Complexity of financial management and procurement. Administrative processes could delay the project execution or could lack integrity or needed capacity.	3 – Medium	3 – Medium	6.1 Financial management arrangements have been defined during project preparation, including identification of potential executing entities 6.2 UN-Habitat's control framework, under the financial rules and regulations of the UN secretariat, will ensure documentation of clearly defined roles and responsibilities for management, internal auditors, the governing body, other personnel and demonstrates proof of payment / disbursement; In line with AF and UN-Habitat policies, audits will take place annually and / or for each contract of USD 500k. 6.3 Activity specific procurement will be managed by the executing entities as agreed through standard Agreements of Cooperation (with relevant conditions, incl. evidence of recognized procurement policies and procedures and specific terms and conditions for timely disbursement of funds for project activities while at the same time ensure provisions on good financial management, hence minimizing the risk of fund mismanagement or corruption).	Timely audit reports (inception and yearly + following UN-H regulations) Timely evidence of recognized procurement policies and procedures provided by Execution Entities	Every year Responsible: UN-Habitat Escalation process: Escalate when issues raised in reports; Escalate to Yemen programme manager, and steering committee
7. Inflation and instability of the national currency leading to budget issues and increased prices for infrastructure delivery.	3 – Medium	2 – Medium	7.1 Monitoring of potential threats to stability of national currency as part of the UN Development System, systemic response to this challenge recommended. 7.2 All budgets will be in US$	Financial management and procurement strategy Budgets increases	Every year Responsible: UN-Habitat Escalation process: Escalate when costs are raising Escalate to Yemen programme manager, and steering committee
Physical					
8. Political instability / conflict inhibits movement to and in the target areas	3 – Medium	4 – High	8.1 The selected project sites are labelled as being safe. However, UN-habitat will only let field work proceed if agreed with the UN security unit 8.2 Execution entities will require having permanent field staff at project sites, recuing the need to travel 8.3 If target areas are not accessible, UN-Habitat and the proposed execution entities will identify alternative intervention locations and request approval from the PSC and AF	Safety updates as per UN procedures Permanent field staff at project locations	Every year Responsible: UN-Habitat Escalation process and contingency: When safety issues arise (alternatives need to be identified) Escalate to Yemen programme manager, DSS and steering committee
Environmental					
9. Poor weather conditions affect implementation of activities	2 - Low	3 - Medium	9.1 UN-Habitat and the proposed execution entities have developed their work plan according to expected weather conditions. If unexpected weather patterns occur, the proposed activities and work plan will be reviewed to make practical adaptations.	Work plans avoiding critical concrete works being planned in rainy seasons	Permanent Responsible: UN-Habitat Escalation process: When weather issues arise Escalate to Yemen programme manager, DSS and steering committee

Table 31 Overview of financial and management risks and measures to mitigate these

C. MEASURES FOR ENVIRONMENTAL AND SOCIAL RISK MANAGEMENT

An environmental and social risks screening has been conducted for this project (and specific interventions) and impacts assessed for those risks triggered, and measures put in place to manage potential risks (as per the ESMP). The details are presented in the ESIA-ESMP in annex 2. The potential risks identified and that will be managed include:

- ☐ 2: access and equity
- ☐ 3: vulnerable and marginalized groups
- ☐ 6: core labour rights:
- ☐ 12: pollution and resource efficiency:
- ☐ 13: public health

Part II.K of this proposal provides an overview of the outcome of the environmental and social risks screening and impacts assessment that has been conducted for this project to comply to the AF's ESP and GP. Part II.I describes the consultation process conducted to support the development of this proposal, including for this project to comply to the AF ESP and GP. Part III.A describes the allocated roles and responsibilities for environmental and social risk management, including the implementation of the project's ESMP. A budget for environmental and social risks management, including the implementation of the ESMP, is part of the project execution costs. In annex 2 on page 124~~104~~), all the details of the risks screening, impact assessment, incl. the risks monitoring system and budget, are provided.

Based on screening against the 15 AF principles, the project has been categorized as a "B" category project in terms of the environmental and social risks it poses.

Below table provides an overview of the AF ESP and GP compliance requirements and what has been done for this proposal to comply.

ESP and GP compliance requirements	Project compliance to the AF ESP and GP	Reference / evidence
Have all potential environmental and social risks been identified for *all* project/programme activities prior to funding approval?	All potential environmental and social risks (incl. for gender and considering their significance) have been identified) for all project/programme activities at the project preparation phase. An ESIA-ESMP has been conducted / prepared in compliance with the AF ESP and GP and in line with national requirements for conducting ESIAs; Outcomes have been consolidated in the proposal	Part II.I Part II.K Annex 2 (ESIA-ESMP) Annex 3 (Social inclusion / gender plan)
Has the environmental and social assessment been completed before the project/programme proposal submission to the Adaptation Fund, and its findings included in the proposal document?	In compliance with the AF ESP and GP and national requirements for conducting ESIAs, the government of Yemen reviewed and approved the ESIA-ESMP	Annex 2 (ESIA-ESMP)
Has an ESMP been developed and does this include safeguard measures to be implemented during a project/programme?	A project ESMP has been developed, including safeguarding measures. The following has been included in the ESMP: - Allocated roles and responsibilities environmental and social risk management / implement of the ESMP - Opportunities for adaptive management - Arrangements to supervise executing entities for implementation of ESMP - Budget provision to manage environmental and social risks / implement of the ESMP - Measures to avoid, minimize, or mitigate potential risks - Risks monitoring system / indicators - Grievance mechanism	Part III.A (roles and responsibilities for env. and social risk management) Annex 2 (ESIA-ESMP)
Will a grievance mechanism be put in place and how will it be made widely known to identified and potentially affected parties	A project grievance mechanism will be put in place, as described in the ESMP. It will be made widely known to identified and potentially affected parties through community mobilisers, posters and online content	Annex 2 (ESIA-ESMP)

Table 32 ESP and GP compliance requirements and how the proposal complies to these requirements

D. MONITORING AND EVALUATION ARRANGEMENTS

Monitoring and Evaluation (M&E) arrangements for this project will be following the AF's M&E guidelines and ESP and GP, and will further be in line with UN-Habitat's M&E policies and guidelines. As such, the following parameters will be monitored and evaluated: project milestones, financial data, procurement data, risks assessments, ESP compliance, GP compliance, project indicators, lessons learned, and project results. The M&E framework for project results will be based on targets and indicators including gender-disaggregated targets where possible, established in the project Results Framework (see Part III.E).

The annual Project Performance Reports (PPR) will include a section covering the status of implementation of environmental and social management plans including measures required to avoid, minimize, or mitigate environmental and social risks. The reports will also include, if necessary, a description of corrective actions that are deemed necessary. The final evaluation report will include an evaluation of the project's performance with respect to environmental and social risks.

UN-Habitat will ensure timely and high-quality M&E deliverables by leading the process and providing guidance to the project execution entities and national government partners. Where possible, the M&E process will be participatory, involving key stakeholders at national, municipal and community levels. Project activities will be monitored by the TAC including compliance to the AF's ESP and GP. The M&E framework and plan will need to be endorsed by the PSC. Audits of the project's financial management will follow AF regulations and rules, and applicable audit policies. The M&E plan will be implemented as proposed in the table below.

Type of M&E activities	Responsible / budgeted parties	Time Frame	Budget (USD)
Inception and completion workshop	Project Coordinator MWE-EPA	Inception meeting within first 3 months	**8.000** (as part of project execution costs)
Direct Project Monitoring and Quality Assurance, including progress and financial reporting, and risk management	Project Monitoring expert Project Coordinator	Quarterly, half-yearly and annually as needed	**99.120** (as part of project execution costs)
Compliance with ESP and GP	Project Monitoring expert Project Coordinator Project supervisor	Annually	
Audits	Project Coordinator Auditor	Annually at year end	**15.000** (as part of project execution costs)
Final evaluation	Project Coordinator External	No later than 3 months upon termination of the project	**50.000** (as part of project execution costs)
Community consultations / Data collection Workshops/ trainings and reporting	Project Coordinator Executing Entities	Quarterly, half-yearly and annually as needed	As part of project activities
Visit to field sides	Project Coordinator Executing Entities	Quarterly, half-yearly and annually as needed	As part of project activities
Overall project monitoring and evaluation	UN-Habitat ROAS	Annually	**13.823** (as part of project cycle management fee)

*An M & E budget has also been included under section III.G

Table 32. M&E Activities Including Responsible Parties, Timeframe and Budget

The Project Coordinator will develop a gender responsive **M&E Plan** during the project's inception phase, which will be distributed and presented to all stakeholders during the initial workshop. The emphasis of the M&E plan will be on (participatory) outcome/result monitoring, learning and sustainability of the project and project risks, including financial & project management risks, environmental social safeguard risks and monitoring of gender-related outcomes and targets as indicated in the results framework and in the social inclusion plan. This will include having sex-disaggregated date. Periodic monitoring will also be conducted through visits to the intervention sites. UN-Habitat will ensure that all executing partners are fully briefed on the M&E requirements to ensure that baseline and progress data is fully collected Moreover, the correlation between the Knowledge Management component and M&E will be adequately established. The AoC will also reflect this.

An **Annual Project Performance Review** (PPR) will be prepared to monitor progress made since the project's start. The PPR includes, but is not limited to, reporting on the following: progress on the project's objective and outcomes – each with indicators, baseline data and end of project targets (cumulative); project outputs delivered per project outcome (annual); lessons learned/ good practices; annual work plan and expenditure; annual management; environmental and social risks (i.e. status of implementation of ESMP, including those measures required to avoid, minimize, or mitigate environmental and social risks. The reports shall also include, if necessary, a description of any corrective actions that are deemed necessary; and project financial and management risks (same as per above). Potential financial and management risks as mentioned under section III.B will also be monitored and reassessed yearly.

The specific M&E **reports** will include: **(i) M&E plan; (ii) project inception report; (iii) the annual-, and terminal project performance reports, and (iv) the technical reports.**[78] [79]

[78] Please refer to Part III. Section G for detailed M&E budget considerations.
[79] Please refer to Part III. Section E for the project's results framework.

E. RESULTS FRAMEWORK

Expected Result	Indicators	Baseline	Targets	Means of verification	Assumptions, risks/impacts and mitigations	Interval	Responsibility
Component 1 Integrated and inclusive natural resource management for climate-resilient water systems							
Outcome 1. Enhanced capacities of national and sub-national government institutions to manage natural resources (focused on water and land) and respond to climate change risks in the Tuban Delta efficiently, sustainably and in a resilient way (in line with AF outcomes 2 and 7)	Capacity of national and sub-national government staff to plan for the management of natural resources and respond to climate change is increased: No. of public staff targeted - Total - Female *sector: multi-sector Operational laboratories Climate change and gender/social inclusion priorities are integrated into natural resources management plan UN-H indicator 3.2: Number of partner cities that are implementing resource efficiency policies, plans and standards in urban management UN-H indicator 3.3: Number of partner cities that are implementing strategies, policies, plans and standards aimed at achieving adaptation, mitigation and/or integrated adaption and mitigation to climate change	 0 0 Capacity: low 0 Integration level: none 0 0	 900 and 300 unique[80] 30% Capacity: medium (80 % of target staff) 2 Integration level: most 2 2	Change of capacity Workshop/training reports and/or survey (from low to medium capacity – exact requirements to be agreed during project) Integration level by checking climate change and gender/social inclusion priorities in plan Lab establishment reports	Sustained engagement and interest by key ministries on climate change Risk: targeting non-relevant staff Mitigation: targeting strategy	Baseline, mid-term and end	TBC with UN-Habitat
Output 1.1. Government capacity strengthened at national and sub-national level on increasing climate change resilience and effective water management	No. of staff trained / participated in workshops. Type: public - Total - Female	 0 0	 900 and 300 unique[81] 30%	Workshop reports Count on attendance sheets Review pictures	Risk: target women involvement not reached Mitigation: quotas will be applied	Every meeting	TBC with UN-Habitat
Output 1.2 Establishment of laboratory for wastewater quality testing and water supply quality testing	No of laboratories established for wastewater quality testing and water supply quality testing. Laboratories should be accessible for disabled.	0 Currently there is insufficient capacity for testing to ensure the quality of wastewater and water supply is	2	Review pictures of labs	Risk: non-agreement on safe consumption levels Mitigation: agree on safe consumption levels before tests start	Baseline, mid-term and end	TBC with UN-Habitat

[80] Unique individuals. Assumption that one individual attends 3 trainings/workshop. 16 training and 20 workshops with 25 participants.
[81] Unique individuals. Assumption that one individual attends 3 trainings/workshop. 16 training and 20 workshops with 25 participants.

		safe for human and agricultural consumption					
Output 1.3 Integrated and inclusive natural resource (focused on water and land) and climate change risk management process and plan	- No of meetings bringing together stakeholders to discuss climate-resilient water management plans - % Female - % Youth *Consider elderly and disabled (venues need to be accessible) No. of plans developed to manage natural resources and address climate change risks (scale: regional)	0 0	70 (20 participants each = 1400 people total) 30% 20% 1	Meeting reports Count on attendance sheets Review pictures	Facilitation which encourages participation of all stakeholders in the process Risk: benefits and concerns of women not fully identified Mitigation: include in ToR and review	Baseline, mid-term and end	TBC with UN-Habitat
Component 2: Increased adaptive Capacity of the Water Sector							
Outcome 2. Increased adaptive capacity of the water sector through the rehabilitation and protection of irrigation systems in the Tuban Delta (in line with AF outcome 4)	Assets produced, developed, improved or strengthened Length of irrigation canals improved to withstand climate change and variability-induced stress Sector: water management	 3km Change in asset: somewhat improved	 61km (change 58) Change in asset: mostly improved -	Identify irrigation canals improved; provide photos	Risk: unclarity about change in asset improvement required Mitigation: agree on typology and compare to baseline	Baseline, mid-term and end	TBC with UN-Habitat
Output 2.1. Assessment and verification / technical specification and engineering studies, including surveys required for improved irrigation canals and water intake systems	No of tools and guidelines developed and shared with relevant stakeholders and: - Detailed engineering studies and designs of below interventions	0	3	Detailed technical specification prepared and advertised	Risk: studies do not comply with law requirements Mitigation: include in ToR and assess studies with purpose to identify compliance	Baseline, mid-term and end	TBC with UN-Habitat
Output 2.2. Rehabilitated irrigation canals to improve water access for agricultural purposes in the Tuban	No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change: - Km of Irrigation canals	3km Change in asset: no improvement	7km (change 4km) Change in asset: fully improved	Report of delivery of work	Delivery of work accepted by recipient local Authority Risk: unclarity about change in asset improvement required Mitigation: agree on typology and compare to baseline	Baseline, mid-term and end	TBC with UN-Habitat
Output 2.3 Improved water intake structures to increase water supply in the irrigation canals	No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change: - Canal intake structures	0	35 strengthened / constructed (in 13 locations)	Report of delivery of work	Delivery of work accepted by recipient local Authority	Baseline, mid-term and end	TBC with UN-Habitat
Output 2.4 Stone-gabions constructed to reinforce canals and protect agriculture lands and Al-what city from flashing floods.	No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change: - Reinforced irrigation canals	0	54km Change in asset: fully improved	Report of delivery of work	Delivery of work accepted by recipient local Authority Risk: unclarity about change in asset improvement required	Baseline, mid-term and end	TBC with UN-Habitat

		Change in asset: no improvement			Mitigation: agree on typology and compare to baseline		
Component 3: Innovative adaptation practices for water supply systems							
Outcome 3. Increased innovative, efficient, sustainable and climate change resilient practices to improve the water supply systems for urban and agriculture purposes. (in line with AF outcomes ~~4 &~~ 8).	Assets produced, developed, improved or strengthened: number of physical infrastructure improved to reduce water stress as the result of climate change - Water supply systems - Wastewater treatment plants	 0 0 Change in assets: somewhat improved	 1 2 Change in assets: fully improved	Identify physical infrastructure improved; provide photos	Agree on typology and compare to baseline	Baseline, mid-term and end	TBC with UN-Habitat
	Innovations adaptation practices are rolled-out and encouraged at national and / or subnational level through: - Demonstration visits	 0	 3	Count workshop reports review content	Workshops / guidelines should explain how interventions can be installed, operated, maintained, replicated	Baseline, mid-term and end	TBC with UN-Habitat
Output 3.1 Assessment and verification / technical specification and engineering studies, including surveys required, for water supply alternatives options outlined below	No of tools and guidelines developed and shared with relevant stakeholders: - Detailed engineering studies and designs of below interventions - O & M and exit strategy plan	 0 0	 3 3	Count number of reports / guidelines and review content	Assessments and specification reports should provide info for technical design of interventions; Guidelines should explain how interventions can be installed, operated, maintained, replicated Risk: studies do not comply with law requirements Mitigation: include in ToR and assess studies with purpose to identify compliance	Baseline, mid-term and end	TBC with UN-Habitat
Output 3.2 Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah, Saber cities and surrounding villages	No. and type of adaptation assets (tangible and intangible) created or strengthened in support of individual or community livelihood strategies - No of water infrastructure assets rehabilitated No. of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type and scale) - Improved Water Resources	 0 0	 1 (total system) 2,500,000 m^3/year	Report of delivery of work	Urban water systems rehabilitated and functioning to provide improved water resources	Baseline, mid-term and end	TBC with UN-Habitat
Output 3.3 Upgrade Tahror WWTP to treat wastewater for use in irrigation	No. of innovative adaptation practices, tools and technologies accelerated, scaled-up and/or replicated - WWTPs	 0	 1	Report of delivery of work	Wastewater treatment unit is installed in time and function to complete the irrigation system	Baseline, mid-term and end	TBC with UN-Habitat

	No. and type of adaptation assets (tangible and intangible) created or strengthened in support of individual or community livelihood strategies - Ha irrigated by efficient irrigation systems of treated water	0	75ha				
Output 3.4 Upgrade Saber WWTP to treat wastewater for use in irrigation	No. of innovative adaptation practices, tools and technologies accelerated, scaled-up and/or replicated - WWTPs No. and type of adaptation assets (tangible and intangible) created or strengthened in support of individual or community livelihood strategies - Ha irrigated by efficient irrigation systems of treated water	0 0	1 40ha	Report of delivery of work	Wastewater treatment unit is installed in time and function to complete the irrigation system	Baseline, mid-term and end	TBC with UN-Habitat
Component 4: Improved ownership and capacities at local level to respond to climate change							
Outcome 4 Improved ownership and capacities at local level to respond to climate change, including to operate, maintain and replicate resilient water and irrigation systems. (in line with AF outcome 3)	No. of people with increased capacity to respond to climate change - Female - Youth *elderly and disabled to be considered No. of technical committees / associations transferring climate change adaptation knowledge, incl. plans Female-headed	0 0 0 0 0	1430 30% 20% 22 6	Training/workshop reports and pictures and survey Count on attendance sheets		Baseline, mid-term and end	TBC with UN-Habitat
Output 4.1 Support farmers with modern irrigation techniques and systems (Urban and Rural Areas)	Number of farmers supported with modern irrigation techniques to respond to the impact of climate change - Of which Female - Of which youth *+Consider elderly and disabled	Unknown Unknown Unknown	78HH (514 people) 30 % 10 %	Check procurement Review pictures Survey to check impact		Baseline, mid-term and end	TBC with UN-Habitat
Output 4.2 Develop maintenance plans for canals, irrigation system	No of tools and guidelines developed and shared with relevant stakeholders and: - O&M plan and exit strategy	0	1	Review tool/guidelines and relevance		Baseline, mid-term and end	TBC with UN-Habitat
Output 4.3 Strengthen water users associations for improved monitoring, maintenance and dissemination of information on irrigation techniques and skills development	No. of technical committees/associations strengthened/trained to ensure transfer of knowledge - Water Users Association (WUA) - Female-headed WUA	0 2	22 (20 people / WUA)[82] 6	Training/workshop reports and pictures Count on attendance sheets		Baseline, mid-term and end	TBC with UN-Habitat
Output 4.4 Skills development with women and youth on water management and climate change adaptation	No of people participating in workshops/trainings - Total Number - Female - Youth	0 0 0	250[83] 30% 20%	Training/workshop reports and pictures Count on attendance sheets	Agree on how to assess skills development	Baseline, mid-term and end	TBC with UN-Habitat

[82] Total of 440 individuals
[83] Unique individuals. Assumption that one individual attends 3 trainings/workshop

Output 4.5 Capacity development for communities with a focus on women and youth civil society organizations on integrated and inclusive natural resource management plans	No of people participating in workshops/trainings - Total Number - Female - Youth	 0 0 0	 166[84] 30% 20%	Training/workshop reports and pictures Count on attendance sheets	Agree on how to assess capacity	Baseline, mid-term and end	TBC with UN-Habitat
Output 4.6 Awareness raising with local communities on water conservation and climate change in Aden and the Tuban Delta	Field visits conducted No of people participating in field visits - Total - Female - Youth *+Consdier elderly and disabled	0 0 0 0	3 60 30% 20%	Field visit reports and pictures Count on attendance sheets	Target direct beneficiaries involved in the project	Baseline, mid-term and end	TBC with UN-Habitat

Table 33. Project's Result Framework

[84] Unique individuals. Assumption that one individual attends 3 trainings/workshop

Impact-level results	Core indicator	Targets		Comment
		Direct	Indirect	
Increased climate change resilience of people and water resource systems in the Tuban Delta	AF Core Indicator: No. of beneficiaries Under Component 1	Directly participating workshops/trainings: T: 900 from government W: 30 % (270)	1,255,888	
	AF Core Indicator: No. of beneficiaries: Under Component 2	T: 73317 W: 50 % (36,658)	1,183,888 (overlap with above)	
	AF Core Indicator: No. of beneficiaries: Under Component 3	T: 89805 W: 50 % (44,902)	876,356 (overlap with above)	
	AF Core Indicator: No. of beneficiaries: Under Component 4	T: 1430 W: 30 % (429)	3,500 (overlap with above)	
	AF Core Indicator 4.2: Assets produced, developed, improved or strengthened - Physical assets	- Rehabilitated irrigation canals: 58 km - Reinforced irrigation canals: 54 km - Rehabilitated water infrastructure assets: 1 - Rehabilitated wastewater treatment plants: 2		
UN-Habitat DoC 3.2: Improved resource efficiency and protection of ecological assets	Number of partner cities that are implementing resource efficiency policies, plans and standards in urban management	2 (Lahj and Aden)		
UN-Habitat DoC 3.3: Effective adaptation of communities and infrastructure to climate change	Number of partner cities that are implementing strategies, policies, plans and standards aimed at achieving adaptation, mitigation and/or integrated adaption and mitigation to climate change	2 (Lahj and Aden)		
	Total Direct Beneficiaries	165,452 Women: 82,259		
	Total Indirect Beneficiaries	1,255,888 (is total project target area beneficiaries with overlap between components 1, 2, 3 and 4)		

Table 34. Indicative AF Core Indicator Targets

F. PROJECT ALIGNMENT WITH THE RESULTS FRAMEWORK OF THE ADAPTATION FUND

Project Objective(s)[1]	Project Objective Indicator(s)	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
Increase the climate change resilience of people and water resource systems in the Tuban Delta.	Number of people with reduced vulnerability and increased adaptive capacity to climate change	Outcome 2: Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses.	2.1. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	488,520
		Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level.	3.1. Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses	1,668,121
		Outcome 4: Increased adaptive capacity within relevant development sector services and infrastructure assets.	4.2. Physical infrastructure improved to withstand climate change and variability-induced stress.	3,386,0667
		Outcome 7: Improved policies and regulations that promote and enforce resilience measures~~Improved policies and regulations that promote and enforce resilience measures.~~	7.~~7.1.~~ Climate change priorities are integrated into national development strategy~~No. of policies introduced or adjusted to address strategies into country development plans climate change risks (by sector)~~	422,440
		Outcome 8: Support the development and diffusion of innovative adaptation practices, tools and technologies.	8. Innovative adaptation practices are rolled out, **of innovative adaptation practices, tools and** scaled up, encouraged and/or accelerated at regional, **technologies** national and/or subnational level.	2,374,910

Project Outcome(s)	Project Outcome Indicator(s)	Fund Output	Fund Output Indicator	Grant Amount (USD)
1. Enhanced capacities of national and sub-national government institutions, communities and vulnerable groups to manage natural resources (focused on water and land) and respond to climate change risks in the Tuban Delta efficiently, sustainably and in a resilient way	Capacity of national and sub-national government staff to plan for the management of natural resources and respond to climate change is increased: No. of public staff targeted - Total - Female *sector: multi-sector Operational laboratories Climate change and gender/social inclusion priorities are integrated into natural resources management plan	Output 2.1: Strengthened capacity of national and sub-national centers and networks to respond rapidly to extreme weather events. Output 7: Improved integration of climate-resilience strategies into country development plans~~Improved integration of climate-resilience~~	2.1.1. No. of staff trained to respond to, and mitigate impacts of, climate-related events (by gender) 7.2. No. of targeted development strategies with incorporated climate change priorities enforced	488,520~~910.960~~ 422,440
2. Increased adaptive capacity of the water sector through rehabilitation and protection of irrigation systems in the Tuban Delta	Assets produced, developed, improved or strengthened Length of irrigation canals improved to withstand climate change and variability-induced stress Sector: water management	Output 4: Vulnerable development sector services and infrastructure 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 sector and scale)	3,386,06~~67~~
3. Increased innovative, efficient, sustainable and climate change resilient practices to improve the water supply systems for urban and agriculture purposes.	Innovations adaptation practices are rolled-out and encouraged at national and / or subnational level through: Demonstration visits	Output 8: Viable innovations are rolled out, scaled up, encouraged and/or accelerated.	8.1. No. of innovative adaptation practices, tools and technologies accelerated, scaled-up and/or replicated.	2.374.910
4. Improved ownership and capacities at local level to respond to climate change, including to operate, maintain and replicate resilient water and irrigation systems.	No. of technical committees / associations transferring climate change adaptation knowledge, incl. plans Female-headed	Output 3.2: Strengthened capacity of national and subnational stakeholders and entities to capture and disseminate knowledge and learning.	3.2.1 No. of technical committees/associations formed to ensure transfer of knowledge.	1.668.121

Table 35. Project's Alignment with AF's Result Framework

A summary of how the project outputs map to the Results Framework of the Adaptation Fund is provided below:

Adaptation Fund Output 2.1: Strengthened capacity of national and sub-national centers and networks to respond rapidly to extreme weather events.

- **Project Outcome 1:** Enhanced capacities of national and sub-national government institutions, communities and vulnerable groups to manage natural resources (focused on water and land) and respond to climate change risks in the Tuban Delta efficiently, sustainably and in a resilient way
- **Project Output 1.1:** Government capacity strengthened at national and sub-national level on increasing climate change resilience and effective water management
- **Project Output 1.2:** Establishment of laboratory for wastewater quality testing and water supply quality testing

Adaptation Fund Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level

- **Project Output 4.4:** Skills development with women and youth on water management and climate change adaptation
- **Project Output 4.5:** Capacity development for communities with a focus on women and youth civil society organizations on integrated and inclusive natural resource management plans
- **Project Output 4.6:** Awareness raising with local communities on water conservation and climate change in Aden and the Tuban Delta

Adaptation Fund Output 3.2: Strengthened capacity of national and subnational stakeholders and entities to capture and disseminate knowledge and learning.

- **Project Output 2.1:** Assessment and verification / technical specification and engineering studies, including surveys required for improved irrigation canals and water intake systems

- **Project Output 3.1:** Assessment and verification / technical specification and engineering studies, including surveys required, for water supply alternatives options outlined below

Adaptation Fund Output 4: Vulnerable development sector services and infrastructure assets strengthened in response to climate change impacts, including variability.

- **Project Output 2.2:** Rehabilitated irrigation canals to improve water access for agricultural purposes in the Tuban
- **Project Output 2.3**: Improved water intake structures to increase water supply in the irrigation canals
- **Project Output 2.4:** Stone-gabions constructed to reinforce canals and protect agriculture lands and Al-what city from flashing floods.

Adaptation Fund Output 5: Vulnerable ecosystem services and natural resource assets strengthened in response to climate change impacts, including variability

- **Project Output 3.2:** Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah, Saber cities and surrounding villages

Adaptation Fund Output 7: Improved integration of climate-resilience strategies into country development plans

- **Project Output 1.3:** Integrated and inclusive natural resource (focused on water and land) and climate change risk management process and plan

Adaptation Fund Output 8: Viable innovations are rolled out, scaled up, encouraged and/or accelerated.

- **Project Output 3.3:** Upgrade Tahror WWTP to treat wastewater for use in irrigation
- **Project Output 3.4:** Upgrade Saber WWTP to treat wastewater for use in irrigation
- **Project Output 4.1:** Support farmers with modern irrigation techniques and systems (Urban and Rural Areas)

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

G. DETAILED BUDGET

Project Components	Expected Concrete Outputs	Expected Concrete Outcomes	TOTAL	Year 1 12 m	Year 2 12 m	Year 3 12 m	Year 4 6 m	% total
1. Integrated and inclusive natural resource management for climate-resilient water systems	1.1.Government capacity strengthened at national and sub-national level on increasing climate change resilience and effective water management	1. Enhanced capacities of national and sub-national government institutions, communities and vulnerable groups to manage natural resources (focused on water and land) and respond to coastal CC risks in the Tuban Delta efficiently, sustainably and in a resilient way	188.800	52.640	62.640	59.760	13.760	1,9%
	1.2 Establishment of laboratory for wastewater quality testing and water supply quality testing		299.720	299.720	-	-	-	3,0%
	1.3 Integrated and inclusive natural resource (focused on water and land) and climate change risk management process and plan		422.440	123.332	165.332	96.888	36.888	4,2%
	TOTAL		**910.960**	475.692	227.972	156.648	50.648	9,1%
2. Increased adaptive capacity of the water sector	2.1 Assessment and verification / technical specification and engineering studies, including surveys required for improved irrigation canals and water intake systems	2. Increased adaptive capacity of the water sector through rehabilitation and protection of irrigation systems in the Tuban Delta	60.000	60.000	-	-	-	0,6%
	2.2 Rehabilitated irrigation canals to improve water access for agricultural purposes in the Tuban		1.665.216	-	1.665.216	-	-	16,7%
	2.3 Improved water intake structures to increase water supply in the irrigation canals		88.500	-	88.500	-	-	0,9%
	2.4 Stone-gabions constructed to reinforce canals and protect agriculture lands and Al-what city from flashing floods.		1.572.350	-	1.572.350	-	-	15,7%
	TOTAL		**3.386.066**	60.000	3.326.066	-	-	33,9%
3. Innovative adaptation practices for water supply systems	3.1 Assessment and verification / technical specification and engineering studies, including surveys required, for water supply alternatives options outlined below	3. Increased innovative, efficient, sustainable and climate change resilient practices to improve the water supply systems for urban and agriculture purposes	45.000	45.000	-	-	-	0,5%
	3.2 Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah, Saber cities and surrounding villages		1.569.400	-	1.569.400	-	-	15,7%
	3.3 Upgrade Tahror WWTP to treat wastewater for use in irrigation		400.020	50.000	350.020	-	-	4,0%
	3.4 Upgrade Saber WWTP to treat wastewater for use in irrigation		360.490	-	360.490	-	-	3,6%
	TOTAL		**2.374.910**	95.000	2.279.910	-	-	23,8%
4. Improved ownership and capacities at local level to respond to climate change	4.1 Support farmers with modern irrigation techniques and systems (Urban and Rural Areas)	4. Improved ownership and capacities at local level to respond to climate change, including to operate, maintain and replicate resilient water and irrigation systems	854.721	20.000	834.721	-	-	8,5%
	4.2 Develop maintenance plans for canals, irrigation system		155.760	-	53.504	79.880	22.376	1,6%
	4.3 Strengthen water user associations for improved monitoring, maintenance and dissemination of information on irrigation techniques and skills development		292.640	69.392	113.856	109.392	-	2,9%

	4.4 Skills development with women and youth on water management and climate change adaptation		141.600	42.480	52.640	46.480	-	1,4%
	4.5 Capacity development for communities with a focus on women and youth civil society organizations on integrated natural resource management plans		94.400	41.760	37.760	14.880	-	0,9%
	4.6 Awareness raising with local communities on water conservation and climate change in Aden and the Tuban Delta		129.000	28.700	48.700	39.800	11.800	1,3%
	TOTAL		**1.668.121**	202.332	1.141.181	290.432	34.176	16,7%
Sub-total Project Components Costs			**8.340.057**	833.024	6.975.129	447.080	84.824	83,4%
Project Execution Costs	Consultants		611.520	195.120	184.920	144.120	87.360	
	Tavel		20.706	5.916	5.916	5.916	2.958	
	Operations		178.200	61.200	41.200	41.200	34.600	
	audit		15.000				15.000	
	Terminal evaluation		50.000				50.000	
Sub-total Project Execution Fee		9,50%	**875.426**	262.236	232.036	191.236	189.918	8,8%
SUB-TOTAL Component + execution fee			**9.215.483**	1.095.260	7.207.165	638.316	274.742	92,2%
Project Cycle Management Fee	UN-H ROAS Project Support Costs	1,40%	128.777	15.305	100.713	8.920	3.839	
	UN-H HQ Project Support Costs	7,10%	654.299	77.763	511.709	45.320	19.507	
Sub-total Project Cycle Managament Fee		8,50%	**783.077**	93.069	612.422	54.240	23.346	7,8%
Amount of Financing Requested			**9.998.560**	**1.188.329**	**7.819.587**	**692.556**	**298.088**	**100,0%**

Table 33~~30~~ Budget notes

Component	Output	Activities	Notes / Staff	%	TOTAL	Year 1	Year 2	Year 3	Year 4		No.	Unit	Rate USD	Year 1	Year 2	Year 3	Year 4	T
														12	12	12	6	42
Project component 1																		
1. Integrated and inclusive natural resource management for climate-resilient water systems	1.1.Government capacity strengthened at national and sub-national level on increasing climate change resilience and effective water management	Trainings	16 trainings with 25 participants each		**80.000**	20.000	30.000	30.000	-		1	no	5.000	4	6	6		**16**
		Workshops	20 workshops with 25 people each		**80.000**	24.000	24.000	24.000	8.000		1	no	4.000	6	6	6	2	**20**
		Technical support	Expertise needed to implement above		**28.800**	8.640	8.640	5.760	5.760		1	Item	28.800	0,3	0,3	0,2	0,2	**1**
	Sub-total				**188.800**	**52.640**	**62.640**	**59.760**	**13.760**									
	1.2. Establishment of laboratory for	Establish 1 lab	For wastewater quality testing at LWSC-Lahj (Instruments, tools		**141.000**	141.000	-	-	-		1	Item	141.000	1				**1**

	wastewater quality testing and water supply quality testing		and furnisher). Time needed: 16 months															
		Establish 1 lab	For water supply quality testing at LWSC-Lahj (Instruments, tools and furnisher). Time needed: 16 months		**113.000**	113.000	-	-	-		1	Item	113.000	1				**1**
		Technical support	Expertise needed to implement above		**45.720**	45.720	-	-	-		1	Item	45.720	1				**1**
	Sub-total				**299.720**	**299.720**	**-**	**-**	**-**									
	1.3.Integrated and inclusive natural resource (focused on water and land) and climate change risk management process and plan	Field workshops	57 workshops with 20 participants each (Water Users Associations, community organisations, women's and youth groups in Tuban Delta		**114.000**	20.000	54.000	40.000	-		1	no	2.000	10	27	20		**57**
		Workshops	13 workshops with 20 participants each		**52.000**	12.000	20.000	20.000	-		1	no	4.000	3	5	5		**13**
		Technical expert (international)	International expert on climate change adaptation and water resource management		**128.000**	48.000	48.000	16.000	16.000		1	Months	8.000	6	6	2	2	**16**
		Technical expert (national)	National Expert on climate change adaptation and water resource management		**64.000**	24.000	24.000	8.000	8.000		1	Months	4.000	6	6	2	2	**16**
		Technical support	Expertise needed to implement above		**64.440**	19.332	19.332	12.888	12.888		1	Item	64.440	0,3	0,3	0,2	0,2	**1**
	Sub-total				**422.440**	**123.332**	**165.332**	**96.888**	**36.888**									
TOTAL Component 1				**9,1%**	**910.960**	**475.692**	**227.972**	**156.648**	**50.648**									
Project component 2																		
2. Increased adaptive capacity of the water sector	2.1. Assessment and verification / technical specification and engineering studies, including	Technical study for output 2.2.	Detailed engineering study and tender documents for the project, incl. technical specifications		**20.000**	20.000	-	-	-		1	no	20.000	1				**1**
		Technical study for output 2.3.	Detailed engineering study and tender documents for the project, incl.		**20.000**	20.000	-	-	-		1	no	20.000	1				**1**

	surveys required for improved irrigation canals and water intake systems		technical specifications															
		Technical study for output 2.4.	Detailed engineering study and tender documents for the project, incl. technical specifications		**20.000**	20.000	-	-	-		1	no	20.000	1				**1**
	Sub-total				**60.000**	**60.000**	**-**	**-**	**-**									
	2.2. Rehabilitated Irrigation canals to improve water access for agricultural purposes in the Tuban	Concrete works for canal intake structure, diversions, small box culvert and protection works.	Unit: m3; quantity: 2135; unit cost: UDS500; time needed: 18 months		**1.067.500**	-	1.067.500	-	-		1	m3	500		2135			**2135**
		Supply and install lifting system + steel gates for intakes of main canals and diversions.	Unit: no; quantity: 35 (13 locations); unit cost: UDS2.500; time needed: 12 months		**87.500**	-	87.500	-	-		1	no	2.500		35			**35**
		Repair and maintenance of the lifting system and steel gates and steel handrails over the intakes of canals.	Unit: no; quantity: 20; unit cost: UDS1.800; time needed: 12 months		**36.000**	-	36.000	-	-		1	no	1.800		20			**20**
		Removal of deposited soil from canal intake structure and along the canal and earth works	Unit: m3; quantity: 73400; unit cost: UDS3; time needed: 12 months		**220.200**	-	220.200	-	-		1	m3	3		73400			**73400**
		Technical support	Expertise needed to implement above		**254.016**	-	254.016	-	-		1	Item	254.016		1			**1**
	Sub-total				**1.665.216**	**-**	**1.665.216**	**-**	**-**									
	2.3. Improved water intake structures to increase water supply in the irrigation canals	Construct, supply and install automatic wadi flow gauging station at Dukeim (old stream gauging station)	Unit: BoQ; quantity: 1; unit cost: USD75.000; time needed: 9 months		**75.000**	-	75.000	-	-		1	BoQ	75.000		1			**1**
		Technical support	Expertise needed to implement above		**13.500**	-	13.500	-	-		1	item	13.500		1			**1**
	Sub-total				**88.500**	**-**	**88.500**	**-**	**-**									
	2.4. Stone-gabions constructed to reinforce canals and	Construction of stone-gabions works for protection of irrigation canals, agriculture lands	Unit: m3: quantity: 20.500; unit cost: UDS50; time needed: 18 months.		**1.332.500**	-	1.332.500	-	-		1	m3	65		20500			**20500**

	protect agriculture lands and Al-what city from flashing floods	and Al-what city from flashing floods.	Includes hybrid option with greening															
		Technical support	Expertise needed to implement above		**239.850**	-	239.850	-	-		1	Item	239.850		1			**1**
	Sub-total				**1.572.350**	**-**	**1.572.350**	**-**	**-**									
TOTAL Component 2				**33,9 %**	**3.386.066**	**60.000**	**3.326.066**	**-**	**-**									
Project component 3																		
3. Innovative adaptation practices for water supply systems	3.1. Assessment and verification / technical specification and engineering studies, including surveys required, for water supply alternatives options outlined below	Technical study for output 3.2.	Detailed engineering study and tender documents for the project, incl. technical specifications		**15.000**	15.000	-	-	-		1	Item	15.000	1				**1**
		Technical study for output 3.3.	Detailed engineering study and tender documents for the project, incl. technical specifications		**15.000**	15.000	-	-	-		1	Item	15.000	1				**1**
		Technical study for output 3.4.	Detailed engineering study and tender documents for the project, incl. technical specifications		**15.000**	15.000	-	-	-		1	Item	15.000	1				**1**
					-	-	-	-	-									**0**
	Sub-total				**45.000**	**45.000**	**-**	**-**	**-**									
	3.2. Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah, Saber cities and surrounding villages	Rehabilitation of buildings and accessories of the pumping station for Al-Waht City.	Unit: BoQ; quantity:3; unit cost: USD55.000; time needed: 12 months		**165.000**	-	165.000	-	-		1	BoQ	55.000		3			**3**
		Construction of Ground Tank made of RCC/stone masonry with capacity of 2000 m3, including the pipings and pups and solar energy	Unit: no; quantity:4; unit cost: USD200 per m2; capacity of 1000m3; time needed: 12 months		**800.000**	-	800.000	-	-		1	no	200.000		4			**4**
		Supply and install seven vertical pumping units for re-pumping station (Magrs nagy wellfield to Al-Hwtah) with all	Unit: no; quantity:7; unit cost: USD45.000; time needed: 6 months		**315.000**	-	315.000	-	-		1	no	45.000		7			**7**

		required accessories																
		Supply and install PV system (33 KwH)	Unit: BoQ: 100 solar panels (550 watt each). All inclusive installation cost/panel: USD500); time needed: 6 months		**50.000**	-	50.000	-	-		1	BoQ	500		100			**100**
		Technical support	Expertise needed to implement above		**239.400**	-	239.400	-	-		1	Item	239.400		1			**1**
	Sub-total		**.**		**1.569.400**	**-**	**1.569.400**	**-**	**-**									
	3.3. Upgrade Tahror WWTP to treat wastewater for use in irrigation	Remove the sludge and trees from the ponds and the plant.	Unit: m3; quantity:10.000; unit cost: USD5; time needed: 6 months		**50.000**	50.000	-		-		1	m3	5	10.000				**10000**
		Install flow measuring device at the inlet chanel to the plant.	Unit: no; quantity:1; unit cost: USD5.000; time needed: 6 months		**5.000**	-	5.000		-		1	no	5.000		1			**1**
		Supply emergency pumping unit	Unit: no; quantity:1; unit cost: USD15.000; time needed: 6 months		**15.000**	-	15.000		-		1	no	15.000		1			**1**
		Supply and Install steel coated mesh fence around the plant including concrete foundation, steel columns and main steel door.	Unit: ml; quantity: 600; unit cost: USD65; time needed: 6 months		**39.000**	-	39.000		-		1	ml	65		600			**600**
		Construction of Ground Tank made of RCC/stone masonry with capacity of 1000 m3	Unit: no; quantity: 1; unit cost: USD200 per m2; capacity: 1000m3; time needed: 6 months		**200.000**	-	200.000	-	-		1	no	200.000		1			**1**
		Connection pipes and irrigation channels	Unit: no; quantity: 1; unit cost: USD30.000; time needed: 6 months		**30.000**	-	30.000		-		1	no	30.000		1			**1**
		Technical support	Expertise needed to implement above		**61.020**	-	61.020		-		1	Item	61.020		1			**1**
	Sub-total		**.**		**400.020**	**50.000**	**350.020**	**-**	**-**									
	3.4. Upgrade Saber WWTP to treat wastewater for use in irrigation	Install flow measuring device at the inlet chnnel to the plant.	Unit: no; quantity:1; unit cost: USD5.000; time needed: 3 months		**5.000**	-	5.000		-		1	no	5.000		1			**1**
		Supply emergency pumping unit	Unit: no; quantity:1; unit cost:		**15.000**	-	15.000		-		1	no	15.000		1			**1**

			USD15.000; time needed: 6 months															
		Supply and Install discharge pipe	Unit: ml; quantity: 700; unit cost: USD65; time needed: 6 months		**45.500**	-	45.500		-		1	ml	65		700			**700**
		Rehabilitate guard room	Unit: BoQ; quantity:1; unit cost: USD4.000; time needed: 6 months		**4.000**	-	4.000		-		1	BoQ	4.000		1			**1**
		Rehabilitate pumping house.	Unit: BoQ; quantity:1; unit cost: USD6.000; time needed: 6 months		**6.000**	-	6.000		-		1	BoQ	6.000		1			**1**
		Construction of Ground Tank made of RCC/stone masonry with capacity of 1000 m3	Unit: no; quantity: 1; unit cost: USD200 per m2; capacity: 1000m3; time needed: 6 months		**200.000**	-	200.000	-	-		1	no	200.000		1			**1**
		Connection pipes and irrigation channels	Unit: no; quantity: 1; unit cost: USD30.000; time needed: 6 months		**30.000**	-	30.000		-		1	no	30.000		1			**1**
		Technical support	Expertise needed to implement above		**54.990**	-	54.990		-		1	Item	54.990		1			**1**
	Sub-total		**.**		**360.490**	**-**	**360.490**	**-**	**-**									
TOTAL Component 3				**23,8 %**	**2.374.910**	**95.000**	**2.279.910**	**-**	**-**									
Project component 4																		
4. Improved ownership and capacities at local level to respond to climate change	4.1 Support farmers' with modern irrigation techniques and system (Urban and Rural Areas) (Agriculture and Irrigation Office - Lahj)	Support farmers' with modern irrigation techniques and system (Urban and Rural Areas) using bubbler irrigation techniques	Unit: ha; quantity: 117; unit cost: USD6.020; includes 'horizontal' solar pumps. time needed: 24 months		**704.340**	-	704.340	-	-		1	ha	6.020		117			**117**
		Technical study	Detailed engineering study and tender documents for the project, incl. technical specifications		**20.000**	20.000						item	20.000	1				**1**
		Technical support	Expertise needed to implement above		**130.381**	-	130.381	-	-		1	Item	130.381		1			**1**
	Sub-total				**854.721**	**20.000**	**834.721**	**-**	**-**									
	4.2 Develop maintenance plans for	Workshops	10 workshops with 25 people each		**40.000**	-	20.000	20.000	-		1	no	4.000		5	5		**10**

	canals, irrigation system and wastewater treatment plants and KM of all components	Technical expert (national)	National Expert on maintenance of canal and irrigations systems		**72.000**	-	24.000	48.000	-		1	Months	4.000		6	12		**18**
		Guidelines and knowledge management materials	Guidelines for on-going maintenance of canal and irrigation systems		**20.000**	-			20.000			item	20.000				1	
		Technical support	Expertise needed to implement above		**23.760**	-	9.504	11.880	2.376		1	Item	23.760		0,4	0,5	0,1	**1**
	Sub-total				**155.760**	**-**	**53.504**	**79.880**	**22.376**									
	4.3 Strengthen water users associations for improved monitoring, maintenance and dissemination of information on irrigation techniques and skills development	Trainings	22 trainings for Water Users Associations		**88.000**	16.000	36.000	36.000	-		1	no	4.000	4	9	9		**22**
		Workshops	22 workshops		**88.000**	16.000	36.000	36.000	-		1	no	4.000	4	9	9		**22**
		Technical expert (national)	National Expert with expertise on climate-resilient irrigation techniques and skills development		**72.000**	24.000	24.000	24.000	-		1	Months	4.000	6	6	6		**18**
		Technical support	Expertise needed to implement above		**44.640**	13.392	17.856	13.392	-		1	Item	44.640	0,3	0,4	0,3		**1**
	Sub-total				**292.640**	**69.392**	**113.856**	**109.392**	**-**									
	4.4 Skills development with women and youth on water management and climate change adaptation	Trainings	20 trainings for 25 people each		**80.000**	24.000	28.000	28.000	-		1	no	4.000	6	7	7		**20**
		Workshops	10 workshops with 25 people each		**40.000**	12.000	16.000	12.000	-		1	no	4.000	3	4	3		**10**
		Technical support	Expertise needed to implement above		**21.600**	6.480	8.640	6.480	-		1	Item	21.600	0,3	0,4	0,3		**1**
	Sub-total				**141.600**	**42.480**	**52.640**	**46.480**	**-**									
	4.5 Capacity development for communities with a focus on women and youth civil society organizations on integrated and inclusive natural resource	Trainings	10 trainings for 25 people each		**40.000**	20.000	20.000	-	-		1	no	4.000	5	5			**10**
		Workshops	10 workshops with 25 people each		**40.000**	16.000	12.000	12.000	-		1	no	4.000	4	3	3		**10**
		Technical support	Expertise needed to implement above		**14.400**	5.760	5.760	2.880	-		1	Item	14.400	0,4	0,4	0,2		**1**

	management plans																	
	Sub-total				**94.400**	**41.760**	**37.760**	**14.880**	**-**									
	4.6 Awareness raising with local communities on water conservation and climate change in Aden and the Tuban Delta	Communications material	10 communications products		**50.000**	10.000	20.000	20.000	-		10	no	5.000	2	4	4		**10**
		Field visits	3 Field visits for awareness raising with local communities		**30.000**	-	10.000	10.000	10.000		1	no	10.000		1	1	1	**3**
		Technical expert (national)	Communications consultant to develop strategy and communications products		**40.000**	16.000	16.000	8.000			1	Months	4.000	4	4	2		**10**
		Technical support	Expertise needed to implement above		**9.000**	2.700	2.700	1.800	1.800		1	Item	9.000	0,3	0,3	0,2	0,2	**1**
	Sub-total				**129.000**	**28.700**	**48.700**	**39.800**	**11.800**									
TOTAL Component 4				**16,7 %**	**1.668.121**	**202.332**	**1.141.181**	**290.432**	**34.176**									
TOTAL Components				83%	8.340.057	833.024	6.975.129	447.080	84.824									
Project execution costs																		
Project execution		Project team	Project execution supervisor (climate change; safeguards/ESMP, etc. (international)	50%	**214.200**	81.600	71.400	30.600	30.600		1	Month	10.200	8	7	3	3	**21**
			Project coordinator(s) (national)	100 %	**172.200**	49.200	49.200	49.200	24.600		1	Month	4.100	12	12	12	6	**42**
			Project admin / finance (national)	100 %	**126.000**	36.000	36.000	36.000	18.000		1	Month	3.000	12	12	12	6	**42**
			Project monitoring	50%	**99.120**	28.320	28.320	28.320	14.160		1	Month	4.720	6	6	6	3	**21**
		Travel	International travel		**20.706**	5.916	5.916	5.916	2.958		1	Mission	2.958	2	2	2	1	**7**
		Operations in Yemen	Inception and completion workshops		**8.000**	4.000	-	-	4.000		1	workshop	4.000	1			1	**2**
			Project execution meetings		**14.000**	4.000	4.000	4.000	2.000		1	Meeting	1.000	4	4	4	2	**14**
			Office Rental Cost in Aden	25%	**46.200**	13.200	13.200	13.200	6.600		1	Month	4.400	3	3	3	1,5	**10,5**

		Office security costs in Aden	25%	**21.000**	6.000	6.000	6.000	3.000		1	Month	2.000	3	3	3	1,5	**10,5**
		Common Services Cost Share	25%	**15.750**	4.500	4.500	4.500	2.250		1	Month	1.500	3	3	3	1,5	**10,5**
		Communication and knowledge management (inc. pre- and post-project video)		**20.000**	10.000	-	-	10.000		1	Item	10.000	1			1	**2**
		Vehicle rental and transportation for project only	100 %	**31.500**	9.000	9.000	9.000	4.500		1	Month	750	12	12	12	6	
		Office Operating Costs	25%	**15.750**	4.500	4.500	4.500	2.250		1	Month	1.500	3	3	3	1,5	**10,5**
		Equipment (computers)		**6.000**	6.000	-	-	-		1	Per item	2.000	3	0	0	0	**3**
	Audits	Audits		**15.000**	-	-	-	15.000		1	Item	15.000				1	**1**
	Terminal evaluation	Independent (lump sum)		**50.000**	-	-	-	50.000		1	Item	50.000				1	**1**
TOTAL Execution costs	**9,50%**		**8,8%**	**875.426**	**262.236**	**232.036**	**191.236**	**189.918**									
TOTAL Project costs				**9.215.483**	**1.095.260**	**7.207.165**	**638.316**	**274.742**									
				100,00%	11,88%	78,21%	6,93%	2,98%									
Project cycle management fee costs																	
Project cycle management	**1,25%**	UN-H ROAS Project oversight (P4)	2%	**20.580**	2.446	16.095	1.425	614		1	Month	24.500	0,1	0,7	0,1	0,0	**0,8**
		UN-H ROAS PMO	3%	**17.136**	2.037	13.402	1.187	511		1	Month	13.600	0,1	1,0	0,1	0,0	**1,3**
		UN-H ROAS PMA	30%	**77.238**	9.180	60.406	5.350	2.303		1	Month	6.130,00	1,5	9,9	0,9	0,4	**12,6**
		Total		**114.954**	13.662	89.902	7.962	3.427									
	0,15%	UN-H ROAS M & E (esp ESP and GP), incl. Travel	0.15 %	**13.823**	1.643	10.811	957	412									
	7,1%	UN-H HQ PSC - Overall project supervision, incl .compliance to UN-H and AF policies (gender, human rights, climate change, etc.).	7,1%	654.299	77.763	511.709	45.320	19.507									
TOTAL management fee	**8,50%**		**7,8%**	783.077	93.069	612.422	54.240	23.346									

TOTAL amount of financing requested			**9.998.560**	**1.188.329**	**7.819.587**	**692.556**	**298.088**									

Table 36. Project's Detailed Budget

Type of M & E Activity	Activity	Entity	Row	Total	Yea 1	Year 2	Year 3	Year 4
Measurements of means of verification (baseline assessment and M & E plans) as part of inception	Inception and conmpletion workshops	UN-H		**8.000**	4.000			4000
	Reports preparation and EE compliance to AF ESP and GP	UN-H		-	See overall project monitoring and evaluation from cycle management fee			
Direct Project Monitoring and Quality Assurance including annual progress and financial reporting, project revisions, technical assistance and ESP and GP compliance (from execution fee M & E and safeguards)	M & E	UN-H		**99.120**	28.320	28.320	28.320	14.160
Overall project monitoring and evaluation (from cycle management fee)				**13.823**	1.643	10.811	957	412
Audits	In line with AF requirements			**15.000**				15.000
Terminal external evaluation		Independent		**50.000**				40.000
Total				**175.943**	**33.963**	**39.131**	**29.277**	**73.572**
From Project Execution fee (incl. safeguards, M & E, audits and terminal evaluation)				**162.120**	32.320	28.320	28.320	73.160
From Project Cycle Management fee				**13.823**	1.643	10.811	957	412

Table 34 M & E budget

H. DISBURSEMENT SCHEDULE

	Year 1	Year 2	Year 3	Year 4
Schedule	1st disbursement	2nd disbursement – One year after project inception	3rd disbursement – Two years after project inception	4th disbursement – Three years after project inception
Milestones	Upon agreement signature	Upon finalization of First Annual Report & financial report indicating disbursement of at least 70% of funds from the 1st year	Upon finalization of Second Annual Report & financial report indicating disbursement of at least 70% of funds from the 2nd year	Upon finalization of Third Annual Report & financial report indicating disbursement of at least 70% of funds from the 3rd year

Tranche	1	2	3	4	5	Total
Project funds	833,024	6,975,129	447,080	84,824		8,340,057
Execution cost	262,236	232,036	191,236	189,918		875,426
Sub-total	1,095,260	7,207,165	638,316	274,742	0	9,215,483
IE fee	93,069	612,422	54,240	23,346		783,077
Total	1,188,329	7,819,587	692,556	298,088	0	9,998,560

	~~Upon Signing~~	~~One Year after project inception~~	~~Two years after project inception~~	~~Three years after project inception~~
~~A. Project Funds (US$)~~	~~833.024~~	~~6.975.129~~	~~447.080~~	~~84.824~~
~~B. Programme Execution (US$)~~	~~262.236~~	~~232.036~~	~~191.236~~	~~189.918~~
~~C. Programme Cycle Mgmt (US$)~~	~~93.069~~	~~612.422~~	~~54.240~~	~~23.346~~
~~TOTAL (US$)~~	~~1.188.329~~	~~7.819.587~~	~~692.556~~	~~298.088~~

Table 3531. Project's Fund Disbursement Schedule

Formatted: Centered

Formatted: Font: (Default) Times New Roman, 11 pt, Bold, Font color: Background 1, English (Malaysia)

Formatted: Normal, Space After: 0 pt

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

A. Record of endorsement on behalf of the government[2]

Mr. AbdulWahid Omar Arman AF Designated Authority Ministry of Environment and Water	Date*: (30 June 2024)*

Republic of Yemen
Ministry of Water & Environment

الجمهورية اليمنية
وزارة المياه والبيئة

الرقم:

التاريخ:

Letter of Endorsement by government

06.30.2024

To: Adaptation Fund Boerd
c/ Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Subject: Endorsement for the project 'Increase climate change resilience to water scarcity and flooding in the Tuban Delta.'

In my capacity as the designated authority for the Adaptation Fund in Yemen, I confirm that the above single-country project proposal is in accordance with the government's priorities, especially those in the INDC, TNA, and TNC. It directly addresses the critical need to reduce the adverse impacts and risks posed by climate change in the Tuban Delta.

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by UN-Habitat. Execution entities include the Ministry of Water and Environment (MWE), and other execution entities that will be identified through a tendering as part of the procurement process.

Sincerely,

Mr. AbdulWahid Omar Arman

AF Designated Authority
Ministry of Water and Environment

Yemen – Aden www.mwe-ye.org E-mail: mwe@mwe-ye.org

B. Implementing Entity certification

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 (including the INDC, TNA and TNC) and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.	
 Rafael Tuts, Director, Global Solutions Division Implementing Entity Coordinator	
Date: 07/19/2024	Tel. and email: +254-713-601278; raf.tuts@un.org
Project Contact Person: Muslim Qazimi; Joris Oele	
Tel. And Email: muslim.qazimi@un.org Joris.oele@un.org	

ANNEXES

ANNEX 1: CLIMATE CHANGE VULNERABILITY ASSESSMENT REPORT FOR THE TUBAN DELTA, YEMEN

Project Introduction and Vulnerability Assessment Summary

This study was completed as part of the Green Climate Fund (GCF) Readiness project 'Strengthen the capacities of sub-national authorities and key actors in the water sector to adapt to climate change in the Tuban delta'. The project is implemented by the United Nations Human Settlement Programme (UN-Habitat) in coordination with the Environmental Protection Authority (EPA) of Yemen, through Mr. Abdulwahid Arman and many national and international stakeholders. The goal of the project is to enable the government of Yemen, and especially target sub-national authorities, to respond to climate change in the Tuban delta. This Climate Change Vulnerability Assessment (CCVA) alongside the hydrology study, also prepared for this project, are the basis for identifying adaptation options for the water sector. Further to this, the project will develop concept notes to access funding for the strategic investment priorities identified in this process.

The CCVA was developed based on the inputs from workshops, field research, focus groups and interviews, the review of related studies and the hydrology study. The focus on the climate change impacts related to water security and flooding and the division of the Tuban Delta into three regions was the result of a workshop held in December 2022 to plan to work. The climate change vulnerability assessment focuses on two key climate change impacts related to water for the Tuban Delta, Yemen: Water Security and Flooding. The table below shows the relationship between climate change drivers, hazards and these two key impacts.

Climate change driver / stressor	Climate change hazard	Impacts / issues
Reduced precipitation	Droughts	Water scarcity (including due to saltwater intrusion) leading to agriculture production issues, lack of clean drinking water, etc.
Increasing temperatures	Heat (wave)	
Increased precipitation	Floods (river and flash)	Flooding (flash, river, coastal) affecting people and critical infrastructure
Sea-level rise	Coastal flooding, erosion, and saltwater intrusion	

Table 1: Relationship Between Climate Change Drivers and Climate Change Hazard With Associated Impact

Vulnerability was assessed as a function of exposure, sensitivity and adaptive capacity to the hazards identified, utilizing qualitative and quantitative indicators. The vulnerability assessment focused on vulnerable assets (both economic and physical), vulnerable groups of people, and vulnerable ecosystems, in order to capture the social, economic and environmental aspects of vulnerability.

Exposure indicators measure the number of people and assets at risk to the impact, for flooding this includes infrastructure assets and ecosystems as well as people; whereas for water security it focuses on agricultural land and people. The sensitivity indicators are more qualitative and try to assess who or what is most vulnerable. For floods, this includes people living in IDP camps and informal settlements as well as whether the infrastructure is critical at a regional or local level. For water security, the sensitivity indicators look at the types of crops being utilized and how drought resistant they are and the percentage of the population engaged in farming.

For adaptive capacity, there were two indicators which were the same across flooding and water security which was about existence of relevant management plans for water, climate change and/or land use and access to financial assistance for men and women. There was one adaptive capacity specifically for water security which was the use of modern irrigation methods and for flooding, the indicator was knowledge of climate change among local officials. The following table summarizes the vulnerability for water security and flooding, the two hydrological climate change impacts assessed for the three regions.

	Upper Region	Middle Region	Lower Region
Water Security	Medium-High	High	High
Flooding	Medium	Medium-High	High

Table 2: Water Security and Flooding Vulnerability in Target Areas

The Lower Region has high vulnerability to both water security and flooding which is largely due to the higher number of people and assets exposed and sensitive to these hazards as well as the added hazard of sea-level rise which affects flooding and water security but only in the Lower Region. The Middle Region has a high vulnerability to water security due in large part to the large agricultural production in the area and a medium-high vulnerability to flooding as it has less assets and people exposed to flooding yet there remain sensitivities and a lack of adaptive capacity. The Upper Region, due at least in part to less assets and people only has a medium level of vulnerability, however due to the reliance on agriculture for livelihoods, there is a medium-high vulnerability for water security.

Climate Change Vulnerability Assessment Methodology

The vulnerability and risk assessment focuses on two key climate change impacts related to water: Water Security and Flooding. The hazard assessment is based on the hydrology study completed as part of this project and the relationship of climate change indicators to hazards to impacts. The methodology was developed based on the Climate Change Vulnerability and Risk guide by UN-Habitat which has been translated into Arabic as part of this project. For water security the climate change indicators are temperature, precipitation and sea level rise which then correlate to the hazards of heat, drought and saltwater intrusion.

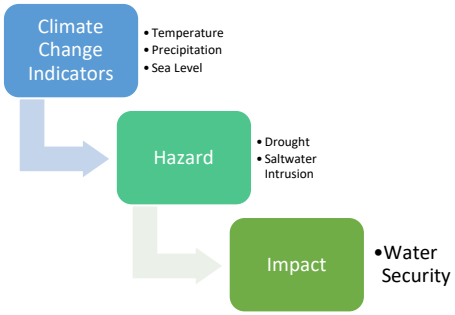


Figure1. Climate Change Indicators, Hazard and Impact for Water Security

For flooding, the climate change indicators are precipitation and sea level rise which correlates to the hazards of both coastal and inland flooding.

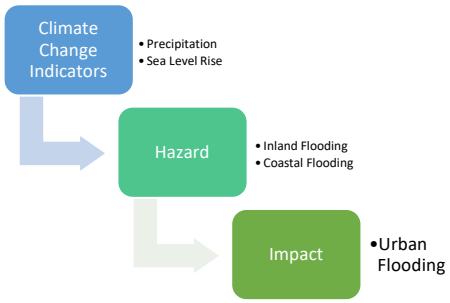


Figure 2. Climate Change indicators, hazards, and impacts for flooding

The hydrological study assessment provides a breakdown of two climate change scenarios RCP8.5 which is the highest emissions scenario and RCP 7 which is also higher emissions. The timeframes used are 2030-2040, 2041-2060, 2061-2080, 2081-2100.

For the flood risk assessment from rainfall, the high is ranked as 3, medium as 2, low as 1.

Years/regions	RCP 7			RCP 8.5		
	LR	MR	UR	LR	MR	UR
2023-2040	2	1	1	2	1	1
2041-2060	2	1	1	3	2	2
2061-2080	3	2	2	2	1	1
2081-2100	3	2	2	3	2	1

Table 3. Urban Flood Risk Assessment for Tuban Delta Based on Hydrology Study

This yields an average risk score for flooding as a result of rainfall as 2.5 for the Lower region, 1.5 for the Middle Region and 1.375 for the Upper Region. Only the Lower Region is potentially susceptible to flooding from sea level rise. It also

should be noted that the flash flood risk assessment yields higher risk for all regions after 2061 in the high emission scenario and after 2081 in the medium-high emission scenario.

How Vulnerability was assessed

Vulnerability was assessed as a function of exposure, sensitivity and adaptive capacity to the hazards identified, utilizing qualitative and quantitative indicators, based on best practice from international guidance including UN-Habitat and IPCC. The vulnerability assessment focused on vulnerable assets (both economic and physical), vulnerable groups of people, and vulnerable ecosystems, in order to capture the social, economic and environmental aspects of vulnerability.

The community profiles developed for the three regions for this project and the hydrology study provide the basis for the data for the indicators. The following indicators were used to assess vulnerability to flooding. These were selected to incorporate quantitative and qualitative aspects as well as to cover the environmental, social and economic aspects. They were also selected based on the availability of data and information and use both historical and current data and context.

Exposure (Quantitative)	Sensitivity (Qualitative)	Adaptive Capacity
Number of Infrastructure & Economic Sectors Assets	Potential for Critical Assets - infrastructure and economic sectors - to be impacted	Local Knowledge of Climate Change
Population size	Potential Vulnerable and Marginalized populations affected	Access to Financial Assistance
Number of critical Ecosystems/nature reserves	Level of Encroachment and Degradation of Critical Ecosystems	Relevant Plans (Climate Change, Land Use)

Table 4: Indicators Applied to Assess Flood Vulnerability

Each indicator was then rated on a scale of 1 to 3, using the following scoring for all of the regions.

	Exposure			Sensitivity			Adaptive Capacity		
Score	**# of Infrastructure Assets**	**# of People**	**# of critical Ecosystems**	**Infrastructure**	**People**	**Ecosystems**	**CC Knowledge**	**Plans**	**Financial Assistance**
3	>10	>500,000	>5	Critical infrastructure of regional importance at risk	People living in IDP camps; people living in informal settlements at risk; elderly; disabled; women and children	Endangered ecosystems or species	Limited	0	None
2	5 to 10	100,000 to 499,999	1 to 5	Critical infrastructure of local importance at risk	People living in informal settlements at risk; elderly; disabled; women and children	Locally important ecosystem	Medium	1	Limited i.e. primarily for men or certain groups such as farmers
1	<5	>100,000	0	No critical infrastructure at risk	Elderly; disabled; women and children		High	At least 2	Accessible to all

Table 5: Indicator Rating across Areas

After all indicators were scored, then the scores were compiled and vulnerability was assessed on the following scale:

The following vulnerability indicators were used for Water Security, based on similar parameters as outlined above for flooding.

Vulnerability Scoring

>20	High
15 to 20	Medium-High
10 to 15	Medium
5 to 10	Medium-Low
0 to 5	Low

Table 6: Vulnerability Scoring Compilation

Exposure (Quantitative)	Sensitivity (Qualitative)	Adaptive Capacity
Hectares of Agricultural Land	Types of crop	Irrigation Methods
Population size	Potential Vulnerable and Marginalized populations affected	Relevant Plans (Water Management, Climate Change)
Water Supply: Renewable Water Sources	Water differential (between supply and demand)	Access to Financial Assistance

Table 7: Vulnerability Indicators Applied for Water Security

Then the following scoring system was applied to the indicators, and the same scoring scale as flooding was utilized.

	Exposure	Sensitivity	Adaptive Capacity

Score	# of Hectares of cultivated land	# of People	Water Supply: Renewable Water Sources	Crop Types	People	Water differential (between supply and demand)	Irrigation Methods	Plans	Financial Assistance
3	>4000	>500,000	<25 MCM	Water Intensive Crops: Cotton, Vegetables	More than 33% of households not linked to water grid	Less than 0	Less than 10% Modern Irrigation	0	None
2	2500-3999	100,000 to 499,999	25 to 50 MCM	Medium Water Intensive crops: Sesame, watermelon	Between 10-33% of households not linked to water grid	0 to 20 MCM	10-25% Modern Irrigation	1	Limited i.e. primarily for men or certain groups such as farmers
1	<2500	>100,000	>50 MCM	Less water intensive crops: Sorghum, millet	Less than 10% of households not linked to water grid	>20 MCM	Over 25% modern irrigation	At least 2	Accessible to all

Table 8: Scoring System Applied to Indicators

Limitations of the extent to which other Impacts/Co-benefits were considered in the Vulnerability Assessment.

There are other impacts from climate change and hazards which may affect the Tuban Delta region, given the existing context especially Food Security, Health, marine and terrestrial ecosystem functioning, and how migration patterns may change. These were not extensively studied as this assessment focused primarily on the water sector, however positive outcomes for food security and health could be considered as important co-benefits in the selection of projects.

Community Profiles

3.1 Lower Region of the Tuban Delta

The Lower Region of the Tuban Delta includes both the Aden Governorate and the city of Aden as well as part of the Lahj Governorate south of Al Hawtah extending to where the two governorates meet. This area covers 1030 km^2 with a population of 1,133,013. Of this, there are 524,106 females and 608,906 males and the majority of people 1,082,942 are in the Aden Governorate and the remaining 50,071 in Lahj Governorate. This region is the largest in terms of land area and population of the three regions.

Information about the community is based on data provided by the Aden and Lahj governorate, through field visits and focus group discussions, interviews with key officials, GIS analysis and the Aden city profile completed by UN-Habitat in 2020. Where information is not available at the local level, estimates from the national level and/or international studies have been utilized. In some cases, the information is only available for Aden city and/or Aden Governorate.

The focus group discussions were divided into three groups: men, women and farmers. In addition, local government officials and representatives of the water user associations were interview in February 2023. They highlighted some key challenges of the population including: lack of jobs, high food prices, and health and water pollution. The farmers' group also highlighted the change in food security for farmers in the sense that they are no longer getting food from their farms to feed their families.

Figure 3. The Three Regions of the Tuban Delta and Major Streams and Elevation. UN-Habitat, 2023.

Population: The Lower Region has a total population of 1,133,013, of which 46.3% are females and 53.7% are males, as with elsewhere in the country, there are more men and boys than women and girls. The Aden Governorate portion of the Lower Region is 1,082,942 as it includes the second largest city in Yemen, Aden which is also the capital of the governorate. The Lahj Governorate in the Lower Region has just over 50,000 people living in over 50 villages ranging in size from less than 100 people to a few larger ones of around 7,000 people.

According to figures provided by the Aden Governorate, the population has grown from 589,419 in 2004 to an estimated 1,051,000 in 2021. This is almost a doubling of the population in 17 years. Yemen is a very young country although the

rural areas and smaller cities skew slightly older than the larger cities. Aden Governorate estimated that there were 485,767 youth under the age of 15 in 2021 which is about 46% of the population, unfortunately gender disaggregated figures are not available. The elderly population (people over the age of 65) of Aden Governorate was estimated at 34,892 in 2001.

There are varying figures estimating the number of disabled people in Yemen from 3% of the population according to the 2013 National Health and Demographic Survey to 14.5% or 4.8 million people according to WHO and Handicap International. Based on this, there may be almost 75,000 handicapped females and over 88,000 handicapped males, in the Lower Region. However, if we take the more conservative estimate then this would be around 15,000 and 18,000 handicapped females and males, respectively.

In terms of diseases, Aden has been affected by cholera outbreaks in 2016 and 2017 and cases of diphtheria in 2017. It was reported that there has also been an increase of malaria and diarrhea in Aden as well. Children are particularly susceptible to diarrhea and also suffering from malnutrition, respiratory tract infections and measles and dengue fever in addition to cholera. Children living in poor housing conditions, lacking water and sanitation and access to health services, such as children in displaced and refugee populations are especially vulnerable. A Nutrition and Mortality Survey in 2015 carried out in Aden governorate in August 2015 found 19.2% of children were acutely malnourished and 23.4% were underweight. [85]

Women and girls face challenges including underrepresentation in education; participation in formal labor markets; lack of legal frameworks setting the minimum age for marriage, divorce, inheritance, and child custody; and lack of maternal healthcare.[86] The women's focus group for this project also highlighted that women are marginalized because they are not involved in decision-making.

In terms of ethnic minorities or marginalized groups, the Muhamasheen community who suffer from caste-based, socio-economic, and political discrimination. There are no official statistics of the community but in 2014, UNICEF estimated that the population is about 10 percent of the population in the country. According to the UN-Habitat Aden city profile, the Muhamasheen face less discrimination in Aden than other places however they still struggle to access employment, housing, and basic services.

There is an on-going humanitarian crisis in Yemen which exacerbate existing social, economic, and environmental inequalities and fragilities. According to UNHCR, there is a total of 95,224 IDPs in the Aden Governorate and 28,345 refugees and asylum seekers, the second largest community in the country.[87] According to the Central Statistical Office of Yemen (CSO) projected numbers for 2018, the age and gender breakdown of IDPs are as follows: 21% are men, 23% are women, 28% are boys and 27% are girls. In the city of Aden, IDPs are in higher density in some neighborhoods than others, as illustrated in the map in Figure 4. According to the UN-Habitat city profile, 70% of IDPs have settled in one of the city cores and only 30% in new expansion areas. In addition, there are 71 IDP camps in 2023 in the Lower Region, according to UNHCR. The water users and government officials interviewed for this project highlighted that IDPs are marginalized in this region.

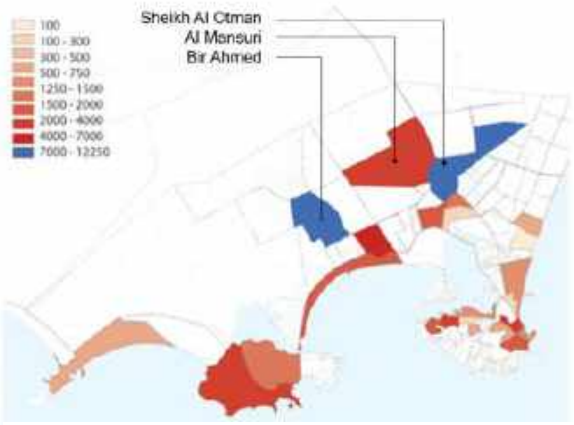


Figure 4. Locations of IDPs Residing in Regular Accommodation in Aden, Yemen. UN-Habitat, 2019.

Land Use: Aden is the largest city in southern Yemen and host to a major seaport in one of the world's largest natural harbors. Historically, the city has been an important node in trading networks and had strategic significance in the British colonial period when it was one of the busiest refueling stations in the world and was a global transit point for trading between Europe, East Africa, the Arabian Peninsula and East Asia.

[85] UN-Habitat (2020) Aden City Profile
[86] UN-Habitat (2020) Aden City Profile
[87] https://data.unhcr.org/en/country/yem#_ga=2.51079209.1447391314.1679905938-1498650503.1679905938

Historically, Aden has consisted of urban centres or clusters of similar size. The UN-Habitat city profile found that the recent growth in the past 15 years has been low density urban development, some of it planned development such as residential compounds with villas or small multi-family condos as well as single houses on empty land in the urban periphery. Due to geographic constraints such as the sea, there have been distinct development patterns in different urban centers. In most districts, the density

increased, however some districts such as Al Buraiqeh and Al Mansaurah, the density decreased due to urban sprawl.

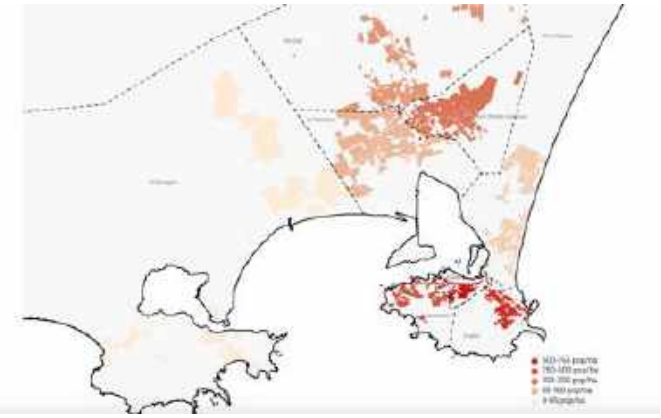


Figure 5. Urban Density in City Districts of Aden. UN-Habitat, 2019.

Demand for housing due to urbanization, demographic pressure and high inflation has resulted in overcrowding in many households in Aden.

In 2005, the World Bank supported a second master plan for Aden for the period of 2005-2025 that estimated USD 30 million was needed to improve public services and infrastructure for a growing population projected to reach 1.5 million by 2025. Despite all that has happened which was note predicted in this plan, as noted above the population of Aden has grown steadily and is over 1 million and could reach this mark by 2025. The Master Plan recommended the construction of 15 new neighborhoods and expansion of the existing industrial zones with planned expansion in areas north and east. The map in figure 6 shows the growth after 2004 and that much of it has been north and east and the urban centers but there has been a lot of built up area with informal development patterns since this time.

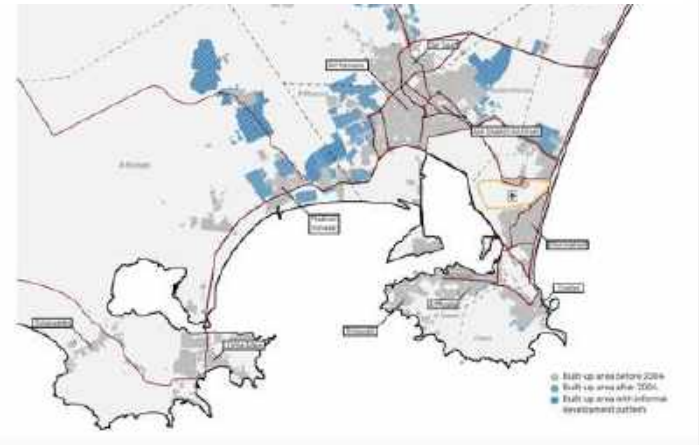


Figure 6. Population, Density, and Built-up Area per District in Aden. UN-Habitat, 2019.

All of the focus groups noted that there has been land use change in the lower region in the past few decades, especially with the loss of agricultural land. However there were different causes of this attributed by the various groups with the men's group citing desertification and flooding of agricultural lands due to dam construction and the women's group and local authorities attributing it to urbanization. Farmers noted that around 10 years ago there was a change with less agricultural land. The men's group also noted this timeframe and loss of agricultural land and cited the issue as desertification.

The main industrial areas in Aden are the oil refinery in Al-Buriqah district, the light industry Al Durain and the Aden Free Zone (AFZ) and there are eleven saltworks in Aden which until recently processed, refined, and packed 150,000 metric tons of salt a year. Figure 7 shows Aden production zones as mapped by UN-Habitat.

In the focus groups and interviews when asked about key infrastructure, the water users noted that in the past there was a cotton factory and tomato paste factory. Now there is the Nasser Well Station with generators. The government officials also noted the water station and the Bir Nasser Power Station as well as the brick factory.

Most of the cultural and religious heritage sites are located in the areas of Attawahi, Al Mualla and Craiter, UN-Habitat (2019). According to UNESCO field surveys, over 95% of heritage sites in the city have sustained significant damages from conflict related causes.

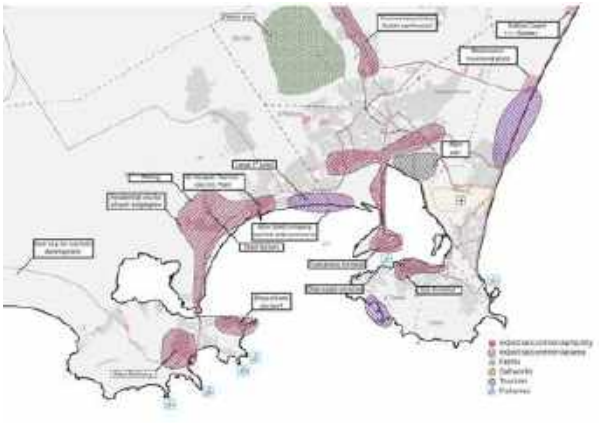


Figure 7. Aden's Production Zones. UN-Habitat, 2019.

Ecosystems/Natural Resources: The Lower Region of the Tuban Delta includes ranges from more arid lands in the northern part to wetlands, coastal ecosystems and the natural harbor in Aden as well as a dormant volcano which is now a major residential area. The wetlands in Aden include lagoons, salt plains, mudflats, marshes and beaches and are habitats for many bird species.[88] There are many pressures on wetland ecosystems in the Aden area, including development encroachment, withdrawal of water for irrigation and contamination from oil pipelines and untreated wastewater. The marine ecosystems are also affected by the untreated wastewater which affects marine life and has resulted in a decline in fishing stocks.[89]

There have been two reserves established in the Aden Governorate: Al-Heswah Wetlands Reserve and a Nature Reserve for Swans. Communities surrounding the Al-Heswah Wetlands Reserve are active in supporting ecosystem restoration and biodiversity management. They worked on an initiative to redirect wastewater from the Aden sewage plant to restore the wetland water table and in order to ensure the water is properly treated, they planted a four-hectare buffer zone with doum palm which purifies the wastewater, removing toxins before the water reaches the wetland ecosystem.[90] The communities have also established an ecotourism site that provides bird-watching sites and recreational sites for a small fee. In the focus group discussions for this project, participants were asked about critical biodiversity and the following flora were noted: Aloe vera, pomegranate, lemon, henna, sesbania and tamarind. The fauna noted were fox, rabbit, ferret and monkey although all of these were said to be in decline.

Economy*:* Aden has a long history has an economic hub in the region, connecting the interior of the country with an active international port. Although the Lower Region still has a lot of agricultural activity, the local economy of Aden is different from much of Yemen. Business and commerce have been a major portion of the economy and contributed to the emergence of a substantial middle class and has a large share of three major economic activities: mining and quarrying, transportation and storage and real estate.[91]

In terms of the economics of the port, prior to the conflict, the majority of cargo consisted of oil and oil represented 75% of the government revenue and 90% of export revenue.[92] However, oil and gas production has slowed due to the conflict. National policy has encouraged investments in the fisheries sector, which is dominated by small-scale enterprises. Fisheries was the largest export earner after oil and gas and employs 1.5% of the national labor force and is also critical to meet food needs in the area. Unfortunately fishing, like agricultural production, has decreased from pre-conflict levels resulting in the displacement of many fishermen.[93]

For the Tuban District of the Lahj Governorate in the Lower Region, 70 percent of the population works in agriculture but this only represents 75 percent of their income and the remaining 25 percent is supplemented by informal and irregular daily work. In Aden, around 7 percent of population work in agriculture, but this is only 50 percent of their income source, while the remaining 50 percent comes from irregular, informal daily work.

[88] https://www.equatorinitiative.org/wp-content/uploads/2017/05/Al-Heswa-Yemen.pdf
[89] UN-Habitat (2020) Aden City Profile
[90] https://www.equatorinitiative.org/wp-content/uploads/2017/05/Al-Heswa-Yemen.pdf
[91] UN-Habitat (2020) Aden City Profile
[92] USAID, Property Rights and Resource Governance: Yemen, USAID Country Profile, 2010, https://www.land-links.org/wp-content/uploads/2016/09/USAID_Land_Tenure_Yemen_Profile-1.pdf
[93] UN-Habitat (2020) Aden City Profile

The focus group discussions also said many people have government jobs or are employed by the private sector however the women's group noted that women are primarily housewives.

Infrastructure and Services: In Aden, the water supply grid is approximately 1,111 km long and consists of 34 reservoirs and water towers, 3 water sterilization facilities, 8 water pumping stations and 116 water wells.[94] The main source for obtaining water is groundwells, however water supply is limited, at least in part due to electricity. The UN-Habitat profile for Aden found that in half of the city's districts (Al Buraiqeh, Al Mansura, Attawahi and Crater), the water is only available on average from 0-4 hours. In five districts (Dar Sad, Crater, Khur Maksar, Al Mualla and Attawahi) lack of water for cooking, bathing, laundry and personal hygiene were reported as a top priority in need of attention.[95] The hydrology study for this project found that 25% of households in the Lower Region are not linked to the public water delivery.

According to the hydrology study for this project, domestic water use is 110 litres per day per capita. Almost half (44%) of the households in Aden have reported reducing water consumption either because of unavailability or because of high prices. As of April 2020, Aden local council provided 30 million m3 of water per year, while the estimated demand was 39 million m3. The majority of households in Aden rely on piped water as the primary source for drinking and other household functions. Other sources of water supply include trucking, boreholes, and storage tanks. The most persistent issues in the community are lack of water points, long waiting times at water point queues, non-functionality of water points, and perceived poor quality of water.

The women's focus group noted that women and children are responsible for water collection and it costs about 1,000 Yemeni riyals in a month. They are also concerned about the water quality. The farmers' group also estimated 1,000 Yemeni riyals per month and that 50 years ago people got water from the well by bucket but now its so deep that they need pumps which require electricity and when this goes out, it is an issue for water collection.

The men's group said it was 2,000 Yemeni riyals per month for water from government and private wells. The local authorities said that water is provided by public water network and ground water wells. They cited that the cost is 1,000 litres for 3,000 RY and that some of the farmers sell water from their wells. The water users said the price of water was 3,000 litres for 1 USD and that farmers provide water to other farms in exchange for 25% of their crops.

There was an agreement that farmers get their water from groundwater floods and that farmers stop farming when there is a lack of water and they use drip irrigation and that the water is drinkable.

Figure 8. Availability of WASH Services in Aden City. UN-Habitat, 2019.

In Aden, about 86% of the city's population is connected to the public water supply system and 69% is connected to the sanitation system. The sanitation system has about 391 km piping collection network and three wastewater treatment plants with a total capacity of 100,000 m3 per day. In three districts located in southern and eastern Aden (Al Mualla, Attawahi, and Crater), insufficient and inadequate sanitation facilities were reported, or too crowded if available. In five districts out of eight (all except for Ash Shaikh Outhman, Al Mansura, and Crater) there is no drainage system. There are major problems with sewage systems reported in five districts (all except Al Buraiqeh, Al Mansura and Ash Shaikh Outhman) as most areas have constant sewage problems. Furthermore, 75% of people living in Al Mualla, Attawahi, Crater and Khur Maksar reported that wastewater is frequently visible; due to non-functioning pumps and intermittent electricity.[96]

There are issues with energy and electricity supply in Aden, exacerbated by the damage that the grid has suffered as a result of the conflict. The figure below shows that many neighborhoods in Aden have electricity for less than half of the day and that all neighborhoods have suffered damage to the grid.

The decrease of electricity supply led residents to increasingly rely on solar energy which they install themselves, however access to solar energy remains limited due to high costs for installation. Many households therefore rely on small generators or invertor batteries to supply some power when the electricity is out.

Solid waste disposal is another issue in Aden. While garbage is collected once or multiple times per week in most districts, visible piles of garbage are still seen in all districts. The number of waste collection vehicles has significantly decreased since 2015, with many vehicles damaged, inaccessible or stolen. There was also a drastic reduction in numbers of available personnel.[97]

[94] *Dorsch International Consultants GmbH, Yemen Water Sector Damage Assessment Report of Twelve Water Supply and Sanitation Local Corporations (LCs) and their Affiliated Branch Offices and Utilities, Annex 2 – Technical Assessment Report for LC Aden; (Bonn and Eschborn: GIZ, September 2018).*
[95] UN-Habitat (2020) Aden City Profile
[96] UN-Habitat (2020) Aden City Profile
[97] UN-Habitat (2020) Aden City Profile

Overall, the condition of roads is poor throughout the city. The road network is completely damaged in four districts (Al Buraiqeh, Al Mualla, Ash Shaikh Outhamn and Dar Sad) which limits the mobility within the city and contributes to traffic congestion across the city. Regional connectivity is also affected by damaged roads, notably the road connecting Aden and Taizz. Due to high fuel prices, many people are increasingly relying on public transportation.[98]

Internet and mobile network services are available in all districts of Aden, however it can be limited and network coverage is poor in most districts, with the exception of Al Mualla and Crater.

In the interviews with local authorities for this project, they noted that almost everyone has a telephone and most men and women utilize social media.

In terms of health services, there is a lack of health facilities, as well as medical personnel throughout the city and certain services, including emergency and major surgery, are not available in most districts.

Furthermore, already prior to the conflict, the quality of healthcare services, especially specialized ones, was poor, with those that could afford it, travelling abroad to receive treatment. The figure below shows the location of the main health facilities in Aden. According to the Humanitarian Needs Overview (HNO), almost half the population of Aden are in need of healthcare assistance and an estimated 245,661 people in Aden governorate are in need of nutrition assistance, with 156,127 people in acute need. Over 80% of Community Focal Points interviewed for the Aden City Profile selected provision of healthcare services, including health facilities, health personnel and health services, as a critical need for the population in Aden. In 2013, the total enrollment for basic education in Aden was 80%, and the following year, the enrollment rate was estimated to be 77%. [99] According to the Joint Education Needs Assessment, an estimated 20 percent of children were out of school in Aden in 2016. Currently, attendance varies from one district to another, with the lowest rates observed in Khur Maskar. Female students aged 3-5 and 13-17 are disproportionately affected in Al Mualla where an estimated two-thirds of the respective age group populations are out of school. The following figure shows school attendance by district, broken down by age and gender.[100]

Most of the schools that sustained damage were rehabilitated by the end of 2016 and during the rehabilitation, many students were able to attend lessons at nearby schools. However teacher absenteeism and lack of studying materials have contributed to quality of education issues. A map of education facilities is below.

Governance: Aden is the interim capital of the Internationally Recognized Government of Yemen. Daily administration of the city and its eight districts is undertaken by the Local Councils (LCs). According to an analysis for the UN-Habitat Aden City Profile, the main sources of revenue for the city are building permits and rehabilitation fees, municipal taxes and levies, fines for building violations, direct investments and parking fees. Revenue has declined since 2015 due to the decline of the oil industry. LCs lack the authority to set a budget to cover their operations and rely on financial support from the central government.

Decentralized authority actually varies by district with some districts able to select contractors and define recovery and development projects without needing permission from the central government and others requiring permission. In general however, districts cannot borrow funds without permission from the central government, however all the districts in Aden, except Dar Sad, can deal with international aid or stabilization programmes without needing to get permission from the central government. About half of the districts can also sign agreements with private sector, however only three can set user charges for services.[101] A full breakdown is portrayed in the figure below.

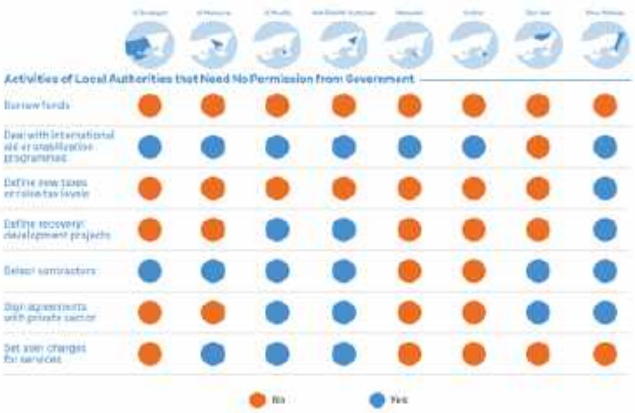


Figure 9. List of Activities Implemented by Local Authority in Aden Requiring Central Government Permission. UN-Habitat, 2019.

[98] UN-Habitat (2020) Aden City Profile
[99] *Save the Children, Yemen Education Cluster, Joint Education Needs Assessment Report, Aden – Yemen, (2016).*
[100] UN-Habitat (2020) Aden City Profile
[101] UN-Habitat (2020) Aden City Profile

The LCs are very important public institutions in Yemen because are responsible for providing basic public services to their electorate in education, health, water and sewage, waste collection, electricity, road repairs, and infrastructure. However, legal ambiguities, bureaucracy, lack of trained personnel, and

disruptions by years of conflict hinder effectiveness. In Aden, the complex governance structures shared between the various political interests complicates local administration. Collaboration tends to work better in non-sensitive areas, such as delivery of basic services like water and electricity.[102]

3.2 Middle Region of the Tuban Delta

The Middle Region of the Tuban Delta is located in the Lahj Governorate. The area covers 570 km^2 and has a population of 85,954, of which 41,371 are females and 44,583 are males. Al-Hawtah, the capital of the Lahj Governorate, is located here accounting for almost half of the population.

Information about the community is based on data provided by the Lahj governorate, through field visits and focus group discussions, interviews with key officials, GIS analysis and the Al-Hawtah city profile completed by UN-Habitat in 2020. Where information is not available at the local level, estimates from the national level and/or international studies have been utilized. The focus group discussions and interview officials which took place in February of 2023 highlighted some key challenges of the population including lack of jobs, food, solid waste management, water, and insufficient salaries. The women's group particularly emphasized the high price and low quality of food as well as the lack of jobs for women.

Figure 10. Map of the Three Regions and Lahj Governorate. UN-Habitat, 2023.

Population/Demographics: As noted above, there are 85,954 people in the Middle Region, of which 48.1% are females and 51.9% are males, as with elsewhere in the country, there are more men and boys than women and girls. Al-Hawtah, the largest city in the region and the capital of Lahj Governorate, has a population of 40,632. In addition, there are 34 villages, the largest is approximately 4,500 people and the smallest less than 100 people. There are 15,114 families, with average family size at 5-6 people. The Al-Hawtah city profile found that there are approximately 300 female-headed households in that city.

The city of Al-Hawtah has been growing at a yearly rate of about 2.52 percent since 2004 with the population projected to reach over 50,000 people by 2030. Yemen is a very young country although the rural areas and smaller cities skew slightly older than the larger cities. Al-Hawtah city was estimated by the UN-Habitat State of Yemeni cities report to have 44% of population between 0-14 years of age and 4% over 65. If we apply these percentages to the rest of the Middle Region, there would be approximately 18,000 females and 19,000 males under the age of 14. The elderly population would be estimated at 1,600 females and 1,800 males.

There are varying figures estimating the number of disabled people in Yemen from 3% of the population according to the 2013 National Health and Demographic Survey to 14.5% or 4.8 million people according to WHO and Handicap International. Based on this, there may be as many as 6,000 handicapped females and almost 6,500 handicapped males, if we take the more conservative estimate then this would be 1,200 and 1,300 respectively.

According to a survey of Community Focal Points (CFP) conducted as part of the UN-Habitat city profile, there are approximately 180 people with disabilities living in Al Hawtah city and an approximate 520 individuals who are in serious medical conditions, either life threatening (requiring immediate treatment) or chronic (requiring long-term treatment). According to the CSO Yearbook from 2017, the most widespread diseases in Lahj Governorate were diarrhea and gastroenteritis followed by lower respiratory infections. There were also some upper respiratory infections, typhoid and influenza cases reported.

In terms of ethnic minorities or marginalized groups, the Al-Hawtah city profile identified the Muhamasheen community (locally referred to as 'Akhdam') who suffer from caste-based, socio-economic and political discrimination. There are no official statistics of the community but in 2014, UNICEF estimated that the population is about 10 percent of the population in the country although Lahj governorate is one place with a large Muhamasheen community. Historically, they have lived in poor conditions in segregated slums on urban peripheries including Al Hawtah City and have limited access to employment opportunities.

[102] UN-Habitat (2020) Aden City Profile

According to UNHCR, there is a total of 79,163 IDPs in the Lahj Governorate, however this is not broken down by the three regions[103]. The Humanitarian Needs Overview (HNO) conducted in 2019 found that there are 7,356 IDPs in Al Hawtah, out of which 4,620 are from the district. The HNO study estimated 21.1% of the total estimated population whereas the CFP survey by UN-Habitat estimated it to be 25% of the population. The Yemen Shelter Cluster report from 2017 found that 32% of IDPs are women aged 18-60 years, the next largest group was men in the same age group and boys 0-17 years old, both at 28%, girls aged 0-17 were only 12% of the IDP population.

According to UNHCR, there are twenty IDP camps in the Middle Region: Al-Sardah, Al Mikhshabah, Al Habeel, Al Khuddad, Al-Hasky, Al Jaroubah, Sad Falej, Al Ziady, Al Hussaini, Al Kudaam, Qaryart An Nouba, Sofyan, Al-Hawtah Al-Harat, Al Amal, Al Hamra'a, Housing/Facilty of Agriculture, Al Maghafa, Internal Housing of the Faculty of Agriculture, Abrlasloum, and Qaryat Ash Shadheif.

Land Use: The hydrology study conducted for this project found that the middle region has a land use breakdown of 86.6% pastureland, 11.1% Agricultural Land and 2.3% populated land. The following map was produced for the Al Hawtah city profile and shows the populated areas in the district, including industry and commerce as well as the wadi and surrounding agricultural land. Al Hawtah district is in the delta of the Wadi Tuban, with the main populated area between the two branches of the wadi as illustrated below with the main roads and markets connecting Al Hawtah with Aden. In the focus group discussions, there was general consensus that the agricultural land in the area has been decreasing in recent decades and there are more buildings and ad-hoc constructions. The local government officials interviewed emphasized the urban expansion of Al Hawtah, especially in the past ten years. The men's group cited that agricultural land began decreasing in the last 5 to ten years and the buildings increased. Women said that changes started 20 years ago with less agricultural and more buildings from "random" construction.

Yemeni law divides state land into to six categories for land administration purposes, with different rules applicable to them. However, there is no specific data on the amounts of land within each of these categories.

- Allocated Land: Lands that have been planned and plotted prior to distribution;
- White Land: Lands that are not allocated lands but fall within urban planning areas;
- Agricultural Land: Land cultivated or well suited for cultivation;
- Fallow Land: Agricultural land that has been abandoned or neglected;
- Public Utility Land: Mountains, hills and slopes that receive rainwater, including the major structures through which flood waters are collected from tributaries;
- Desert Land: Lands that are covered by sand or sandy lands

Most structures are built using mud brick with thick walls and are used because they tend to lock cool air inside the building which helps in an area with high temperatures. Mud is also widely abundant and cheaper than concrete and wood. However, these homes are extremely vulnerable to heavy rains and floods. In addition, an estimated 60% of Al Hawtah's building exhibit signs of structural damage much of a direct result of the war.

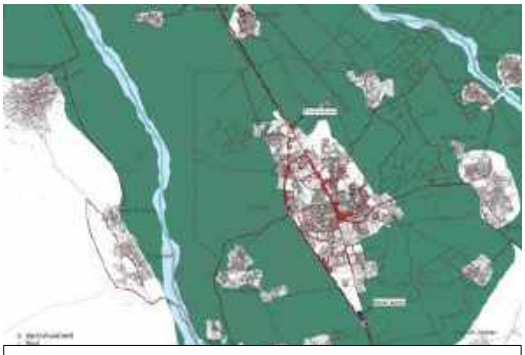


Figure 11. Agricultural Land and Industrial and Commercial Activities in Al Hawtah. UN-Habitat, 2019

There is a lack of housing in the city, a result of the destruction of many buildings combined with the rapid influx of IDPs, especially a limited number of rental units. The Yemen Shelter Cluster report found that, as of 2018, 75.1% of prospective tenants are IDPs. Informal settlements, known locally as "Ashwaiyat" are found throughout the city, although many of them are quite small and not exceeding a few meters. Some of them are home to many IDPs who lost their homes in the district or were displaced from other cities. The World Bank estimates that 44% of the urban population lives in slums based on the international definition which would amount to almost 18,000 people in Al Hawtah living in informal settlements.

Al Hawtah is also home to many cultural heritage sites including palaces, shrines, and ancient water wells. A map of the main heritage sites from the UN-Habitat profile is below. Unfortunately, cultural heritage sites have also suffered damage because of the conflict and due to their fragile status, many are in need of regular maintenance, preservation and protection. Given the housing situation, the Sultan's Palace, Al Abdali is being used by IDP families as shelters and in exchange they are providing maintenance to the building and grounds.

[103] https://data.unhcr.org/en/country/yem#_ga=2.51079209.1447391314.1679905938-1498650503.1679905938

Ecosystems/Natural Resources: As highlighted above, the Middle Region of the Tuban Delta is predominately agricultural lands and pastureland. The climate is semi-tropical and arid and the elevation varies from 100 meters above sea level to 490 meters above sea level. The region has several streams and the wadi splits into two branches in this area. Lahj has two livelihood zones: The Western Coastal Plain millet, considered a sorghum

Figure 12. Main Heritage Sites in Al Hawtah. UN-Habitat, 2020.

and livestock zone (highlands), and the Western and Central Wadi which is regarded as the sorghum, millet, vegetable, fruit and livestock zone (lowlands).

The Tuban Delta used to be known for the purity of its water and gardens of jasmine trees and roses.[104] However the focus group discussions conducted for this project noted poor water quality and that water used to be more plentiful but now wells needed to be dug deeper and still sometimes there is no water. It was also noted that some wells have become polluted by sewage water. Water availability was estimated in the hydrology study as 84 mm from rainfall for the Middle Region in 2022 and 25.5 MCM (Million Cubic Meters) was calculated as available runoff water for the Middle Region.

Irrigation systems have been built around floodplains to take advantage of seasonal rainwater from the north, however sometimes seasonal rainwater washes away parts of agricultural lands.[105] The irrigation methods used in the Middle region are predominately check basin irrigation (55%) and spate irrigation (40%) with modern irrigation only accounting for 5%.

The region is also well known for an abundance of clay minerals which have been used manufacturing cement and bricks. The focus group discussions highlighted the following plants as critical biodiversity: aloe vera, mashmoom, ziziphus, spina-christi, morimerah and sisaban “prosopis” trees. Honey production is also an important ecosystem service in the region.

Issues around food – availability, price, quality – were raised in the focus groups discussions. There are not disaggregated figures about food security and nutrition for the Middle Region however the HNO analysis in 2019 found that 71.8% of households in the Lahj Governorate were food insecure, with more than half of those people (416,500) categorized as in acute need of food security.

Economy/Production: Al Hawtah city is located along the main trading route which links Aden, Sana’a and other cities in the region. Employment figures from before the conflict from ILO showed an unemployment rate of 13.5%, relatively evenly split between men and women however labor force participation rates are much higher for men at 65.4% and only 6% for women. In terms of employment by sector, services was the leading sector with over 50% followed by industry (29.2%) and Agriculture (22.7%).According to World Bank data for the national level, agricultural employment has declined steadily since the early 1990s from 47% to 27% of male employment and from 85% to 42% for female employment.[106] It is important to note that while women make up a smaller portion of the labor force participation, agriculture and services employ almost equal percentages of women.

The survey of Community Focal Points for Al Hawtah confirmed the importance of informal employment for income with 54% of the primary source of income coming from Informal employment income generating activities, the next largest share was 24.3% and formal employment was the same percentage as loans from the bank, government or microfinance at 8.1%. Interestingly the highest percentage of the reported secondary source of income was from formal employment (29.7%) followed by safety nets (24.3%).

Although not the highest share of employment, agriculture is the lead economic activity in terms of economic productivity, with the main crops in the Middle Region by hectares as sorghum, millet, cotton and vegetables.

In the focus group discussions, the farmers explained that farm production is for daily subsistence as well as crops for sale and that farms were abundant in the small wadi until 1994 and there used to be agriculture cooperatives but the land was redistributed. They explained the historical changes in what was planted from the Sultans Era to the socialist era where there was more investment in agriculture, but they noted that the weather changed, and rice became an alternative food source which was gotten from the market.

[104] UN-Habitat (2020) Al Hawtah City Profile
[105] UN-Habitat (2020) Al Hawtah City Profile
[106] https://data.worldbank.org/country/yemen-rep

Women noted for agriculture that there is a lack of some crops such as cotton, sesame, Djar[107] and lack of grain cultivation. Men also noted that before there was cotton and grain and now more vegetables, fodder, tomato, and onion. The local government made similar observations to the men on how crops changed.

One of the main challenges in the region is poverty. Again disaggregated data for the Middle Region and Al Hawtah city is limited however Lahj Governorate is the second poorest governorate in Yemen based on CSO data from 2014 which estimate the poverty rate as 69.1%.[108] Further, data from 2005-2006 showed that the rural poverty rate was higher in the Lahj Governorate at 49.5% compared to urban poverty at a rate of 22.9% however both were higher than the national averages.[109] Given the large youth population in the region, youth unemployment is a major concern and estimates from 2016 showed a youth unemployment rate around 30% in urban areas.

The CFP survey found that for women specifically, it is difficult to secure and maintain a job in Al Hawtah due to the need to focus on raising children and domestic work. A lack of jobs and skills, which are similar obstacles for men, were also cited.

Infrastructure and Services: The focus groups for the Middle Region discussed water use and water availability describing that many households get tap water from government wells and networks, but there are also private wells even in Al Hawtah but as some wells are polluted, they are not suitable for drinking. They noted that some people are also purchase treated water by purification companies. The women's discussion group said that women are responsible for the collection of water and noted concern about the low quality of water and need for it to be filtered. The concern about the quality of water coming from wells was reiterated by the group of farmers.

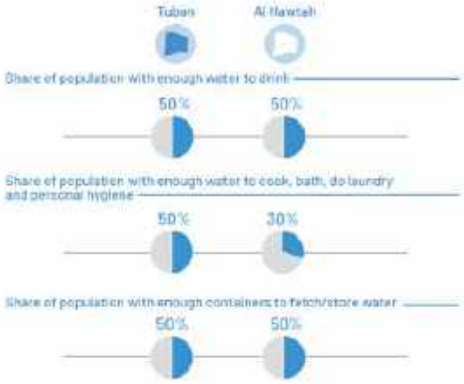


Figure 13. Perceptions of WASH in Tuban District and Al Hawtah. UN-Habitat, 2020.

The Al Hawtah city profile noted that the water supply infrastructure sustained extensive damage from the conflict, including reservoirs, pumping stations, and wells. In the CFP survey, almost all respondents said that water for drinking purposes is not readily available, and most households have trouble getting enough water to drink. They also reported on affordability issues which was also reported in the focus groups for this project. The hydrology study for this project found per capita consumption in the Middle Region to be 103 litres per capita per day and that 40% of the households in the Middle Region are not linked to the public water supply system.

Sewage and wastewater management issues were also reported as a key issue throughout the Tuban region. Local Water and Sanitation Corporation - Lahj (LWSC) is the body responsible for managing the water services in Al Hawtah and Tuban districts as well as the rest of the Lahj Governorate.[110] The LWSC water infrastructure includes 20 water reservoirs and water towers, with a capacity of 28,800 m3, one water sterilization facility and 89 km of the supply network. The LWSC has seven fuel generators for the water supply system but there are no operation and maintenance vehicles, and as they have been damaged or stolen during the conflict.

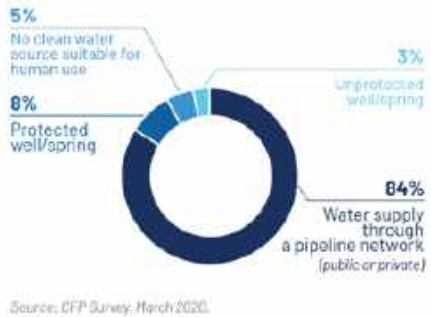


Figure 14. Main Source of Water in Al Hawtah City Based on Community Focal Point Survey. UN-Habitat, 2020.

In terms of healthcare facilities, there are a total of 39 public and private facilities operating in Al Hawtah. Ibn Khaldoun is the main public hospital in Lahj Governorate and has a bed capacity of 250. The majority of IDPs from surrounding areas are also frequently transferred to it for treatment.

Education serves have been disrupted in recent years due to the conflict and influx of IDPs.

[107] A type of edible bean, smaller than soya bean
[108] UN-Habitat (2020) Al Hawtah City Profile
[109] UN-Habitat (2020) Al Hawtah City Profile
[110] GIZ (2018), Damage Assessment Report of Twelve Water Supply and Sanitation Local Corporations (LCs), (Bonn and Eschborn, Germany: GIZ, 2018).

While there was an increase of children due to the arrival of IDPs, the number of facilities in the Tuban district has not increased.

On Information and Communication Technologies (ICT), the focus groups noted that mostly every household has a mobile phone and people use WhatsApp and social media to communicate however the internet is weak and mostly only available in Al Hawtah. In the CFP survey for the Al Hawtah city profile, about 15% of respondents said that communication services are not readily available and there is only one mobile tower that is partially functioning.[111]

IDPs face particular challenges in accessing services from WASH to health and infrastructure. Most IDPs in Al Hawtah have problems accessing water. Surveys from the United Nations High Commissioner for Refugees (UNHCR) suggested that approximately two-thirds of IDP children were not enrolled in school in 2015.[112]

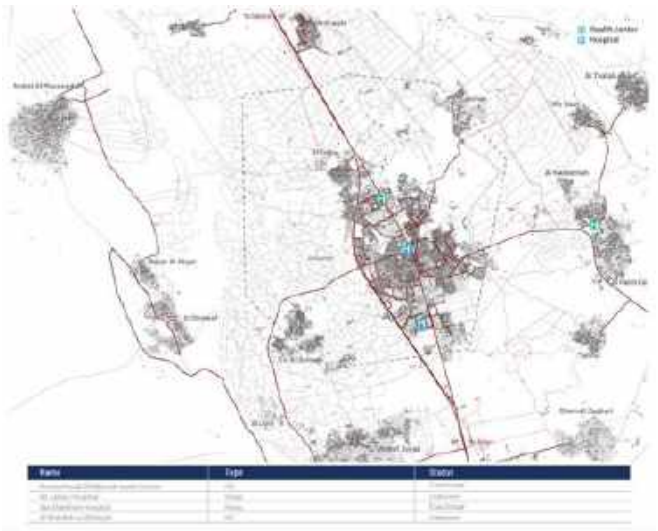


Figure 15.. Main Governmental Health Facilities in Al Hawtah. UN-Habitat, 2020.

Governance: Even prior to the conflict, Al Hawtah Local Council (LC) had lower operational functioning than the national average, including human resources, sufficient capacity, office space equipment and fiduciary responsibility. Despite the capacity gaps, the LC staff was responsible for both preparing and implementing the annual plan and budget, and unlike in other LCs, the governorates level did not seem to be involved in the district plans and budgets. The figure to the side shows the governance framework from national to governorate and district levels.

Disputes over land are an on-going issue in the region and land dispute resolution mechanisms are not functioning well. Property rights and tenure security is undermined by adequate dispute resolution.

In tribal areas in Lahj, Tribal Sheikhs are occupying a prominent role in dispute resolution and conflict mediation within their local communities. While Governmental Executive Units and LCs also operate collectively or sometimes in parallel with the Tribal Sheikhs.[113]

There are a few women's groups active in Al Hawtah. Al Hawtah's Women and Children Department, Local Leadership Program of the STC, Al Hawtah Women Development Association, Al Hawtah District Union of Southern Women, Department of Women and Children. On the environment, the Environmental Protection and Development Organization (EPSDO), initially known as the Association of Bees for Environmental Protection has obtained recognition from the United Nations Convention to Combat Desertification (UNCCD). A youth focused organization, Youth Without Borders Foundation, engages youth to achieve sustainable development capacity, encouraging youth to participate in Yemen's development process and communicating youth voices to decision makers.

3.3 Upper Region of the Tuban Delta

The Upper Region of the Tuban Delta is located in the Tuban District in the Lahj Governorate. The area covers 450 km^2 and has a population of 36,921. There are an estimated 6,538 families in the region and 19,125 males and 17,796 females. The region has predominately small to medium sized villages with the largest a little over 5,000 people but the majority with a few thousand or several hundred.

Information about the community is based on data provided by the Lahj governorate, through field visits and focus group discussions, interviews with key officials and GIS analysis, and national. Where information is not available at the local level, estimates from the national level and/or international studies have been utilized.

The focus group discussions and interview officials which took place in February of 2023 highlighted some key challenges of the population including: lack of jobs, food, and insufficient salaries. The women's group also emphasized poor food quality as well as lack of drinking water due to increased population and high cost of water and the group of

[111] UN-Habitat (2020) Al Hawtah City Profile
[112] UN-Habitat (2020) Al Hawtah City Profile
[113] UN-Habitat (2020) Al Hawtah City Profile

farmers emphasized all of these as well as lack of agricultural activities and that the majority of changes occurred in the past two years.

Population/Demographics: As noted above, there are 36,921 people in the Upper region, of which 51.8% are males and 48.2% are females. There are 27 villages, the largest is 5,890 people and the smallest less than 100 people. There are 6,358 families, with average family size at 5-6 people.

The population data is not further broken down by age, poverty level, etc so the following estimates are based on national averages and data from international studies. Yemen is a very young country and the rural areas and smaller cities skew slightly older than the larger cities. Al Hawtah city was estimated by the UN-Habitat State of Yemeni cities report to have 44% of population between 0-14 years of age and 4% over 65. If we apply these percentages to the Upper Region, there would be an estimated 7,830 females and 8,415 males under the age of 14. The elderly population would be estimated at 712 females and 765 males.

There are varying figures estimating the number of disabled people in Yemen from 3% of the population according to the 2013 National Health and Demographic Survey to 14.5% or 4.8 million people according to WHO and Handicap International. Based on this, there may be around 2,500 handicapped females and about 2,750 handicapped males in the Upper Region, if we take the more conservative estimate then this would be about 500 and 570 respectively.

According to UNHCR, in 023, there are four IDP camps in the Upper Region; Al Shaqa'a, Al And, Ash Shaqa'h and Al Zaydah. In the focus group discussions and interviews, the women's group noted that women are marginalized from decision-making and the farmers noted that there are homeless in Wadi Kahl, however there are not statistics about the number of homeless in the region.

Land Use: The Upper Region is predominately rural with small and medium-sized towns and a lot of agricultural and pastureland. The hydrology study conducted for this project found that the Upper Region has a land use breakdown of 91.4% pastureland, 7.1% Agricultural Land and 1.6% populated land. The study also found that there is 3,180 hectares of agricultural land and 2,830 hectares of cultivated land. The main crops as per number of hectares dedicated to the crops are Fodder and Sorghum followed by Millet and to a lesser extent Sesame, Vegetables and melons.

The focus groups said there have been some decreases in agricultural land and this is the result of urbanization, although one group also said it was the result of desertification. They also noted that there has been in a chance of the crops planted, away from cotton and cereals to cash crops.

Ecosystems/Natural Resources: The climate is semi-tropical and arid and the elevation varies from 200 meters above sea level to 500 meters above sea level (see map). The region has several streams.

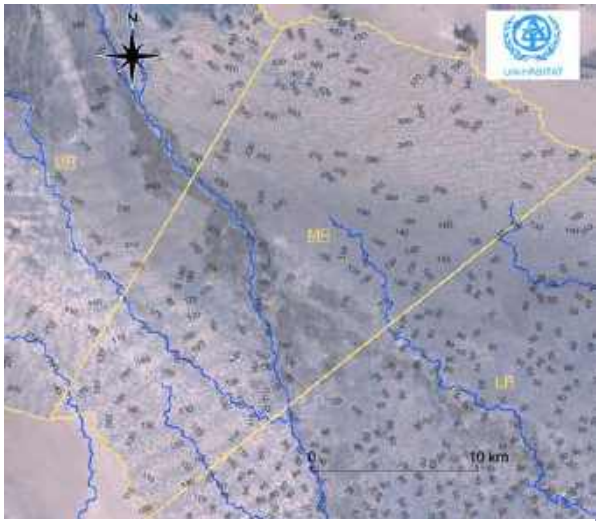


Figure 15. Elevations and Streams in the Upper Region of the Tuban Delta.

UN-Habitat, 2023.

In the focus group discussions, the follow species were highlighted: Sesbania, Sada'a, Allabina, Allwa, Dom, Palm, Coconut (currently not available), lemon, acacia, saber, tamarind, madras thorn fruit, grapes, mango, aloe vera, Ziziphus spina-christi, basil and cloves.

The women and farmers groups noted a decline in species.

Economy/Production: Employment figures from before the conflict from ILO showed an unemployment rate of 13.5%, relatively evenly split between men and women however labor force participation rates are much higher for men at 65.4% and only 6% for women. In terms of employment by sector, services was the leading sector with over 50% followed by industry (29.2%) and Agriculture (22.7%).According to World Bank data for the national level, agricultural employment has declined steadily since the early 1990s from 47% to 27% of male employment and from 85% to 42% for female employment.[114] It is important to note that while women make up a smaller portion of the labor force participation, agriculture and services employ almost equal percentages of women. The figure below shows these pre-conflict figures, including the very high rate of employment in the informal sector.

[114] https://data.worldbank.org/country/yemen-rep

In the focus group discussions, the main forms of employment highlighted were farming, government and private businesses and specifically for men, the military and day laboring, whereas specifically for women, the handicraft industries and harvesting.

Infrastructure and Services: The focus group discussions identified an asphalt plant, cement plant, and Coca-Cola plant as key infrastructure in the region. The Al-anad Water Supply Station and the Dar Al-Araes Palace are the two key infrastructure assets identified in the hydrology study.

On water services, the Al-Hawtah City Profile found that for the Tuban District as a whole, only 50% of the population has enough water for drinking, cooking, bathing and to do laundry, as illustrated in the figure below. In the focus group discussions, the women's group explained that women are responsible for collecting water and household water is obtained from the market as water access from wells is far away from households.

The groups also reported that the water quality is not good because they are "artesian" wells that don't have desalination and because of pollution due to the lack of sanitation and sewage leaks into the wells.

It was explained that some people have their own private wells and others buy from carts that sell water for household use.

The hydrology study for this project found per capita consumption in the Upper Region to be 100 litres per capita per day and that 40% of the households in the Upper Region are not linked to the public water supply system.

In terms of other services in the area, there are a number of schools in the Tuban District, however this is not broken down by the different regions. In total, there are 80 schools in the entire district, however given the lower population in this region, it is likely that there are less schools here.

In terms of ICT access, in the interviews, they said that most households have at least one mobile phone but that internet is weak. However a lot of people get news from social media. ***Governance:*** The Upper Region is within the Tuban District of the Lahj Governorate. The figure below shows the local governance framework that shows the relationship between the district, governorate and national levels.

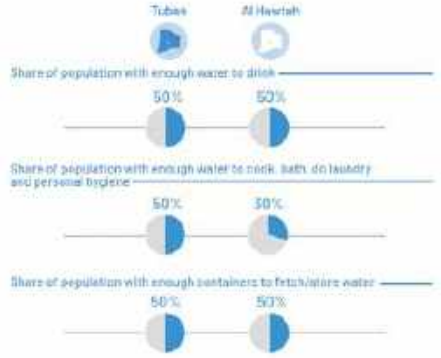


Figure 16. Perceptions of WASH in Tuban District and Al Hawtah. UN-Habitat, 2020.

Also of note in tribal areas in Lahj, Tribal Sheikhs are occupying a prominent role in dispute resolution and conflict mediation within their local communities. While Governmental Executive Units and LCs also operate collectively or sometimes in parallel with the Tribal Sheikhs.[115]

CCVA Outcomes for the three regions

The CCVA utilizes the methodology developed and highlighted above and the data and information which was collected for the community profiles (in the previous section) and the hydrology study for this project.

The vulnerability is assessed on exposure, sensitivity and adaptive capacity for the two main hydrological risks from climate change: flooding and water security. All of the exposure and sensitivity indicators were ascertained from the hydrology study and/or data provided by the government. The Adaptive capacity indicators are all based on the responses from the focus group discussions.

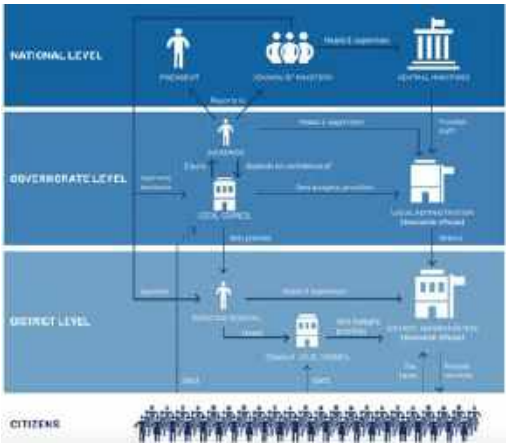


Figure 17.. Local Governance Framework in Yemen. UN-Habitat, 2020.

[115] UN-Habitat (2020) Al Hawtah City Profile

Figure 18. Boundaries of Watersheds Contributing to Flash Flood Risks in the Tuban Delate

Figure 19. Major Assets and Streams in the Tuban Delta

For flooding, the lower region is the only one susceptible to coastal flooding which is exacerbated by sea level rise and all three regions are at risk from flooding as the result of precipitation.

As demonstrated in the map below, the larger watershed of the Tuban Delta contributes to the potential of flash flooding in the three regions.

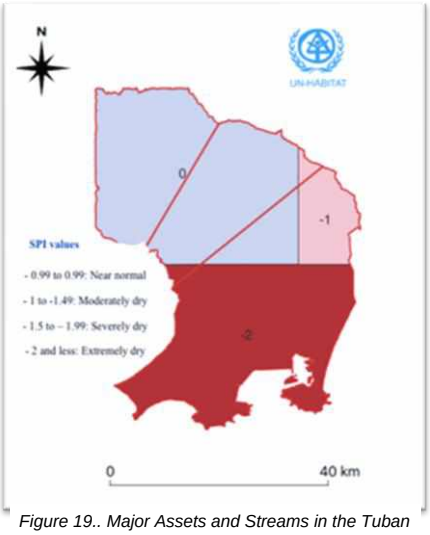


Figure 19.. Major Assets and Streams in the Tuban Delta

The hydrology study also mapped the assets throughout the Tuban Delta alongside the major streams to understand which assets are at highest risk to flash flooding.

The water security of the three regions is affected by the occurrence of drought combined with an imbalance of water resources. In addition, saltwater intrusion into groundwater has an adverse impact on water supply in the lower region and thus affects water security of that region as well. The hydrology study assessed the drought index by region, as shown in the map below, it is clear that the lower region has an extremely dry rating over the majority of the region.

Specific risks and vulnerabilities by each region are outlined below.

4.1 Lower Region Risks and Vulnerabilities

The Lower Region of the Tuban Delta includes the Aden Governorate and the city of Aden as well as a portion of the Tuban District of the Lahj Governorate. It is the largest in terms of population of the three regions and it is the only one which includes a coastal area.

There are 71 total IDP camps, of which 10 have high flood risk.

Governorates	District Name	Site Name EN	Site Name AR	Regions	Flood risk
Aden	Al Burayqah	Al Burayqah	رأس عباس	LR	High risk
Aden	Dar Sad	Dar Sad	حوش درهم	LR	High risk
Aden	Dar Sad	Dar Sad	موقع عمار بن ياسر	LR	High risk
Aden	Dar Sad	Dar Sad	حوش عثمان	LR	High risk
Aden	Dar Sad	Dar Sad	المعهد السعودي	LR	High risk
Lahj	Tuban	Al Hawtah - Tuban	الرباط الغربي	LR	High risk
Lahj	Tuban	Al Hawtah - Tuban	مخيم عطيرة	LR	High risk
Lahj	Radfan	al Habilin	المحوى الأعلى	LR	High risk

Lahj	Al Malah	Al Malah	سيلة بله	LR	High risk
Lahj	Radfan	al Habilin	المحوى الاسفل	LR	High risk

Table 9: Flood Risks in Lower Tuban Regions

Based on the hydrology assessment for this project, the assets with high flood risks are the airport, two main roads, one wastewater treatment plant and the nature reserve for swans. At medium flood risk are wetlands, two hospitals, one power station, one water supply station, one wastewater treatment plant and two landfills. The remainder of the assets assessed have low flood risk.

Name	Region	Climate risks
Aden Airport	LR	High flood risks
Biodiversity		
Nature reserve of the Swans	LR	High sea-level rise risk
Al-Heswah Wetlands	LR	Medium Sea-level rise risk
Hospitals		
Al-Waht Hospital	LR	Medium flood risk
Aden Hospital	LR	Medium flood risk
Al-Gamhoria Hospital	LR	Low risk
Al-Sadakh Hospital	LR	Low risk
Refinary Hospital	LR	Low risk
22 May Hospital	LR	Low risk
Power stations		
Al-Haswah Thermoelectric Plant	LR	Low risk
Al-Mansorah Power station	LR	Low risk
Khormksr Power station	LR	Low risk
Hugaif Power station	LR	Low risk
Chihnaz Power station	LR	Medium flood risk
Water Supply and WWTps		
Bir Naser Water Supply station	LR	Low flood risk
Al-Barzakh water supply station	LR	Medium flood risk
Bir Ahmed Water Supply station	LR	Low flood risk
Saber Wastewater treatment plant	LR	Low flood risk
Al-Mansorah Wastewater treatment plant	LR	Low flood risk
Al-Areesh Wastewater treatment plant	LR	Low flood risk
Salah Addin Wastewater treatment plant	LR	High flood risk
Landfills (waste management)		
Al-Fashlah waste landfills	LR	Low flood risk
Al-Haswah waste landfills	LR	Medium sea-level rise risk
Roads		
Al-What Al-Rugaa Road	LR	High flood risk
Al-What Al-Rugaa Road	LR	High flood risk

Table 10: Specific Locations with Climate Risks in Target Areas

Given its location, the Lower Region is the only region which has a risk of coastal flooding from sea level rise. The following figure shows the potential extent of sea level rise in Aden in 2040 and 2100 under a high emission scenario (SSP5/RCP 8.5).

Figures 20 & 21. Extent of Sea Level Rise in Aden in 2040 (Fig. 20) and 2100 (Fig. 21), Based on a High Emission Scenario

Outlined below is the data for the flooding indicators for the Lower Region.

Exposure	Sensitivity	Adaptive Capacity
Infrastructure Assets: 24	Airport, hospitals, power stations, water supply stations, wastewater treatment plant, waste landfills, roads, museum	Local Knowledge of CC: Medium-Low
Population size Females: 524,106 Males: 608,906 Total: 1,133,013	IDP camps: 71 People living in Informal Settlements/Floodplains	Water Distribution Plan: 1 Agriculture plan (previously): 1
Ecosystems: 2	Wetlands Reserve Nature Reserve Encroachment and Degradation	Access to Financial Assistance: Cooperative Agricultural Credit Bank

Table 11: Flooding Indicator Data for Lower Regions

Utilizing the scoring system, the Lower Region has a high vulnerability to flooding with a score of 23.

	Exposure	Sensitivity	Adaptive Capacity	
Infrastructure	3	3	3	Knowledge
People	3	3	1	Plans
Ecosystems	2	3	2	Financial Assistance
Total	8	9	6	23

Table 12: Vulnerability Scoring for Flooding in Lower Region

For Water Security in the Lower Region, the data for the indicators is below:

Exposure (Quantitative)	Sensitivity (Qualitative)	Adaptive Capacity
Hectares of Agricultural Land 2948 ha	Types of crop Mix of high and low Water Intensive Crops: Sorghum, Cotton, Vegetables	Irrigation Methods 5% Modern Irrigation
Population size Females: 524,106 Males: 608,906 Total: 1,133,013	25% of households not linked to water grid	Relevant Plans (Water Management, Climate Change) Water Distribution Plan: 1 Agriculture plan (previously): 1
Water Supply: 25.5 MCM Renewable Water	Water differential (between supply and demand) 2022 -84.3 (MCM)	Access to Financial Assistance Cooperative Agricultural Credit Bank

Table 13: Water Security-related Indicators in Lower Region

The Lower Region has a high vulnerability of water security with a score of 20.

	Exposure	Sensitivity	Adaptive Capacity	
Agriculture	2	2	3	Irrigation Method
People	3	2	1	Plans
Water	2	3	2	Financial Assistance
Total	7	7	6	20

Table 14: Water Security Vulnerability Score in Lower Region

4.2 Middle Region Risks and Vulnerabilities

The Middle Region of the Tuban Delta is located in the Lahj Governorate and includes the city of Al Hawtah, capital of Lahj Governorate.

There are two IDP camps in the Middle Region with high flood risk:

Governorates	District Name	Site Name EN	Site Name AR	Regions	Flood risk
Lahj	Tuban	Al Hawtah - Tuban	المخشابة	MR	High risk
Lahj	Tuban	Al Hawtah - Tuban	سد فالج	MR	High risk

Table 15: IDP Camps in Middle Region with High Flood Risk

In terms of infrastructure and heritage sites, there are several with low flood risk and the natural channel is the only asset with medium flood risk.

Name	Region	Climate risks
Biodiversity		
The natural channel from Byzag Weir to Al-Hadarm Weir	MR	Medium flood risk
Heritage		
Al-Rawda Palace	MR	Low flood risk
Al-Qomondan Palace	MR	Low risk
Hospitals		
Ibn Khldoon Hospital	MR	Low risk
Power stations		
Abass Power Station	MR	Low flood risk
Water Supply and WWTps		
Al-Hawtah Water supply station	MR	Low flood risk
Al-Hawtah Wastewater treatment plant	MR	Low flood risk

Table 16: Infrastructure and Heritage Sites Climate Risk Levels in Middle Reion

Outlined below are the Flooding indicators:

Exposure	Sensitivity	Adaptive Capacity
Infrastructure Assets: 7	Hospital, Power Station, water supply station, wastewater treatment plant, palaces	Local Knowledge of CC: Medium-Low
Population size Females: 41,371 Males: 44,583 Total: 85,954	IDP camps: 20 People living in Informal Settlements/Floodplains	Rainwater Management and irrigation plan: 1
Ecosystems: 1	Natural channel Encroachment and Degradation	Access to Financial Assistance: International organizations for farmers, banks Less assistance for women reported

Table 17: Flooding Indicators

The UN-Habitat City profile for Al Hawtah also noted the extreme vulnerability of the city to heavy rains and flooding, especially on buildings made of mud brick.

The Middle Region has a medium-high vulnerability to flooding with a score of 19.

	Exposure	Sensitivity	Adaptive Capacity	
Infrastructure	2	2	3	Knowledge
People	1	3	2	Plans
Ecosystems	2	2	2	Financial Assistance
Total	5	7	7	19

Table 18: Flood Vulnerability Scoring for Middle Region

For Water Security in the Middle Region, the data for the indicators is below:

Exposure (Quantitative)	Sensitivity (Qualitative)	Adaptive Capacity
Hectares of Agricultural Land 4398 ha	Types of crop Mix of High and Low Water Intensive Crops: Sorghum, Cotton, Vegetables	Irrigation Methods 5% Modern Irrigation
Population size Females: 41,371 Males: 44,583 Total: 85,954	40% of households not linked to water grid	Rainwater Management and Irrigation Plan: 1
Water Supply: 22 MCM Renewable Water	Water differential (between supply and demand) in 2022 8.8 MCM	Access to Financial Assistance Cooperative Agricultural Credit Bank

Table 19: Water Security Indicators for Middle Region

The Middle Region has a high vulnerability for water security with a score of 21.

	Exposure	Sensitivity	Adaptive Capacity	
Agriculture	3	2	3	Irrigation Method
People	1	3	2	Plans
Water	3	2	2	Financial Assistance
Total	7	8	7	21

Table 20: Water Security Vulnerability Scoring in Middle Region

4.3 Upper Region Risks and Vulnerabilities

The Upper Region of the Tuban Delta is the least densely populated and most rural of the three regions and at the highest altitude.

There is only one IDP camp with high flood risk in the Upper Region:

Governorates	District Name	Site Name EN	Site Name AR	Regions	Flood risk
Lahj	Radfan	al Habilin	محوى الكهرباء	UR	High risk

Table 21: IDP Camp with High Flood Risk in Upper Region

In terms of heritage sites and infrastructure in the region, there is one palace and one water supply station with high flood risk.

Name	Region	Climate risks
Heritage		
Dar Al-Araes Palace	UR	High flood risk
Water Supply and WWTps		
Al-Anad Water Supply station	UR	High flood risk

Table 22: Infrastructure and Heritage Sites with High Flood Risk in Upper Region

Outlined below is the data for the indicators for flooding vulnerability.

Exposure	**Sensitivity**	**Adaptive Capacity**
Infrastructure Assets: 2	Water Supply Station, palace	Local Knowledge of CC: Medium-Low
Population size Females: 17,796 Males: 19,125 Total: 36,921	IDP camps: 4 People living in Informal Settlements/Floodplains	Water Management Plan: 1 Land Use Plan: 1
Critical Ecosystems: 0	N/A	Access to Financial Assistance for men and women: Cooperative and Agricultural Credit (CAC) Bank

Table 23: Flooding Vulnerability Indicators for Upper Region

Utilizing the scoring system, this yields a vulnerability to flooding level of Medium, with a score of 15.

	Exposure	Sensitivity	Adaptive Capacity	
Infrastructure	1	2	3	Knowledge
People	1	2	2	Plans
Ecosystems	1	1	2	Financial Assistance
Total	3	5	7	15

Table 24: Scoring System for Flooding Level Vulnerability in Upper Region

For Water Security in the Upper Region, the data is below:

Exposure (Quantitative)	Sensitivity (Qualitative)	Adaptive Capacity
Hectares of Agricultural Land 2830 ha	Types of crop Low Water Intensive Crops: Sorghum and Millet	Irrigation Methods 10% Modern Irrigation
Population size Females: 17,796 Males: 19,125 Total: 36,921	40% of households not linked to water grid	Water Management Plan: 1 Land Use Plan: 1
Water Supply: 24 MCM Renewable Water	Water differential (between supply and demand) in 2022 +38.6 MCM	Access to Financial Assistance Cooperative Agricultural Credit Bank

Table 25: Water Security Data in Upper Region

The vulnerability of the Upper Region for Water Security is Medium-High with a score of 18.

	Exposure	Sensitivity	Adaptive Capacity	
Agriculture	2	1	2	Irrigation Method
People	1	3	2	Plans
Water	3	2	2	Financial Assistance
Total	6	6	6	18

Table 26: Water Security Vulnerability Levels in Upper Region

ANNEX 2: ESIA-ESMP

Public Consultation / disclosure notice[116]

Public Consultation/Disclosure Notice

Date: **XXXX**

The United Nations Human Settlement Porgramme (UN-Habitat) and the Environment Protection Authority (EPA) are requesting feedback on this draft Environmental and Social Impact Assessment and associated Environmental and Social risks Management Plan for this project.

Comments and questions can be sent to the following address:

United Nations Human Settlement Porgramme
Email: unhabitat-yemen@un.org
Website: https://www.unhabitat.org
The last date for receiving of comments is XXXX

This document and its content have been prepared and are intended for UN-Habitat's, AF's and Yemen government information and use in relation to the project 'increase climate change resilience to water scarcity and flooding in the Tuban Delta.' The report was prepared by UN-Habitat and reviewed by the Environment Protection Authority (EPA), the AF Designated Authority (DA) in Yemen.

[116] In line with standard practice and requirement for UN-Habitat projects that seek support from the Adaptation Fund (AF), UN-Habitat discloses the proposed project ESMP before the AF Board consideration of the project proposal on the relevant UN-Habitat website in both English and the local language(s).

Environmental and Social risks and Impacts Assessment (ESIA)

Executive summary and key recommendations

In short

- ❑ Project is categorized as category B project (moderate risk)
- ❑ This ESIA-ESMP has been approved by the Yemen government
- ❑ This ESIA-ESMP[117] has been prepared for the proposed project with a focus on the concrete interventions, which include:
  - Rehabilitation of the irrigation system activities (outputs 2.1.; 2.2.; 2.3.) and modern irrigation system (output 4.1)
  - Activities related to (re)use of (treated) (waste)water (outputs 3.1.; 3.2.; 3.3.; 3.4)
  - Activities related to awareness raising, capacity strengthening and planning have been screened as well in **Error! Reference source not found.**~~Table 67~~.
- ❑ As long as the proposed follow-up actions are taken, and the main proposed risks mitigation measures are fully implemented, any potential environmental and social risks and impacts will be site-specific and localized.

Project Categorization

Based on the risks screening against the 15 AF safeguard areas, the project has been categorized as a "B" category project in terms of the environmental and social risks it poses (in line with the AF ESP categories used).

Main Outcomes of the Environmental and Social Risks Screening and Impact Assessment

- ❑ Potential risks and impacts have been identified in related to AF principles:
  - o 2: access and equity
  - o 3: vulnerable and marginalized groups
  - o 6: core labour rights:
  - o 12: pollution and resource efficiency:
  - o 13: public health
- ❑ No risks and impacts were identified in relation to:
  - o 1: compliance with the law
  - o 4: human rights:
  - o 5: gender equality and women's empowerment:
  - o 7: indigenous people:
  - o 8: involuntary resettlement:
  - o 9: protection of natural habitats:
  - o 10: conserving biodiversity:
  - o 11: climate change:
  - o 14: physical and cultural heritage:
  - o 15: land and soil erosion:
- ❑ Mitigation measures are in place to avoid or reduce any of above potential risks and impacts.

Key Recommendations

- ❑ All project beneficiary groups will be consulted again during the inception phase to verify and further identify all specific needs and concerns of groups.
- ❑ The project will ensure equal opportunities in participation and decision-making of women, youth and other vulnerable groups by using quotas and by agreeing on representation in decision-making processes using ToRs, agreements, etc. Quotas and a targeting strategy will be applied for meetings, workshops, and trainings.
- ❑ A Grievance and Redress Mechanism will be strictly applied.
- ❑ The project follows ILO core labor standards. Looking at the conventions and protocols not ratified, the project will be particularly attentive to any health and safety and inspections.
- ❑ Employment and working conditions following core labour standards to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply.

[117] Environmental and Social Impact Assessment and Environmental and Social risks Management Plan.

- ❑ A waste management plan will be prepared. Reference to the waste management plan to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. It will be ensured treated wastewater is only used for appropriate crops (through coordination with farmer/water user associations and authorities and related monitoring), while complying with (international) standards for water quality.

Purpose, Scope, and Methodology of ESIA-ESMP

Social and environmental policies are essential tools to prevent and / or mitigate undue harm of projects and project activities to people and their environment. In line with the Adaptation Fund's Environmental and Social Policy (ESP) and UN-Habitats safeguards system, UN-Habitat is required to categorize the risk of the project as a whole and to identify and manage any potential environmental and social risks and impacts. This Environmental and Social Impact Assessment (ESIA) and Environmental, Social Risks Management Plan (ESMP) has been prepared by UN-Habitat.

The purpose of the ESIA-ESMP document is to demonstrate how this project complies to the AF's ESP. The document shows what potential environmental and social risks and co-benefits and opportunities have been identified per project activity, the potential impacts of the risks and how these will be managed / mitigated.

To ensure compliance with the AF ESP, all proposed project activities have been screened against the 15 AF principles (i.e., safeguards) to identify potential environmental and social risks and to assess related potential impacts. Where risks have been identified, the significance of impacts have been assessed and where needed, measures to avoid or mitigate risks and impact identified (+ monitoring arrangements). Analyses are based on collected disaggregated data focused on identification of climate change related needs, limitations, constraints, and requirements specific for marginalized and vulnerable groups, especially of women and youth. Activity prioritization has been done in consultations with project beneficiary groups. The executing entities and other contractors will also comply to the ESMP.

Socio-economic and Environmental Context of the Tuban Delta

The Tuban Delta region is highly vulnerable to water insecurity, with the highest level of vulnerability in the Lower Region which includes Aden and the middle region which includes Al-Hawtah. The area is vulnerable due to the high level of exposure of assets and people, the sensitivity of the existing systems including agriculture, natural resources, and health systems and low levels of adaptive capacity.

The city of Aden, located in the Tuban Delta, has grown from 589,419 in 2004 to an estimated 1,051,000 in 2021, in part due to in-migration of Internally Displaced Persons fleeing conflict in the north. Yemen, including Aden and the Tuban Delta, experiences extreme water scarcity due to its climate and overexploitation of groundwater which will be exacerbated by increased heat and unpredictable precipitation patterns as a result it is necessary for Yemen to increase water supply through innovative methods which is why the development of a desalination plant is the proposed intervention.

In terms of exposure, there are over one million people in Aden, and an additional 100,000 plus in the region, that are potentially water insecure due to higher water demand than supply and the climate hazards such as drought and evapotranspiration from heat which could further reduce water supply. In addition, despite the high levels of urbanization there are over 9,000 hectares of agricultural land in the surrounding area, the majority of which do not have modern irrigation methods.

Water scarcity has profound socioeconomic impacts in arid areas like the Tuban Delta. The limited availability of water severely affects agriculture, leading to reduced crop yields, livestock losses, food insecurity, unemployment, and poverty. Inadequate water supply and sanitation facilities contribute to health issues, as clean water access decreases and waterborne diseases become more prevalent. Education is also affected, as children, especially girls, must spend significant time fetching water instead of attending school, and educational institutions struggle to provide clean water and sanitation facilities. Water scarcity hampers economic productivity, particularly in water-intensive industries, leading to decreased production, job losses, and hindered economic growth. Additionally, water scarcity can fuel migration and conflicts as competition for limited water resources arises, disrupting social cohesion and straining resources. Comprehensive strategies focusing on water management, infrastructure development, and socio-economic interventions are necessary to address water scarcity and promote sustainable socio-economic development in areas like Aden.

Climate Change Vulnerability Assessment of the Tuban Delta

A Climate Change Vulnerability Assessment (CCVA) was prepared as part of the GCF readiness project (for more details see annex 1 on 10274). The CCVA, together with the hydrology study, form the basis for identifying adaptation options for the water sector.

The following table summarizes the vulnerability for water security and flooding, the two hydrological climate change impacts assessed for the three regions.

	Upper Region	Middle Region	Lower Region
Water Security	Medium-High	High	High
Flooding	Medium	Medium-High	High

Table 1: Water Security and Flood Vulnerability Levels per Region

The Lower Region has high vulnerability to both water insecurity and flooding, which is largely due to the higher number of people and assets exposed and sensitive to these hazards. Besides sea-level rise is a risk, which may also negatively affects water security and flood impacts.. The Middle Region has a high vulnerability to water security due in large part to the large agricultural production in the area and a medium-high vulnerability to flooding as it has less assets and people exposed to flooding yet there remain sensitivities and a lack of adaptive capacity. The Upper Region, due at least in part to less assets and people only has a medium level of vulnerability, however due to the reliance on agriculture for livelihoods, there is a medium-high vulnerability for water security.

Increased temperature and variations in precipitation patterns are beginning to affect Yemen and expected to intensify in coming decades with impacts on extreme events, sea level rise, and water and food security. This project is concentrated on the water security issues faced by the Tuban Delta, including Aden, as a result of climate change while recognizing that other climatic hazards will also impact on the overall resilience and development of Yemen and the Tuban Delta.

Looking from a water security lens, the potential **temperature increases** of as high as +3.5 to +4.0ºC along the Red Sea and Arabian Sea coastline by the end-century (2070-2099) and approximately +2.0 ºC by mid-century (2050). Further modeling shows that an increase of 30 additional hot days (>40ºC) per year by mid-century under a medium emission scenario (RCP 7).[118] This will **increase evapotranspiration**, thereby decreasing water supply for households and agriculture while also potentially simultaneously increasing water demand as a coping mechanism.

In addition, the number of dry days per year is expected to increase along the western Arabian Sea coastline as well as towards the Highlands by approximately 2 to 6 additional days/yr. under the low-emission scenario (RCP 2.6) and by 8 to 14 days/yr. under the high emission scenario (RCP 8.5.).[119] Further the lower Tuban Delta region, which includes Aden, is likely to have more **drought periods** than the rest of the Tuban Delta.

Sea-level rise (30 cm by mid-century and up to 77 cm by the late 21st century) will continue to exacerbate shoreline erosion, as well as accelerate **saltwater intrusion** into groundwater which is already being observed as a result of increased water demand and drought years.

Serious and severe flooding in all regions of the Tuban Delta is likely to increase from 2040 under both medium and high emission scenarios due to increased heavy precipitation.[120]

In summary, major climatic threats for the Tuban Delta include (i) higher intensity and frequency of floods in exposed areas, (ii) prolonged droughts due to increasingly erratic rainfall and temperature (iii) increasing water stresses due to higher evapotranspiration rates from heat, increasing pressure on water resources and sea-level rise

These climatic threats combined with the current depleted water supply (outlined below) and growing demand for water in the region due to population and economic growth results in an untenable situation in which reduced water supply, exacerbated by climate change, can not meet the demands necessary for the region. This has implications for agricultural productivity and subsequently food security and livelihoods security for thousands of families in the Tuban Delta.

[118] GCF Country Programme Yemen 2023 (in draft)
[119] Ibid
[120] UN-Habitat (2023) Hydrology Study of the Tuban Delta

Water resources in Tuban Delta face many challenges, including climate change, overuse, and lack of a sustainable water management strategy. Climate change impacts on water resources include:

- Reduce water availability due to the reduction of annual rainfall rates during the last decades, which have depleted groundwater levels by about 1 m/year, increased saltwater intrusion, and led to land & soil degradation.
- Increase drought periods has dried out many streams in the LR, which encouraged illegal housing near the dried streams, thus exposing them to the risk of intense flooding.
- Increase extreme events, for example, a heavy rainfall in March 1981 led to a catastrophic flood.

These issues have affected the growing population, land use, water quality, water quantity and agricultural systems. The 2022 estimation of water supplies include renewable surface water, renewable groundwater water and non-conventional water resources, which have been estimated at 59, 139, and 10 MCM, respectively. While the water uses include 194 MCM for agricultural uses and 50 MCM for domestic uses, which means agricultural water represents 80% of the total water use. This results in a total water deficit of 36 MCM. Furthermore, the development of several dams and other rainwater harvesting techniques and the overuse of surface water in the upper section of Tuban watershed (upstream) have decreased the risk of floods but decreased the availability of surface water in Tuban Delta (downstream). As a result, limited water reaches the lower region and no water reaches the ocean, which has forced people and farmers to depend mainly on groundwater using renewable energy leading to a big water deficit. These factors coupled with climate change have increased saltwater intrusion to groundwater aquifers, desertification, increased groundwater depletion, led many well to run dry and deteriorated the fertile soils in the lower region of Tuban Delta.

Possible options to reduce this deficit include:

- Shifting from traditional surface irrigation to drip irrigation (if all agricultural lands use drip irrigation, 45-50% of the deficit will be covered).
- Wastewater treatment and reuse: Most people in the Tuban Delta use septic tanks. The available wastewater that can be treated can cover about 10% of the deficit.
- Greywater treatment and reuse: can be used in the nearby areas, however, if it is used in toilet flushing, it can cover 5% of the deficit, which is not applicable at this time.
- Groundwater recharge from flooding water and from the treated wastewater can cover 5%.
- Monitoring groundwater resources and preventing unauthorized extraction activities. This option should be used to reduce illegal groundwater recharge, thus reduce groundwater depletion and saltwater intrusion.

However, the mentioned above options will be insufficient to satisfy the growing water demand in Aden, especially considering future climate change impacts and population growth. Therefore, with the current dependence on depleting groundwater resources, sea-water desalination has become a crucial alternative for providing fresh water and is part of a strategy to diversify water supply resources and use renewable water resources.

Future projections: The MRI-ESM2-0 climate model and QGIS have been used to analyze future water availability under two Shared Socioeconomic Pathways (SSP3: RCP 7) and (SSP5: RCP 8.5). Two main scenarios have been assessed, the first is the reference scenario where all activities and population growth stay the same, while the second one is the improve scenario, which considers modern irrigation, decreasing in the population growth rates and increase the use of treated wastewater. The results reveal a wide range in water availability estimates up to 2100 in the three regions. Under the reference scenario, water deficit might be more than 400 MCM in 2100 under both climatic pathways (SSP3 and SSP5). However, examining the improved scenarios show a better situation in Tuban Delta. However, the water shortage might not be more than 43 and 10 MCM in 2100 under SSP3 and SSP5, respectively. On the other hand, the LR will experience the greatest water scarcity due to rising demands brought on by traditional irrigation methods and population growth as all these scenarios predict severe water shortages in the LR, which might range from 60 to 80 MCM under the improved scenarios. Therefore, the LR will need extra water resources such as a 50 MCM solar pumped sea-water desalination plant as soon as possible, then other 10 MCM plants every 5-10 years.

Examining the improved scenario shows show a better situation in Tuban Delta, by which the water deficit might not be more than 40MCM. However, the LR will not recover its water deficit, because all these scenarios predict severe water shortages in the lower region, which might range from 60 to 80 MCM under the IDS. Therefore,

the LR needs extra water resources such as a 50 MCM solar-powered seawater desalination plant as soon as possible, then other 10 MCM plants every 5-10 years. On the other hand, groundwater recourses are depleting. Tuban Delta is one of the critical basins in Yemen where most of the illegal rigs/wells are found. The assessment of 2023 shows that there are 3600 wells, 1200 of which have gone dry, and the average annual drop of groundwater levels reaches one meter due to the imbalance between discharge and recharge rate. If this imbalance continues as it is in 2022, the projections show that most of the wells will go dry or become brackish in the LR by 2060.

Future climate risks: The three regions can be affected by drought and flooding in the future. For instance, under SSP3 and SSP5, extremely high rainfall rates might cause flooding between 2060 and 2063, and between 2074 and 2076, respectively, while drought might occur between 2029 and 2034, and between 2069 and 2072. The LR, on the other hand, is the most susceptible to the effects of climate change since it is impacted by four main climate hazards namely flooding, drought, sea-level rise, and saltwater intrusion, which will have an impact on water supply systems and coastal infrastructure. Moreover, the LR faced severe meteorological and socioeconomic droughts in 2022, and unfortunately the socioeconomic drought will last the coming years until finding a new water resource.

Management and climate adaptation options: The study area has been divided into three regions revealed management shortcomings and the requirement for a sustainable water management strategy to distribute the existing water resources under climatic and socioeconomic challenges. The study reveals a need for new sustainable solutions to meet the rising water demand in the lower region and to reduce saltwater intrusion. Different adaptation options have been discussed and ranked with national stakeholders through consultation and workshops including:

- Rehabilitating irrigation canals and improve the current irrigation system to be drip irrigation.
- Rehabilitating some of the wastewater treatment plants to reuse the treated wastewater and the sludge to improve agricultural productivity.
- Groundwater recharge; and floodwater harvesting.
- Installing solar-powered seawater desalination plants to meet the rising demand in Aden.
- Disaster management plan coupled to an early warning system is required at the head of Tuban Delta to alert residents of flooding dangers if water flow surpasses 150 m3/sec combined by a proper disaster management plan to reduce the risk of flooding. In this light, it is important to note that a devastating flood in Tuban Delta in 1982 was brought on by a water flow of 225 MCM from the top of the Tuban Delta (Wadi Tuban upstream).
- Yemen, meanwhile, has both a water law and a water policy. They are inactive, nevertheless, and were unable to address Yemen's water sector's problems. To conserve the natural resources, particularly groundwater and to enhance human welfare, new versions are therefore required that address climate-related hazards, water management methods, roles and responsibilities. However, these might take long time to be adapted and approved. Therefore, an Integrated Water Resources Management strategy for Tuban Delta is urgently needed.

Policy & Legal Framework and Safeguarding Requirements

By Yemen government

Policy & legal framework

Policy / Document	Year
National Adaptation Programme of Action (NAPA)	2008
Initial National Communication INC)	2001
Second National Communication (SNC)	2013
Intended National Designated Contribution (INDC)	2015
Third National Communication (TNC)	2018
Technical Needs Assessment (TNA)	2023
National Adaptation Plan (NAP)	Forthcoming
Fourth National Communication	Forthcoming
Nationally Determined Contributions	Forthcoming
The 4th Socio-Economic Development Plan for Poverty Reduction	2002
National Environmental Action Plan (NEAP)	2005
National Strategy for Environmental Sustainability (NSES)	2005
National water sector Strategy and investment programme	2004
National Food Security Strategy	2010
National Agriculture Sector Strategy (NASS) 2012-2016	2012

National Action Plan to Combat Desertification	2000
National Biodiversity Strategy and Action Plan (NBSAP)	2017
Yemen's Sixth National Report to Convention On Biological Diversity (CBD)	2019
Yemen Aden Master Plan	2005-2025

Table 2: Relevant Policies and Strategies in Yemen

Law / standard	Year
Republican Resolution on Law No. 25 of 1992 on the appropriation of land for public benefit	1992
The primary civil law governing land is the Law of Land and Real. Estate No. 21 of 1995	1995
Law No: 26 / 1995 EPL Environmental Protection Law.	1995
Environmental Impact Assessment Policy for the Republic of Yemen 1996	1996
Republican Resolution No. 170 of 1996 issuing the Implementing Regulation for Law No. 21 of 1995 on lands and real estate of the State	1996
Law No. 20 of 1998 on seeds and agricultural fertilizers	1998
Yemeni Standards for Water, Water Used for Irrigation 1999	1999
Law No. 39 of 1999 on the hygiene and environmental health.	1999
Evaluation of Future Development of the EIA System in Yemen 2001	2001
Water Law No. 33 of 2002, and its executive regulations	2002
Law No. 41 of 2006 amending some articles of Water Law No. 33 of 2002	2006
Law No.13 of 2006 approving the Convention on Wetlands of International Importance especially as Waterflow Habitat	2006
Public Health Law, Law No: 04 / 2009	2009

Table 3: Relevant National Laws and Standards in Yemen

International conventions / agreements	Year
Climate and Atmosphere	
Civil Responsibility for Damage from Oil Pollution	1979
The Montreal Protocol on Substances that Deplete the Ozone Layer and its amendments	1987
United-Nations Framework Convention on Climate Change (UNFCCC)	1994
Vienna Convention for the Protection of the Ozone Layer	1994
Stockholm Convention on Persistent Organic Pollutants (i.e. a global treaty to protect human health and the environment from chemicals that remain intact in the environment for long periods, become widely distributed geographically and accumulate in the fatty tissue of humans and wildlife).	2001; 2004
Kyoto Protocol to the UNFCC	1997; 2005
Paris Agreement	2016
Land and Physical Cultural Resources	
The Convention on the Protection of World Cultural and Natural Heritage	1982
Biodiversity and Natural Habitats	
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	1997; 1979
Ramsar Convention on Wetlands of International Importance, especially as Waterfowl Habitats	2000
Convention on Biological Diversity (CBD)	2005
Convention on the Conservation of Migratory Species of Wild Animals CMS) à (P#100)	2006
Others	
Environmental Modification Hazardous Wastes Law of the Sea The Rio Declaration on Environment and Development	

Table 4: Yemen's Ratifications of International Conventions and Agreements

Safeguarding / Environmental Impact Assessment Requirements

7. In Yemen, the following mechanism is in place to obtain environmental approval for projects:
8. Screening (list all positive and negative impacts); If the negative impacts are not serious, no need to continue.
9. Scoping (optional): This step should be based on consultations with the local people and national experts after listing the impacts.
10. Impact assessment
11. Develop possible mitigation measures (for the negative impacts)
12. Writing all in an Environmental Impact Assessment (EIA) report
13. Send the EIA report to EPA and MWE to be approved.

Screening

The process is based on contents of EIA by-law which clearly states:

- Which areas are considered of high value, requiring a (preliminary) EIA for any activity in that area;
- Which activities are considered potentially harmful to the environment and therefore requiring and EIA;
- Below what capacity or size the requirement for an EIA for any particular activity can be dispensed with. EIA should also be obligatory for existing facilities with plans for major expansions (e.g. 25% of capacity), if a new facility of this kind would be eligible for EIA.

Sensitive areas: There is specific requirement formulated for protected areas. The EPL provides for the formulation of a list of special environmentally sensitive areas and locations by the cabinet. Projects with likely effects to such areas as historical and archaeological places, wetlands, coral islands, natural protected areas, and public parks require full EIA. (Confirm with EPA.)

Timeline: Within 24 working days after receipt of necessary information. In case of the need for additional information, the screening procedure starts when this additional information is received.

Scoping
Scoping is advised, but not mandatory. MPE and EPA in collaboration with specialists and responsible authority prepare a scoping report (incl. Terms of Reference), which is submitted to the competent authority. Communication between project proponent and MWE and EPA does not occur directly but goes through the competent authority, unless MWE and EPA requires specified information about the project.

Timeline: between six weeks and three months.

Impact assessment
The impact assessment is based on the scoping report (including the Terms of Reference). The EPA distributes free copies of the EIA to stakeholders. The report is available to the public for printing at their own costs. Governments must respond with comments to the EPA, otherwise it is assumed that they agree. The EIA can be returned to the project proponent with additional advice and comments. Consequently, the final EIA is drawn.

The main points discussed in the ToR are a) the description of the proposed project, b) description of the surrounding environment, c) description of the social and cultural environment, d) regulatory legal considerations, e) identification of negative and positive environmental impacts, f) potential alternatives to the proposed project, g) preparation of a plan to manage and mitigation of negative impacts, h) preparation of a plan for monitoring and follow-up, i) coordinating with other parties and involving communities and non-governmental organizations.

The EIA report is presented in a concise manner and focuses on important environmental points such as the results of studies, conclusions, and recommendations, supported by summaries of the data collected and references, these data presented as separated attachment from the main report along with the other documents that were used.

Contents of the EIA report

- Description of the proposed activity, including a map of the location; the use of the neighbouring lands; the project's requirements of water, energy, drainage, and roads; description of manufacturing operations of the project raw materials handling incidents and risk and safety methods and measures of waste.
- Description of the environment that potentially might be affected.
- Description of alternatives to proposed project (e.g., using materials of least pollution).
- Evaluation and assessment of the probable environmental impact and effects of the proposed activity and the alternatives, including those direct and indirect effects, and short- and long-term accumulations contains (potable water quality, wastewater quality for agriculture, solid and liquid waste, gas emission, ambient air quality, land uses, noise levels, biodiversity, protected areas and socioeconomic factors).
- The extent to which areas outside the national sovereignty may be affected by the proposed activity.
- Monitoring plan
- Example: 1) Introduction 1.1: background, 1.2: description, 1.3: location, 1.4: environment management plan, 2) Impacts 2.1: introduction, 2.2: impacts of the project (main components and their impacts) for example for the artificial lake (the pumping facilities, the pipes, the digging, and the planting and construction within the lake). 3) Mitigation 3.1: introduction, 3.2: mitigation measures (same as 2.2 for each component), 4) Conclusion 4.1: main conclusions, 4.2: monitoring plan, 5) Annex: 5.1: review lists (same as 2.2 for each project components), 5.2: inspection check list (during construction), 5:3: community participation. The report can differ in its structure but should contain the main issues (description, impacts, measures)

Accreditation of consultants: MWE and EPA are responsible for maintaining a data base of consultants and consulting firms that may be contracted for EIA studies. Information and activities of these consultants have to be part of the data base. MWE and EPA advises project proponents on the consultants for their projects (EIA policy).

Review process: MWE and EPA receives the EIS from the proponent (or consultant). It then reviews the report and consults relevant stakeholders including the public. If satisfied, either approves the EIS or sends it back to the project proponent with comments. If not accepted, the EIA must be improved and submitted again for review.

The report copied to EPA consultants (EIA committee), they review if the data provided is enough, good quality and complete, also the relevant environmental standards, effectiveness of the measures suggested in the report

Review expertise: The EIA is sent back to the initial contributors of comments to review. This also include the public, in which case MWE and EPA are responsible for ensuring the public are invited for comments. There is also the possibility for external review by experts from other concerned ministries. The public can be involved through field visit to the community benefiting or impacting by the project and discussed with them or through local association.

Timeline Review: Between six months and one year (EIA policy).

Integration of EIA into decision-making: The competent agencies that give permits are co-operating agencies in EIA and, in this way; EIA is integrated into other existing consent procedures. The licensing Agency gives the final permission for the proposal.

The MWE and EPA in conjunction with other relevant government ministry or authority decides if, or under what conditions, the proposed activity is environmentally acceptable. Accordingly, the MoWE issue clearance letter which may include conditions and mitigating measures (changes in design or location), to monitoring requirements or to requirements for operation and maintenance.

Decision justification: Decisions are justified in writing. The competent authority must prepare a document in which the justification of the decision is elaborated upon, including:

- The decision of approval or rejection of the project is based upon the EIS. The competent authority may decide upon the proposed project or can select one of the alternatives. The competent authority does not necessarily follow the outcomes of the EIS review but may take a different decision. This does however not mean that the EIA outcome can be omitted.
- The competent authority must provide the MWE and EPA with a copy of the decision report. There is no mentioning of publication of the decision towards civil society and other actors that are not directly involved.

The ESIA policy is part of environmental protection authority law. The Environmental Protection Authority (EPA) is the public agency with overall responsibility for ESIA. It coordinates with sectoral ministries with the purpose of implementing & supervising ESIAs.

By the Adaptation Fund

This document intends to be in line with the AF Environmental and Social Policy (ESP) and Gender Policy (GP) and related guidance documents for the ESP and GP.

Risks screening has been conducted against the 15 AF safeguard areas below:

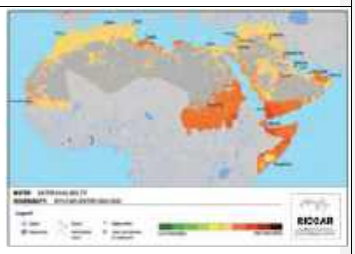
1) Compliance with the Law
2) Access and Equity
3) Marginalized and Vulnerable Groups
4) Human Rights
5) Gender Equity and Women's Empowerment
6) Core Labour Rights
7) Indigenous Peoples
8) Involuntary Resettlement
9) Protection of Natural Habitats
10) Conservation of Biological Diversity
11) Climate Change
12) Pollution Prevention and Resource Efficiency
13) Public Health
14) Physical and Cultural Heritage

15) Lands and Soil Conservation

Project description

<table>
<tr><td colspan="2">Project introduction and problem description and need statement</td></tr>
<tr><td>2. Name / title proposed adaptation measure / intervention</td><td>Increase climate change resilience to water scarcity and flooding in the Tuban Delta</td></tr>
<tr><td>3. Name Country, town, community</td><td>Yemen, Tuban delta</td></tr>
<tr><td>4. Introduction</td><td>Water-related challenges
Water resources in Tuban Delta, including Aden/Lahj face many challenges, including:
❑ Climate change risks and impacts
❑ Overuse of water / depletion
❑ Lack of a sustainable / integrated water management strategy

Main hazards Tuban delta
❑ Droughts / Water scarcity
❑ Flooding (flash, river, coastal)
❑ Sea level rise (and saltwater intrusion)
❑ Heat (Heat waves, high nr hot days)

Impacts on water resources in Tuban delta
❑ Reduced water availability due to the reduction of annual rainfall rates, which have depleted groundwater levels by about 1 m/year, increased saltwater intrusion, and led to land & soil degradation.
❑ Increased drought periods have dried out many streams in the lower Tuban region, which led to informal housing near the dried streams, thus exposing these to the risk of flooding.
❑ Increased extreme events, for example, a heavy rainfall in March 1981 led to a catastrophic flood.

Water deficit (2022 estimation)
❑ Water supplies: 53 MCM
❑ Water demand: 137.4 MCM
➢ Domestic: 45.5 MCM
➢ Agricultural 91.9 MCM
❑ Total current water deficit: 84.4 MCM.
The deficit will increase due to climate change and population growth to about 90 MCM in 2025 and 147 MCM in 2050</td></tr>
<tr><td>5. Problem description and need statement</td><td>Problem description: droughts and mismanagement of water resources in the Tuban delta are increasing water scarcity issues, while flooding risks are also increasing.

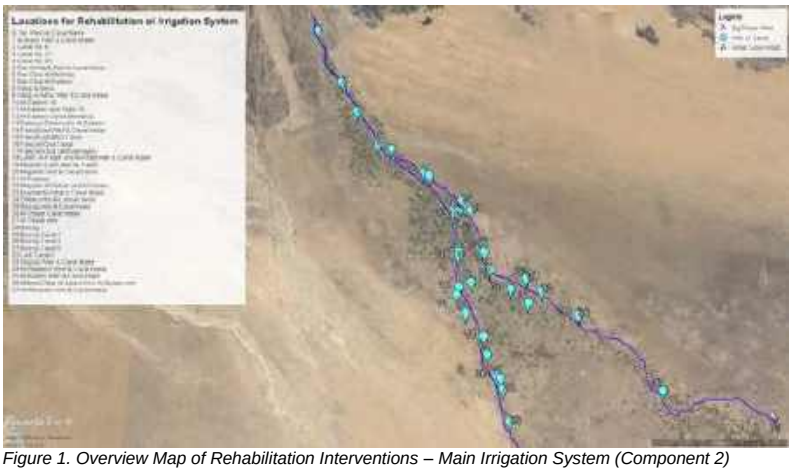
Needs statement: to address water scarcity and flood risks issues, water resources need to be management sustainably while considering future climate change impacts.

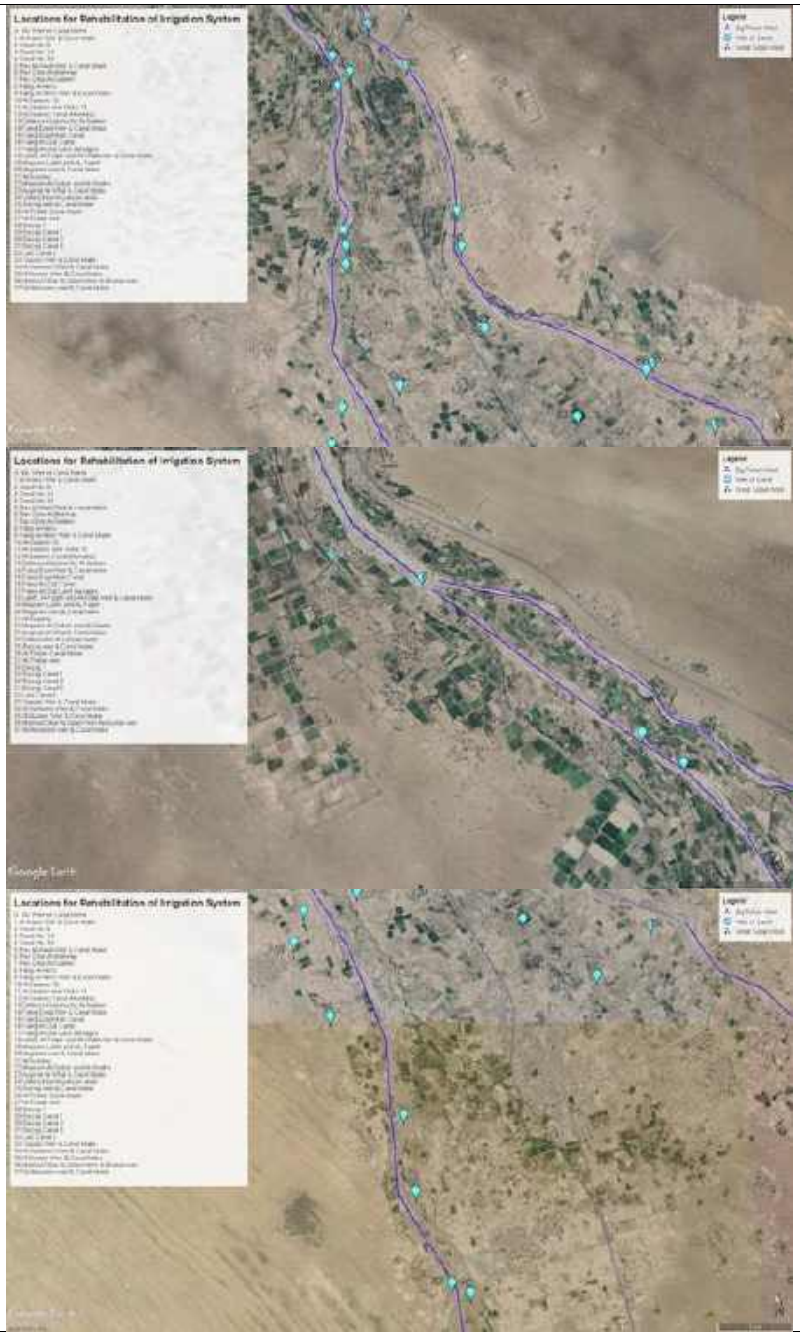
<table>
<tr><th>Potential solutions to address water scarcity issues</th><th>Potential contribution to addressing water deficit</th></tr>
<tr><td>❑ Shift to modern / efficient irrigation</td><td>45-50%</td></tr>
<tr><td>❑ Wastewater treatment and reuse.</td><td>10 %</td></tr>
<tr><td>❑ Greywater treatment and reuse.</td><td>5 %</td></tr>
<tr><td>❑ Groundwater recharge from flood water and from the treated wastewater.</td><td>5 %</td></tr>
<tr><td>Total</td><td>65-70%</td></tr>
<tr><td>❑ Seawater desalination (as last resort)</td><td>30-35 %</td></tr>
</table></td></tr>
<tr><td>6. Adaptation action (how will the measure(s) address problems and needs)</td><td>The project will support:

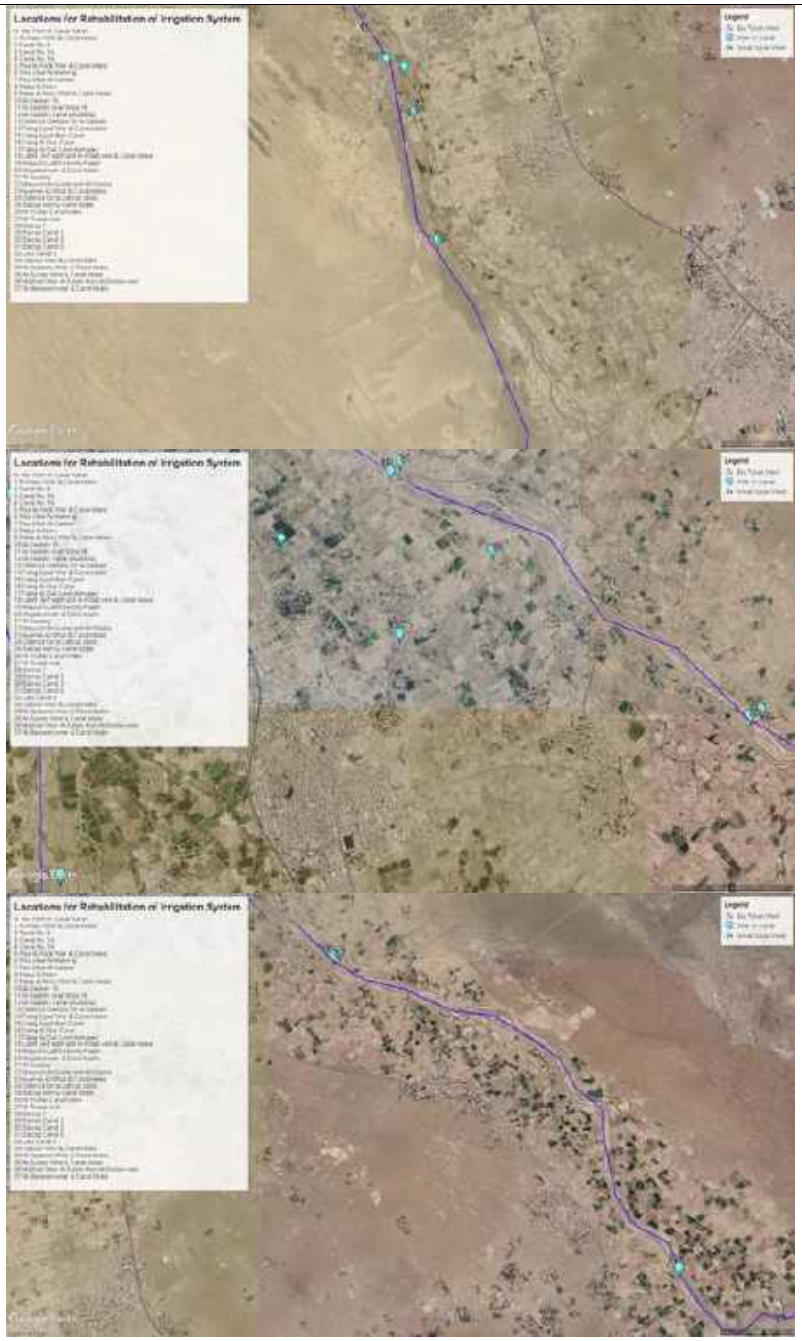
❑ Integrated and inclusive natural resource management
❑ Shift to modern / efficient irrigation
❑ Reduce flood risks
❑ Reuse of treated wastewater

The existed irrigation system in Tuban Delta faces many problems that reduce water use efficiency and pose flooding risks to people, cultivated lands and infrastructure. Therefore, this project aims at rehabilitating the irrigation systems canals and installing drip irrigation system to deliver water in the stream effectively, increase water use efficiency and reduce flooding risks. Thus, the project addresses the two main climate risks in Tuban delta, namely water scarcity and flooding.</td></tr>
</table>

	Besides that, reuse of treated wastewater is limited. The project will support the required treatment and measures for reuse for plants where feasible.

Project location	
7. Location (map, showing issues and response action)	*Component 2 interventions site assessment*: the irrigation system to be rehabilitated is in 3 wadies: the great wadi Al-Wadi Al-A'adhm, the big wadi: Al-Wadi Al-Kabeer, and small wadi: Al-Wadi Al-Sageer. The system consists of 14 weirs and irrigates 28540 acre (11 550 ha), 28 per cent of which are irrigated by flood irrigation. The conducted field visits in October 2023 showed that the system faces the following problems: ▪ Erosion of canal embankment. ▪ Some canals and control structures are blocked with sands, plants, and sedimentation. ▪ Some intakes structures of sub-canals are damaged. ▪ Some gates and their lifting system are damaged. These problems have made the system a source of flooding risk and caused damages and displacement to the local communities during heavy rainfall periods. The gabion work will be located at the sides of the wadi and in critical locations where there is a risk of floods on villages, canals, and agricultural lands. The total area for the agricultural lands to be protected by gabion works is around 1,440 hectares. The total residents in the cities and villages proposed to be protected by gabion works is around 41,500 people.  *Figure 1. Overview Map of Rehabilitation Interventions – Main Irrigation System (Component 2)* 


Locations for Rehabilitation of Irrigation System
Legend
Locations for Rehabilitation of Irrigation System
Legend
Google Earth
Locations for Rehabilitation of Irrigation System
Legend


Locations for Rehabilitation of Irrigation System
Legend
Locations for Rehabilitation of Irrigation System
Legend
Locations for Rehabilitation of Irrigation System
Legend


Villages and Agricultural Lands at Risk from Flash Floods
Legend


Villages and Agricultural Lands at Risk from Flash Floods
Legend


Villages and Agricultural Lands at Risk from Flash Floods
Legend


Villages and Agricultural Lands at Risk from Flash Floods
Legend

Figure 2-13. Detailed Maps of Rehabilitation Interventions of the Main Irrigation System

Component 3 interventions site assessment: Al-What and Al-Hawtah villages are in Tuban district Lahj. Al-What has a dry area in the west and agricultural fields in the east, north and south. Al Hawtah has agriculture fields around.

The WWTPs (Tahror and Saber) are surrounded by agricultural land. The lands towards the west are mostly affected by drought and sand encroachment. These lands will benefit from the project intervention.

Alheswa is located on the coast of Aden. The area consists of the Alheswah wastewater treatment plant, Alheswa nature reserve, Alheswa power plant and some residential areas. The proposed location is 3km west or Alheswa nature reserve and within the Alheswa power plant area. In the north of the location there is Alsha'ab city and in the northwest, there is Bir ahmed with more open areas and agricultural land, which could benefit from the project intervention

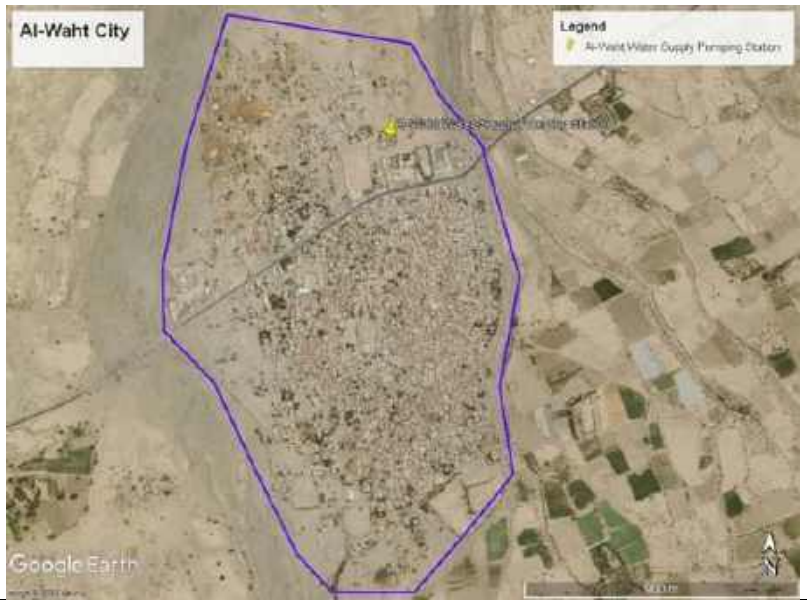
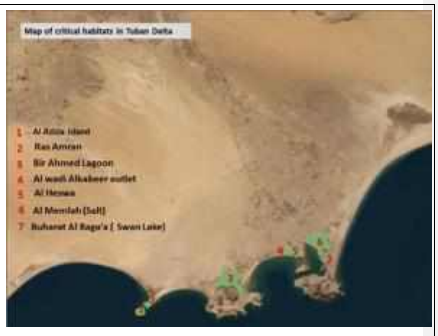
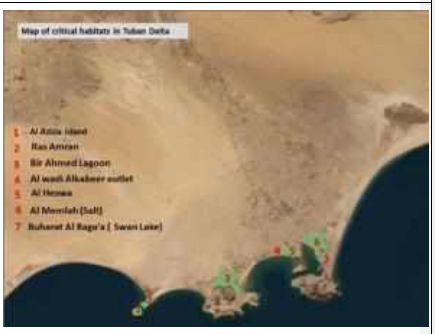
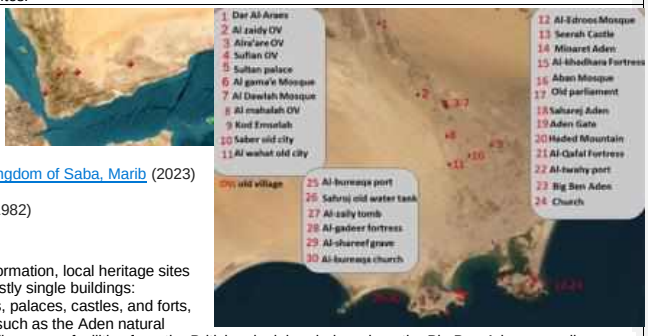


Figure 14-15. Al-Waht City and Location of Water Supply Pumping Station

Figure 16-17. Al-Hawtah City and Water Supply Pumping Station

	 *Figure 18. Saber WWTP and Reuse of Treated Wastewater Interventions and Beneficiary Areas*  *Figure 19. Tahror WWTP and Reuse of Treated Wastewater Interventions and Beneficiary Area*
8. Has land ownership (private; public) been identified, as well as land use (also informally and consent with intervention given?	❑ Shift to modern / efficient irrigation o Rehabilitation of main irrigation channel activities is on public land and on locations where irrigation infra already exists. Supporting modern irrigation techniques will be on private land (farmers, but only with the consent of farmers. ❑ Reduce flood risks o Gabions will be placed in the wadi on public land and where no people live or have livelihood activities ❑ Reuse of treated wastewater o The treatment activities are on plant locations already existing and existing irrigation channels will be used

9.	Are there vulnerable / critical natural habitats in or close to the target area. If so, describe	❑ No vulnerable / critical natural habitats in the Tuban delta as per the Convention on Wetlands (Ramsar, Iran, 1971)[121] ❑ No vulnerable / critical natural habitats in the Tuban delta as per the UNESCO Man and the Biosphere Programme.[122] There are two protected biospheres in Yemen (Socotra Archipelago and Bura'a Archipelago), but these are not located in the Tuban delta area. ❑ According to government information, Aden wetlands is an ecosystem that provides a breeding and feeding site for more than 100 migratory bird species, including flamingos. As a result, the Aden wetlands are among the most important wetland ecosystems in Yemen and in the entire region. Aden wetlands protected areas comprise of five sites: Al-Heswa, Al-Memlah, Al-Wady Al-Kabeer, Swan Lake, and Khour bir Ahmad. In addition to birds, the sites host several plant and aquatic animal species, such as turtles in AlAzizia island and Ras Amran and coral reefs, seaweeds, halophytes and algae. The ecosystems also provides several services, including protection of coastal areas and support marine habitats and consist lagoons, marshes and beaches. 
10.	Is there vulnerable biodiversity in or close to the target area. If so, describe	❑ As per the IUCN Red List of Threated Species[123], there may be some endangered birds in the Tuban delta, including the Egyptian vulture, Saker falcon and Slender-billed curlew. These may be in scrublands, grasslands, wetlands and Marine areas. However, these will not be impacted by the proposed interventions. ❑ According to government information, the Aden Coastal Wetlands are considered to be one of the most important sites for migratory birds and regularly host over 10,000 waterfowl, including three globally threatened and 12 regionally important species populations. The site meets the conditions of the International Ramsar site and Bonn Conventions. Among the most significant species found in the area are Lesser Flamingo (Phoenicopterus minor) with 9200 birds counted on the last census (in 1996), the largest concentration anywhere in the Middle East. Other important species include Great Spotted Eagle (Aquila clanga), Imperial Eagle (Aquila heliaca), and Crab Plover (Dromas ardeola). Aden wetlands host rich marine biodiversity such as sea grasses 6 species, 13 species green and brown algae,19 species of crustaceans and 67 species of mollusks. There are recorded of 24 species of fish from 18 families in Aden wetlands Pas and hard corals were presented as patches in Khor Bir Ahmed. Sea crabs were reported; Soldier crab Charybdis natator and Fiddler crabs Uca sp are common in Khor Bir Ahmed. sea cucumber was recorded includes Halothuria atra, Halothuria edulis, Halothuria scabra and Actinopyga echinites. 
11.	Are there heritage sites in or close to the target area? If so describe	❑ There are no heritage acknowledged by UNESCO[124] in the Tuban delta. UNESCO acknowledged the following sites in Yemen: **Cultural** (4) - Historic Town of Zabid (1993) - Landmarks of the Ancient Kingdom of Saba, Marib (2023) - Old City of Sana'a (1986) - Old Walled City of Shibam (1982) **Natural** (1) - Socotra Archipelago (2008) ☐ According to government information, local heritage sites in the Tubn Delta include mostly single buildings: buildings of ancient mosques, palaces, castles, and forts, in addition to water facilities such as the Aden natural water tanks (Saharej), as well as some facilities from the British colonial period, such as the Big Ben Aden, as well as some ancient cemeteries and tombs. All the identified sites are not in or close to proposed project interventions. 
12.	Are there any fragile soils in the target area? If so, describe	☐ Soils on the margin of a desert area: The tuban delta has desert areas, but there will be no project interventions in these areas. ☐ Coastal soils: no vulnerable coastal soils ☐ Soils located on steep slopes, rocky areas with very thin soils; no

[121] https://www.ramsar.org/wetland/yemen
[122] https://en.unesco.org/biosphere/arab-states#yemen
[123] https://www.iucnredlist.org/search?landRegions=YE&searchType=species
[124] https://whc.unesco.org/en/statesparties/ye

13. Are there lands that provide ecosystem services in the target area?	☐ The Tuban delta is an agriculture area, so the main ecosystem is agroecosystem with agriculture lands (crops, fruits, and ornamental shrubs) and windbreaks trees. Other ecosystems include wadies, bare land and sand dunes with plant species such as Acacia sp., Senna sp., these ecosystem is important for shepherds.

Project measures, budget and specifics

14. Adaptation measure / intervention description and budget

Output / measure	Budget USD
1.1. Capacity development with national and sub-national authorities on effective water management, including project oversight, development, and implementation of integrated management plans.	188.800
1.2. Establishment of laboratory for wastewater quality testing and water supply quality testing.	299.720
1.3. Integrated and inclusive natural resource and climate change risk management process convened bringing together government and community stakeholders	422.440
2.1. Assessment and verification / technical specification and engineering studies, including surveys required for improved irrigation canals and water intake systems	60.000
2.2. Rehabilitated Irrigation canals to improve water access for agricultural purposes in the Tuban.	1.665.216
2.3. Improved water intake structures to increase water supply in the irrigation canals.	88.500
2.4. Stone-gabions constructed to reinforce canals and protect agriculture lands and Al-what city from flashing floods.	1.572.350
3.1. Assessment and verification / technical specification and engineering studies, including surveys required, for water supply alternatives options outlined below	45.000
3.2. Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah, Saber cities and surrounding villages.	1.569.400
3.3. Upgrade Tahror WWTP to treat wastewater for use in irrigation.	400.020
3.4. Upgrade Saber WWTP to treat wastewater for use in irrigation.	360.490
4.1. Support farmers with modern irrigation techniques and system (Urban and Rural Areas)	854.721
4.2. Develop maintenance plans for canals, irrigation system and wastewater treatment plants and KM of all components.	155.760
4.3. Strengthen water user associations for improved monitoring, maintenance and dissemination of information on irrigation techniques and skills development	292.640
4.4. Skills development with women and youth on water management and climate change adaptation	141.600
4.5. Capacity development for communities with a focus on women and youth civil society organizations on integrated and inclusive natural resource management plans	94.400
4.6. Awareness raising with local communities on water conservation and climate change in Aden and the Tuban Delta	129.000
4.7.	

15. Materials to be used

16. Dimension and other technical specifications (length, size, etc.)

Output / measures	Materials to be used	Quantities / size
1.2. Establishment of laboratory for wastewater quality testing and water supply quality testing.	- Instruments, tools and furnisher for two labs	- 2
2.1. Rehabilitated Irrigation canals to improve water access for agricultural purposes in the Tuban	- Small box culvert and protection materials - Lifting system + steel gates	- 2135m3 - 35
2.2. Improved water intake structures to increase water supply in the irrigation canals	- Automatic wadi flow gauging station	- 1
2.3. Stone-gabions constructed to reinforce canals and protect agriculture lands and Al-what city from flashing floods	- Stone-gabions	- 20.500m3
3.2. Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah cities and surrounding villages	- Accessories of the pumping station - Ground Tank - vertical pumping units - PV system	 - 4000m3 - 3 - 33 KwH
3.3. Upgrade Tahror WWTP to treat wastewater for use in irrigation	- Flow measuring device - Emergency pumping unit - Steel coated mesh fence, incl. concrete foundation, steel columns and main steel door. - Ground Tank - Connection pipes and irrigation channels	- 1 - 1 - 600ml - 1000m3 - 2000 m
3.4. Upgrade Saber WWTP to treat wastewater for use in irrigation	- Flow measuring device - Emergency pumping unit - Discharge pipe - Rehabilitate guard room - Rehabilitate pumping house. - Ground Tank - Connection pipes and irrigation channels	- 1 - 1 - 1 - 1 - 1 - 1000m3 - 1000 m
4.1. Support farmers with modern irrigation techniques and system (Urban and Rural Areas)	- Modern irrigation system using bubbler irrigation techniques	- 150 ha
4.2.		

16. Does the intervention result in extra energy use. If so, describe

Modern irrigation requires pumps or elevated tanks. Using solar-powered pumps will not result in additional energy use.

	Additional energy use due to project	Compensation
3.2. Developing efficient and safe water supply alternatives for Al-What, Al-Hawtat cities and surrounding villages.	33 Kwh / day	100 solar panel 550 watt each

	3.3. Upgrade Tahror WWTP to treat wastewater for use in irrigation.	NA		
	3.4. Upgrade Saber WWTP to treat wastewater for use in irrigation.	NA		
	4.6. Support farmers with modern irrigation techniques and system (Urban and Rural Areas)	268 KwH / day	67 horizontal solar pumps (4 KwH each)	

17. Start and end date of activity / works

Output / measure	Nr. months
1.1. Capacity development with national and sub-national authorities on effective water management, including project oversight, development, and implementation of integrated management plans.	42
1.2. Establishment of laboratory for wastewater quality testing and water supply quality testing.	16
1.3. Integarted and inclusive natural resource and climate change risk management process convened bringing together government and community stakeholders	42
2.1. Assessment and verification / technical specification and engineering studies, including surveys required for improved irrigation canals and water intake systems	6
2.2. Rehabilitated Irrigation canals to improve water access for agricultural purposes in the Tuban.	24
2.3. Improved water intake structures to increase water supply in the irrigation canals.	9
2.4. Stone-gabions constructed to reinforce canals and protect agriculture lands and Al-what city from flashing floods.	18
3.1. Assessment and verification / technical specification and engineering studies, including surveys required for improved irrigation canals and water intake systems	6
3.2. Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah cities and surrounding villages.	18
3.3. Upgrade Tahror WWTP to treat wastewater for use in irrigation.	12
3.4. Upgrade Saber WWTP to treat wastewater for use in irrigation.	12
4.1. Support farmers with modern irrigation techniques and system (Urban and Rural Areas)	30
4.2. Develop maintenance plans for canals, irrigation system and wastewater treatment plants and KM of all components.	42
4.3. Strengthen water users' associations for improved monitoring, maintenance and dissemination of information on irrigation techniques and skills development	42
4.4. Skills development with women and youth on water management and climate change adaptation	42
4.5. Capacity development for communities with a focus on women and youth civil society organizations on integrated and inclusive natural resource management plans	42
4.6. Awareness raising with local communities on water conservation and climate change in Aden and the Tuban Delta	42

Project beneficiaries and benefits

18. Beneficiaries (type and number, disaggregated)

Output / measure	Number	
	Total	Women
1.1. Capacity development with national and sub-national authorities on effective water management, including project oversight, development, and implementation of integrated management plans.	300	30%
1.2. Establishment of laboratory for wastewater quality testing and water supply quality testing.		
1.3. Integrated and inclusive natural resource management planning to support the efficient, sustainable and CC resilient use of water in the Tuban, Aden, Abyan Basin.	1,255,888	50 %
2.1. Assessment and verification / technical specification and engineering studies, including surveys required for improved irrigation canals and water intake systems		
2.2. Rehabilitated Irrigation canals to improve water access for agricultural purposes in the Tuban.	72,000	50 %
2.3. Improved water intake structures to increase water supply in the irrigation canals.		
2.4. Stone-gabions constructed to reinforce canals and protect agriculture lands and Al-what city from flashing floods.	50,140	50 %
3.1. Assessment and verification / technical specification and engineering studies, including surveys required for improved irrigation canals and water intake systems		
3.2. Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah, Saber cities and surrounding villages.	89,000	50 %
3.3. Upgrade Tahror WWTP to treat wastewater for use in irrigation.	525	50 %
3.4. Upgrade Saber WWTP to treat wastewater for use in irrigation.	280	50 %
4.1. Support farmers with modern irrigation techniques and system (Urban and Rural Areas)	514	30 %
4.2. Develop maintenance plans for canals, irrigation system and wastewater treatment plants and KM of all components.		
4.3. Strengthen water users associations for improved monitoring, maintenance and dissemination of information on irrigation techniques and skills development		
4.4. Skills development with women and youth on water management and climate change adaptation	250	30 %
4.5. Capacity development for communities with a focus on women and youth civil society organizations on integrated and inclusive natural resource management plans	166	30 %
4.6. Awareness raising with local communities on water conservation and climate change in Aden and the Tuban Delta		

19. How will equal access / benefits be ensured?

☐ Through participative planning and implementation approach with quotas.

20. What are the economic, social and environmental benefits of proposed measures to the community, marginalized and vulnerable groups and women and youth?	☐ Improving water supply and distribution will lead to (20-30%) increase in food production, which can contribute to food security by increasing the availability of food crops and reducing the need for food imports, potentially lowering food prices. ☐ Rehabilitation will lead to an increase in land values in the affected area by 20-30%. ☐ Improving the irrigation systems can help reduce the reliance on rain-fed agriculture, making farming more predictable and stable and encourage farmers to keep their farms. ☐ The project will increase employment opportunities in the construction and maintenance phases, in addition to the farming opportunities. ☐ The project will support 350 poor farmers with drip irrigation systems, which will increase their income. ☐ This project will develop the area allowing to new infrastructure and encourage education. ☐ Average costs of flood damage which would be avoided as the result of the rehabilitation. ☐ Create new job opportunities for 6000 farmers. ☐ Improved Water Efficiency (reduce water wastage through leaks and evaporation). ☐ Reduce groundwater depletion: Farmers who get water from the canals will reduce their dependency of groundwater resources. Thus, reducing groundwater depletion. ☐ Canal rehabilitation provides opportunities for habitat restoration and enhancement. This includes planting native vegetation along canal banks and creating or restoring wetlands, which can support biodiversity. ☐ Rehabilitated canals control soil erosion by managing water flow and preventing sediment from entering natural water bodies. ☐ Improved canal management leads to better water quality and flow patterns, which can benefit aquatic ecosystems and the species they support. ☐ Enhanced irrigation systems support sustainable agriculture by ensuring a reliable water supply, which will reduce the pressure on natural water sources like rivers and lakes.
21. How have beneficiary communities and groups been consulted	☐ Through woprkshops and field consultations, also separate for women, youth and farners. Focus: specific needs and potential concerns
22. Have relevant local authorities (and national government) been consulted and how will they be engaged in the future?	☐ Through woprkshops and bilateral. Focus on needs / priorities and potnetial issues.
Data and monitoring	
23. What data is needed to measures the effectiveness of the proposed measure?	☐ Additional water supply ☐ Water consumption per ha ☐ Irrigated areas and crops.
24. Any data / consultations missing? How to get it?	☐ Consultaties wit hall beneficiary groups have been completed

Environmental and social context	
25. Is an EIAs required by national law? If yes, has this been conducted / will it be conducted? Have outcomes been shared publicly?	In Yemen, the following mechanism is in place to obtain environmental approval for projects: ☐ Screening (list all positive and negative impacts); If the negative impacts are not serious, no need to continue. ☐ Scoping (optional): This step should be based on consultations with the local people and national experts after listing the impacts. ☐ Impact assessment ☐ Develop possible mitigation measures (for the negative impacts) ☐ Writing all in an Environmental Impact Assessment (EIA) report ☐ **Send the EIA report to the MWE and EPA to be approved.** The process is at the last step in bold above
26. Description of gender and youth situation. Are there any unions, organisations in the area? How will these be involved?	Principal areas of concern ☐ Yemen ranked second last in the Gender Gap Index in 2021, just before Afghanistan[125] ☐ Yemen ranks last in the Gender Inequality Index[126] ☐ The CEDAW committee reviewing the 2007 Yemen CEDAW report (their 6th periodic report) noted among other concerns a very low rate of representation of women in decision-making positions in Parliament (0.3 per cent), in the Government (1.82 per cent of commissioned ministers) and in the judiciary (1.65 per cent), low rates of girls' education, women's paid employment, and the legalization of girl marriage below age 15.[127] This has been exacerbated by the war since the last review.

[125] Resourcewatch gender gap index
[126] UNDP GII
[127] Draft UN Women country gender equality brief Yemen (March 2023)

	☐ Deterioration of the rule of law and massive internal displacement have exacerbated women's and girls' vulnerability to violence, including sexual violence, child and forced marriages, and arbitrary detentions and enforced disappearance perpetrated by all parties to the conflict. [128] ☐ More than 77 per cent of internally displaced persons in Yemen are women and children, and at least 26 per cent of displaced households are now female headed, a significant increase from pre-war level.[129] ☐ Lack of representation of women in the political / leadership sphere[130] ☐ Prevailing traditional gender norms in Yemen, including that Yemen has one of the world's lowest female labour force participation rates (estimated at 7 percent).[131] Existing associations and organizations in the project target area: ☐ Women organizations: 15 ☐ Youth organizations: 7 ☐ Water user associations: 22 ☐ Community organizations (leaders): 13 Women and youth organizations in the target area will be involved in awareness and capacity strengthening activities, as well as in natural resource management planning. The activities will be tailored to the needs (and concerns) of women and youth. Quotas will be set for women participation in the project steering committee and technical committee, as well as for workshops and trainings.

Table 5: Project Description

Environmental and social risks screening and impacts

Risks screening and impacts assessments have been conducted in detail for concrete project interventions, namely:

- ☐ Rehabilitation of the irrigation system activities (outputs 2.1.; 2.2.; 2.3.) and modern irrigation system (output 4.1)
- ☐ Activities related to (re)use of (treated) (waste)water (outputs 3.1.; 3.2.; 3.3.; 3.4)

Activities related to awareness raising, capacity strengthening and planning have been screened as well in **Error! Reference source not found.**~~Table 13~~

As required by the Yemen government.

Positive impacts	Potential environmental and social risks categories	Item	Impact assessment	Mitigation measures
- Increase agricultural productivity: farmers will gain access to a reliable and efficient water supply for their crops leading to increased agricultural productivity and higher crop yields. - Water Conservation: The measure will minimise water losses through leaks or evaporation, leading to more efficient water use and conservation of this valuable resource. - Enhanced Water Distribution and Equity: These upgrades help ensure more equitable water	Protection of the environment	Emissions and dust	Some activities may release dust and emission, which impact labour and neighbouring communities	- Use to the extent possible, vehicles in appropriate technical conditions. - Ensure that vehicle engines and equipment on site are not left running unnecessarily. - Best practice to ensure minimization of dust emissions during dry and windy conditions (e.g. proper stockpiling, watering etc.). - Exact project-related energy use to be determined during project inception phase. 'Extra' energy use to be compensated through installation of solar PV
		Noise and vibrations	Some activities may release noise and vibrations, which impact labour and neighbouring communities	- Avoid operations and vehicle movements at night. - Set traffic speed limits for construction and operation-related traffic - Position equipment as far as possible from sensitive areas (neighboring communities)
		Waste management	The activities might produce some solid wastes	- Identify waste management facilities and ensure disposal through treatment/removal/recycling of each of the waste types. - Ensure that all wastes produced are properly collected, segregated, stored, transported and treated - Minimize the waste production to the extent possible. - Document all waste related operations (type of wastes, quantities produced etc.). - Appropriate and safe storage of fuels, construction materials, wastes and any

[128] Idem
[129] USAID. September 2022. Yemen: Complex Emergency Fact Sheet #11.
[130] OHCHR
[131] YEMEN Women's economic empowerment in the Yemeni context

distribution among farmers, reducing disparities in access to water resources. - Environmental Benefits: Efficient water use reduces the strain on the depleted groundwater, helps control soil erosion and reduces sediment runoff into the streams. - Rehabilitating irrigation systems will lead to increased agricultural production (food security), stimulating economic growth and development. It creates job opportunities in farming, processing, and related industries, contributing to rural livelihoods and overall economic well-being. - Rehabilitating irrigation systems can help farmers adapt to the impacts of climate variability and protect the local communities and the infrastructure from flooding.				materials that can cause spills (e.g. batteries from energy generators).
		Land uses (land degradation)	Some activities where machineries are used may lead to soil / land degradation in the area around the canals	- The contractor will fix any degradation after rehabilitating the canals for example, no trees should be cut, and no soil should be removed. Trees will be replanted.
		Biodiversity	Machineries and rehabilitation work might impact the local habitat and vegetation	- In cooperation with local authorities, the activities will be planned to avoid sensitive periods for breeding or migration of wildlife and any affected native vegetation will be replanted in new locations. Moreover, low-impact construction techniques and equipment will be used to minimize soil erosion, habitat destruction, and noise disturbance.
	Worker health and safety	Occupational Health and Safety Plan	In addition to noise, CO2 and dust emission, workers might be exposed to work-related health and safety risks	Develop an Occupational Health and Safety (H & S) Plan
		Incident reporting		Ensure all H&S related incidents (e.g. observations, accidents) on site are recorded and followed up properly.
		Personal protective equipment		Ensure the provision of Personal Protective Equipment (PPE) for workers (hardhats, masks, safety glasses, safety boots etc. depending on project type).
		UXO/ Damaged structure clearance		Ensure UXO clearance/damaged structure clearance obtained prior to start of works
		First-aid		Provide one trained first aiders per 50 employees and adequate amount of first aid kits on site.
		Access to health care		- Ensure the workforce has access to primary healthcare on site, providing prescriptions and vaccinations where necessary/applicable - In case more than 35 workers are present on site, ensure that a hospital, medical clinic or a health centre can be reached within a period of 45 minutes.
	Community health and safety	Vulnerable Groups	Due to lack of funding, only poor farmers will install modern irrigation. This might raise questions regarding inequity and reduce the trust in the authorities.	- Ensure all vulnerable groups are consulted during inception phase and continually throughout project cycle to verify and further identify all specific needs, limitations and constraints. Final decisions on who will benefit will be made with communities and water-user associations

Positive impacts	Potential environmental and social risks categories		Impact assessment	Mitigation measures
- Water Conservation: Reusing treated wastewater for irrigation, will conserve groundwater resources (efficient water use). - By utilizing treated wastewater, farmers have	Protection of the environment	Emissions and dust	Some activities may release dust and emission, which impact labour and neighbouring communities	- Use to the extent possible, vehicles in appropriate technical conditions. - Ensure that vehicle engines and equipment on site are not left running unnecessarily. - Best practice to ensure minimization of dust emissions during dry and windy conditions (e.g. proper stockpiling, watering etc.).
		Noise and vibrations	Some activities may release noise and vibrations, which impact labour and neighbouring communities	- Avoid operations and vehicle movements at night. - Set traffic speed limits for construction and operation-related traffic - Position equipment as far as possible from sensitive areas (neighboring communities)

access to a reliable water source, even during periods of water scarcity. - Using treated wastewater for irrigation leads to recycling nutrients, thus reducing the need for synthetic fertilizers, and minimizing the environmental impact associated with their production and use - Treated wastewater often contains organic matter and beneficial microorganisms that can enhance soil fertility and improve its structure, which will lead to increased crop productivity and better soil sustainability. - Reusing treated wastewater offers cost savings for farmers and municipalities including cost-effective irrigation and wastewater disposal. - Treating wastewater removes harmful pollutants and contaminants thus, protecting the environment and public health. - Reusing treated wastewater for irrigation can enhance the resilience of agricultural systems to climate-related challenges.		Waste management	The activities might produce some solid wastes	- Identify waste management facilities and ensure disposal through treatment/removal/recycling of each of the waste types. - Ensure that all wastes produced are properly collected, segregated, stored, transported and treated - Minimize the waste production to the extent possible. - Document all waste related operations (type of wastes, quantities produced etc.). - Appropriate and safe storage of fuels, construction materials, wastes and any materials that can cause spills (e.g. batteries from energy generators).
		Pollution prevention	If wastewater is not treated well, this will lead to negative impacts on human health and the ecosystem.	- Ensure all works carried out minimize pollution risk (e.g. liquid effluents, air quality and emissions, noise and vibration management, vehicle and equipment maintenance and selection, fuel, oil and chemical storage and handling) including the whole duration of the Project. - The local authorities and the wastewater companies will monitor the quality of the outflow to be used for irrigation
			Contaminant Residues in Soil and Crops; Treated wastewater may contain residual contaminants such as heavy metals, pharmaceuticals, pathogens, and other pollutants. Continued irrigation with wastewater can lead to the accumulation of these contaminants in the soil, affecting soil quality and potentially entering the food chain through crops.	- A comprehensive water quality monitoring program to assess the content of nutrients, heavy metals, pathogens, and other contaminants in the treated wastewater.
			Soil Salinity and Sodicity; Treated wastewater may have elevated levels of salts, which can contribute to soil salinity and sodicity over time. High salinity can degrade soil structure, reduce water infiltration, and negatively impact plant growth by affecting water uptake.	- Regular soil testing to monitor nutrient levels, salinity, and other soil parameters should be conducted. - Implement appropriate soil management practices, such as the addition of organic matter, to maintain soil fertility and structure.
		Effluents	Effluent at site can lead to health risks	Ensure appropriate containment and storage of construction wastewater, including sanitary water. No untreated effluent is discharged.
	Worker health and safety	Occupational Health and Safety Plan	In addition to noise, CO2 and dust emission, workers might be exposed to work-related health and safety risks	Develop an Occupational Health and Safety (H & S) Plan
		Incident reporting		Ensure all H&S related incidents (e.g. observations, accidents) on site are recorded and followed up properly.
		Personal protective equipment		Ensure the provision of Personal Protective Equipment (PPE) for workers (hardhats, masks, safety glasses, safety boots etc. depending on project type).
		UXO/ Damaged structure clearance		Ensure UXO clearance/damaged structure clearance obtained prior to start of works
		First-aid		Provide one trained first aiders per 50 employees and adequate amount of first aid kits on site.

		Access to health care		- Ensure the workforce has access to primary healthcare on site, providing prescriptions and vaccinations where necessary/applicable - In case more than 35 workers are present on site, ensure that a hospital, medical clinic or a health centre can be reached within a period of 45 minutes.
	Community health and safety	Vulnerable Groups	Due to lack of funding, only poor farmers will install modern irrigation. This might raise questions regarding inequity and reduce the trust in the authorities.	Ensure all vulnerable groups are consulted during inception phase and continually throughout project cycle to verify and further identify all specific needs, limitations and constraints. Final decisions on who will benefit will be made with communities and water-user associations

Table 6: Risks Screening of Rehabilitation of the Irrigation System Activities (Outputs 2.1.; 2.2.; 2.3.) and Modern Irrigation System (Output 4.1)

As required by the Adaptation Fund

Checklist of potential risk areas of non-compliance of the activity / intervention within the adaptation fund's environmental and social and gender principles	initial environmental or social risks present YES / NO	Explanation why yes / no and reference to information
ADAPTATION FUND PRINCIPLE 1: COMPLIANCE WITH THE LAW: ***Requirement:*** *The proposed activity should be in compliance with all applicable domestic and international law.*		
27. Have all relevant rules, regulations and technical standards been identified?	YES	All relevant rules, regulations and standards have been identified for all proposed project activities. Procedures for compliance of key ones initiated. Therefore, no potential risk of non-compliance exists. This has been fully presented in proposal Part II.E
28. Have the procedures to comply, including authorizing offices been identified?	YES	Authorizing offices and approvals required: ☐ Ministry of Water and Environment - Environmental Protection Authority ☐ Ministry of Agriculture, Irrigation and Fishery-General Administration of Irrigation Local Corporation Water and Sanitation ☐ National Water & Resources Authority – NWRA ☐ Aden and Lahj Local Authorities ☐ Water users' group
29. If an ESIA is required by national law for the proposed activity, has this been prepared and approved?	YES/NO	In Yemen, the following mechanism is in place to obtain environmental approval for projects: ☐ Screening (list all positive and negative impacts); If the negative impacts are not serious, no need to continue. ☐ Scoping (optional): This step should be based on consultations with the local people and national experts after listing the impacts. ☐ Impact assessment ☐ Develop possible mitigation measures (for the negative impacts) ☐ Writing all in an Environmental Impact Assessment (EIA) report ☐ Send the EIA report to the MWE and EPA to be approved. The ESIA-ESMP has been approved by the Ministry of water and environment
ADAPTATION FUND PRINCIPLE 2: ACCESS AND EQUITY: ***Requirement****: Ensure fair and equitable access to benefits of the activity*		
30. Have all potential beneficiaries and been identified?	YES	All project beneficiaries (i.e. population; groups) have been mapped
31. Have rivals, disputants and concerns related to equal access of project beneficiaries been identified and are measures in place to avoid these?	YES/NO	Community consultations and focus groups discussions have been conducted per beneficiary group to identify possible rivals, disputants and concerns related to equal access of project benefits. Some concerns were raised regarding: ☐ Unequal distribution of irrigated water (to small-holder farmers, women farmers, farmers which have not received support previously and other vulnerable groups) ☐ That interventions may take place during the agriculture season, which may hinder irrigation. ☐ Disruption of gate control mechanism
32. Has the process of allocating and distributing benefits equally (fair and impartial access) been described?	YES	In many cases, interventions will benefit all residents of the area equally. In cases where project benefits are limited, they will be allocated and distributed equally through a participatory process and through joint decision-making through the involvement of water user associations, social/community organizations and women and youth groups.
ADAPTATION FUND PRINCIPLE 3: VULNERABLE AND MARGINALIZED GROUPS: ***Requirement****: Avoid imposing any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS.*		
33. Have all potential beneficiaries, including marginalized and vulnerable groups been identified?	YES	All project beneficiaries (i.e. population; groups) have been mapped
34. Have the characteristics of the marginalized or vulnerable groups been described?	YES	Desk research, expert consultations and community consultations and focus group discussions have been conducted (see proposal Part II.H) to identify possible risks / adverse impacts of project activities on marginalized and vulnerable beneficiary groups (i.e. specific needs, limitations, constraints and concerns of groups).

35. Have potential adverse impacts that each marginalized and vulnerable group may experience from the activity been identified and have the groups been consulted on specific needs, limitations, constraints and requirements?	YES/NO	As per above, any potential adverse impact has been identified. There will be neither discrimination nor favouritism in accessing project/programme benefits. Project benefits will be allocated and distributed equally through a participatory process and through joint decision-making. There is a small potential risk that needs and concerns of various groups have changed once the project starts.
ADAPTATION FUND PRINCIPLE 4: HUMAN RIGHTS: ***Requirement:*** *The activity shall respect and where applicable promote international human rights*		
36. Has any citing of the host country in any Human Rights Council Special Procedures been identified and has the project described how to deal with potential related issues?	YES	Human right treaties not ratified in Yemen[132]: ❑ CAT-OP - Optional Protocol of the Convention against Torture ❑ CCPR-OP2-DP - Second Optional Protocol to the International Covenant on Civil and Political Rights aiming to the abolition of the death penalty ❑ CED - Convention for the Protection of All Persons from Enforced Disappearance ➢ Citing in relation to the armed conflict ❑ CED, Art.32 - Interstate communication procedure under the International Convention for the Protection of All Persons from Enforced Disappearance ❑ CMW - International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families ➢ There are issues reported with migrants along the boders
ADAPTATION FUND PRINCIPLE 5: GENDER EQUALITY AND WOMEN'S EMPOWERMENT: ***Requirement:*** *Design and implement the activity in such a way that both women and men* *1) have equal opportunities to participate; 2) receive comparable social and economic benefits; and 3) do not suffer disproportionate adverse effects during the development process*		
37. Has the legal and regulatory context with respect to gender equality and women's empowerment been analyzed to identify any obstacles to comply?	YES	A social inclusion plan has been developed. This is a 'gender' plan, but with a less sensitive title considering the context
38. Has the cultural, traditional, religious, or any other grounds that might result in differential allocation of benefits between men and women of the activity been analyzed?	YES	A social inclusion plan has been developed.
39. Does the project actively pursue equal participation and access to activity benefits through specific gender approach?	YES	A social inclusion plan has been developed.
ADAPTATION FUND PRINCIPLE 6: CORE LABOUR RIGHTS: ***Requirement:*** *The activity should meet the core labour standards as identified by the International Labour Organization and respect, promote ILO core labour standards*		
40. Has it been summarized how Executing Entities will comply to core labour standards?	YES	In the ESMP it has been described how executing entities will comply with the core labour standards
41. Has it been identified if the eight ILO core conventions have been ratified in project countries and if not ratified, are measures in place to avoid potential risks of non-compliance?	YES	Core labour rights not ratified in Yemen:[133] ☐ Fundamental Conventions: 8 of 10. Not ratified: **C155** - Occupational Safety and Health Convention, 1981 (No. 155) **C187** - Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187) **P029** - Protocol of 2014 to the Forced Labour Convention, 1930 ☐ Governance Conventions (Priority): 3 of 4. Not ratified **C129** - Labour Inspection (Agriculture) Convention, 1969 (No. 129) ☐ Technical Conventions: 19 of 177

[132] https://tbinternet.ohchr.org/_layouts/15/TreatyBodyExternal/Treaty.aspx?CountryID=170&Lang=EN
[133] ILO ratification (or not) of core labour standards in Yemen

42. Have potential risks of non-compliance with ILO core labour standards of the activity been identified through consultations (experts and communities) and are measures in place to avoid potential risks of non-compliance?	YES/NO	There is a small risk of core labour standards not being respected by contractors, especially related to standards for safety and health and labour inspection.
ADAPTATION FUND PRINCIPLE 7: INDIGENOUS PEOPLE: ***Requirement**: The activity shall not be inconsistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments relating to indigenous peoples.*		
43. Has it been assessed if indigenous people are present in the activity target area? If so:	YES	There have not been any indigenous groups in the area identified utilizing the criteria of the UN-Habitat Environmental and Social Safeguards System[134]: "A distinct social and cultural group possessing the following characteristics in varying degrees: 121.1. Self-identification as members of a distinct indigenous social and cultural group and recognition of this identity by others; and 121.2. Collective attachment to geographically distinct habitats, ancestral territories, or areas of seasonal use or occupation, as well as to the natural resources in these areas; and 121.3. Customary cultural, economic, social, or political institutions that are distinct or separate from those of the mainstream society or culture; and 121.4. A distinct language or dialect, often different from the official language or languages of the country or region in which they reside."
44. Has it been identified if the host country ratified the ILO Convention 169?	YES	ILO convention 169 has not been tarified in Yemen[135]
45. Has it been described how the project (and activity) will be consistent with UNDRIP, and particularly with regard to Free, Prior, Informed Consent (FPIC) during project design, implementation and expected outcomes related to the impacts affecting the communities of indigenous peoples?	N/A	
46. Has it been described how indigenous peoples will be involved in the design and the implementation of the project and provide detailed outcomes of the consultation process of the indigenous peoples?	N/A	
47. Has documented evidence of the mutually accepted process between the project and the affected communities and evidence of agreement between the parties as the outcome of the negotiations been provided?	N/A	
48. Has a summary of any reports, specific cases, or complaints that have been made with respect to the rights of indigenous peoples by the Special Rapporteur and that are relevant to the project/programme been provided?	N/A	
49. Has awareness about the rights of indigenous peoples and how it is a general principle in the implementation of the project been included in the project design?	N/A	
ADAPTATION FUND PRINCIPLE 8: INVOLUNTARY RESETTLEMENT: ***Requirement**: The activity shall be designed and implemented in a way that avoids or minimizes the need for involuntary resettlement.*		

[134] https://unhabitat.org/environmental-and-social-safeguards-system-version-3-esss-31

[135] idem

50. If there is any acquisition of lands, will the procedure be in accordance with the legal system of the country and international standards?	YES	Land acquisition is not required as all proposed interventions will be on publicly owned land ❑ Shift to modern / efficient irrigation o Rehabilitation of main irrigation channel activities is on public land and on locations where irrigation infra already exists. Supporting modern irrigation techniques will be on private land (farmers, but only with the consent of farmers. ❑ Reduce flood risks o Gabions will be placed in the wadi on public land and where no people live or have livelihood activities
51. Will any unnecessary displacement be avoided? Determine if any potential displacement is physical or economic/ livelihood and if it is voluntary or involuntary (through identification of land ownership and use (also informally) and consultations on consent to the activity?	YES	It is not foreseen that land other than public land will be targeted under this project. It has been determined that no physical or economic (even informal) displacement will take place due to project activities. This has been determined by mapping project target sites land ownership (private, public) and land use, also informally, and through consulting communities / users on the possible risk of resettlement and to get agreement on proposed interventions (i.e., no interventions will take place without the consent of inhabitants in the targeted areas). Landowners, private or public, have agreed with using their land for project activities.
52. Is awareness building of involuntary resettlement and the applicable principles and procedures of the activity / project part of the project activities?	YES	This will be part of the grievance and redress mechanism to be implemented
53. If it is involuntary: has justification for the need for involuntary resettlement been provided by demonstrating any realistic alternatives that were explored, and how the proposed involuntary resettlement has been minimized and is the least harmful solution.	N/A	
54. If it is involuntary: have details of the extent of involuntary resettlement been described, including the number of people and households involved, their socio-economic situation and vulnerability, how their livelihoods will be replaced, and the resettlement alternatives and/or the full replacement cost compensation required whether the displacement is temporary or permanent?	N/A	
55. If it is involuntary: have the details of the involuntary resettlement process that the activity will apply been described, and the built-in safeguards to ensure that displaced persons shall be informed of their rights in a timely manner, made aware of the grievance mechanism, consulted on their options, and offered technically, economically, and socially feasible resettlement alternatives or fair and adequate compensation? This also should include an overview of the applicable national laws and regulations.	N/A	
56. If it is involuntary: has it been justified that the involuntary resettlement is feasible?	N/A	
57. If it is involuntary: has the adequacy of the activity / project organisational structure to successfully implement the involuntary resettlement as well as the capacity and experience of the project/programme management with involuntary resettlement been described?	N/A	
ADAPTATION FUND PRINCIPLE 9: PROTECTION OF NATURAL HABITATS: ***Requirement:*** *The activity shall not result in unjustified conversion or degradation of critical natural habitats*		

58. Has the presence in or near the activity area of natural habitats been identified?	YES	❑ No vulnerable / critical natural habitats in the Tuban delta as per the Convention on Wetlands (Ramsar, Iran, 1971)[136] ❑ No vulnerable / critical natural habitats in the Tuban delta as per the UNESCO Man and the Biosphere Programme.[137] There are two protected biospheres in Yemen (Socotra Archipelago and Bura'a Archipelago), but these are not located in the Tuban delta area ❑ According to government information, Aden wetlands is an ecosystem that provides a breeding and feeding site for more than 100 migratory bird species, including flamingos. As a result, the Aden wetlands are among the most important wetland ecosystems in Yemen and in the entire region. Aden wetlands protected areas comprise of five sites: Al-Heswa, Al-Memlah, Al-Wady Al-Kabeer, Swan Lake, and Khour bir Ahmad. In addition to birds, the sites host several plant and aquatic animal species, such as turtles in AlAzizia island and Ras Amran and coral reefs, seaweeds, halophytes and algae. The ecosystems also provides several services, including protection of coastal areas and support marine habitats and consist lagoons, marshes and beaches. 
59. Has the potential of activity to impact directly, indirectly, or cumulatively upon natural habitats been identified?	YES	The interventions are not planned in or close to natural habitats and indirect or cumulative impacts are not expected as environmental impacts should be positive rather than.
60. Are there any risks management arrangement in place for potential risks identified above?	N/A	N/A
61. If such habitats exist, has the location of the critical habitat in relation to the project and why it cannot be avoided, as well as its characteristics and critical value been described?	N/A	N/A
62. If such habitats exist, for each affected critical natural habitat, has an analysis on the nature and the extent of the impact including direct, indirect, cumulative, or secondary impacts been provided?	N/A	N/A
ADAPTATION FUND PRINCIPLE 10: CONSERVING BIODIVERSITY: ***Requirement:*** *The activity shall be designed and implemented in a way that avoids any significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species.*		

[136] https://www.ramsar.org/wetland/yemen
[137] https://en.unesco.org/biosphere/arab-states#yemen

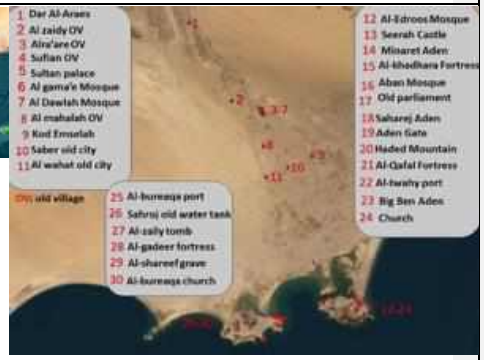
63. Has the presence in or near the project/programme area of important biological diversity been identified?	YES	❑ As per the IUCN Red List of Threated Species[138], there may be some endangered birds in the Tuban delta, including the Egyptian vulture, Saker falcon and Slender-billed curlew. These may be in scrublands, grasslands, wetlands and Marine areas. However, these will not be impacted by the proposed interventions. ❑ According to government information, the Aden Coastal Wetlands are considered to be one of the most important sites for migratory birds and regularly host over 10,000 waterfowl, including three globally threatened and 12 regionally important species populations. The site meets the conditions of the International Ramsar site and Bonn Conventions. Among the most significant species found in the area are Lesser Flamingo (Phoenicopterus minor) with 9200 birds counted on the last census (in 1996), the largest concentration anywhere in the Middle East. Other important species include Great Spotted Eagle (Aquila clanga), Imperial Eagle (Aquila heliaca), and Crab Plover (Dromas ardeola). Aden wetlands host rich marine biodiversity such as sea grasses 6 species, 13 species green and brown algae,19 species of crustaceans and 67 species of mollusks. There are recorded of 24 species of fish from 18 families in Aden wetlands Pas and hard corals were presented as patches in Khor Bir Ahmed. Sea crabs were reported; Soldier crab Charybdis natator and Fiddler crabs Uca sp are common in Khor Bir Ahmed. sea cucumber was recorded includes Halothuria atra, Halothuria edulis, Halothuria scabra and Actinopyga echinites. 
64. Has the potential of a significant or unjustified reduction or loss of biological diversity, and the potential to introduce known invasive species been identified?	YES	The interventions are not planned in or close to critical biodiversity and indirect or cumulative impacts are not expected as environmental impacts should be positive rather than.
65. If important biological diversity exists (Biological diversity), have the elements of known biological diversity importance in the project/programme area been described?	N/A	N/A
66. If important biological diversity exists (Biological diversity), has it been described why the biological diversity impact cannot be avoided?	N/A	N/A
67. Are there any risks management arrangement in place for these identified potential risks?	N/A	N/A
68. If important biological diversity exists (Invasive species), has it been described the invasive species that either may or will be introduced and why such introduction cannot be avoided?	N/A	N/A
69. If important biological diversity exists (Invasive species), has evidence that this introduction is permitted in accordance with the existing regulatory framework and the results of a risk assessment analysing the potential for invasive behaviour been provided?	N/A	N/A

[138] https://www.iucnredlist.org/search?landRegions=YE&searchType=species

<table>
<tr><td>70. If important biological diversity exists (Invasive species), has it been described the measures to be taken to minimize the possibility of spreading the invasive species?</td><td>N/A</td><td>N/A</td></tr>
<tr><td colspan="3">ADAPTATION FUND PRINCIPLE 11: CLIMATE CHANGE:
Requirement: The activity shall not result in any significant or unjustified increase in greenhouse gas emissions or other drivers of climate change.</td></tr>
<tr><td>71. When relevant, has a risk-based assessment of resulting increases in the emissions of greenhouse gasses or in other drivers of climate change been conducted?</td><td>YES</td><td>Some machinery will be used for project activities. However, energy use and related GHG emissions will be limited.</td></tr>
<tr><td colspan="3">ADAPTATION FUND PRINCIPLE 12: POLLUTION AND RESOURCE EFFICIENCY:
Requirement: The activity shall be designed and implemented in a way that meets applicable international standards for maximizing energy efficiency and minimizing material resource use, the production of wastes, and the release of pollutants.</td></tr>
<tr><td>72. Will the activities discharge pollution into water and / or land; use hazardous materials; generate noise and vibration; and/or generate waste including hazardous waste? If so, does the project has measures in place to prevent negative effects, e.g., by preparing a waste and pollution prevention and management plan for the activity or whole project</td><td>YES/NO</td><td>Waste / pollution:
☐ The main wastes are construction materials and deposits from the canals. These wastes will be removed to authorized disposal facilities/sites and processed in coordination with EPA and local authority.

There is a risk that waste will not properly be managed / recycled.

Noise:
Although construction activities will not be close to residential areas, there may be noise or vibration due to the construction activities. The following measures will be put in place to minimize potential negative effects:
☐ Avoid operations and vehicle movements at night.
☐ Set traffic speed limits for construction and operation-related traffic
☐ Position equipment as far as possible from sensitive areas (neighboring communities)</td></tr>
<tr><td>73. Will the project avoid producing / using additional natural resources, including water and energy and / or generate activity- related greenhouse gas emissions? If these are produced / used, does the project has measures in place to prevent or reduce these to manageable levels, e.g., by using water as efficient as possible for the activity or whole project or by compensating for energy use through use of renewable energy?</td><td>YES</td><td>Some machinery will be used for project activities. However, energy use and related GHG emissions will be limited. As for water use, the project intends to maximize efficient use of water sources.</td></tr>
<tr><td colspan="3">ADAPTATION FUND PRINCIPLE 13: PUBLIC HEALTH:
Requirement: The activity shall be designed and implemented in a way that avoids potentially significant negative impacts on public health.</td></tr>
<tr><td>74. Has it been demonstrated that the activity will not cause potentially significant negative impacts on public health and safety of the affected community by screening for possible risks / impacts (related to safe infrastructure, equipment, water, clean air, healthy workspace, safe house, employment and working conditions, etc. and including the results of the screening in the proposal, including general project measures to avoid risks?</td><td>YES</td><td>
<table>
<tr><th>General Potential risk / impact</th><th>Mitigation measures (for more details see ESMP)</th></tr>
<tr><td>☐ Security incidents</td><td>• Ensure health and safety procedure prior to construction that establishes procedures</td></tr>
<tr><td>☐ Occupational Health and Safety</td><td>• Occupational health and safety procedures must be developed, specific to execution entity / project output</td></tr>
<tr><td>☐ Increase in Social Tension due to Contractor-Community Interactions and Security</td><td>• A Worker Code of Conduct must be developed</td></tr>
<tr><td>❑ Increase in Vector Borne and Communicable Diseases</td><td>• A Vector Borne and Communicable Diseases Procedure must be developed</td></tr>
<tr><td>❑ Limited emergency Response Local Capacity and Equipment</td><td>• Audit and gap assessment of local capacity
• Coordinate with local emergency response teams (fire, EMS, police, hospital) and implement mitigations to address gaps</td></tr>
</table>
</td></tr>
</table>

		❑ Workplace health and safety incidents	• An Emergency Preparedness and Response Procedure must be developed
		❑ Interaction with security actors	• Develop Security and Human Rights Management Procedure that is in alignment with UNDSS and the Voluntary Principles of Human Rights • All private security personnel to receive procedural or knowledge training • Engage the public security force through the correct hierarchy and channels early in the process to set up good working relationship and improve opportunities for influence on the adoption of International Standards.
		❑ Stolen Items	• In the case of public spaces, the municipality will assign a guard
		❑ Covid-19 (if relevant)	• A Health and Safety Risk Assessment of each project activity, including supply chains and associated facilities, against International Standards needs to be carried out including specific alignment with IFC PS2 (Labour and Working Conditions) as well as IFC PS4 (Community Health and Safety and Security).
ADAPTATION FUND PRINCIPLE 14: PHYSICAL AND CULTURAL HERITAGE: ***Requirement**: The activity shall be designed and implemented in a way that avoids the alteration, damage, or removal of any physical cultural resources, cultural sites, and sites with unique natural values recognized as such at the community, national or international level.*			
75. Has the presence of heritage in or near the activity been identified?	YES	❑ There are no heritage acknowledged by UNESCO[139] in the Tuban delta. UNESCO acknowledged the following sites in Yemen: **Cultural** (4) - Historic Town of Zabid (1993) - Landmarks of the Ancient Kingdom of Saba, Marib (2023) - Old City of Sana'a (1986) - Old Walled City of Shibam (1982) **Natural** (1) - Socotra Archipelago (2008) ☐ According to government information, local heritage sites in the Tubn Delta include mostly single buildings: buildings of ancient mosques, palaces, castles, and forts, in addition to water facilities such as the Aden natural water tanks (Saharej), as well as some facilities from the British colonial period, such as the Big Ben Aden, as well as some ancient cemeteries and tombs. All the identified sites are not in or close to proposed project interventions.	 
76. If heritage exists, has the cultural heritage, the location and the results of a risk assessment analysing the potential for impacting the cultural heritage been described?	N/A	N/A	
77. If heritage exists, have the measures to be taken to ensure that heritage is not impacted, and if it is being accessed by communities, how this access will continue described?	N/A	N/A	
ADAPTATION FUND PRINCIPLE 15: LAND AND SOIL EROSION: ***Requirement:** The activity shall be designed and implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services.*			

[139] https://whc.unesco.org/en/statesparties/ye

78. Soil conservation: Has the presence of fragile soils (e.g. soils on the margin of a desert area, coastal soils, soils located on steep slopes, rocky areas with very thin soil) within the activity area been identified?	YES	☐ Soils on the margin of a desert area: The tuban delta has desert areas, but there will be no project interventions in these areas. ☐ Coastal soils: no vulnerable coastal soils ☐ Soils located on steep slopes, rocky areas with very thin soils; no
79. Soil conservation: Have activities that could result in the loss of otherwise non-fragile soil been identified. If such soils exist and potential soil loss activities will take place:	YES	No loss of soil is expected. On the contrary, project activities aim to reduce any movement of soil
80. Has the following been Identified and described? • Soils that may be impacted by the activity • Activities that may lead to loss of soils. • Reasons why soil loss is unavoidable • Measures that will be taken to minimize soil loss.	YES	See above
81. Has it been described how soil conservation has been promoted to the Executing Entities?	YES	This will be a standard clause in their contract
82. Valuable lands: Have productive lands and/or lands that provide valuable ecosystem services within the activity area been identified.	YES	The Tuban delta is an agriculture area, so the main ecosystem is agroecosystem with agriculture lands (crops, fruits and ornamental shrubs) and windbreaks trees. Other ecosystems include wadies, bare land and sand dunes with plant species such as Acacia sp., Senna sp., these ecosystem is important for shepherds.
83. Has the following been identified and described? • Any valuable lands. • Activities that may lead to land degradation. • Reasons why using these lands is un-avoidable and the alternatives that were assessed, and • Measures that will be taken to minimize productive land degradation or ecosystem service impacts.	YES	See above

Table 7: Risks Screening of Rehabilitation of the Irrigation System Activities (Outputs 2.1.; 2.2.; 2.3.) and Modern Irrigation System (Output 4.1)

AF principle number and description of risks (answer NO)	**Potential risk (+ description)**	**Impact assessment (significance of risk)**	**Mitigation measures**	**Monitoring Indicators (expected result) and means of verification**	**Responsible party / person**	**Cost / Budget**
ADAPTATION FUND PRINCIPLE 2: ACCESS AND EQUITY	Some concerns were raised regarding: ☐ Unequal distribution of irrigated water (to small-holder farmers, women farmers, farmers which have not received support previously and other vulnerable groups) ☐ That interventions may take place during the agriculture season, which may hinder irrigation. ☐ Disruption of gate control mechanism	Potential disputes if water is irrigated unequally. This may affect farmers in 22 water user associations, including small-holder farmers and women farmers	❑ Final agreement on proposed project interventions during project inception phase between: ▪ Women organizations: 15 ▪ Youth organizations: 7 ▪ Water user associations: 22 ▪ Community organizations (leaders): 13 ▪ Religious leaders ▪ Representative displaced persons ▪ Agriculture office ☐ Implement interventions during November – February and / or ensure irrigation is not disrupted due to project interventions. ☐ Develop control method or close the gates managed only by the irrigation department.	❑ Consultation / workshop report and final agreement ❑ Work plan and / or check measures to avoid disruption of irrigation. ❑ Check gate management protocol / method / plan with irrigation department	UN-Habitat and executing entities	As part of workshop budget and executing entities' budget

PRINCIPLE 3: VULNERABLE AND MARGINALIZED GROUPS	There is a small potential risk that needs and concerns of various groups have changed once the project starts.	This could lead to dissatisfaction about project interventions of project beneficiaries	❑ All project beneficiary groups will be consulted again during the inception phase to verify and further identify all specific needs and concerns of groups (see also above) ❑ Strictly apply the Grievance and Redress Mechanism ❑ The project will ensure equal opportunities in participation and decision-making of women, youth and other vulnerable groups by using quotas and by agreeing on representation in decision-making processes through the use of ToRs, agreements, etc.	❑ Verification report of needs and potential concerns of project beneficiaries ❑ Grievance and Redress mechanism in place ❑ Attendance sheets and workshop / training reports	UN-Habitat and executing entities	As part of comp 1
PRINCIPLE 6: CORE LABOUR RIGHTS:	There is a small risk of core labour standards not being respected by contractors, especially related to standards for safety and health and labour inspection.	Dissatisfaction among workers and employees in the project	The project follows ILO core labor standards. Looking at the conventions and protocols not ratified, the project will be particularly attentive to any health and safety and inspections. ❑ Employment and working conditions following core labour standards to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. ❑ Regular inspections will be conducted. ❑ Strictly apply the Grievance and Redress Mechanism	❑ Check agreements for relevant clauses ❑ Inspection reports ❑ Grievance and Redress mechanism in place	UN-Habitat	As part of execution fee (consultants)
PRINCIPLE 12: POLLUTION AND RESOURCE EFFICIENCY:	There is a risk that waste (mostly construction materials and deposits from the canals mostly related to output 2.1.) will not properly be managed / recycled.	Waste may be dumped / processed inappropriately with potential negative environmental impacts. Although waste is not expected to be hazardous, it should not be dumped on inappropriate sites or not recycled while this is possible	❑ A waste management plan will be prepared. ❑ Reference to the waste management plan to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply.	❑ Check waste management plan ❑ Check agreements for relevant clauses ❑ Conduct inspections	UN-Habitat	As part of execution fee (consultants)

Table 8: Potential Risks and Impact Assessment Details and Measures to Avoid / Mitigate Risks / Impacts

Checklist of potential risk areas of non-compliance of the activity / intervention within the adaptation fund's environmental and social and gender principles	**initial environmental or social risks present YES / NO**	**Explanation why yes / no and reference to information**
ADAPTATION FUND PRINCIPLE 1: COMPLIANCE WITH THE LAW: ***Requirement:*** *The proposed activity should be in compliance with all applicable domestic and international law.*		
84. Have all relevant rules, regulations and technical standards been identified?	YES	❑ All relevant rules, regulations and standards have been identified for all proposed project activities. Procedures for compliance of key ones initiated. Therefore, no potential risk of non-compliance exists. This has been fully presented in proposal Part II.E
85. Have the procedures to comply, including authorizing offices been identified?	YES	Authorizing offices and approvals required: ☐ Ministry of Water and Environment - Environmental Protection Authority ☐ Ministry of Agriculture, Irrigation and Fishery-General Administration of Irrigation Local Corporation Water and Sanitation ☐ National Water & Resources Authority – NWRA ☐ Aden and Lahj Local Authorities ☐ Water users' group

86. If an ESIA is required by national law for the proposed activity, has this been prepared and approved?	YES/NO	In Yemen, the following mechanism is in place to obtain environmental approval for projects: ☐ Screening (list all positive and negative impacts); If the negative impacts are not serious, no need to continue. ☐ Scoping (optional): This step should be based on consultations with the local people and national experts after listing the impacts. ☐ Impact assessment ☐ Develop possible mitigation measures (for the negative impacts) ☐ Writing all in an Environmental Impact Assessment (EIA) report ☐ Send the EIA report to the MWE and EPA to be approved. The ESIA-ESMP has been approved by the ministry of water and environment
ADAPTATION FUND PRINCIPLE 2: ACCESS AND EQUITY: ***Requirement**: Ensure fair and equitable access to benefits of the activity*		
87. Have all potential beneficiaries and been identified?	YES	All project beneficiaries (i.e. population; groups) have been mapped
88. Have rivals, disputants and concerns related to equal access of project beneficiaries been identified and are measures in place to avoid these?	YES/NO	Community consultations and focus groups discussions have been conducted per beneficiary group to identify possible rivals, disputants and concerns related to equal access of project benefits. Some concerns were raised regarding: ☐ Unequal distribution of irrigated water (to small-holder farmers, women farmers, farmers which have not received support previously and other vulnerable groups)
89. Has the process of allocating and distributing benefits equally (fair and impartial access) been described?	YES	Project benefits will be allocated and distributed equally through a participatory process and through joint decision-making through the involvement of water user associations, social/community organizations and women and youth groups.
ADAPTATION FUND PRINCIPLE 3: VULNERABLE AND MARGINALIZED GROUPS: ***Requirement**: Avoid imposing any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS.*		
90. Have all potential beneficiaries, including marginalized and vulnerable groups been identified?	YES	All project beneficiaries (i.e. population; groups) have been mapped
91. Have the characteristics of the marginalized or vulnerable groups been described?	YES	Desk research, expert consultations and community consultations and focus group discussions have been conducted (see proposal Part II.H) to identify possible risks / adverse impacts of project activities on marginalized and vulnerable beneficiary groups (i.e. specific needs, limitations, constraints and concerns of groups).
92. Have potential adverse impacts that each marginalized and vulnerable group may experience from the activity been identified and have the groups been consulted on specific needs, limitations, constraints and requirements?	YES/NO	As per above, any potential adverse impact has been identified. There will be neither discrimination nor favouritism in accessing project/programme benefits. Project benefits will be allocated and distributed equally through a participatory process and through joint decision-making. There is a small potential risk that needs and concerns of various groups have changed once the project starts.
ADAPTATION FUND PRINCIPLE 4: HUMAN RIGHTS: ***Requirement:** The activity shall respect and where applicable promote international human rights*		
93. Has any citing of the host country in any Human Rights Council Special Procedures been identified and has the project described how to deal with potential related issues?	YES	Human right treaties not ratified in Yemen[140]: ❑ CAT-OP - Optional Protocol of the Convention against Torture ❑ CCPR-OP2-DP - Second Optional Protocol to the International Covenant on Civil and Political Rights aiming to the abolition of the death penalty ❑ CED - Convention for the Protection of All Persons from Enforced Disappearance ➢ Citing in relation to the armed conflict ❑ CED, Art.32 - Interstate communication procedure under the International Convention for the Protection of All Persons from Enforced Disappearance ❑ CMW - International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families ➢ There are issues reported with migrants along the boders
ADAPTATION FUND PRINCIPLE 5: GENDER EQUALITY AND WOMEN'S EMPOWERMENT: ***Requirement:** Design and implement the activity in such a way that both women and men*		

[140] https://tbinternet.ohchr.org/_layouts/15/TreatyBodyExternal/Treaty.aspx?CountryID=170&Lang=EN

1) have equal opportunities to participate; 2) receive comparable social and economic benefits; and 3) do not suffer disproportionate adverse effects during the development process		
94. Has the legal and regulatory context with respect to gender equality and women's empowerment been analyzed to identify any obstacles to comply?	YES	A social inclusion plan has been developed. This is a 'gender' plan, but with a less sensitive title considering the context
95. Has the cultural, traditional, religious, or any other grounds that might result in differential allocation of benefits between men and women of the activity been analyzed?	YES	A social inclusion plan has been developed.
96. Does the project actively pursue equal participation and access to activity benefits through specific gender approach?	YES	A social inclusion plan has been developed.
ADAPTATION FUND PRINCIPLE 6: CORE LABOUR RIGHTS: ***Requirement:*** *The activity should meet the core labour standards as identified by the International Labour Organization and respect, promote ILO core labour standards*		
97. Has it been summarized how Executing Entities will comply to core labour standards?	YES	In the ESMP it has been described how executing entities will comply with the core labour standards
98. Has it been identified if the eight ILO core conventions have been ratified in project countries and if not ratified, are measures in place to avoid potential risks of non-compliance?	YES	Core labour rights not ratified in Yemen:[141] ☐ Fundamental Conventions: 8 of 10. Not ratified: **C155** - Occupational Safety and Health Convention, 1981 (No. 155) **C187** - Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187) **P029** - Protocol of 2014 to the Forced Labour Convention, 1930 ☐ Governance Conventions (Priority): 3 of 4. Not ratified **C129** - Labour Inspection (Agriculture) Convention, 1969 (No. 129) ☐ Technical Conventions: 19 of 177
99. Have potential risks of non-compliance with ILO core labour standards of the activity been identified through consultations (experts and communities) and are measures in place to avoid potential risks of non-compliance?	YES/NO	There is a small risk of core labour standards not being respected by contractors, especially related to standards for safety and health and labour inspection.
ADAPTATION FUND PRINCIPLE 7: INDIGENOUS PEOPLE: ***Requirement****: The activity shall not be inconsistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments relating to indigenous peoples.*		
100. Has it been assessed if indigenous people are present in the activity target area? If so:	YES	There have not been any indigenous groups in the area identified utilizing the criteria of the UN-Habitat Environmental and Social Safeguards System[142]: "A distinct social and cultural group possessing the following characteristics in varying degrees: 121.1. Self-identification as members of a distinct indigenous social and cultural group and recognition of this identity by others; and 121.2. Collective attachment to geographically distinct habitats, ancestral territories, or areas of seasonal use or occupation, as well as to the natural resources in these areas; and 121.3. Customary cultural, economic, social, or political institutions that are distinct or separate from those of the mainstream society or culture; and 121.4. A distinct language or dialect, often different from the official language or languages of the country or region in which they reside."
101. Has it been identified if the host country ratified the ILO Convention 169?	YES	ILO convention 169 has not been tarified in Yemen[143]
102. Has it been described how the project (and activity) will be consistent with UNDRIP, and particularly with regard	N/A	

[141] ILO ratification (or not) of core labour standards in Yemen
[142] https://unhabitat.org/environmental-and-social-safeguards-system-version-3-esss-31
[143] idem

to Free, Prior, Informed Consent (FPIC) during project design, implementation and expected outcomes related to the impacts affecting the communities of indigenous peoples?		
103. Has it been described how indigenous peoples will be involved in the design and the implementation of the project and provide detailed outcomes of the consultation process of the indigenous peoples?	N/A	
104. Has documented evidence of the mutually accepted process between the project and the affected communities and evidence of agreement between the parties as the outcome of the negotiations been provided?	N/A	
105. Has a summary of any reports, specific cases, or complaints that have been made with respect to the rights of indigenous peoples by the Special Rapporteur and that are relevant to the project/programme been provided?	N/A	
106. Has awareness about the rights of indigenous peoples and how it is a general principle in the implementation of the project been included in the project design?	N/A	
ADAPTATION FUND PRINCIPLE 8: INVOLUNTARY RESETTLEMENT: ***Requirement**: The activity shall be designed and implemented in a way that avoids or minimizes the need for involuntary resettlement.*		
107. If there is any acquisition of lands, will the procedure be in accordance with the legal system of the country and international standards?	YES	Land acquisition is not required as all proposed interventions will be on publicly owned land ❑ Reuse of treated wastewater o The wastewater treatment activities are on plant locations already existing and existing irrigation channels will be used
108. Will any unnecessary displacement be avoided? Determine if any potential displacement is physical or economic/ livelihood and if it is voluntary or involuntary (through identification of land ownership and use (also informally) and consultations on consent to the activity?	YES	It is not foreseen that land other than public land will be targeted under this project. It has been determined that no physical or economic (even informal) displacement will take place due to project activities. This has been determined by mapping project target sites land ownership (private, public) and land use, also informally, and through consulting communities / users on the possible risk of resettlement and to get agreement on proposed interventions (i.e., no interventions will take place without the consent of inhabitants in the targeted areas).
109. Is awareness building of involuntary resettlement and the applicable principles and procedures of the activity / project part of the project activities?	YES	This will be part of the grievance and redress mechanism to be implemented
110. If it is involuntary: has justification for the need for involuntary resettlement been provided by demonstrating any realistic alternatives that were explored, and how the proposed involuntary resettlement has been minimized and is the least harmful solution.	N/A	
111. If it is involuntary: have details of the extent of involuntary resettlement been described, including the number of people and households involved, their socio-economic situation and vulnerability, how their livelihoods will be replaced, and the resettlement alternatives and/or the full replacement cost compensation required whether the displacement is temporary or permanent?	N/A	
112. If it is involuntary: have the details of the involuntary resettlement process that the activity will apply been described, and the built-in safeguards to ensure that displaced persons shall be informed of their rights in a	N/A	

timely manner, made aware of the grievance mechanism, consulted on their options, and offered technically, economically, and socially feasible resettlement alternatives or fair and adequate compensation? This also should include an overview of the applicable national laws and regulations.		
113. If it is involuntary: has it been justified that the involuntary resettlement is feasible?	N/A	
114. If it is involuntary: has the adequacy of the activity / project organisational structure to successfully implement the involuntary resettlement as well as the capacity and experience of the project/programme management with involuntary resettlement been described?	N/A	
ADAPTATION FUND PRINCIPLE 9: PROTECTION OF NATURAL HABITATS: ***Requirement:*** *The activity shall not result in unjustified conversion or degradation of critical natural habitats*		
115. Has the presence in or near the activity area of natural habitats been identified?	YES	❑ No vulnerable / critical natural habitats in the Tuban delta as per the Convention on Wetlands (Ramsar, Iran, 1971)[144] ❑ No vulnerable / critical natural habitats in the Tuban delta as per the UNESCO Man and the Biosphere Programme.[145] There are two protected biospheres in Yemen (Socotra Archipelago and Bura'a Archipelago), but these are not located in the Tuban delta area ❑ According to government information, Aden wetlands is an ecosystem that provides a breeding and feeding site for more than 100 migratory bird species, including flamingos. As a result, the Aden wetlands are among the most important wetland ecosystems in Yemen and in the entire region. Aden wetlands protected areas comprise of five sites: Al-Heswa, Al-Memlah, Al-Wady Al-Kabeer, Swan Lake, and Khour bir Ahmad. In addition to birds, the sites host several plant and aquatic animal species, such as turtles in AlAzizia island and Ras Amran and coral reefs, seaweeds, halophytes and algae. The ecosystems also provides several services, including protection of coastal areas and support marine habitats and consist lagoons, marshes and beaches. 
116. Has the potential of activity to impact directly, indirectly, or cumulatively upon natural habitats been identified?	YES	The interventions are not planned in or close to natural habitats and indirect or cumulative impacts are not expected as environmental impacts should be positive rather than. negative
117. Are there any risks management arrangement in place for potential risks identified above?	N/A	N/A
118. If such habitats exist, has the location of the critical habitat in relation to the project and why it cannot be avoided, as well as its characteristics and critical value been described?	N/A	N/A
119. If such habitats exist, for each affected critical natural habitat, has an analysis on the nature and the extent of the impact including direct, indirect, cumulative, or secondary impacts been provided?	N/A	N/A
ADAPTATION FUND PRINCIPLE 10: CONSERVING BIODIVERSITY:		

[144] https://www.ramsar.org/wetland/yemen
[145] https://en.unesco.org/biosphere/arab-states#yemen

Requirement: *The activity shall be designed and implemented in a way that avoids any significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species.*		
120. Has the presence in or near the project/programme area of important biological diversity been identified?	YES	❑ As per the IUCN Red List of Threated Species[146], there may be some endangered birds in the Tuban delta, including the Egyptian vulture, Saker falcon and Slender-billed curlew. These may be in scrublands, grasslands, wetlands and Marine areas. However, these will not be impacted by the proposed interventions. ❑ According to government information, the Aden Coastal Wetlands are considered to be one of the most important sites for migratory birds and regularly host over 10,000 waterfowl, including three globally threatened and 12 regionally important species populations. The site meets the conditions of the International Ramsar site and Bonn Conventions. Among the most significant species found in the area are Lesser Flamingo (Phoenicopterus minor) with 9200 birds counted on the last census (in 1996), the largest concentration anywhere in the Middle East. Other important species include Great Spotted Eagle (Aquila clanga), Imperial Eagle (Aquila heliaca), and Crab Plover (Dromas ardeola). Aden wetlands host rich marine biodiversity such as sea grasses 6 species, 13 species green and brown algae,19 species of crustaceans and 67 species of mollusks. There are recorded of 24 species of fish from 18 families in Aden wetlands Pas and hard corals were presented as patches in Khor Bir Ahmed. Sea crabs were reported; Soldier crab Charybdis natator and Fiddler crabs Uca sp are common in Khor Bir Ahmed. sea cucumber was recorded includes Halothuria atra, Halothuria edulis, Halothuria scabra and Actinopyga echinites. 
121. Has the potential of a significant or unjustified reduction or loss of biological diversity, and the potential to introduce known invasive species been identified?	YES	The interventions are not planned in or close to natural habitats and indirect or cumulative impacts are not expected as environmental impacts should be positive rather than. negative
122. If important biological diversity exists (Biological diversity), have the elements of known biological diversity importance in the project/programme area been described?	N/A	N/A
123. If important biological diversity exists (Biological diversity), has it been described why the biological diversity impact cannot be avoided?	N/A	N/A
124. Are there any risks management arrangement in place for these identified potential risks?	N/A	N/A
125. If important biological diversity exists (Invasive species), has it been described the invasive species that either may or will be introduced and why such introduction cannot be avoided?	N/A	N/A
126. If important biological diversity exists (Invasive species), has evidence that this introduction is permitted in accordance with the existing regulatory framework and the results of a risk assessment analysing the potential for invasive behaviour been provided?	N/A	N/A

[146] https://www.iucnredlist.org/search?landRegions=YE&searchType=species

<table>
<tr><td>127. If important biological diversity exists (Invasive species), has it been described the measures to be taken to minimize the possibility of spreading the invasive species?</td><td>N/A</td><td>N/A</td></tr>
<tr><td colspan="3">ADAPTATION FUND PRINCIPLE 11: CLIMATE CHANGE:
Requirement: The activity shall not result in any significant or unjustified increase in greenhouse gas emissions or other drivers of climate change.</td></tr>
<tr><td>128. When relevant, has a risk-based assessment of resulting increases in the emissions of greenhouse gasses or in other drivers of climate change been conducted?</td><td>N/A</td><td>
<table>
<tr><th></th><th>Additional energy use due to project</th><th>Compensation</th></tr>
<tr><td>3.2. Developing efficient and safe water supply alternatives for Al-What, Al-Hawtat cities and surrounding villages.</td><td>33 Kwh / day</td><td>100 solar panel 550 watt each</td></tr>
<tr><td>3.3. Upgrade Tahror WWTP to treat wastewater for use in irrigation.</td><td>NA</td><td></td></tr>
<tr><td>3.4. Upgrade Saber WWTP to treat wastewater for use in irrigation.</td><td>NA</td><td></td></tr>
<tr><td></td><td>NA</td><td></td></tr>
<tr><td>1.1. Support farmers with modern irrigation techniques and system (Urban and Rural Areas)</td><td>268 KwH / day</td><td>67 horizontal solar pumps (4 KwH each)</td></tr>
</table>
</td></tr>
<tr><td colspan="3">ADAPTATION FUND PRINCIPLE 12: POLLUTION AND RESOURCE EFFICIENCY:
Requirement: The activity shall be designed and implemented in a way that meets applicable international standards for maximizing energy efficiency and minimizing material resource use, the production of wastes, and the release of pollutants.</td></tr>
<tr><td>129. Will the activities discharge pollution into water and / or land; use hazardous materials; generate noise and vibration; and/or generate waste including hazardous waste? If so, does the project has measures in place to prevent negative effects, e.g., by preparing a waste and pollution prevention and management plan for the activity or whole project</td><td>YES/NO</td><td>Waste / pollution:
☐ The treated wastewater will still have some pollutants, only suitable for certain crops. Although farmers are aware of the suitability of the use of treated wastewater (for fodders), there is still a risk that treated wastewater will be used inappropriately and that farmers are not using enough health safety equipment.
☐ Related to above some concerns were raised regarding irrigation of inappropriate crops and discharge of bad quality wastewater.
☐ Some sludge may need to be removed from the WWTP sites. There is a risk this will not be processed appropriately.

Noise:
Although construction activities will not be close to residential areas, there may be noise or vibration due to the construction activities. The following measures will be put in place to minimize potential negative effects:
▪ Avoid operations and vehicle movements at night.
▪ Set traffic speed limits for construction and operation-related traffic
▪ Position equipment as far as possible from sensitive areas (neighboring communities)</td></tr>
<tr><td>130. Will the project avoid producing / using additional natural resources, including water and energy and / or generate activity- related greenhouse gas emissions? If these are produced / used, does the project has measures in place to prevent or reduce these to manageable levels, e.g., by using water as efficient as possible for the activity or whole project or by compensating for energy use through use of renewable energy?</td><td>YES</td><td>☐ The two wastewater treatment plants will treat up to 4700 m^3/day. The treated water will be reused for irrigation this will support rationalizing the use of surface and underground water resources and prevent further pollution on the resource. The treated wastewater will irrigate 115 ha, 2 seasons/year.
☐ See principe 11</td></tr>
<tr><td colspan="3">ADAPTATION FUND PRINCIPLE 13: PUBLIC HEALTH:
Requirement: The activity shall be designed and implemented in a way that avoids potentially significant negative impacts on public health.</td></tr>
<tr><td>131. Has it been demonstrated that the activity will not cause potentially significant negative impacts on public health and safety of the affected community by screening for possible risks / impacts (related to safe infrastructure, equipment, water, clean air, healthy workspace, safe house, employment and working conditions, etc. and</td><td>YES/NO</td><td>
<table>
<tr><th>General Potential risk / impact</th><th>Mitigation measures (for more details see ESMP)</th></tr>
<tr><td>☐ Security incidents</td><td>• Ensure health and safety procedure prior to construction that establishes procedures</td></tr>
<tr><td>☐ Occupational Health and Safety</td><td>• Occupational health and safety procedures must be developed, specific to execution entity / project output</td></tr>
</table>
</td></tr>
</table>

<table>
<tr>
<td>including the results of the screening in the proposal, including general project measures to avoid risks?</td>
<td></td>
<td>
<table>
<tr><td>☐ Increase in Social Tension due to Contractor-Community Interactions and Security</td><td>• A Worker Code of Conduct must be developed</td></tr>
<tr><td>❑ Increase in Vector Borne and Communicable Diseases</td><td>• A Vector Borne and Communicable Diseases Procedure must be developed</td></tr>
<tr><td>❑ Limited emergency Response Local Capacity and Equipment</td><td>• Audit and gap assessment of local capacity
• Coordinate with local emergency response teams (fire, EMS, police, hospital) and implement mitigations to address gaps</td></tr>
<tr><td>❑ Workplace health and safety incidents</td><td>• An Emergency Preparedness and Response Procedure must be developed</td></tr>
<tr><td>❑ Interaction with security actors</td><td>• Develop Security and Human Rights Management Procedure that is in alignment with UNDSS and the Voluntary Principles of Human Rights
• All private security personnel to receive procedural or knowledge training
• Engage the public security force through the correct hierarchy and channels early in the process to set up good working relationship and improve opportunities for influence on the adoption of International Standards.</td></tr>
<tr><td>❑ Stolen Items</td><td>• In the case of public spaces, the municipality will assign a guard</td></tr>
<tr><td>❑ Covid-19 (if relevant)</td><td>• A Health and Safety Risk Assessment of each project activity, including supply chains and associated facilities, against International Standards needs to be carried out including specific alignment with IFC PS2 (Labour and Working Conditions) as well as IFC PS4 (Community Health and Safety and Security).</td></tr>
</table>
There remains a risk that treated wastewater will be used inappropriately and that farmers are not using enough health and safety equipment.
</td>
</tr>
<tr>
<td colspan="3">ADAPTATION FUND PRINCIPLE 14: PHYSICAL AND CULTURAL HERITAGE:
Requirement: The activity shall be designed and implemented in a way that avoids the alteration, damage, or removal of any physical cultural resources, cultural sites, and sites with unique natural values recognized as such at the community, national or international level.</td>
</tr>
<tr>
<td>132. Has the presence of heritage in or near the activity been identified?</td>
<td>YES</td>
<td>
❑ There are no heritage acknowledged by UNESCO[147] in the Tuban delta. UNESCO acknowledged the following sites in Yemen:
Cultural (4)
- Historic Town of Zabid (1993)
- Landmarks of the Ancient Kingdom of Saba, Marib (2023)
- Old City of Sana'a (1986)
- Old Walled City of Shibam (1982)
Natural (1)
- Socotra Archipelago (2008)
☐ According to government information, local heritage sites in the Tubn Delta include mostly single buildings: buildings of ancient mosques, palaces, castles, and forts, in addition to water facilities such as the Aden natural water tanks (Saharej), as well as some facilities from the British colonial period, such as the Big Ben Aden, as well as some

</td>
</tr>
</table>

[147] https://en.unesco.org/biosphere/arab-states#yemen

		ancient cemeteries and tombs. All the identified sites are not in or close to proposed project interventions.
133. If heritage exists, has the cultural heritage, the location and the results of a risk assessment analysing the potential for impacting the cultural heritage been described?	N/A	N/A
134. If heritage exists, have the measures to be taken to ensure that heritage is not impacted, and if it is being accessed by communities, how this access will continue described?	N/A	N/A
ADAPTATION FUND PRINCIPLE 15: LAND AND SOIL EROSION: ***Requirement:*** *The activity shall be designed and implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services.*		
135. Soil conservation: Has the presence of fragile soils (e.g. soils on the margin of a desert area, coastal soils, soils located on steep slopes, rocky areas with very thin soil) within the activity area been identified?	YES	☐ Soils on the margin of a desert area: The tuban delta has desert areas, but there will be no project interventions in these areas. ☐ Coastal soils: no vulnerable coastal soils ☐ Soils located on steep slopes, rocky areas with very thin soils; no
136. Soil conservation: Have activities that could result in the loss of otherwise non-fragile soil been identified. If such soils exist and potential soil loss activities will take place:	YES	No loss of soil is expected. On the contrary, project activities aim to reduce any movement of soil
137. Has the following been Identified and described? • Soils that may be impacted by the activity • Activities that may lead to loss of soils. • Reasons why soil loss is unavoidable • Measures that will be taken to minimize soil loss.	YES	See above
138. Has it been described how soil conservation has been promoted to the Executing Entities?	YES	This will be a standard clause in their contract
139. Valuable lands: Have productive lands and/or lands that provide valuable ecosystem services within the activity area been identified. If such lands exist:	YES	The Tuban delta is an agriculture area, so the main ecosystem is agroecosystem with agriculture lands (crops, fruits and ornamental shrubs) and windbreaks trees. Other ecosystems include wadies, bare land and sand dunes with plant species such as Acacia sp., Senna sp., these ecosystem is important for shepherds.
140. Has the following been identified and described? • Any valuable lands. • Activities that may lead to land degradation. • Reasons why using these lands is un-avoidable and the alternatives that were assessed, and • Measures that will be taken to minimize productive land degradation or ecosystem service impacts.	YES	See above

Table 9: Risks Screening of Activities Related to (re)Use of (treated) Wastewater (Outputs 3.1.; 3.2.; 3.3.; 3.4)

AF principle number and description of risks (answer NO)	**Potential risk (+ description)**	**Impact assessment (significance of risk)**	**Mitigation measures to avoid / reduce any potential risks**	**Monitoring indicators and verification**	**Responsible party / person**	**Cost / Budget**
ADAPTATION FUND PRINCIPLE 2: ACCESS AND EQUITY	Some concerns were raised regarding: ☐ Unequal distribution of irrigated water (to small-holder farmers, women farmers, farmers which have not received support previously and other vulnerable groups)	Potential disputes if water is irrigated unequally. This may affect farmers in 22 water user associations, including small-holder farmers and women farmers	❑ Final agreement on proposed project interventions during project inception phase between: ▪ Women organizations: 15 ▪ Youth organizations: 7 ▪ Water user associations: 22 ▪ Community organizations (leaders): 13 ▪ Religious leaders ▪ Representative displaced persons ▪ Agriculture office	❑ Consultation / workshop report and final agreement	UN-Habitat and executing entities	As part of workshop budget and executing entities' budget
PRINCIPLE 3: VULNERABLE AND MARGINALIZED GROUPS	There is a small potential risk that needs and concerns of groups have changed once the project starts.	This could lead to dissatisfaction about project interventions of project beneficiaries	❑ All project beneficiary groups will be consulted again during the inception phase to verify and further identify all specific needs and concerns of groups. ❑ Strictly apply the Grievance and Redress Mechanism ❑ The project will ensure equal opportunities in participation and decision-making of women, youth and other vulnerable groups by using quotas and by agreeing on representation in decision-making processes through the use of ToRs, agreements, etc.	❑ Verification report of needs and potential concerns of project beneficiaries ❑ Grievance and Redress mechanism in place ❑ Attendance sheets and workshop / training reports	UN-Habitat and executing entities	As part of comp 1
PRINCIPLE 6: CORE LABOUR RIGHTS:	There is a small risk of core labour standards not being respected by contractors, especially related to standards for safety and health and labour inspection.	Dissatisfaction among workers and employees in the project	The project follows ILO core labor standards. Looking at the conventions and protocols not ratified, the project will be particularly attentive to any health and safety and inspections. ❑ Employment and working conditions following core labour standards to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. ❑ Regular inspections will be conducted. ❑ Strictly apply the Grievance and Redress Mechanism	❑ Check agreements for relevant clauses ❑ Inspection reports ❑ Grievance and Redress mechanism in place	UN-Habitat	As part of execution fee (consultants)
PRINCIPLE 12: POLLUTION AND RESOURCE EFFICIENCY:	The treated wastewater will still have some pollutants, only suitable for certain crops. Although farmers are aware of the suitability of the use of treated wastewater (for fodders), there is still a risk that treated wastewater will be used inappropriately and that farmers are not using enough health and safety equipment.	Crops (115 ha) may get contaminated, and farmers may get sick. This may also have a secondary negative effect on consumers of the crops Treated water for drinking will be mixed into the water supply network, serving the whole of	❑ Ensure treated wastewater is only used for appropriate crops (through coordination with farmer/water user associations and authorities and related monitoring) ❑ Comply with (international) standards for water quality and monitor water quality. ❑ Ensure farmers are aware of the risks and wear appropriate shoes and gloves (as part of awareness campaign and trainings planned)	❑ Regular water quality checks ❑ Conduct inspections. ❑ Check if is part of the awareness raising campaign and trainings	UN-Habitat	As part of execution fee (consultants), laboratories established and planned awareness campaigns

	Besides that, there is a risk that sludge need to be removed from the WWTP sites, but that this will not be processed appropriately.	Aden				
PRINCIPLE 13: PUBLIC HEALTH	The treated wastewater will still have some pollutants, only suitable for certain crops. Although farmers are aware of the suitability of the use of treated wastewater (for fodders), there is still a risk that treated wastewater will be used inappropriately and that farmers are not using enough health and safety equipment.	Crops (115 ha) may get contaminated, and farmers may get sick. This may also have a secondary negative effect on consumers of the crops	❑ Ensure treated wastewater is only used for appropriate crops (through coordination with farmer/water user associations and authorities and related monitoring) ❑ Comply with (international) standards for water quality and monitor water quality. ❑ Ensure farmers are aware of the risks and wear appropriate shoes and gloves (as part of awareness campaign and trainings planned)	❑ Regular wastewater quality check ❑ Conduct inspections. ❑ Check if is part of the awareness raising campaign and trainings	UN-Habitat	As part of execution fee (consultants), laboratories established and planned awareness campaigns

Table 10: Potential Risks and Impact Assessment Details and Measures to Avoid / Mitigate Risks and Impacts

Environmental and Social risk Management Plan (ESMP)

Summary ESMP

ESP principle	Initial environmental or social risks present Y/N	Potential risks	Explanation	Impact assessment	Mitigation measures to avoid / reduce any potential risks	Monitoring indicators and verification	Responsible and frequency
1.Compliance with the Law	NO	No risk has been identified but 'standard' mitigation measures will be put in place to ensure compliance of project activities with relevant standards and regulations	Relevant national laws and standards and project compliance with these have been identified. A risks screening and impact assessment for proposed project interventions has been conducted and an ESIA-ESMP prepared and approved by the ministry of water and environment 		❑ Standard clause / references to laws and standards to which project activities need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. ❑ Ensure the ESIA-ESMP is implemented, including guiding executing entities to do so *Responsible: UN-Habitat *Budget: as part of project activities / assignment project consultants and staff	- Standard clauses in contracts - Executing entities reporting on ESIA-ESMP implementation	UN-Habitat Executing entities Every contract and as part of annual monitoring
2.Access and Equity	YES	Some concerns were raised regarding: ☐ Unequal distribution of irrigated water (to small-holder farmers, women	Project beneficiaries (i.e., population; groups) have been mapped. Community consultations and focus groups discussions have been conducted per beneficiary group to identify possible rivals, disputants and	Potential disputes if water is irrigated unequally. This may affect farmers in 22 water user associations, including small-holder farmers and women farmers	❑ Final agreement on proposed project interventions during project inception phase between: ▪ Women organizations: 15 ▪ Youth organizations: 7 ▪ Water user associations: 22	☐ Consultation / workshop report and final agreement ☐ Work plan and / or check measures to	UN-Habitat and executing entities c

		farmers, farmers which have not received support previously and other vulnerable groups) ☐ That interventions may take place during the agriculture season, which may hinder irrigation. ☐ Disruption of gate control mechanism	concerns related to equal access of project benefits.		▪ Community organizations (leaders): 13 ▪ Religious leaders ▪ Representative displaced persons ▪ Agriculture office ☐ Implement interventions during November – February and / or ensure irrigation is not disrupted due to project interventions. ☐ Develop control method or close the gates managed only by the irrigation department. ☐ Quotas and a targeting strategy will be applied for meetings, workshops and trainings *Responsible: UN-Habitat and executing entities *Budget: as part of project activities / assignment project consultants and staff	avoid disruption of irrigation. ☐ Check gate management protocol / method / plan with irrigation department ☐ Check targeting strategy and attendance sheets and workshop / training reports	
3.Marginalized and Vulnerable Groups	YES	There is a small potential risk that needs and concerns of groups have changed once the project starts.	Project beneficiaries (i.e., population; groups) have been mapped. Community consultations and focus groups discussions have been conducted per beneficiary group to identify needs and possible concerns	This could lead to dissatisfaction about project interventions of project beneficiaries	❑ All project beneficiary groups will be consulted again during the inception phase to verify and further identify all specific needs and concerns of groups (see also above) ❑ Strictly apply the Grievance and Redress Mechanism ❑ The project will ensure equal opportunities in participation and decision-making of women, youth and other vulnerable groups by using quotas and by agreeing on representation in decision-making processes using ToRs, agreements, etc. ❑ Quotas and a targeting strategy will be applied for meetings, workshops and trainings *Responsible: UN-Habitat and executing entities *Budget: as part of project activities / assignment project consultants and staff	❑ Verification report of needs and potential concerns of project beneficiaries ❑ Grievance and Redress mechanism in place - Check targeting strategy and attendance sheets and workshop / training reports	UN-Habitat and executing entities Every contract and as part of annual monitoring
4.Human Rights	NO	No risk has been identified but 'standard' mitigation measures will be put in place to no	Any Human right treaties not ratified or citing of the host country in a Human Rights Council Special Procedures has been identified. Although some Human right treaties are not ratified in Yemen, risks related to these are manageable as the		☐ Standard clause / references to relevant Humans rights declarations to which the project activity will need to comply will be included in all legal agreements		UN-Habitat

		Human rights will be violated	project does not foresee works leading to any resettlement and will prevent this.		with all sub-contractors, including steps and responsibilities to comply. ☐ Develop Security and Human Rights Management Procedure that is in alignment with UNDSS and the Voluntary Principles of Human Rights ☐ Share information on human rights with project beneficiary groups at the inception phase of the project and during implementation ☐ Share information on the grievance and Redress mechanism and human rights at every meeting *Responsible: UN-Habitat and executing entities *Budget: as part of assignment project consultants and staff		
5.Gender Equity and Women's Empowerment	NO	No risk has been identified but 'standard' mitigation measures will be put in place avoid any risk	The legal and regulatory context with respect to gender equality and women's empowerment been analyzed, as well as the cultural, traditional, religious, or any other grounds that might result in differential allocation of benefits between men and women. Based on this a social assessment and inclusion /gender plan has been developed		☐ Reference to the social inclusion plan to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. ☐ Implement the project social inclusion /gender plan, including guiding executing entities to do so *Responsible: UN-Habitat *Budget: as part of project activities / assignment project consultants and staff	☐ Standard clauses in contracts ☐ Executing entities reporting on social inclusion plan	UN-Habitat Executing entities
6.Core Labour Rights	YES	There is a small risk of core labour standards not being respected by contractors, especially related to standards for safety and health and labour inspection.	In the ESMP it has been described how executing entities will comply with the core labour standards	Dissatisfaction among workers and employees in the project	The project follows ILO core labor standards. Looking at the conventions and protocols not ratified, the project will be particularly attentive to any health and safety and inspections. ❑ Employment and working conditions following core labour standards to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply.	❑ Check agreements for relevant clauses ❑ Inspection reports - Grievance and Redress mechanism in place	UN-Habitat Every contract and as part of annual monitoring

					❑ Regular inspections will be conducted. ❑ Strictly apply the Grievance and Redress Mechanism *Responsible: UN-Habitat *Budget: as part of project activities / assignment project consultants and staff		
7.Indigenous Peoples	NO	No risk has been identified	No indigenous people have bene identified in the project target area				
8.Involuntary Resettlement	NO	No risk has been identified but 'standard' mitigation measures will be put in place avoid any risk	Resettlement because of project activities will be always avoided.It is not foreseen that land other than public land will be targeted under this project. The project determined that no physical or economic displacement will take place due to the project. This has been determined by mapping project target sites land ownership (private, public) and land use, also informally, and through consulting communities / users on the possible risk of resettlement and to get agreement on proposed interventions (i.e., no interventions will take place without the consent of inhabitants in the targeted areas). Any agreement / contract for project works signed will include a clause mentioning that project activities will not result in any resettlement.		☐ Standard clause / references to relevant Humans rights declarations to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. ☐ Develop Security and Human Rights Management Procedure that is in alignment with UNDSS and the Voluntary Principles of Human Rights *Responsible: UN-Habitat *Budget: as part of project activities / assignment project consultants and staff	☐ Standard clauses in contracts	UN-Habitat Every contract and as part of annual monitoring
9.Protection of Natural Habitats	NO	No risk has been identified	The project ensures that no unjustified conversion or degradation of critical natural habitats will take place because of project activities. The proposed project interventions are not planned in or close to natural habitats and indirect or cumulative impacts are not expected as environmental impacts should be positive rather than. Negative. During project preparation, it has been checked if any critical natural habitats exist in the target location, including their location, characteristics and critical value (i.e., legal protection status, common knowledge or traditional knowledge), as well as possible negative impacts on these due to project activities.				
10.Conservation of Biological Diversity	NO	No risk has been identified	The project ensures that any significant or unjustified reduction or loss of biological diversity because of project activities will be avoided. The proposed project interventions are not planned in or close to critical biodiversity and indirect or cumulative impacts are not expected as environmental impacts should be positive rather than. Negative. During project preparation, it has been checked if any important biodiversity exists in				

			the target location, including their protection status and other recognised inventories as well as possible negative impacts on these due to project activities.				
11.Climate Change	NO	No risk has been identified but 'standard' mitigation measures will be put in place avoid any risk	Any additional energy use due to project activities have been identified and will be compensated by renewable energy sources installed		☐ Exact project-related energy use to be verified through engineering studies and to be compensated through installation of solar PV *Responsible: UN-Habitat *Budget: as part of project activities / assignment project consultants and staff	Report on exact project-related energy use by the project	UN-Habitat During studies and as part of annual monitoring
12.Pollution Prevention and Resource Efficiency	YES	There is a risk that waste (mostly construction materials, deposits from the canals and sludge will not properly be managed / recycled. Besides, the treated wastewater will still have some pollutants, only suitable for certain crops. Although farmers are aware of the suitability of the use of treated wastewater (for fodders), there is still a risk that treated wastewater will be used inappropriately and that farmers are not using enough health and safety equipment.	The main wastes are construction materials, the deposits from the canals and sludge. These wastes will be removed and processed in coordination with EPA and local authority. Treated wastewater is already used for irrigation. The treated wastewater will still have some pollutants, only suitable for certain crops. Although farmers are aware of the suitability of the use of treated wastewater (for fodders)	Waste may be dumped / processed inappropriately with potential negative environmental impacts. Although waste is not expected to be hazardous, it should not be dumped on unappropriated sites Crops (115 ha) may get contaminated, and farmers may get sick. This may also have a secondary negative effect on consumers of the crops Treated water for drinking will be mixed into the water supply network, serving the whole of Aden	❑ A waste management plan will be prepared. ❑ Reference to the waste management plan to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. ❑ Ensure treated wastewater is only used for appropriate crops (through coordination with farmer/water user associations and authorities and related monitoring) ❑ Comply with (international) standards for water quality. ❑ Ensure farmers are aware of the risks and wear appropriate shoes and gloves (as part of awareness campaign and trainings planned) *Responsible: UN-Habitat *Budget: as part of project activities / assignment project consultants and staff	❑ Check waste management plan ❑ Check agreements for relevant clauses ❑ Regular wastewater quality check ❑ Conduct inspections. ❑ Check if is part of the awareness raising campaign and trainings	UN-Habitat and executing entities Every contract and as part of annual monitoring
13.Public Health	YES	There is a risk that treated wastewater will be used inappropriately and that farmers are not using enough health and safety equipment.	Treated wastewater is already used for irrigation. The treated wastewater will still have some pollutants, only suitable for certain crops. Although farmers are aware of the suitability of the use of treated wastewater (for fodders)	Crops (115 ha) may get contaminated, and farmers may get sick. This may also have a secondary negative effect on consumers of the crops	❑ References to relevant ICSC international health and safety standards to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. ❑ Ensure treated wastewater is only used for appropriate crops (through coordination with farmer/water user associations	❑ Regular water quality check ❑ Conduct inspections ❑ Check if is part of the awareness raising campaign and trainings	UN-Habitat Every contract and as part of annual monitoring

					and authorities and related monitoring) ❑ Comply with (international) standards for water quality. ❑ Ensure farmers are aware of the risks and wear appropriate shoes and gloves (as part of awareness campaign and trainings planned)		
14.Physical and Cultural Heritage	NO	No risk has been identified but 'standard' mitigation measures will be put in place avoid any risk	There are no heritage sites acknowledged by UNESCO[148] in the Tuban delta. Also, according to government information, no heritage sites will be affected by the project		☐ Reference to a heritage chance find procedure to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. *Responsible: UN-Habitat *Budget: as part of project activities / assignment project consultants and staff		UN-Habitat
15.Lands and Soil Conservation	NO	No risk has been identified	No loss of soil is expected. On the contrary, project activities aim to reduce any movement of soil				

Table 11: Summary Environmental and Social Risks Management Plan

Screening and categorization

Based on the screening against the 15 AF principles, the project has been categorised as a "B" category project in terms of the environmental and social risks it poses. See also Part II.L.

For an overview of project activities' screening results against the 15 AF principles see below table. For details, see the next section.

Checklist of environmental and social principles	No further assessment required for compliance (during project implementation)	Potential impacts and risks – further assessment and management required for compliance
16. Compliance with the Law	X	
17. Access and Equity		X
18. Marginalized and Vulnerable Groups		X
19. Human Rights	X	
20. Gender Equality and Women's Empowerment	X	
21. Core Labour Rights		X

[148] https://whc.unesco.org/en/statesparties/ye

22. *Indigenous Peoples*	X	
23. *Involuntary Resettlement*	X	
24. *Protection of Natural Habitats*	X	
25. *Conservation of Biological Diversity*	X	
26. *Climate Change*	X	
27. *Pollution Prevention and Resource Efficiency*		X
28. *Public Health*		X
29. *Physical and Cultural Heritage*	X	
30. *Lands and Soil Conservation*	X	

Table 12: Overview of Environmental and Social Impacts and Risks for Which Further Assessments and Management are Required

Detailed outputs / activities	Risk screening result	Explanation why triggered or not
Component 1: Integrated and inclusive natural resource management for climate-resilient water systems		
1.1. Capacity development with national and sub-national authorities on climate change resilience, effective water management, including project oversight, development, and implementation of integrated management plans	No risk	❑ No risk principle was triggered as capacity development of national and sub-national authorities will take place based on the needs identified during project preparation, while this will be verified during project inception. Also quotas will be applied for women participation and all relevant stakeholders will be invited
1.2. Establishment of laboratory for wastewater quality testing and water supply quality testing	No risk	❑ No risk principle was triggered as the laboratories will be established in existing buildings and will support water quality testing
1.3. Integrated and inclusive natural resource management planning to support the efficient, sustainable and CC resilient use of water in the Tuban, Aden, Abyan Basin	Potential risks related to AF ESP Principles 2 and 3	☐ Principle 2 was triggered because some concerns were raised during the proposal preparation phase regarding unequal distribution of irrigated water (to small-holder farmers, women farmers, farmers which have not received support previously and other vulnerable groups) ❑ Principle 3 was triggered because the needs and concerns of groups may have changed once the project starts.
1.4. Integrated and inclusive natural resource and climate change risk management process convened bringing together government and community stakeholders	Potential risks related to AF ESP Principles 2 and 3	❑ Principle 2 was triggered because some concerns were raised during the proposal preparation phase regarding unequal distribution of irrigated water (to small-holder farmers, women farmers, farmers which have not received support previously and other vulnerable groups) ❑ Principle 3 was triggered because the needs and concerns of groups may have changed once the project starts.
❑ **Component 2:** Adaptive capacity of the water sector		
2.1. Assessment and verification / technical specification and engineering studies, including surveys required for improved irrigation canals and water intake systems	No risk	No risk principle was triggered as the activity will identify details of concrete interventions below and related potential issues and solutions
2.2. Rehabilitated irrigation canals to improve water access for agricultural purposes in the Tuban	Potential risks related to AF ESP Principles 2, 3, 6 and 12	The existing irrigation channels will be rehabilitated. This may result in some waste ☐ Principle 2 was triggered because some concerns were raised during the proposal preparation phase regarding unequal distribution of irrigated water (to small-holder farmers, women farmers, farmers which have not received support previously and other vulnerable groups) and because interventions may take place during the agriculture season, which may hinder irrigation. ❑ Principle 3 was triggered because the needs and concerns of groups may have changed once the project starts. ❑ Principle 6 was triggered because core labour standards may not be respected by contractors, especially related to standards for safety and health and labour inspection. ❑ Principle 12 was triggered because waste from the rehabilitation of canals may not be properly managed / recycled
2.3. Improved water intake structures to increase water supply in the irrigation canals	Potential risks related to AF ESP Principles 2, 3, 6	Water intake structures will be improved as part of existing irrigation channels ❑ Principle 2 was triggered because some concerns were raised during the proposal preparation phase because interventions may take place during the agriculture season, which may hinder irrigation and because there may be disruption of the gate control mechanism. ❑ Principle 3 was triggered because the needs and concerns of groups may have changed once the project starts. ❑ Principle 6 was triggered because core labour standards may not be respected by contractors, especially related to standards for safety and health and labour inspection.
2.4. Stone-gabions constructed to reinforce canals and protect agriculture lands and Al-what city from flashing floods.	Potential risks related to AF ESP Principles 3, 6	The stone gabions will be placed on the side of the riverbed, reducing flood risks to settlements. Initial locations for the stone gabions have been identified, based on flood risks. The exact locations will be identified based on further assessments and engineering studies planned as part of the output. ❑ Principle 3 was triggered because the needs and concerns of groups may have changed once the project starts. ❑ Principle 6 was triggered because core labour standards may not be respected by contractors, especially related to standards for safety and health and labour inspection.

Component 3: Innovative adaptation practices for water supply systems		
3.1. Assessment and verification / technical specification and engineering studies, including surveys required for improved irrigation canals and water intake systems	No risk	No risk principle was triggered as the activity will identify details of concrete interventions below and related potential issues and solutions
3.2. Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah cities and surrounding villages	Potential risks related to AF ESP Principles 3, 6, 12 and 13	This intervention will supply 6,931 m^3/day water to Al-Waht, Al-Hawtah cities and surrounding villages, serving 89,000 people. The intervention will be on public land ❑ Principle 3 was triggered because the needs and concerns of groups may have changed once the project starts. ❑ Principle 6 was triggered because core labour standards may not be respected by contractors, especially related to standards for safety and health and labour inspection. ❑ Principle 13 was triggered because the quality of the water supplied may not be ensured without standards and procedures in place to ensure the quality
3.3. Upgrade Tahror WWTP to treat wastewater for use in irrigation	Potential risks related to AF ESP Principles 2, 3, 6, 12 and 13	This intervention will supply 3,800 m3/day treated water to irrigate 95 ha, serving 525 farms. The intervention will be on public land ❑ Principle 2 was triggered because some concerns were raised during the proposal preparation phase regarding unequal distribution of irrigated water (to small-holder farmers, women farmers, farmers which have not received support previously and other vulnerable groups) ❑ Principle 3 was triggered because the needs and concerns of groups may have changed once the project starts. ❑ Principle 6 was triggered because core labour standards may not be respected by contractors, especially related to standards for safety and health and labour inspection. ❑ Principle 12 was triggered because treated wastewater could be used inappropriately, and farmers may not be using enough health and safety equipment. ❑ Principle 13 was triggered because treated wastewater could be used inappropriately, and farmers may not be using enough health and safety equipment.
3.4. Upgrade Saber WWTP to treat wastewater for use in irrigation	Potential risks related to AF ESP Principles 2, 3, 6, 12 and 13	This intervention will supply 900 m3/day treated water to irrigate 20 ha, serving 280 farms. The intervention will be on public land ❑ Principle 2 was triggered because some concerns were raised during the proposal preparation phase regarding unequal distribution of irrigated water (to small-holder farmers, women farmers, farmers which have not received support previously and other vulnerable groups) ❑ Principle 3 was triggered because the needs and concerns of groups may have changed once the project starts. ❑ Principle 6 was triggered because core labour standards may not be respected by contractors, especially related to standards for safety and health and labour inspection. ❑ Principle 12 was triggered because treated wastewater could be used inappropriately, and farmers may not be using enough health and safety equipment. ❑ Principle 13 was triggered because treated wastewater could be used inappropriately, and farmers may not be using enough health and safety equipment.
Component 4:		
4.1. Support farmers with modern irrigation techniques and systems (Urban and Rural Areas)	Potential risks related to AF ESP Principles 2, 3, 6, 12 and 13	This intervention will cover 200 ha serving 350 farmers. The intervention will be on private land (farmers) but only with their consent. There will be no excavations. ❑ Principle 2 was triggered because some concerns were raised during the proposal preparation phase regarding unequal distribution of irrigated water (to small-holder farmers, women farmers, farmers which have not received support previously and other vulnerable groups) ❑ Principle 3 was triggered because the needs and concerns of groups may have changed once the project starts. ❑ Principle 6 was triggered because core labour standards may not be respected by contractors, especially related to standards for safety and health and labour inspection. ❑ Principle 12 was triggered because treated wastewater could be used inappropriately, and farmers may not be using enough health and safety equipment. ❑ Principle 13 was triggered because treated wastewater could be used inappropriately, and farmers may not be using enough health and safety equipment.
4.2. Develop maintenance plans for canals, irrigation system and wastewater treatment plants and KM of all components	No risk	❑ No risk principle was triggered as this is mitigation measure to ensure maintenance and sustainability of proposed interventions
4.3. Strengthen water user associations for improved monitoring, maintenance, and dissemination of	Potential risks related to AF ESP Principles 2 and 3	❑ Principle 2 was triggered because some concerns were raised during the proposal preparation phase regarding unequal distribution of irrigated water (to small-holder farmers, women farmers, farmers which have not received support previously and other vulnerable groups) ❑ Principle 3 was triggered because the needs and concerns of groups may have changed once the project starts.

information on irrigation techniques and skills development		
4.4. Skills development with women and youth on water management and climate change adaptation	No risk	❑ No risk principle was triggered as the selection of women and youth groups will be agreed upon by all groups, by also identifying and addressing and concerns and specific needs these groups have
4.5. Capacity development for communities with a focus on women and youth civil society organizations on integrated and inclusive natural resource management plan	No risk	❑ No risk principle was triggered as the selection will be agreed upon by large stakeholder group, by also identifying and addressing and concerns and specific needs
4.6. Awareness raising with local communities on water conservation and climate change in Aden and the Tuban Delta	No risk	❑ No risk principle was triggered as the awareness raising target communities will be agreed upon by large stakeholder group.

Table 13: Overview of Project Activities' Screening Results Against the 15 AF Risk Areas / Principles

Allocated roles and responsibilities for implementing the ESMP

UN-Habitat will be responsible for environmental and social risks management of the project, including implementation of the Project ESMP. A safeguard expert (i.e., project execution supervisor) will be part of the project execution team. This expert, together with the national project coordinator, will also supervise the executing entities on the implementation of the Project ESMP. Guidelines showing how to comply to the AF ESP and GP will be tailored to and shared with the executing entities, and these will be guided on the process, including monitoring. Monitoring project staff will also require having expertise on environmental and social risk management and be familiar with the AF safeguarding system.

Team	Role	Responsibility
UN-Habitat	Project execution supervisor, project coordinator and M & E (from execution fee)	• Guide the executing entities on implementing the ESMP • Prepare guidelines / plans for executing entities to implement the ESMP • Documentation of site, interviews with beneficiaries • ESMP monitoring
	Overall project supervision (from project cycle management fee_	• Review ESMP at inception phase • ESMP monitoring • Reporting (PPR)
Contractor	Project Manager	• Reporting to UN-Habitat on implementation of ESMP • Appoint project grievance mechanism focal point to implement the Grievance Redress Mechanism
Project steering committee	Approve changes when required	• When changes in project activities or additional activities are required, these will need to go through a new risks screening and impact assessment process in compliance with AF, UN-Habitat and national policies and standards. When this is required, this will be led by UN-Habitat and the steering committee would need to approve the changes.

Table 14: Project Safeguarding Roles and Responsibilities

All project-related ToR's and contracts will include clauses stating contractors require to comply to the AF ESP, especially principle 1 (law), 4 (human rights), 5 (gender), 6 (core labour standards) 8 (involuntary resettlement), 11 (GHG emissions), 12 (waste and pollution), 13 (health and safety) and 14 (heritage sites) and to the AF GP. This includes:

- ☐ Principle 1: References to laws and standards to which project activities need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply.
- ☐ Principle 4: References to relevant Humans rights declarations to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply.
- ☐ Principle 5: Reference to the social inclusion plan to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply.
- ☐ Principe 6: Employment and working conditions following core labour standards to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply.
- ☐ Principle 8: Commitment that no involuntary resettlement will take place due to project activities.
- ☐ Principle 11: Commitment to avoiding GHG emission due to project activities
- ☐ Principle 12: Reference to the waste management plan to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply.
- ☐ Principle 13: References to relevant ICSC international health and safety standards to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply.
- ☐ Principle 14: Reference to a heritage chance find procedure to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply.

Minimum requirements and standard clauses will include:

Potential risk / impact	Mitigation measure
Non-compliance with laws / standards	☐ Standard clause / references to laws and standards to which project activities need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply.

Table 15: Principle 1: Compliance with the Laws

Potential risk / impact	Mitigation measure
Unequal access to project benefits	❑ Final agreement on proposed project interventions during project inception phase between: ▪ Women organizations: 15 ▪ Youth organizations: 7 ▪ Water user associations: 22 ▪ Community organizations (leaders): 13

	▪ Religious leaders ▪ Representative displaced persons ▪ Agriculture office ☐ Quotas and a targeting strategy will be applied for meetings, workshops and trainings

Table 16: Principle 2: Access and Equity

Potential risk / impact	Mitigation measure
Changing needs and concerns	❑ All project beneficiary groups will be consulted again during the inception phase to verify and further identify all specific needs and concerns of groups (see also above) ❑ Strictly apply the Grievance and Redress Mechanism ❑ The project will ensure equal opportunities in participation and decision-making of women, youth and other vulnerable groups by using quotas and by agreeing on representation in decision-making processes using ToRs, agreements, etc. ❑ Quotas and a targeting strategy will be applied for meetings, workshops and trainings

Table 17: Principle 3: Marginalized and Vulnerable Groups

Potential risk / impact	Mitigation measure
Limited awareness on human rights	• Standard clause / references to relevant Humans rights declarations to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. • Develop Security and Human Rights Management Procedure that is in alignment with UNDSS and the Voluntary Principles of Human Rights • Share information on human rights with project beneficiary groups at the inception phase of the project and during implementation • Share information on the grievance and Redress mechanism and human rights at every meeting

Table 18: Principle 4: Human Rights

Potential risk / impact	Mitigation measure
Limited awareness of social inclusion / gender plan	• Reference to the social inclusion plan to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. • Implement the project social inclusion /gender plan, including guiding executing entities to do so

Table 19: Principle 5: Gender Equality and Women's Empowerment.

Potential risk / impact	Mitigation measure
- Non-involvement of local employment	• Work with local community on verification of local workers where feasible, including migrant workers
- Non-compliance with worker rights, including migrants and non-compliance with safety and health standards	• Screen potential contractors and contracts o Expected workers to be involved (direct, contract, supply chain) and how? o Expected working conditions (Human resource policies and procedures; working conditions and terms of employment; workers' organizations; non-discrimination and equal opportunities (women, youth, other); grievance redress mechanism. o Measures to protecting the work force (incl. child labor; forced labor) • Include standard clause in all contracts: o HR policy aligned with ILO Core Conventions o Worker Grievance Mechanism to be established. o Enforce minimum age expectations (according to ILO) o Measures to ensure Contractor adopts project HR Policy standards (either contractually or through monitoring) o Ensure all employees are provided with a written employment contract before start of works. o Provide details of the transport arrangements for all workers to and from their accommodation (dedicated or in the local community) o Refer to occupational health and safety procedures
- Limited Facilities	• Contractor to provide or facilitate access to necessary worker facilities which include but are not limited to: toilets, rest areas, smoking areas, canteen and potable drinking water to WHO standards • All worker facilities and accommodation will be cleaned, maintained, and centrally managed

Table 20: Principle 6: Core Labour Standards

Potential risk / impact	Mitigation measure
Non-compliance with laws / standards	☐ Standard clause / references to relevant Humans rights declarations to which the project activity will need to comply will be included in all legal agreements with all sub-contractors, including steps and responsibilities to comply. ☐ Develop Security and Human Rights Management Procedure that is in alignment with UNDSS and the Voluntary Principles of Human Rights

Table 36 Principle 8 Involuntary resettlement

Potential risk / impact	Mitigation measure
Increased GHG Emissions due to Project Emissions	• Exact project-related energy use to be verified through engineering studies and to be compensated through installation of solar PV

Table 21: Principle 11: Climate Change

Potential risk/ impact	Mitigation measure
Lack of appropriate waste management procedure	A Waste Management procedure/ plan will be developed and at a minimum include the following mitigations: • Identification of appropriate waste management to handle, treat and / or recycle waste, including land fill if required.

Potential risk/ impact	Mitigation measure
	• Regular inspections schedule

Table 22: Principle 12: Pollution Prevention and Resource Efficiency

Potential risk / impact	Mitigation measure
Security incidents	• Ensure health and safety procedure prior to construction that establishes procedures
Occupational Health and Safety	Occupational health and safety procedures must be developed, specific to each Project output, for the following: • Working at height • Heavy lifting • Working in confined spaces • Excavation works • Hot work • Working and scaffolding • Electrical safety • Working with machinery • Site clearance (debris management, unexploded ordinances) • Collapsing structures • Handling of hazardous materials • Weather conditions • Lone working • Material transport (unloading and storage) • Earthmoving and concreting • Permit to work system • Lock Out Tag Out (LOTO) System • Minimum Mandatory PPE (incl. shoes, helmets, gloves, high-visibility vest, safety glasses) • Proper Safety signage • Medical clinic and first aid • Housekeeping
Increase in Social Tension due to Contractor-Community Interactions and Security	A Worker Code of Conduct must be developed and at a minimum must: • Outline general requirements and expectations on security interaction with community and external stakeholders, respectful, polite, and honest behavior is expected from all employees. • Outline requirements on conflict avoidance and sensitivity to local cultures, traditions, and lifestyles. • Ensure that no workers are to engage with the local community except via an appointed representative. • Ensure zero tolerance of illegal activities by all personnel including: prostitution; illegal sale or purchase of alcohol; the sale, purchase, or consumption of drugs; gambling and fighting. • Be included as part of induction and signed by all employees.
Increase in Vector Borne and Communicable Diseases	A Vector Borne and Communicable Diseases Procedure must be developed and at a minimum must: • Limit the spread of vector borne disease and communicable diseases
Limited emergency Response Local Capacity and Equipment	• Audit and gap assessment of local capacity • Coordinate with local emergency response teams (fire, EMS, police, hospital) and implement mitigations to address gaps
Workplace health and safety incidents	An Emergency Preparedness and Response Procedure must be developed and at a minimum must: • Define individual emergency response actions for all potential scenarios. • Define a schedule of emergency drills and scenarios. • Establish an Emergency Response Team with dedicated resources and equipment. • Ensure emergency communications system is in place and reliable. • Implement a drill schedule and provide reports. • Define COVID-19 procedure (see below)

Interaction with security actors	• Develop Security and Human Rights Management Procedure that is in alignment with UNDSS and the Voluntary Principles of Human Rights
	• All private security personnel to receive procedural or knowledge training in:
	  • Guard-post orders and procedures
	  • Proper conduct and ethics/human rights
	  • Rules of engagement and use of force
	  • Community interaction and community grievance mechanism
	• Engage the public security force through the correct hierarchy and channels early in the process to set up good working relationship and improve opportunities for influence on the adoption of International Standards.

Stolen Items	• In the case of public spaces, the municipality will assign a guard
Covid-19 (if relevant)	• A Health and Safety Risk Assessment of each project activity, including supply chains and associated facilities, against International Standards needs to be carried out including specific alignment with IFC PS2 (Labour and Working Conditions) as well as IFC PS4 (Community Health and Safety and Security). The assessment involves a four-step process: 1. Conduct a Health and Safety Risk Assessment to identify the potential risk and impact of COVID-19 on project activities, including supply chains and associated facilities. 2. Develop and implement mitigation measures to manage health risks for each project activity (to be provided in the ESMPs during the project inception phase). 3. If despite the implementation of mitigation measures a positive COVID-19 case is identified, then alternative “lower risk” activities will be proposed. 4. If “lower risk” activities are not an option, then activities will be delayed/postponed.

Potential risk / impact	Mitigation measure
	Contractors should start to implement COVID-19 mitigation measures now, even if the virus has not arrived in the communities they are operating within. The following is a list of mitigation measures to prevent the spread of COVID-19 in the workplace that must be implemented at each work site: Ensure workplaces are clean and hygienic. Surfaces (e.g. desks and tables) and objects (e.g. telephones, keyboards) need to be wiped with disinfectant regularly. Promote regular and thorough hand washing. Put sanitizing hand rub dispensers in prominent places around the workplace and ensure these dispensers are regularly refilled. Display posters promoting hand washing and ensure that workers have access to places where they can wash their hands with soap and water. Brief workers that if COVID 19 starts spreading in your community anyone with even a mild cough or low-grade fever needs to stay at home. Where N95 masks are not available, ordinary surgical face masks will be provided. The World Health Organization (WHO) has additional information and best practice approaches to occupational health and safety during the COVID-19 outbreak. The International Finance Corporation (IFC), also provides specific guidance regarding preventing and managing health risks of COVID-19 in the workplace and support for workers.

Table 23: Principle 13: Health (and safety)

Potential risk / impact	Mitigation measure
Chance Finds	A Chance Finds Procedure must be developed and requires: • Stop work in the event of a find and cordon off until next steps are agreed. • Identify relevant national authority for communication in the event of a chance find. • In the event of a find, prepare Next-step Action Plan (if required). • Liaise with Competent Authority to arrange oversight of the excavation works and storage and transportation of any finds

Table 24: Principle 14: Physical and Cultural Heritage

Opportunities for adaptive management

When changes in project activities or additional activities are required, these will need to go through a new risks screening and impact assessment process in compliance with AF, UN-Habitat and national policies and standards. When this is required, this will be led by UN-Habitat and the steering committee would need to approve the changes.

Arrangements to supervise executing entities for implementing the ESMP.

Potential executing entity	Skills and expertise to implement ESMP	Specific requirements execution entities for compliance	Capacity building needs
Ministry of environment and ministry of agriculture and irrigation	Limited (although some experience with UN agencies)	- Appoint an ESP compliance focal point - Enough capacity to implement the ESMP - Enough capacity to monitor the implementation of the ESMP	- Awareness on requirements - Share tailored ESMP - Share guidelines to comply - Guide on implementation - Coordinate with technical committee if needed - Provide training if needed
CAC Bank	To be determined during inception phase		
TBD	To be determined during inception phase		
Ministry of environment and ministry of agriculture and irrigation	Limited (although some experience with UN agencies)		

Table 25: Capacity of Potential Executing Entities to Implement ESMP

Budget provision for implementing the ESMP.

Dedicated risks / safeguard management time is allocated under project execution fees (Project execution supervisor: USD 214,200 in total, and M & E person: USD 99.120 in total). This person will be supported by UN-Habitat regional office and headquarters on compliance with relevant policies.

General measures to avoid, minimize, or mitigate potential risks and impacts.

The table below sets out the general Environmental and Social (E&S) commitments/policies to avoid, minimise or mitigate potential risks, that are to be fulfilled by the contractor, supported by UN-Habitat, during project activities.

Item	Mitigation, Management and Enhancement Measures	Means of Verification	Responsibility	Monitoring Procedure
A. General Requirements				
A1. Responsibilities and Liabilities	Ensure that all workers, suppliers, and possible subcontractors are familiar and comply with the requirements and specifications of the ESMP. Review Contracts to ensure that safeguard requirements are included	Contracts	UN-Habitat and contractor	Review of Contracts to ensure that ESS requirements are included
	Review and adjust ESMP if needed. Identify if further Management Plans need to be prepared.	Final Project-specific ESMP	UN-Habitat and contractor	Review at project inception phase
A2. Resources allocated to safeguard Management	People responsible risk management including requirements and responsibilities to be defined. A safeguard expert (i.e., project execution supervisor will be part of the project execution team. Besides that, focal points within the executing entities will be defined.	Final Project-specific ESMP	UN-Habitat and contractor	Review at project inception phase
A3. Reporting	Reporting of progress ESMP, including potential incidents, accidents, observations, etc.	Final Project -specific ESMP Reporting protocol for Major Incidents	UN-Habitat	Review at project inception phase
A4. Safeguard Training	Provided if required during implementation for UN-Habitat and executing entities	Training performed and recorded	UN-Habitat	Review of training records

Item	Mitigation, Management and Enhancement Measures	Means of Verification	Responsibility	Monitoring Procedure
B. Protection of the Environment				
B1. Emissions and dust	Use to the extent possible, vehicles in appropriate technical conditions.	Technical Specification Sheet	Contractor/ EE	Prior to commencement of works and each time new equipment/ vehicle is used at the site. Visual inspection on regular basis
	Ensure that vehicle engines and equipment on site are not left running unnecessarily.	Engines switched off	Contractor/ EE	Site inspection
	Best practice to ensure minimization of dust emissions during dry and windy conditions (e.g. proper stockpiling, watering etc.).	Watering conducted, no dust emissions are observed, no workers' grievances	Contractor/ EE /	Regular site inspection Review of grievance records
	Exact project-related energy use to be determined during project inception phase. 'Extra' energy use to be compensated through installation of solar PV	Recording of energy use	Contractor/ EE	Regular monitoring and review of energy use
B2. Noise and vibration	Avoid operations and vehicle movements at night.	No work conducted between 10 pm and 7 am No grievances received	Contractor/ EE	Random site inspection Review of grievance records Review of accident/incident records
	Set traffic speed limits for construction and operation-related traffic	Speed signs installed. Accident/incident reports	Contractor/ EE	Random site inspection Review of grievance records Review of accident/incident records
	Position equipment as far as possible from sensitive areas (neighboring communities)	Distances between equipment and receptors are kept	Contractor/ EE	Once prior to commencement of works Review of grievance records
B3. Wastewater management	Ensure access to toilet facilities or portable toilet facilities that will be serviced on a weekly basis	Visual inspection of condition of facilities	Contractor/ EE	Random site inspection
	Control surface water and where appropriate incorporate storm water management into project designs	Visual inspection, design review	Contractor/ EE	Regular site inspection Final project design

Item	Mitigation, Management and Enhancement Measures	Means of Verification	Responsibility	Monitoring Procedure
B. Protection of the Environment				
B4. Pollution prevention	Ensure all works carried out minimize pollution risk (e.g. liquid effluents, air quality and emissions, noise and vibration management, vehicle and equipment maintenance and selection, fuel, oil and chemical storage and handling) including the whole duration of the Project. The local authorities and the wastewater companies will monitor the quality of the outflow to be used for irrigation A comprehensive water quality monitoring program to assess the content of nutrients, heavy metals, pathogens, and other contaminants in the treated wastewater. Regular soil testing to monitor nutrient levels, salinity, and other soil parameters should be conducted. Implement appropriate soil management practices, such as the addition of organic matter, to maintain soil fertility and structure.	Ensure that potential pollutants are not stored and handled within 50 m of sensitive receptors (particularly watercourses).	Contractor/ EE	Regular site inspection Review of grievance records
B5. Effluents	Ensure appropriate containment and storage of construction wastewater, including sanitary water. No untreated effluent is discharged.	No untreated wastewater discharge	Contractor/ EE	Regular site inspection Review of grievance records
B6. Waste Management	Identify waste management facilities and ensure disposal through treatment/removal/recycling of each of the waste types.	Waste management procedure Waste transfer notes	Contractor/ EE	Inspect waste management facilities Review of waste transfer records
	Ensure that all wastes produced are properly collected, segregated, stored, transported and treated	Waste collection areas existent, waste inventories Waste transfer notes	Contractor/ EE	Random site inspection, Review of waste inventories Review of waste transfer records
	Minimize the waste production to the extent possible.	Records of waste production are kept Waste Management Plan Training performed and recorded	Contractor/ EE	Monitor (e.g. monthly) the amount of waste produced Review of training records
	Document all waste related operations (type of wastes, quantities produced etc.).	Storage, transport and treatment of waste is documented. Waste transfer notes Waste inventories	Contractor/ EE	Review of waste transfer records Review of waste inventories
	Appropriate and safe storage of fuels, construction materials, wastes and any materials that can cause spills (e.g. batteries from energy generators).	Safe storage of materials Spill prevention and response procedure Spill response and remediation equipment in place.	Contractor/ EE	Random site inspection
B7. Land uses	The contractor will fix any degradation after rehabilitating the canals for example, no trees should be cut, and no soil should be removed. Trees will be replanted.	Visual inspection of areas	Contractor/ EE	Review of pictures and reports
B8. Biodiversity	In cooperation with local authorities, the activities will be planned to avoid sensitive periods for breeding or migration of wildlife and any affected native vegetation will be replanted in new locations. Moreover, low-impact construction techniques and equipment will be used to minimize soil erosion, habitat destruction, and noise disturbance.	Execution plans; Visual inspection of areas	Contractor/ EE	Review of pictures and reports

Item	Mitigation, Management and Enhancement Measures	Means of Verification	Responsibility	Monitoring Procedure
C. Worker Health and Safety				
C1. Occupational Health and Safety Plan	Develop an Occupational Health and Safety (H & S) Plan	Occupational H&S Plan in place	Contractor/ Safeguard Consultant Team (for review)	Review of Occupational H&S Plan
C2. Incident reporting	Ensure all H&S related incidents (e.g. observations, accidents) on site are recorded and followed up properly.	Reporting protocol for Major Incidents	Contractor/ EE	Check incident/accident records
C3. Personal protective equipment	Ensure the provision of Personal Protective Equipment (PPE) for workers (hardhats, masks, safety glasses, safety boots etc. depending on project type).	PPE used by everyone on-site.	Contractor/Site Manager	Random site inspection

Item	Mitigation, Management and Enhancement Measures	Means of Verification	Responsibility	Monitoring Procedure
C. Worker Health and Safety				
C4. UXO/ Damaged structure clearance	Ensure UXO clearance/damaged structure clearance obtained prior to start of works.	Documentation of clearance (Commencement of Works Letter)	Contractor/ EE	Review documentation
C5. First-aid	Provide one trained first aiders per 50 employees and adequate amount of first aid kits on site.	Suitable first aid kits on site Ensure the presence of first aid helpers in all shifts. First aid certificates	Contractor/ EE	Regular monitoring of first aid kits Review of first aider certificates Review of number of first aiders required by local legislation
C6. Access to health care	Ensure the workforce has access to primary healthcare on site, providing prescriptions and vaccinations where necessary/applicable	Healthcare available on site	Contractor/ EE	Random site inspection Review of grievance records Review of medical records (in case not confidential)
	In case more than 35 workers are present on site, ensure that a hospital, medical clinic or a health centre can be reached within a period of 45 minutes.	Medical centres in the proximity of the site.	Contractor/ EE	Medical centres in the proximity of the site identified once prior the commencement of works

Item	Mitigation, Management and Enhancement Measures	Means of Verification	Responsibility	Monitoring Procedure
D. Community Health and Safety				
D1. Contractor-Community Interactions and Security	Engage/ communicate/ inform communities. Ensure consultations with the local authorities and communities regarding the construction.	Minutes of Meetings Grievance Mechanism	Contractor/ EE	Review of grievance register Minutes of consultation meetings
	Initiate an efficient Grievance Mechanism to allow potentially affected individuals to raise their concerns.	Grievance Mechanism in place, grievances recorded	Contractor/ EE	Review of grievance register
	Establish a Code of Conduct taking into consideration legislation, safety rules, driving safety rules, substance abuse, environmental sensitivity, communicable diseases, gender issues (sexual harassment), respect for local beliefs and customs, community interactions etc.	Code of Conduct in place and rules shared with personnel	Contractor/ EE	Review of Code of Conduct induction records Review of reported punishable or misconduct behavior Review of grievance records
D2. Traffic and transportation management	Use local traffic signage and collaborate with the responsible local authorities and communities. Use flagmen where appropriate and install clear and visible signage.	Warning signs	Contractor/ EE	Inspection of traffic routes, Review of grievance register
	Implement speed limits for all project vehicles. In the case of road closures, crossing for pedestrians will be provided.	Local access plan	Contractor/ EE	Review of local access plan Random site inspection Review of grievance records
	All vehicles used to transport workers to site must meet national requirements, demonstrate that their condition has been checked and approved prior to use. All drivers shall conduct daily inspections before operating a vehicle.	Technical Specification Sheet	Contractor/ EE	Prior to commencement of works and each time new equipment/ vehicle is used at the site. Visual inspection on regular basis
D3. Vector Borne and Communicable Diseases	Ensure the provision of adequate space, supply of water, adequate sewage and garbage disposal system, appropriate protection against heat, cold, damp, fire and disease-carrying animals and insects, adequate sanitary and washing facilities, adequate lighting, and basic medical services, in accordance with all applicable health and safety regulations and norms.	Vector Borne and Communicable Diseases Procedure Appropriate conditions for workers on site Irrigation plans and procedures	Contractor/ EE	Regular inspection Review of grievance records
D4. Emergency scenarios prevention	Ensure immediate cleaning of any spills and remediation of contaminated areas after construction.	Emergency Preparedness and Response Procedure Workers trained. Emergency Response Team (ERT) is in place	Contractor/ EE	Random site inspection after spill events One-time inspection after construction Review of training records Review of ERT
D5. Security and Human Rights	Ensure security and human rights in alignment with UNDSS SOP, IFC PS4 and the Voluntary Principles of Human Rights	Security and Human Rights Management Procedure	Contractor/ EE/UNH	Regular inspection Review of grievance records

Item	Mitigation, Management and Enhancement Measures	Means of Verification	Responsibility	Monitoring Procedure
D. Community Health and Safety				
D6. Damage to people and property	Ensure that site areas are provided with appropriate security, fencing, signage and lighting. Use hazard notices/signs/barriers to protect children and other vulnerable people from harm and prevent access to non-workers.	H&S planning of construction site done, items installed	Contractor/ EE	Inspection prior to the activities. Random site inspection Review of grievance register
D7. Involuntary resettlement	Ensure no physical displacement. Include standard clause in MoU / all contracts: Stating no physical displacement will take place due to project activities (unless project beneficiaries request this)	Contracts Resettlement Action Plan (if necessary)	Contractor/ EE	Review of Contracts
	Ensure no economic displacement. Include standard clause in MoU / all contracts: Stating no economic displacement (even informal) will be take place due to project activities (unless project beneficiaries request this)	Contracts Livelihood Restoration Plan (if necessary)	Contractor/ EE	Review of Contracts
D8. Vulnerable Groups	Ensure all vulnerable groups are consulted during inception phase and continually throughout project cycle to verify and further identify all specific needs, limitations and constraints. Final decisions on who will benefit will be made with communities and water-user associations	Meeting Minutes Grievance Mechanism in place, grievances recorded	Contractor/ EE	Review of grievance register Minutes of consultation meetings and consultation reports

Item	Mitigation, Management and Enhancement Measures	Means of Verification	Responsibility	Monitoring Procedure
E. Labour				
E1. Worker Rights	Ensure minimum legal labour standards as per ILO regulations (child/forced labour, sexual assault, no discrimination, equal opportunities, working hours, minimum wages) are met.	Grievance Mechanism Records	Contractor	Review of Inspection reports (also from labour authorities), Review of grievance records
	Ensure that all direct and indirect workers have access to and are aware about the Workers Grievance Mechanism were they can raise workplace relevant complaints anonymously.	Workers Grievance Mechanism in place and grievances recorded	Contractor	Review of workers grievance register
	Ensure all workers have the same rights and are treated equally.	Non-discrimination policy in place	Contractor	Random site inspection Review of grievance register
E2. Local employment and procurement	Ensure local communities are preferred for the supply of goods and services to the Project and Project personnel, where appropriate.	Local Employment and Procurement Records	Contractor	Review procurement and employment records Review of grievance register
E3. Facilities	Ensure provision of OR facilitate access to necessary worker facilities which include but are not limited to: toilets, rest areas, smoking areas, potable drinking water to WHO standards	Appropriate H&S and sanitary facilities provided at site	Contractor	Regular inspection Review of grievance records
E4. Fossils/ Archaeological Chance Finds	Establish specific procedures to manage the protection of archaeological and historical sites, chance finds and fossils. Ensure all finds of cultural heritage (e.g. graves, old ceramic, old building fragments) are reported immediately to the relevant authority and avoid excavation in the ultimate neighborhood of a chance find, fence the chance find and await instructions from the competent authority.	Notification records to relevant authority Training records, Records about chance finds	Contractor / EE	Site inspection

Item	Mitigation, Management and Enhancement Measures	Means of Verification	Responsibility	Monitoring Procedure
F. Supply Chain – Suppliers and Disposal				
F1. Supply Chain Verification	Verify that operations of these facilities meet Lybian national standards and are permitted.	Visual inspection of facility operations and review of permits	EE/ UN-Habitat	Verification at Project commencement
	Verify if facilities require expansion for Project works.	Visual inspection on a quarterly basis	EE/ UN-Habitat	Regular quarterly monitoring
F2. Supply Chain Monitoring	Monitor the operations of these facilities for risks related to: 5. Controversial linkages with sanctioned entities. 6. Exclusion list (including child labour and trafficking of arms along supply routes); and 7. Security (number of checkpoints along supply routes)	1. Verification of receipts of material sources 2. Visual inspection of facility operations and supply routes 3. Visual inspection of supply routes	EE/ UN-Habitat	Regular quarterly monitoring

Table 26: Detailed Project-level Mitigation Policies

Risks monitoring system / indicators.

The environmental, social and climate risks management approach includes monitoring of potential risks and implementation of risks mitigation measures. This monitoring program commensurate with project activities and will report on the monitoring results to the Fund annual, and terminal performance reports. Monitoring will be done to ensure that actions are taken in a timely manner and to determine if actions are appropriately mitigating the risk / impact or if they need to be modified to achieve the intended outcome. Annual reporting will include information about the status of implementation of this ESMP, including those measures required to avoid, minimize, or mitigate environmental and social risks. The reports shall also include, if necessary, a description of any corrective actions that are deemed necessary.

UN-Habitat will be responsibility for environmental and social risks management, including monitoring of the implementation of the ESMP. Gender specific indicators and targets have been developed as shown in the results framework. M&E staff under the execution fee section will require having expertise in environmental and social risk management and be familiar with the AF safeguarding system.

Action	Indicator and method	Responsibility and frequency
Monitoring of capacity execution entities to comply	❑ Guidelines and action plans shared ❑ Monitoring reports comply to requirements	UN-Habitat within half a year from inception when reports are required
Implementation of grievance mechanism	❑ Grievance mechanism information is at target locations (buildings, etc.) ❑ Grievance mechanism information is shown on UN-Habitat project website	UN-Habitat in coordination with execution entities Within half a year from inception
Monitoring of measures to avoid or mitigate risks / impacts per output	❑ See table above	UN-Habitat in coordination with execution entities When reports are required

Table 27: Monitoring Arrangements for General Risks Management

Grievance and Redress Mechanism

For all Project activities, a Grievance Redress Mechanism will be employed to receive and address Project Affected Persons (PAP) concerns, complaints, and grievances about any project's environmental and social performance. The Grievance Redress Mechanism addresses affected people's concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, confidential (if desired) and readily accessible to all segments of the affected people at no costs and without retribution.

UN Habitat in coordination with the execution entities were appropriately informed Project Affected Persons about the Grievance Redress Mechanism at the commencement event of project and throughout the lifecycle of the project through project grievance focal points (Dr. Mohammed Zain – project coordinator).

Communication Channels for Submitting Grievances: Potential communication channels for submitting grievances could include those identified in the table below. When confirmed, this information will be readily available throughout project implementation and communicated during engagement activities

Communication Channel	Description
Engagement Activities	• Grievances can be communicated during engagement activities verbally and/or written and submitted into a comment box
Verbal	• Grievances can be communicated directly to project focal points
Phone	• Phone Number to be provided in relevant ESMP • Phone Number to be provided on billboard at project site location • Calls will be received from: 9AM - 5PM
WhatsApp	• Phone Number to be provided in relevant ESMP • Phone Number to be provided on billboard at project site location • Grievances can be communicated through WhatsApp instant messaging system with audio and video support if required
Email	• Email to be provided in relevant ESMP • Written grievances can be communicated through email
Comment Box	• A comment box will be available at all engagement activities and at Management Team office for written grievances

Table 28: Communication Channels for Submitting Grievances

Receiving Grievances**:** Grievances will be recorded in a Grievance Form and Grievance Register by the project's focal points within two days of receipt. A template for a Grievance Form will be developed. The project grievance focal point will assist the applicant at all stages of their grievance and ensure that their grievance is properly handled and addressed by the appropriate party. The following is the procedure for receiving grievances.

Receive a grievance: Stakeholders shall be able to use the following methods to submit a grievance:

Phone / WhatsApp
- Email
- Verbally to project focal point

The grievance is recorded in the Grievance Form and classified in a Grievance Register by the project's grievance focal point. If the Complaint is readily resolvable and can be dealt with immediately, the project grievance focal point takes action to address the issue directly and records the details in the Grievance Register.

1. **Grievance is formally acknowledged** through a personal meeting, phone call, or letter as appropriate, within 5 working days of submission. If the grievance is not well understood or if additional information is required, clarification should be sought from the complainant during this step.

2. **The project grievance focal point delegates the grievance** in writing to the relevant department(s)/personnel / contractor for development of an appropriate response. The project grievance focal point will estimate the subject matter of this grievance and identify the risk category. If required, the grievance may be sent for consideration of the senior management.

3. **A response is developed** by the delegated team and the project grievance focal point, with input from senior management and others, as necessary.

4. **Required actions are implemented** to deal with the issue, and completion of these is recorded on the Grievance Register.

5. **The response is signed-off** by the project grievance focal point. The sign-off may be a signature on the grievance form or in correspondence, which should be filed with the grievance to indicate agreement.

6. **The response is communicated to the affected party;** the response should be carefully coordinated. The project grievance focal point ensures that a suitable approach to communicating the response to the affected party is agreed and implemented. The response to a grievance will be provided 20 working days after receipt of the grievance.

7. **The response of the complainant is recorded** to help assess whether the grievance is closed or whether further action is needed. The project grievance focal point will use appropriate communication channels, most likely telephone or face-to-face meeting, to confirm whether the complainant has understood and is satisfied with the response. The complainants' response should be recorded in the Grievance Register.

8. **The grievance is closed** with sign-off from the project grievance focal point, who determines whether the grievance can be closed or whether further attention and action is required. If further attention is required the project grievance focal point should return to Step 2 to re-assess the grievance and then take appropriate action. Once the project grievance focal point has assessed whether the grievance can be closed, they will sign off to approve closure of the grievance on the grievance log or by written communication.

9. In case the affected person is not satisfied with the decision resulting from the consideration of grievance, a stakeholder may turn to court in accordance with the existing legislation of Yemen.

Grievance Form	
Reference No:	
Please enter your contact information and grievance. This information will be dealt with confidential. ***Please note: If you wish to remain anonymous please enter your comment/grievance in the box below without indicating any contact information – your comments will still be considered.***	
Full Name	_____
Anonymous submission	☐ **I want to remain anonymous**
Please mark how you wish to be contacted (mail, telephone, e-mail).	☐ **By Mail (Please provide mailing address):** _____ _____ ☐ **By Telephone (Please provide Telephone number):** _____ **By E-mail (please provide E-Mail address):** _____
Preferred Language for communication	☐ **Arabic** ☐ **English** ☐ **Other, please specify:** _____

Description of Incident or Grievance:	What happened? Where did it happen? Who did it happen to? What is the result of the problem?
Date of Incident/Grievance: _____	☐ **One time incident/grievance (date _____)** ☐ **Happened more than once (how many times? _____)** ☐ **On-going (currently experiencing problem)**
What would you like to see happen to resolve the problem?	

Table 29: Grievance Form

ANNEX 3: SOCIAL INCLUSION ASSESSMENT AND PLAN

Purpose

The purpose of this section is to demonstrate how this project complies with the AF Gender Policy (GP) and what barriers / challenges need to be addressed for equal[149] opportunities for women and men and for women empowerment in the proposed project. Thus, this section show the project interventions' suitability to meet the adaptation needs of targeted women and men and youth.

Methodology

During the project preparation phase, potential inequality and women's and youth empowerment barriers / challenges and opportunities have been identified through initial data analysis / desk research, surveys and focus group discussions with women, youth and other groups. Through these methods, specific women and youth needs were identified, as well as potential risks and impacts for women, including possible concerns regarding proposed project activities. The outcomes are summarized below. A data baseline covering number or percentage of women has been established, which is necessary at the project start against which implementation progress and results can be measured.

Determinants for social inclusion-responsive stakeholder consultations

Table 37~~101~~ Stakeholders consulted to develop social inclusion approach.

Type of stakeholder	Specific stakeholder	Inputs incorporated in the proposal
UN agencies and NGO's	▪ UN Women	❑ Target share of women in project steering committee: 10 per cent ❑ Target share of women in technical committee: 30 per cent ❑ Awareness raising, capacity strengthening and planning activities will include farmers, women and youth groups, as well as community leaders, religious leaders and IDPS. ❑ Using the term gender will be avoided during engagement at national and local level;
Government	▪ Women focal point	❑ Have a women focal point in the project steering / technical committee
Community level	▪ Focus group discussions with women and youth (nr done: 6)	Concerns regarding involvement in the project and project benefits. Awareness raising, capacity strengthening and planning activities will include farmers, women and youth groups, as well as community leaders, religious leaders and IDPS. Quotas and a targeting strategy will be applied for meetings, workshops and trainings, and process and materials tailored, if needed.
	▪ Consultations with women and youth groups / associations (nr done: 2)	

Initial assessment

Positive aspects

❑ Cedaw was ratified in 1984

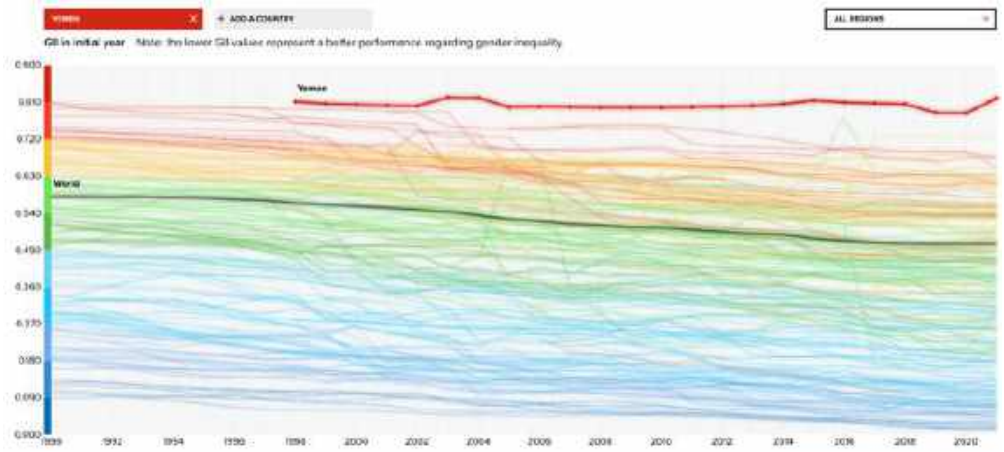
[149] Equal rights, responsibilities and opportunities and access of women and men; equal consideration of their respective interests, needs and priorities

- ❑ Legislative reforms, in particular the adoption of Law No. 25 in 2010 on Amending Law No. 6 of 1990 Concerning Yemeni Nationality. [150]
- ❑ Efforts to improve its institutional and policy framework aimed at accelerating the elimination of discrimination against women and promoting gender equality. [151]

Principal areas of concern

- ◻ Yemen ranked second last in the Gender Gap Index in 2021, just before Afghanistan[152]
- ◻ Yemen ranks last in the Gender Inequality Index[153]
- ◻ The CEDAW committee reviewing the 2007 Yemen CEDAW report (their 6th periodic report) noted among other concerns a very low rate of representation of women in decision-making positions in Parliament (0.3 per cent), in the Government (1.82 per cent of commissioned ministers) and in the judiciary (1.65 per cent), low rates of girls' education, women's paid employment, and the legalization of girl marriage below age 15.[154] This has been exacerbated by the war since the last review.
- ◻ Deterioration of the rule of law and massive internal displacement have exacerbated women's and girls' vulnerability to violence, including sexual violence, child and forced marriages, and arbitrary detentions and enforced disappearance perpetrated by all parties to the conflict. [155]
- ◻ More than 77 per cent of internally displaced persons in Yemen are women and children, and at least 26 per cent of displaced households are now female-headed, a significant increase from pre-war level.[156]
- ◻ Lack of representation of women in the political / leadership sphere[157]
- ◻ Prevailing traditional gender norms in Yemen, including that Yemen has one of the world's lowest female labour force participation rates (estimated at 7 percent).[158]

Figure 1164 -Yemen ranks last in the Gender Inequality Index



Data baseline

Table 38102 Project beneficiaries' baseline – women and youth

Detailed outputs / activities	Direct	
	Women	Youth
1.1. Capacity development with national and sub-national authorities on climate change resilience, effective water management, including project oversight, development and implementation of integrated management plans	30 %	20 %
1.2. Establishment of laboratory for wastewater quality testing and water supply quality testing	N/A	N/A
1.3. Integrated and inclusive natural resource and climate change risk management process convened bringing together government and community stakeholders	30%	20%

[150] CEDAW/C/YEM/CO/7-8 - Concluding observations on the combined seventh and eighth periodic reports of Yemen*
[151] Idem
[152] Resourcewatch gender gap index
[153] UNDP GII
[154] Draft UN Women country gender equality brief Yemen (March 2023)
[155] Idem
[156] USAID. September 2022. Yemen: Complex Emergency Fact Sheet #11.
[157] OHCHR
[158] YEMEN Women's economic empowerment in the Yemeni context

2.1. Assessment and verification / technical specification and engineering studies, including surveys required for improved irrigation canals and water intake systems	N/A	
2.2. Rehabilitated irrigation canals to improve water access for agricultural purposes in the Tuban	33,000	
2.3. Improved water intake structures to increase water supply in the irrigation canals		
2.4. Stone-gabions constructed to reinforce canals and protect agriculture lands and Al-what city from flashing floods.	23,064	
3.1 Assessment and verification / technical specification and engineering studies, including surveys required for improved irrigation canals and water intake systems		
3.2 Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah, Saber cities and surrounding villages	40,940	
3.3 Upgrade Tahror WWTP to treat wastewater for use in irrigation	241	
3.4 Upgrade Saber WWTP to treat wastewater for use in irrigation	128	
4.1. Support farmers with modern irrigation techniques and systems (Urban and Rural Areas)	630	
4.2. Develop maintenance plans for canals, irrigation system	N/A	
4.3. Strengthen water users associations for improved monitoring, maintenance and dissemination of information on irrigation techniques and skills development	6 women-led	
4.4. Skills development with women and youth on water management and climate change adaptation	30 %	20 %
4.5. Capacity development for communities with a focus on women and youth civil society organizations on integrated and inclusive natural resource management plan	30 %	20 %
4.6. Awareness raising with local communities on water conservation and climate change in Aden and the Tuban Delta	50 %	50%

* 'Age' and 'disability' also to be considered as part of the targeting strategy

Differentiated climate change impacts.

Table 39~~103~~ Differentiated climate change impacts on men and women (considering sectoral impacts relevant fro the project)

Sector / Livelihood relevant to the project	Climate change impact	Women and youth equality and empowerment issues, incl. specific Vulnerabilities / barriers to adapt	Opportunities for promoting 'women' and 'youth' as agents of change
Food scarcity / security and Agriculture	Water scarcity and food insecurity	❑ Women-headed households and girls are at higher risk of food insecurity, many to most having no steady source of income, exposing these families to risks of exploitation, harassment and abuse[159] ❑ Less than 1 per cent of agricultural landholders in Yemen are female. However, women have a major role in agriculture, providing 60 per cent of labour in crop farming, 90 per cent in livestock farming and 10 per cent of wage labour. (IFAD) ❑ Lack of official papers are an obstacle for women, boys and girls to be registered and be entitled to food distribution. Restrictions in mobility (due to security and cultural reasons) are an obstacle for women and girls to go to the food distribution points.[160]	❑ Ensure women's representation in decision making bodies (committees) ❑ Promoting equality in work ❑ Ensure women's equal access to information, technology, markets and work ❑ Promote women access to project benefits and equal benefits of project activities to women, ❑ Ensure safety of women when beneficiaries of the project (direct and indirect) ❑ Ensure equal treatment of internally displaced persons, including women ❑ Address potential risks to migrant workers, includuing women
Water, Sanitation and Hygiene	Water scarcity and food insecurity	❑ Women, girls and boys are the primary carriers of water in rural areas. Men's role is passive, especially if the water point is not in the village or within proximity. This places women and girls under threat of harassment and potential GBV while going to wells and water points. Women and children are also at risk of being injured by mines and UXOs while trying to access WASH infrastructure and services. ❑ Women and children might spend between one or to two hours fetching water for domestic use. This causes delays in other vital roles that women and children should play in their daily lives (for example attending school for children and carrying out economic activities or paid work for women). ❑ Women and girls are specially affected when they must travel long distances to use shared toilets, or practice open defecation. Many choose to wait until nightfall (sometimes more than 12 hours), making them vulnerable to harassment or violence. Many also limit their consumption of food and drink to delay the need to relieve themselves. Both strategies increase the chance of urinary tract infections. The shame and indignity of defecating in the open and the lack of water for washing clothes and personal hygiene affects women's self-esteem. ❑ Men, women, boys and girls lack basic hygiene education. They are equally in need of hygiene promotion.[161]	

Capacity gaps for social inclusion plan compliance.

Table 40~~104~~ Capacity of potential executing entities to carry-out social inclusion plan

Potential executing entity	Skills and expertise to implement ESMP	Specific requirements execution entities for compliance	Capacity building needs
Ministry of environment and	Limited (although some experience with UN agencies)	☐ Appoint a social inclusion plan compliance focal point	- Awareness on issues, risks and requirements

[159] UN Yemen. 2022. United Nations Yemen Sustainable Development Cooperation Framework, 2022 –2024.
[160] **gender considerations in the humanitarian response in yemen**
[161] IDEM

ministry of agriculture and irrigation		☐ Enough capacity to implement the social inclusion plan ☐ Enough capacity to monitor the implementation of social inclusion plan ☐ Awareness of social inclusion issues and potential risks	- Share social inclusion plan - Share guidelines to comply - Guide on implementation - Coordinate with technical committee if needed - Provide training if needed - Establish grievance mechanisms
CAC Bank	To be determined during inception phase		
TBD	To be determined during inception phase		

Opportunities for promoting change.

The project aims to target women (and youth) in community level skill building and trainings and to especially target women-headed households. Opportunities include:

- ❑ Ensure women's equal representation in decision making bodies (project committees). Project technical committee to have > 30 % women. Project steering committee to have > 10 % women. Women focal point from government in project steering committee.
- ❑ Promoting equality in work. Ensure women have same opportunities to be employed by the project as men. The same accounts for youth, elderly, disabled and any other vulnerable or marginalized groups .
- ❑ Ensure women's equal access to information, technology, markets and work. Have targeting strategy and communication strategy. The same accounts for youth, elderly and disabled and any other vulnerable or marginalized groups .
- ❑ Promote women access to project benefits and equal benefits of project activities to women. Have at least 30 % women participate in workshops and trainings. Target/maximize women-headed households as beneficiaries of irrigation interventions. Have outputs specifically designed to benefit women and youth and have workshops/trainings and other activities tailored for the needs and concerns of women. Age and disablity and any other vulnerable or marginalized groups also to be considered for he targeting strategy.
- ❑ Ensure safety of women when beneficiaries of the project. Labour rights and health and safety standards to be applied considering specific needs and concerns of women. The same accounts for youth, elderly and disabled
- ❑ Ensure equal treatment of internally displaced persons, including women. Don't exclude participation of women IDPs in the project and address potential risks to migrant workers, including women.

Project planning and design.

Table 41~~105~~ Social inclusion plan, including barriers / issues, needs and activities. The plan many be updated during the project inception phase

Project outputs	Specific barriers / issues	Key needs (to improve equality)	Entry points (to integrate considerations / empower women / youth)	Additional activities needed to ensure women perspective, incl. potential risk mitigation measures	Specific Indicator / targets (% women)
1.4. Capacity development with national and sub-national authorities on climate change resilience, effective water management, including project oversight, development and implementation of integrated management plans	Lack of representation of women in the political / leadership sphere and lack of capacity building of women	Ensure women's representation in decision making bodies (committees) and ensure women benefit from capacity building activities	Agree on ToR steering and technical committee, targeting strategy and use of quotas; Trainings to be tailored	Ensure buy-in from the highest political level	Project steering committee: 10% Project steering committee: 30% Workshops and trainings: 30 %
1.5. Establishment of laboratory for wastewater quality testing and water supply quality testing	N/A				
1.6. Integrated and inclusive natural resource and climate change risk management process convened bringing together government and community stakeholders	Lack of women engagement in development process and lack of women responsiveness / mainstreaming Women-headed households and girls are at higher risk of food / water insecurity. Less than 1 per cent of agricultural landholders in Yemen are female. However, women have a major role in agriculture, providing 60 per cent of labour in crop farming, 90 per cent in livestock farming and 10 per cent of wage labour;	Ensure women are engaged through the development process and that the plan is women responsive / mainstreamed	Targeting strategy and use of quotas;	Disaggregated data / assessment and expertise required	Workshops: 30 % Women-specific vulnerabilities and actions benefitting women identified in plan
5. Assessment and verification / technical specification and engineering studies, including surveys required for improved irrigation canals and water intake systems	N/A				
6. Rehabilitated irrigation canals to improve water access for agricultural purposes in the Tuban 7. Improved water intake structures to increase water supply in the irrigation canals 8. Stone-gabions constructed to reinforce canals and protect agriculture lands and Al-what city from flashing floods.	Women restrictions in mobility Unequal work opportunities and safety issues Women-headed households and girls are at higher risk of food / water insecurity. Less than 1 per cent of agricultural landholders in Yemen are female. However, women have a major role in agriculture, providing 60 per cent of labour in crop farming, 90 per cent in livestock farming and 10 per cent of wage labour; Women, girls and boys are the primary carriers of water in rural areas.	Ensure executing entities use procurement and contracting processes providing equal opportunities to all people, while ensuring safety and mobility needed	ESMP has measures in place to ensure this	Awareness raising / capacity building of executing entities and sub-contractors on compliance with the ESMP (as proposed in the ESMP)	Check % of women contracting for labour. No target as this may be challenging for construction work; 23,000 of people protected by reinforced canals are women/girls
o Assessment and verification / technical specification and engineering studies, including	N/A				

surveys required for improved irrigation canals and water intake systems					
o Developing efficient and safe water supply alternatives for Al-What, Al-Hawtah, Saber cities and surrounding villages	Women restrictions in mobility Unequal work opportunities and safety issues Women-headed households and girls are at higher risk of food / water insecurity. Less than 1 per cent of agricultural landholders in Yemen are female. However, women have a major role in agriculture, providing 60 per cent of labour in crop farming, 90 per cent in livestock farming and 10 per cent of wage labour; Women, girls and boys are the primary carriers of water in rural areas.	Ensure executing entities use procurement and contracting processes providing equal opportunities to all people, while ensuring safety	ESMP has measures in place to ensure this	Awareness raising / capacity building of executing entities and sub-contractors on compliance with the ESMP (as proposed in the ESMP)	Check % of women contracting for labour. No target as this may be challenging for construction work; At least 40,000 women and girls benefit from increased access to treated drinking water
o Upgrade Tahror WWTP to treat wastewater for use in irrigation					
o Upgrade Saber WWTP to treat wastewater for use in irrigation					
4.2. Support farmers with modern irrigation techniques and systems (Urban and Rural Areas)		Ensure female headed households are prioritized	Targeting strategy and use of quotas;	Ensure safety. Mobility, etc. covered by the ESMP	30% of farmers applying modern irrigation techniques are women
4.7. Develop maintenance plans for canals, irrigation system	N/A				
4.8. Strengthen water users associations for improved monitoring, maintenance and dissemination of information on irrigation techniques and skills development	Lack of representation of women in the political / leadership sphere Less than 1 per cent of agricultural landholders in Yemen are female. However, women have a major role in agriculture, providing 60 per cent of labour in crop farming, 90 per cent in livestock farming and 10 per cent of wage labour; Women, girls and boys are the primary carriers of water in rural areas.	Ensure wome are represented in water user associations Prioritize women-led water user Association	Targeting strategy and use of quotas;	Ensure safety. Mobility, etc. covered by the ESMP Capacity building tailored to specific needs if relevant	At least 6 strengthened water user associations are women-led
4.9. Skills development with women and youth on water management and climate change adaptation	Unequal access to information, technology, markets and work and related capacity building	Ensure relevant skills on water management and adaptation are built.	Capacity building activities / trainings specifically designed for this purpose. Targeting strategy and use of quotas;	Disaggregated data / assessment and expertise required	100 women are trained in skills development on water management and CCA
4.10. Capacity development for communities with a focus on women and youth civil society organizations on integrated and inclusive natural resource management plan					50 women receive capacity development on integrated natural resource plans
4.11. Awareness raising with local communities on water conservation and climate change in Aden and the Tuban Delta		Ensure awareness raising also targets and reaches women	Targeting strategy and awareness raising materials		30% of women in the area are aware of predicted adverse impacts of climate change

*Where 'women' is mentioned, youth, elderly, disabled and any other vulnerable or marginalized groups will also be considered. Target for youth engagement is 10 per cent.

Project implementation

UN-habitat aims to have a specific needs responsive and adaptable management approach in place which, when needed, allows adjustment based on learning from earlier decisions and interventions and received feedback. This is done through having specific expertise and focal points in place, who should identify challenges, barriers or restrictions that arise during project implementation, which might hinder the equal participation of men and women in activities. Execution entities will be supported to ensure specific needs are mainstreamed and to identify any challenges that may arise during project implementation, which might hinder the equal participation of men and women in activities. This requires appointing a women focal point and having quota targets for women and youth participation in project activities. The women focal points from the government will be part of the steering committees. The project Grievance mechanism established will be capable to accept grievances and complaints specifically related to women equality and women's empowerment.

Performance Monitoring and Evaluation

The specific needs responsive management approach includes women responsive monitoring and evaluation, which is participatory and where 'disaggregated data' will be collected and analyzed. Where possible, women and youth will be encouraged to participate in monitoring activities.

Knowledge Management, Information Sharing and Reporting

UN-Habitat aims to have a specific needs responsive knowledge management approach in place, where specific women considerations are highlighted through reporting on the project commitment to equality and women's empowerment in all outreaches, communication and information sharing efforts.