REGIONAL PROJECT PROPOSAL

Title of Project:	Strengthening Resilience to Climate and Covid-19 shocks through Integrated Water Management on the Sudan – Chad Border area (SCCIWM)
Countries:	Chad, Sudan
Thematic Focal Area[1]:	Food Security, Disaster Risk Reduction and Early Warning Systems
Type of Implementing Entity:	Multilateral Implementing Entity (MIE)
Implementing Entity:	Food and Agriculture Organisation (FAO)
Executing Entities:	Higher Council for Environment and Natural Resources (Sudan) Ministry of Agriculture and Natural Resources (Sudan) Ministry of Irrigation and Water Resources (Sudan) Ministry of Environment and Fisheries (Chad) Ministry of Agriculture (Chad)
Amount of Financing Requested:	14,000,000 (in U.S Dollars Equivalent)

[1] Thematic areas are: Food security; Disaster risk reduction and early warning systems; Transboundary water management; Innovation in adaptation finance.

Table of Contents

Table of Contents ii
List of Acronyms iii

PART I: PROJECT INFORMATION 1

A. Project Background and Context: 1
Sahel Region 1
National Contexts 2
Early Warning Early Action (EWEA) 6
Sanitation and Climate Change 7
COVID-19 8
SMART Irrigation – SMART WASH 8
Project Area 9
B. Project Objectives: 14
C. Project Components and Financing: 15
D. Projected Calendar: 16

PART II: PROJECT JUSTIFICATION 17

A. Project Components 17
B. Innovative Approaches, Technologies and Mechanisms 28
C. Economic, Social and Environmental Benefits 29
D. Cost-effectiveness 31
E. Strategic Alignment 31
F. National Technical Standards and Environmental and Social Policy 35
G. Duplication 35
H. Learning, Knowledge Management and Lessons Learned 36
I. Consultative Process 37
J. Justification for Funding 38
K. Sustainability 40
L. Environmental and Social Impact Risks 41

PART IV: ENDORSEMENT BY GOVERNMENTS AND CERTIFICATION BY THE IMPLEMENTING ENTITY 43

Annex 1 Endorsement Letters 45
Annex 2 Project Command Area 47
Annex 3 List of People Met 49

List of Acronyms

AF	Adaptation Fund
AfDB	African Development Bank
CBO	Community-Based Organisations
COP	Conference of the Parties
COVID-19	Coronavirus Disease 2019
CWU	Conjunctive Water Use
DRR	Disaster Risk Reduction
ECHO	European Civil Protection and Humanitarian Aid Operations
EWEA	Early Warning Early Action
EWS	Early Warning System
FAO	United Nations Food and Agriculture Organisation
FSTS	Food Security Technical Secretariat
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environmental Facility
HDI	Human Development Index
IDP	Internally Displaced People
IPCC	Intergovernmental Panel on Climate Change
IFAD	International Fund for Agricultural Development
INDC	Intended Nationally Determined Contributions
ITCZ	Inter-Tropical Convergence Zone
IWM	Integrated Water Management
MWU	Multiple Water Use
NAPA	National Adaptation Programme of Action
NDC	Nationally Determined Contributions
NGO	Non-Governmental Organisations
SP	Service Provider
SREX	Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Conventions on Climate Change
UNHCR	United Nations High Commissioner for Refugees
VAT	Village Agriculture Technicians
VDC	Village Development Committees
WAM	West African Monsoon
WASH	Water, Sanitation and Hygiene
WFP	World Food Programme
WUA	Water User Associations

PART I: PROJECT INFORMATION

A. Project Background and Context:

Provide brief information on the problem the proposed project is aiming to solve, including both the regional and the country perspective. Outline the economic social, development and environmental context in which the project would operate in those countries.

Sahel Region

1. **Geography.** The Sahel spans around 6,000 km from the Atlantic Ocean and Senegal in West Africa to Sudan and Ethiopia by the Red Sea in East Africa, in a belt covering an area of around 3 million square kilometres. It is a semi-arid region stretching longitudinally and latitudinally from just north of the tropical forests to just south of the Sahara Desert; it is a transitional ecoregion between the Saharan desert and the wet climate of tropical Africa comprising semi-arid grasslands, savannas, steppes, and thorn shrublands. The Sahel is mainly flat and most of the region lies between 200 and 400 meters above sea level and is known to be particularly vulnerable to natural variability as most human activities in the region depend on the highly volatile single annual rainfall season, June through September peaking in August.

2. **Precipitation.** Annual precipitation in the Sahel region averages between 250 and 500 mm.[2] Rainfall distribution can be roughly divided into different homogeneous regions: one along the west coast, a weaker one around Lake Chad and one over the western Ethiopian plateau. The dominant feature of the climate of this region is the West African Monsoon (WAM) system, which is a recurrent low latitude large-scale circulation pattern arising from the meridional boundary layer gradient of dry and moist static energy between the warm sub-Saharan continent and the tropical Atlantic Ocean. The WAM system develops from April to October, bringing the Inter-Tropical Convergence Zone (ITCZ) and associated rainfall peak in August.[3] The predominant weather in the eastern Sahel, particularly south of Khartoum, are significantly influenced by weather patterns deflected around and over the Ethiopian Highlands to the southeast.[4] Along with the transcontinental south-westerly winds carrying moisture from the South Atlantic, the moisture-laden weather systems entering from the Indian Ocean through the Turkana depression south of the Ethiopian Highlands, and circulating around the southwest corner of the latter, are significant players in the development of convective systems over the plains of East Sudan.[5]

3. **Climate change.** The Sahelian region is experiencing the full impact of climate change with rainfall deficits and severe droughts, but also heavy rains and severe flooding with devastating consequences on people's livelihoods. The region is one of the most severely affected from land degradation and desertification in the world.[6] It has experienced severe drought and increasing deterioration of soil quality and vegetation cover[7] and the scarcity of natural resources has led to conflict and migration. In the Sahel, droughts are becoming increasingly intense and temperatures are rising 1.5 times faster than in the rest of the world. But climate change is also causing heavy rains (violent thunderstorms, above-normal rainfall) and the land is too dry to absorb the water. More than elsewhere, in the Sahel these natural disasters are degrading the natural resources essential to the agropastoral livelihoods that underpin the economy in much of the area 80 to 90 percent of the population actively engage in agriculture.[8] Under the combined effect of drought and floods, land is deteriorating and losing its fertility. Insufficient rain-fed irrigation means that crops fail or are destroyed, while livestock struggle to find water for drinking and sufficient pasture. The

[2] http://www.fao.org/3/y7738e/y7738e09.htm
[3] Met Office Hadley Centre (2010), Sahelian climate: past, current, projections.
[4] El Gamri T, Saeed AB, Abdalla AK (2009) Rainfall of the Sudan: characteristics and prediction. Arts J 27: 18–35. Journal of the Faculty of Arts, Univ of Khartoum, Sudan
[5] Riddle EE, Cook KH (2008) Abrupt rainfall transitions over the greater horn of Africa: Observations and regional model simulations. J Geophys Res 113(D15): D15109.
[6] UNEP. 1992. World Atlas of Desertification. Edward Arnold. London.
[7] Geist, H.J., Lambin, E.F. 2004. Dynamic causal patterns of desertification. Bioscience 54(9): 817-829.
[8] UNEP. 2012. Sahel Atlas of Changing Landscapes: Tracing trends and variations in vegetation cover and soil condition. United Nations Environment Programme. Nairobi.

Intergovernmental Panel on Climate Change (IPCC) predicted that yields from rainfed agriculture would already have fallen by 50% over the 20-year period between 2000 and 2020.[9]

4. Near surface temperatures have increased over the last 50 years in the Sahel with the number of cold days and cold nights decreasing and the number of warm days and warm nights increasing between 1961 and 2000, research also shows warming of between 0.5°C and 0.8°C between 1970 and 2010 over the region. Extreme precipitation changes over eastern Africa such as droughts and heavy rainfall have been experienced more frequently during the last 30 to 60 years.[10] A continued warming in the Indian-Pacific warm pool has been shown to contribute to more frequent East African droughts over the past 30 years during the spring and summer seasons.[11] Projected increases in heavy precipitation over the region have been reported with high certainty in the IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) that indicate an increase in the number of extreme wet days by the mid-21st century.[12]

5. In order to tackle the climate-driven challenges, countries in the Sahel region have laid out their national priorities to adapt to climate change and committed to limit the impacts of climate change through specific adaptation measures. At the Conference of the Parties (COP) in Paris in 2015, the United Nations Framework Conventions on Climate Change (UNFCCC) requested signatory countries to present their Nationally Determined Contributions (NDCs) for both adaptation and mitigation. In the central-eastern Sahel the countries of Chad and Sudan have outlined their respective priority actions aimed at reducing the impacts generated by extreme weather events on the most vulnerable sectors. The proposed concept note focuses those sectors that have been identified as being of national adaptive importance for both countries, namely agriculture, water resources, livestock and land resources.

Table 1 Identified national adaptation priority sectors for Chad and Sudan

Sectors	Chad	Sudan
Agriculture	+	+
Water Resources	+	+
Rangeland		+
Livestock	+	+
Forestry	+	+
Land Resources	+	+
Coastal		+
Marine / Fisheries	+	+

National Contexts

Chad - General Characteristics

6. **Geography.** Chad is the fifth largest country in Africa and ranks second among Sahelian countries after Sudan and is landlocked. Chad is located in central northern Africa at 7-23˚ north of the equator, straddling the sub-tropical climate band called the Sahel. The north of Chad extends well into the arid

[9] Boko, M., I. Niang, A. Nyong, C. Vogel, A. Githeko, M. Medany, B. Osman-Elasha, R. Tabo and P. Yanda,(2007): "Africa. Climate Change 2007: Impacts, Adaptation and Vulnerability." Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge UK, 433-467.

[10] Funk, C., M.D. Dettinger, J.C. Michaelsen, J.P. Verdin, M.E. Brown, M. Barlow, and A. Hoell, 2008: Warming of the Indian Ocean threatens eastern and southern African food security but could be mitigated by agricultural development. *Proceedings of the National Academy of Sciences of the United States of America*, 105(32), 11081-11086.

[11] Williams, A.P. and C. Funk, 2011: A westward extension of the warm pool leads to a westward extension of the Walker circulation, drying eastern Africa. *Climate Dynamics*, 37(11-12), 2417-2435.

[12] Niang, I., O.C. Ruppel, M.A. Abdrabo, A. Essel, C. Lennard, J. Padgham, and P. Urquhart, (2014): Africa. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1199-1265.

Sahara Desert, whilst the south has a much wetter and typically tropical climate. The country's terrain is one of a shallow basin rising gradually from the Lake Chad area in the west and is surrounded by mountains to the north, east and south. Chad is bordered in the north by Libya, in the east by Sudan, in the south by the Central African Republic, and in the west by Cameroon, Nigeria, and Niger. The northern part of the country in the Sahara Desert has a population density of only about 8 people per square km, and is home to just 1 percent of Chad's population. The whole central swath is in the Sahel and both N'Djamena, the capital, and Lake Chad are found in this region. Lake Chad is fed by the country's two main rivers, the Chari and the Logone, it is the largest body of water in the Sahel and a major centre of economic activity for the region. Natural irrigation is limited to the rivers and their tributaries, which flow from the southeast into Lake Chad. Due to erratic variations in the region's climate and overexploitation of the rivers that feed it, this shallow lake (1.5 m deep on average) has shrunk to a small fraction of its 1960 size. Chad's population lives mainly in the southern part of the country, in the more humid Sudanian climate zone, southern Chad has the largest, relatively intact expanses of wooded savannas and woodlands of any of the Sahelian countries.

7. **Economy** Traditionally, Chad's economy has been based on farming and livestock, but in the last decade the economy has changed dramatically from the oil boom. Besides oil, there are also significant deposits of gold, marble, and sodium carbonate. After two years of recession (2016 and 2017) following the fall in the price of oil, which led to a debt crisis, real Gross Domestic Product (GDP) growth turned positive, reaching 2.4% in 2018 and 2019, driven by the good performance of grain (up 1.2% in 2019), cotton (142%), and oil production (14%, or 146,000 barrels a day).[13]

8. **Human Development Index (HDI)**. Chad's HDI value for 2019 is 0.398 which puts the country in the low human development category - positioning it 187th out of 189 countries and territories. Between 2000 and 2019, Chad's HDI value increased from 0.293 to 0.398, an increase of 35.8 percent. Between 1990 and 2019, Chad's life expectancy at birth increased by 7.2 years, mean years of schooling increased by 1.2 years and expected years of schooling increased by 4.2 years. Chad's Gross National Income (GNI) per capita increased by about 57.3 percent between 1990 and 2019.

9. **Food Security**. Chad has one of the highest levels of hunger in the world - 66.2 percent of its population of 15.5 million live in severe poverty. It is surrounded by countries at war, and conflict and the climate crisis exacerbate hunger and poverty. Around 40 percent of children aged under five suffer stunting, with low height for their age caused by chronic malnutrition. The presence of hundreds of thousands of refugees who have fled conflict in neighbouring countries has put additional pressure on Chad's already limited resources. Displaced people, and other poor communities, in the Lake Chad Basin, the east and south of the country are dependent on humanitarian assistance for survival. According to the 2019 Humanitarian Response Plan, 4.3 million people are in need of humanitarian assistance, of whom only 2 million are targeted with adequate support.[14]

10. **Climate.** The northern desert regions of Chad receive very little rainfall all year round while the southern, tropical savannah regions of Chad experience a wet season between May and October (receiving 150- 300mm per month), and the central sub-tropical regions have a shorter wet season between June and September (receiving 50-150 mm per month). In the dry months between November and March, almost no rain falls at all. These seasonal rainfalls are controlled by the movement of the tropical rain belt (also known as the ITCZ which oscillates between the northern and southern tropics over the course of a year. Variations in the latitudinal movements of the ITCZ from one year to another cause large inter-annual and decadal variability in wet-season rainfall. Annually, mean temperatures are similar across most of the country at 25-30℃, and only differ substantially in the cooler mountainous regions of the north at 15-25℃. However, seasonal variations are large, and differ in their patterns for different parts of the country. In the north and central regions, summer and winter temperatures are distinct at 27- 35℃ in summer and 20-27℃ in winter (these temperatures are 5-10℃ lower, year-round, in the northernmost mountainous regions). In the south, less seasonal variation is evident, but the summer months are the coolest (22-25℃) due to the cooling effects of rain at this time of year.

[13] African Development Bank (2020) Chad Economic Outlook https://www.afdb.org/en/countries/central-africa/chad/chad-economic-outlook

[14] WFP (2020) Chad Country Brief. https://www.wfp.org/countries/chad

Recent Climate Trends[15]

11. **Temperature.** Mean annual temperature has increased by 0.7℃ since 1960, an average rate of 0.16℃ per decade. The rate of increase is most rapid in the wettest season, (July – September), at 0.36℃ per decade. There is insufficient daily observed data to identify trends in daily temperature extremes for all seasons, but the average number of 'hot' nights per year in Chad has increased by 50 (an additional 13.6% of days) between 1960 and 2003. Cold nights are observed to decrease in all seasons where data are available. The average number of 'cold' nights per month in these seasons has decreased by 3.6-4.6 (11.6-14.9% of days) between 1960 and 2003.

12. **Precipitation.** Mean annual rainfall over Chad has not changed with any discernible trend since 1960. Some unusually high rainfalls have occurred in the dry season in the very recent years (2000- 2006), but this has not been a consistent trend. There is not sufficient daily precipitation data available to determine trends in the daily variability of rainfall.

Climate Change[16]

13. **Temperature.** The mean annual temperature is projected to increase by 1.0 to 3.4℃ by the 2060s, and 1.6 to 5.4℃ by the 2090s with the range of projections by the 2090s under any one emissions scenario between 1.5- 2℃. The projected rate of warming is similar across all seasons and regions of Chad and all projections indicate substantial increases in the frequency of increased maximum and minimum temperatures. Annually, projections indicate that 'hot' days will occur on 17-36% of days by the 2060s, and 21-54% of days by the 2090s with maximum temperatures increasing most rapidly in the summer months. Nights that are considered 'hot' for the annual climate of 1970-99 are projected to occur on 26-49% of nights by the 2060s and 31-63% of nights by the 2090s. Projected increases in maximum and minimum temperatures are expected to be more rapid in the south of the country than the north. All projections indicate increases in minimum temperatures leading to decreases in the frequency of days and nights that are considered 'cold' in current climate, and in much of the country, will not occur at all by the 2090s.

14. **Precipitation.** Projections of mean annual rainfall averaged over the country from different models project a wide range of changes in precipitation for Chad. Projected change in precipitation range from -15 to +9 mm per month (-28 to +29%) by the 2090s. Whilst the range of projections is large, the regional changes in rainfall more consistently indicate increases in wet-season rainfall in the south of the country. The proportion of total rainfall that falls in heavy[17] events is projected to increase in the south of the country, but to decrease in the north. Projections indicate that maximum 1- and 5-day rainfalls may increase in magnitude in the south of the country.

15. **Impact of Climate Change**. Climate change will threaten food security due to the impact of projected temperature increases and extreme weather events on crop nutrient content and yields, livestock, fisheries and aquaculture, and land use. Climate change has already affected crop suitability in many areas, resulting in changes in the production levels of main agricultural crops. Crop production is negatively affected by the increase in both direct and indirect climate extremes. Changing precipitation patterns, and increased temperatures will cause increased probability of drought, heat stress and flooding. Climate change will also increase the spread of pest and diseases that also have detrimental effects on cropping systems.[18]

Sudan - General Characteristics

16. **Geography.** Sudan is the largest country in Africa and has a special geopolitical location bonding the Arab world to Africa south of the Sahara. It has an area of 2.5 million km^2 extending between 4º and 22º north latitudes and 22º to 38º east longitudes. Its north-south extent is about 2 000 km, while its maximum east-west extent is about 1 500 km. On the north-east it is bordered by the Red Sea and it shares common borders with nine countries: Eritrea and Ethiopia in the east, Kenya, Uganda and the Democratic Republic of Congo in the south, The Central African Republic, Chad and the Libyan Arab Jamahiriya in the west, and Egypt in the north. The country is a gently sloping plain with the exception of Jebel Marra, the Red Sea Hills, Nuba Mountains and Imatong Hills. Its main features are the alluvial clay deposits in the

[15] C. McSweeney, M. New and G. Lizcano. UNDP Climate Country Profiles Chad. *School of Geography and Environment, University of Oxford. Tyndall Centre for Climate Change Research*
[16] Ibid
[17] A 'Heavy' event is defined as a daily rainfall total which exceeds the threshold that is exceeded on 5% of rainy days in current the climate of that region and season.
[18] World Bank Group Climate knowledge portal. https://climateknowledgeportal.worldbank.org/country/chad

central and eastern part, the stabilized sand dunes in the western and northern part and the red ironstone soils in the south. The soils of Sudan are broadly divided into six main categories according to their locations and manner of formation: i) desert; ii) semi-desert; iii) sand; iv) alkaline catena; v) alluvial; and vi) iron stone plateau. Within these soil categories there are many local variations with respect to drainage conditions.

17. **Human Development.** Sudan's HDI value for 2019 is 0.510 which put the country in the low human development category - positioning it 170th out of 189 countries and territories a position shared with Haiti. Between 1990 and 2019, Sudan's HDI value increased from 0.331 to 0.510, an increase of 54.1 percent. Between 1990 and 2019, Sudan's life expectancy at birth increased by 9.8 years, mean years of schooling increased by 2.3 years and expected years of schooling increased by 4.0 years. Sudan's GNI per capita increased by about 142.9 percent between 1990 and 2019.[19]

18. **Food Security.** Conflicts and natural disasters cause widespread displacement (including both internally displaced persons and refugees from South), fractured infrastructure, and broken institutions. These factors have led to the Sudanese population suffering from expansive hunger (ranked 7th on Global Hunger Index[20]) food insecurity and malnutrition with women, children and youth suffering disproportionately. Rural women and youth in Sudan form the majority of the extremely poor people in the country. According to World Food Programme (WFP), approximately 9.6 million people were food insecure in early 2020, and estimated 80 per cent were unable to afford the food one needs on daily basis[21]. And 2.7 million children under 5 are suffering from acute malnutrition. Basic health services are available to less than 50 per cent of the population, while only 13 per cent of the rural population has access to improved sanitation facilities.[22]

19. **Economy**. In 2010, Sudan was considered as the 17th fastest growing economy in the world given the rapid development of the country largely from oil profits, despite international sanctions. However, the secession of the South in 2011 has gravely affected the economy as more than 80% of Sudan's oil fields existed in the southern part of the country. This decline in oil revenues caused a major adjustment to the Sudanese fiscal situation and prompting financial austerity measures. The situation was further exacerbated by the continuing tensions between Sudan and South Sudan and their inability to reach an agreement over transit fees for oil from South Sudan. Both parties have still not reached an agreement on this issue. Sudan however is endowed with rich natural resources, including natural gas, gold, silver, chromite, asbestos, manganese, gypsum, mica, zinc, iron, lead, uranium, copper, kaolin, cobalt, granite, nickel, tin and aluminium. Historically, agriculture has been the main source of income and employment in Sudan, hiring over 80% of Sudanese and making up a third of the economic sector. Despite this strong agricultural orientation, oil production drove most of Sudan's post-2000 growth. In the agricultural sector, the government has tried to diversify its cash crops; however cotton and gum Arabic remain its major agricultural exports. Livestock production also has vast potential, and many animals, particularly camels and sheep, are exported to Egypt, Saudi Arabia, and other Arab countries. Problems of irrigation and transportation remain the greatest constraints to a more dynamic agricultural economy.[23]

Climate

20. Sudan has a variable climate ranging from desert and semi-desert areas in the north to arid savannah in the east, west and south, with seasonal rains in central areas between El Obeid and Atbara. Mean annual temperatures vary between 26ºC and 32ºC across the country. The most extreme temperatures are found in the far north, where summer temperatures can often exceed 43ºC and sandstorms blow across the Sahara Desert from April to September. The main rainy season is from May to October, with precipitation ranging between less than 50 mm in the extreme north to more than 1500 mm in the extreme south.[24]

[19] UNDP (2020) Human Development Report Sudan Briefing note http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/SDN.pdf
[20] International Food Policy Research Institute. 2017. 2017 Global Hunger Index: The inequalities of hunger. https://www.globalhungerindex.org/pdf/en/2017.pdf
[21] World Food Programme. October 2020. Country Brief Sudan. https://docs.wfp.org/api/documents/WFP-0000121832/download/
[22] Ibid
[23] UNDP (2020) About Sudan. https://www.sd.undp.org/content/sudan/en/home/countryinfo.html
[24] Sudan Ministry of Environment and Physical Development. 2013. Second National Communications to the UNFCCC.

Climate Change.[25]

21. **Temperature**. Air temperature is projected to be between 1.5°C and 3°C warmer in the Sudan water region by the 2050s. By 2100 the range of projected temperatures is greater with Saharan region showing projected increases of 3°C to 7°C.

22. **Precipitation**. Rainfall projections across the Sudan region show a pattern of potential increased rainfall emerging during the second half of the century. That pattern appears to be consistent across the majority of CMIP5 models in the ensemble. Relative magnitudes of potential increased rainfall in the Upper White Nile region could potentially reach about 500mm / year wetter by 2100 which equates to 40% of the baseline normal. The rainfall over the much drier Sahara region could potentially increase by up to 100% above the baseline normal. The increase in rainfall seems to be strongly associated with increase in all rainfall events and also high intensity rainfall events. It must be noted that these results are derived from GCM projections which may not accurately represent changes in extreme rainfall dynamics. They are, however, consistent with the increased convective rainfall intensity (e.g. thunderstorm-related rainfall) expected in a warmer climate.

23. **Climate change impacts.** The frequency of extreme climatic events is increasing, particularly drought. Once a rare occurrence (occurring in the 1910s, 1940s, and 1970s, and 1980s), severe drought is now one of the most important and frequently recurring challenges facing Sudan. Since the end of the last drought in 1984, droughts have recurred with increasing frequency in 1987, 1989, 1990, 1991, 1993, and 1996, mainly in western Sudan in Kordofan and Darfur states, as well as in areas in central Sudan. Future drought threatens about 19 million hectares of rain-fed mechanised and traditional farms, as well as the livelihoods of many pastoral and nomadic groups.[26] The results of climate model simulations reveal that extreme negative variability will cost the Sudan cumulatively between 2018 and 2050 USD 109.5 billion in total absorption and USD 105.5 billion in GDP relative to a historical mean climate scenario without climate change.[27]

Early Warning Early Action (EWEA)[28,29]

24. Evidence shows that the frequency and intensity of climate-driven natural disasters and conflict is increasing. Natural disasters are occurring more often compared to 40 years ago, with great costs to local economies, livelihoods and lives. Expanding needs, competing priorities and scarce resources globally mean that new tools are needed to ensure smart, effective investments to help attenuate the impact of disasters before they occur. Acting early before a disaster occurs or reaches its peak is critical to save lives and protect livelihoods from the immediate shocks as well as protecting longer term development gains by increasing the resilience of local communities over time. At the global level, FAO has a number of strategic partnerships with humanitarian, development and scientific organisations who are doing pioneering work in linking early warning analysis with early action and funding. FAO closely collaborates with among others the International Federation of the Red Cross, the Red Cross Climate Centre, World Food Programme and the German Red Cross.

25. FAO's EWEA system was piloted in Sudan in 2016 and it translates warnings into anticipatory actions to reduce the impact of specific disaster events. It focuses on consolidating available forecasting information and putting plans in place to make sure FAO acts when a warning is at hand. At country level, the EWEA team works closely with country offices to develop EWEA systems tailored to the local context. These systems enable FAO to monitor major risks and to act early to mitigate its effects on the agriculture sector and livelihoods through an operational tool, the EWEA plan. The EWEA plans are tailored to each country and are based on existing early warning systems to identify timely triggers for early actions.

26. The EWEA approach in Sudan currently focuses on drought as it stands out as the prominent hazard affecting the agriculture sector and targeting vulnerable agro-pastoralist households, mostly engaged in

[25] USAID
[26] Ministry of Environment Forestry & Physical Development (2013). Sudan's Second National Communication under the United Nations Framework Convention on Climate Change
[27] Siddig, Khalid; Stepanyan, Davit; Wiebelt, Manfred; Zhu, Tingju; and Grethe, Harald. 2018. Climate change and agriculture in the Sudan: Impact pathways beyond changes in mean rainfall and temperature. MENA RP Working Paper 13. Washington, DC and Cairo, Egypt: International Food Policy Research Institute (IFPRI). http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/132833
[28] FAO (2020) Early Warning Early Action http://www.fao.org/emergencies/fao-in-action/ewea/en/
[29] FAO (2019) Early Warning Early Action http://www.fao.org/3/CA3127EN/ca3127en.pdf

traditional rain-fed cultivation of small plots and rearing of limited numbers of small ruminants. The EWEA Sudan plan for drought was piloted in two states that are chronically affected by the hazard: Kassala and North Darfur. It systematically monitors a set of indicators and thresholds for the likely impact of drought on the livelihoods and food security of target groups and links the monitoring to the implementation of specific early actions aiming to: safeguard target group's assets and support their production through likely droughts; enhance their livelihood diversification, increase access to income, food and nutrients; support resilience building; and reduce the costs of response. FAO's experience in piloting and developing the EWEA will be essential for the Adaptation Fund project as it looks to upscale and build on the positive results in developing the innovative Early Warning System (EWS) pilot that aims to collect and disseminate real-time water levels and climate risk data through a community developed, people-centred EWSs.

Sanitation and Climate Change

27. An estimated 4.5 billion people worldwide live without access to safely managed sanitation[30] putting them at risk of infectious diseases; climate variability and change exacerbate these risks by placing strain on sanitation systems. Climate change projections indicate changes to the timing, intensity and spatial distribution of weather- and climate-related events. Increasing global and regional temperatures have the potential to increase the frequency, intensity and duration of severe extreme weather events increasing the variability and unpredictability of precipitation. These changes affect sanitation systems and the infrastructure, water resources, water services, and other social and governance systems on which sanitation depends. Many of the direct and indirect effects on sanitation pose a danger to human health and development.[31]

28. Climate change-related health consequences from sanitation systems generally fit within two overarching categories: (i) increased risk of disease or illness from exposure to pathogens and hazardous substances through increased environmental contamination, and/or (ii) increased risk of disease or illness resulting from a lack of access to adequate sanitation when systems are destroyed or damaged. Poor and vulnerable groups face the most immediate and severe consequences from climate change, and health is no exception. People without access to basic services experience overlapping forms of disadvantage and are likely to face the worst effects.[32]

Table 2 The impact of climate change on sanitation[33]

Climate change effect	Example impact on sanitation	Examples of associated health effects
More intense precipitation (leading to extreme rainfall events, floods, landslides, etc.) or inundation caused by mean sea-level rise	Flooding of on-site systems causing destruction of facilities, spillage, overflow and environmental contamination (e.g. in water supplies, floodwaters, surface water, soil)	• Increased stress, fear, potential exposure to violence and anxiety from lack of access to toilet facilities and reliance on open defecation • Increased risks of water- and vector-borne diseases through reduced functioning • Increased exposure to faecal contamination resulting in environmental enteric dysfunction
Long-term declines in rainfall and run-off (leading to e.g. long-term drought etc.)	Declining water supply impeding function of water-reliant sanitation systems (e.g. flush toilets, sewerage); Increased demand for use of	• Increased risks of water- and vector-borne diseases (e.g. due to lack of water for flushing and cleaning resulting in poor sanitary conditions and poor hygiene, and changes in mosquito breeding between dry and wet)

[30] WHO and UNICEF (2017) Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and SDG Baselines. Geneva: World Health Organization and United Nations Children's Fund.
[31] WHO (2019) Discussion Paper: Climate Sanitation and Health
[32] Mukheibir, P., Boronyak-Vasco, L. and Alofa, P. (2017) 'Dynamic Adaptive Management Pathways for Drinking Water Security in Kiribati', in Leal Filho, W. (ed.) *Climate Change Adaptation in Pacific Countries: Fostering Resilience and Improving the Quality of Life*. Springer International Publishing, pp. 287-301.
[33] WHO (2017) Climate-resilient water safety plans: Managing health risks associated with climate variability and change. Geneva: World Health Organization.

Climate change effect	Example impact on sanitation	Examples of associated health effects
	wastewater – especially in agriculture; shifting ground due to drying soils cracks or damages infrastructure	• Increased open defecation and associated health risks • Increase risk of water- and vector- borne diseases linked to untreated wastewater reuse for food production
Higher temperatures (leading to e.g. warmer surface water and soil temperatures, heatwaves)	Malfunction, breakdown or inaccessibility of sanitation systems deterring safe sanitation behaviours (e.g. strong odours during heatwaves deterring use of latrines)	• Health impacts resulting from unsafe use or non- use of sanitation systems (e.g. physical or mental health conditions)

COVID-19

29. The outbreak of coronavirus disease 2019 (COVID-19) caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is a global public health concern with rapid growth in the number of patients with significant mortality rates. FAO estimates that the COVID-19 in Sudan and related containment measures is adversely impacting all four dimensions of food security: availability, access, utilization and stability. Food availability is affected due to on-farm labour shortages as well as shortages of transportation of items while access to food will be challenged as many micro-enterprises and petty / small informal businesses are restricted or curtailed. This will cause the loss of essential income sources that enable vulnerable people to access basic commodities. With limited availability and access, vulnerable families will resort to low quality and quantity of food which will result in undernutrition.[34]

30. At the extraordinary G20 Agriculture's Minister's meeting held in April 2020 involving inter alia FAO, a joint statement on the impacts of COVID-19 on food security and nutrition was issued concluding that the pandemic is also already affecting the entire food system at multiple levels. The situation poses critical challenges that might lead to food insecurity and that the impact is most devastating on people living in the poorest countries as they require urgent support to avoid further setbacks reversing progress thus far achieved in combating poverty, inequality and underdevelopment. Sudan's Food Security Technical Secretariat (FSTS) [35] projects that the consumption patterns will shift towards low quality and quantity and this will increase malnutrition. Restrictions and interruptions in the flow of goods and services that ensure safety nets and social protection of the vulnerable population is expected to have an impact on food stability. Safely managed water, sanitation, and hygiene services are an essential part of slowing the spread of COVID-19.

SMART Irrigation – SMART WASH

31. The Central and Eastern Sahel Region is largely underdeveloped and facing a number of critical climate change-related challenges caused by increasing water insecurity and rising temperatures that adversely impact human and animal health causing increased food insecurity and reduced capacity to ensure basic sanitation requirements. In 2020 the global COVID-19 pandemic has brought additional vulnerability to bear on already climate-vulnerable rural communities, with no quick end on the horizon. To address these multiple and mutually reinforcing aggravating conditions, FAO has developed the innovative SMART Irrigation – SMART WASH initiative. The initiative proposes a twin-track approach for solutions to enhance irrigation and provide Water, Sanitation and Hygiene (WASH) facilities to vulnerable communities,

[34] OCHA (2020) Humanitarian Response Plan – Sudan https://www.who.int/health-cluster/countries/sudan/Sudan-Humanitarian-Response-Plan-COVID-Addendum-March-December-2020.pdf?ua=1

[35] Sudan Federal Food Security Technical Secretariat (2020) Food Security Information and Knowledge Sharing System http://fsis.sd/Pages/FoodSecurity/PublicationsFind.aspx?lang=EN&l=103892&DId=0&CId=0&CMSId=5003213&q=creator:Food%20Security%20Technical%20Secretariat%20(FSTS)

hereby responding inter alia to the needs in times of the COVID-19 crisis whilst ensuring adaptation to climate change at multiple levels in agriculture and sanitation through Multiple Water Use (MWU) systems.[36]

32. The **Conjunctive Water Use (CWU)** includes the surface water from pond and groundwater resources lifted by a solar-powered system. The optimal combination of rainfall water and groundwater preserve the vulnerable groundwater resources, minimizes the undesirable physical and environmental effects and balances the water demand and supply.[37]

33. **Multiple Water Use (MWU)** systems form part of the CWU and allow to fight the pandemic while helping to reduce the climate-vulnerability of rural communities by using water from the same source or infrastructure for multiple uses and functions; the SMART Irrigation – SMART WASH approach combines multiple water uses where water is required to meet the demands of both irrigation and WASH. The harmonised development of water resources through multiple water use techniques play a key role to mitigate the adverse impacts in developing countries, where food production systems are often fragile. The MWU also addresses access to safe water which is not available or affordable and health systems that are underdeveloped with institutions too fragile to establish appropriate infrastructure.[38]

Project Area

34. The aim of the project is to build climate resilience into agricultural and sanitation systems within the broader watershed of the Chari River in Chad on the border between Chad and Sudan (as shown in Annex 2). The project will be focused on improving agricultural productivity, food security, health and sanitation and pilot innovative multi-purpose water infrastructure that will also help fight the COVID-19 pandemic. It will do this through an Integrated Water Management (IWM) approach involving the piloting of an Early Warning System (EWS) to provide real-time monitoring of existing water supplies that will i) enable planning and early action functions against future drought and flooding events; ii) upscale FAO pilots in macro- and micro-level water-efficient, multiple and conjunctive use climate-smart irrigation and sanitation infrastructure; iii) develop climate-resilient agricultural techniques to climate-proof livelihoods; and iv) promote a regional cooperation platform where national and knowledge institutions and organisations are able to share experiences and best practices.

35. **Regional Approach.** By adopting a regional approach, the project will enable the two countries to reap the full benefits of the potential spillover effects of a shared scale-up strategy in the most cost-effective way. A regional approach for irrigation development will help: (a) facilitate coordinated investment planning in shared natural resource areas; (b) build the knowledge base and facilitate cross-learning at the regional level; and (c) facilitate adoption of regional and national policies through institutional benchmarking. The regional approach provides a window of opportunity and entry point for solutions at scale that have not been achievable to date. Experience shows that separate national projects do not provide the scale and depth that is required to induce lasting institutional changes and that analytical work is not sufficient to create an enabling environment.

Chad- Sudan Chari River basin

36. The project proposes to implement climate change adaptation measures along the watershed between the Chad and Sudan border as shown in Annex 2 of this proposal. Activities are proposed along two rivers the Assongha River (Chad) and Wadi Kadja (Sudan) that are tributaries to the larger Chari river that in turn drains into Lake Chad. The Wadi Kadja originates from the western Jebel Marra highlands in North Darfur State and drains the west and southwest of the mountain towards Chari River in Chad. Along the Chadian side of the border the project proposes to focus on the Asoungha department in the Ouaddaï province while on the Sudan side the project will focus on the West Sudan State, on both sides focusing on villages and towns with agricultural potential.

37. **Disa Sandstone Aquifer.** The sandstone covers an area of 300 km^2 in West Darfur and extends into Chad. Geneina town is situated on top of the eastern part of the Sandstone aquifer. The lithology of the sandstone formation comprises mainly of medium to coarse grained sand, cemented by arenaceous and ferruginous materials, sometimes containing kaolinite and with thin inter-bedded layers of clay,

[36] OCHA (2020) Humanitarian Response Plan – Sudan https://www.who.int/health-cluster/countries/sudan/Sudan-Humanitarian-Response-Plan-COVID-Addendum-March-December-2020.pdf?ua=1
[37] Ibid
[38] Ibid

ironstone and conglomerates (gravels). At Jebel Disa the bedding of the sandstone slightly dips to the north. However, the dipping of strata cannot be observed from boreholes data. The total water storage capacity of Disa Sandstone aquifer is calculated as 49.9 x 106m^3. Disa Sandstone Aquifer is considered as one of the key aquifers providing towns in West Darfur, the Asoungha Department, Internally Displaced People (IDP) and refugee camps with water supply requirements.[39,40]

38. **Water Availability.** The rivers are highly seasonal and according to the Aqueduct Water Risk Atlas[41], the target area is considered a high-water risk area in terms of water stress; water depletion; and is a high riverine flood risk area. The main water resources are seasonal surface water catchments and alluvial, fractured basement and deep groundwater aquifers. Many rural water systems in Darfur were damaged or destroyed as part of the conflict. High population densities in IDP camps in Darfur and refugee camps in Ouaddaï have created intense water demand, which can lead to diminished and depleted ground water, particularly when rainfall is low. The humanitarian response effort resulted in extensive drilling of boreholes as emergency measures, often in concentrated locations and without conducting coordinated hydrological and hydrogeological surveys. As a result, the ongoing extraction volume, especially in areas where deep wells have tapped into poor aquifers, water resources have been negatively affected and have lowered the water table and dried up some shallower wells.[42]

Food Production

39. **Ouaddaï.** Specific food production baseline information on the proposed project target watershed area is limited, however food production in the region of Ouaddaï can be defined as 'rain-fed cereals and market gardening', with most households also maintaining some animals. In a good year, the combination of rain-fed and off-season grain production coupled with off-season garden production along the wadis has potential to fulfil most food requirements. However, as a combined result of rainfall deficits, crop pests, animal disease outbreaks, over-grazing and environmental degradation, and sale of food stuffs to regions in the north, the zone as a whole is considered food deficient in two years out of three. The staple food crop are millet, groundnuts and sorghum, along with niébé, sesame, and cowpeas with grain crops used for household consumption, animal feed and alcohol production. Ground nuts are of particular importance as they can be transformed into peanut oil and the residue used for animal feed. They therefore generate an important source of household income and subsistence. [43] Garden production comprises garlic, tomato, pepper, gumbo, squash, carrots, lettuce, parsley, melon and watermelon; fruit production includes guava, lemon, bananas and mango. Gathering activities particularly during the dry season, are also important, and conducted principally by women and children. Livestock holding is essentially of the sedentary kind, although the zone also provides important passage-ways for the herds of the transhumant zone in the north that are taken south for grazing. This promotes economic exchange between herders and the local farmers, but also provokes conflicts arising from crop damage by the transhumant herds.[44]

40. **West Darfur.** The project target area in Western Darfur falls under the FIEWSNET category of 'Western Agropastoral Millet' zone that is a narrow agroclimatic zone stretching from the proposed project area on the border with Chad east through Darfur and neighbouring Kurdufan to the south of Khartoum in Central Sudan. This is considered a marginal agricultural zone in which only drought-resistant millet is reliably produced. Mean annual rainfall in much of the area is well under 300mm, at best marginally adequate for millet cultivation but not for cash crops such as groundnuts or sesame, although small amounts may be grown for home consumption.[45] Households also grow watermelon, hibiscus, and okra in low-lying areas. Given limited agricultural productivity, livestock sales account for the majority of the better-off and middle groups' cash income, while the incomes of the poor groups mainly come from labour and trade. When the rains fail poorer people may not even be able to harvest a month's supply of grain, and for

[39] Mandel, S. and Shiftan, Z. L., (1981): Groundwater Resources, Investigation and Development. Academic Press. New York. Journal of water resource and protection, vol. 6, No. 9, June 26, 2014.
[40] Ali, K.M., El Sheikh, A.E. and El Khidir, S.O., Determination of Hydrogeological Parameters of Alluvial and Disa Sandstone Aquifers of West Darfur State, Western Sudan. Al Neenlain Journal of Geosciences, vol 3, issue 1, 2019
[41] https://www.wri.org/aqueduct
[42] UN Fund for Recovery Reconstruction and Development in Darfur (2014) Increased Access to and Use of Sustainable Water, Sanitation and Hygiene (WASH) Services Underpinned by Improved Integrated Water Resources Management (IWRM) in Darfur. http://mptf.undp.org/document/download/15873
[43] FEWSNET (2011) Chad Rapid Livelihood Zone Profiles https://fews.net/west-africa/chad/livelihood-profile/august-2011
[44] Ibid
[45] FIEWSNET (2011) Livelihood zoning "Plus" Activity in Sudan. https://documents.wfp.org/stellent/groups/public/documents/ena/wfp239943.pdf

the one or two extra goats they may have to sell they are likely to receive low prices, while grain prices may be unusually high. Wild foods can be sought, but there is little extra local work to be found, and so the only recourse is migration.[46]

41. **Beneficiaries and Target Groups.** The exact number of beneficiaries will be defined during the design of the full project proposal. The SCCIWM will target the climate-vulnerable rural poor smallholders, engaged in agricultural, pastoral and agro-pastoral activities. The target group is characterised as ethnically diverse and will take into account measures of gender-responsive consultation, participation and inclusion of ethnic minorities where needed. Specific targeting measures will be also adopted to ensure that socially disadvantaged categories such as women, youth and elderly at risk of exclusion, will be included. Gender-responsive affirmative action will be taken into consideration for women participation in activities as well as decision-making processes and community-based organisations (CBO). The entry point of the project will be the CBOs that have already been formed and are operational, or create new ones where they are not, such as the Village Development Committees (VDC) in Sudan and the Groupements in Chad. The final selection of departments within the binational watershed will be assessed considering implementation capacities and potential impact at landscape level; consultations for the full design will be in full compliance with the AF Environmental and Social Policy as well as the Gender Policy.

Threats to the border area

Chad – Ouaddaï

42. The main factors causing food insecurity in Ouaddaï are linked first to low diversification of income sources and despite secondary incomes from growing produce such as tomatoes, onions and gumbo, 40.5% of the population suffers from severe food insecurity. The decrease in grain production in the area is also important considering that 97.2% of the population practices agriculture. Soil depletion is a major factor affecting production and following a period of poor production, locals are heavily dependent on local markets for food, especially during the lean season. The resilience of communities to external shocks on livelihoods such as irregular rains and flooding is also considered to be very weak. Proper hygiene practices are also an issue as just 14% of women with children demonstrated having knowledge of appropriate hand washing techniques. Furthermore, soap products are expensive or can some- times be in short supply and are also principally used for laundry and not for handwashing.[47]

43. Key constraints to agriculture include: loss of soil fertility and lack of fertiliser, crop pests, population pressure on the land, including through the influx of refugees in the zone, loss of land through erosion by wadis, destruction of crops by animals, irregular and poorly timed rains; and post-harvest losses. Most cultivation is done with rudimentary instruments – primarily the hoe, which further limits productivity; tractor use remains rare. Water retention activities to enhance agricultural potential have included installation of weirs (seuils d'appendage) and dams; but these have so far had limited coverage. Key constraints to animal husbandry include lack of sufficient pasture, lack of pastoral water points, lack of veterinary services in the face of animal disease outbreaks and insufficient technical support, including for transformation and marketing of animal products. [48]

Sudan – Darfur.

44. Population growth, climate change, prolonged conflict, and rapid urbanization have combined to create conditions in Darfur that place the region's water resources under considerable strain. While raw data is scarce, there is a general decline and variability of rainfall over the past 50 years that has resulted in less dependable seasonal surface water availability, increased desertification, increased rates of surface water run-off, increased siltation rates and reduced rates of aquifer recharge. Over the past 30 years, climatic factors and conflict have driven rapid urbanization, and more recently the concentration into urban or peri-urban camps of upwards of 1.7m conflict-affected people. This has resulted in unsustainable rates of local groundwater extraction in some areas.

[46] FIEWSNET (2015) Rural Livelihoods of Eastern, Central and Northern Sudan https://fscluster.org/sites/default/files/documents/Sudan%20Profiles%20Final%20en%20%283%29.pdf

[47] Patrick McCarty (2016) Case Study Chad, Abdi District of the Ouaddaï region 2015-2016. Action Against Hunger https://linknca.org/article/etude_de_cas_-_district_d_abdi_region_du_ouaddai_tchad.htm?lng=en&

[48] Watson, C., Dnalbaye, E. and Nan-guer, B., 2018. REFUGEE AND HOST COMMUNITIES IN CHAD: DYNAMICS OF ECONOMIC AND SOCIAL INCLUSION. http://documents1.worldbank.org/curated/en/734861563057353544/pdf/Refugee-and-Host-Communities-in-Chad-Dynamics-of-Economic-and-Social-Inclusion-Report-of-Qualitative-Research-Findings.pdf

45. Agriculture and livestock are the two key sources of livelihoods for Darfuris and both are dependent upon rainwater. It is estimated that across Darfur there exist more than 50 surface water reservoirs and 100 major hafirs, along with numerous small storage structures and a scattering of other water harvesting schemes, as well as over 400 deep borehole water yards and thousands of hand pumps. Many rural water supply structures have suffered from conflict destruction and a historic lack of maintenance. Most are used for both animal and human water supply and are in need of water treatment facilities[49]. Their restoration and increase in the coverage of surface and sub-surface water infrastructure will be central to successful integrated water resource management.

Water Health and Sanitation (WASH)

46. **West Darfur.** Water scarcity is a central factor in the border area's struggle to develop. Groundwater levels in the Disa Sandstone Aquifer have shown significant and substantial reduction due to excessive abstraction from the aquifer for various water utilisation purposes. The groundwater level fluctuations reflect the variation of the atmospheric pressure of the aquifer and the aquifer's water recharging and withdrawal are the most important factors that cause groundwater-level fluctuations. During the daytime, the water level is affected by abstraction, where it ranges from 12.2 to 12.8 m below surface, while the seasonal variation in water level indicates clear water level fluctuation. The water level reaches 12.5m below surface during the summer period, while it reaches a value of 12.1m during the rainy season.[50,51]

47. Extremely poor water and sanitation conditions throughout the region have led to years of interventions from both humanitarian and development actors, but the situation remains extremely challenging throughout Darfur and Ouaddaï. on average only about half of the population in Darfur states have access to improved water sources. As per 2013 Sudan S3M (Simple Spatial Survey Methodology) around 17% of households in West Darfur have access to improved sanitation facilities.[52] Water quality monitoring capacity is underdeveloped, and in remote rural areas, is non-existent although the Ministry of Health (MOH) with World Health Organisation (WHO) support have established basic water quality laboratories in each Darfur state with trained personnel. Field missions from the State Laboratory and MOH environmental department, mostly supported by WHO, are organised to take water samples, assess the availability of water and conduct sanitary inspection of water sources and distribution.[53]

48. **Ouaddaï.** According to the comprehensive food security and vulnerability analysis conducted by Action Against Hunger in Ouaddaï, only 3% of households use a water source without risk for contamination. Additionally, faecal matter contamination from humans and animals is a major concern as only around 13% of households have access to latrines. Proper hygiene practices are also an issue as just 14% of women with children demonstrated having knowledge of appropriate hand washing techniques. Furthermore, soap products are expensive or can some-times be in short supply and are also principally used for laundry and not for handwashing.[54] A generally improving security situation in recent years has made access to isolated regions easier, however capacity to sustainably manage WASH services at both community and institutional levels remains a challenge. Lack of clarity and accountability continues to affect the roles and responsibilities of relevant authorities, leading to the absence of clear regulatory framework, politicised decision-making, and waste of extremely limited resources. Key risks in the WASH sector include environmental factors (including groundwater depletion and reduced rainfall), continuing urban migration, and weak water management capacities that contribute to increased risks of disease outbreaks. [55]

[49] UN Fund for Recovery Reconstruction and Development in Darfur (2014) Increased Access to and Use of Sustainable Water, Sanitation and Hygiene (WASH) Services Underpinned by Improved Integrated Water Resources Management (IWRM) in Darfur. http://mptf.undp.org/document/download/15873

[50] Mandel, S. and Shiftan, Z. L., (1981): Groundwater Resources, Investigation and Development. Academic Press. New York. Journal of water resource and protection, vol. 6, No. 9, June 26, 2014.

[51] Ali, K.M., El Sheikh, A.E. and El Khidir, S.O., Determination of Hydrogeological Parameters of Alluvial and Disa Sandstone Aquifers of West Darfur State, Western Sudan. Al Neenlain Journal of Geosciences, vol 3, issue 1, 2019

[52] Sudan National S3M (2013): Report of a Simple Spatial Surveying Method (S3M) survey in Sudan. Federal Ministry of Health, Sudan. 2013. https://www.coverage-monitoring.org/wp-content/uploads/2014/12/Sudan_S3M-_2013_FINAL-Endorsed-EXECUTIVE-SUMMARY_25Nov2014.pdf

[53] UN Fund for Recovery Reconstruction and Development in Darfur (2014) Increased Access to and Use of Sustainable Water, Sanitation and Hygiene (WASH) Services Underpinned by Improved Integrated Water Resources Management (IWRM) in Darfur. http://mptf.undp.org/document/download/15873

[54] Ibid

[55] Darfur Development Strategy Review Steering Committee (Oct. 2019). Review of the Darfur Development Strategy 2013-2019 – Consolidated Review Report. Trias Consult.

Gender

49. **In Ouaddaï** an Action Against Hunger survey showed that the role of women in the community was found to affect their well-being and the nutrition of their children and their high workload was linked with infants' undernutrition due to the mother's general unavailability to be able to provide care. According to the survey 32% of local women reportedly were too busy to care for their young children. The research shows that the workload for women is higher than that for men and women are expected to carry out all domestic duties as well as collect well water and fire wood and buy and sell food in the local markets. Women are also the principal source of manual labour. In addition to tending their own plots, women are expected to work as agricultural day laborers, which is a key source of income during the lean season. Men and women alternate between working their own land and working other fields.[56]

50. **In Darfur** women have largely been excluded from the Native Administration and from leadership positions among traditional authorities. There have been small steps toward women's participation in traditional structures although most female leaders attend primarily to women's affairs. Furthermore, there are perceptions that traditional structures and customary courts perpetuate patriarchal and social norms that may circumscribe women's access to justice, with particularly serious implications for disputes related to land or sexual and gender-based violence.[57]

Gender and Climate Change

51. Climate change severely affects the poorest and most vulnerable populations, particularly women and girls because of the increased time burden, reduced economic opportunities, and health implications associated with increasingly scarce resources and the disproportionate exposure to risk from climate-induced phenomena such as droughts and floods compared with men. In the West Darfur – Ouaddaï border area climate change and environmental degradation are leading to deteriorating soil quality, water scarcity, severe droughts and floods which all have a disproportionate effect on women and girls. For example, women and girls are often the most affected by water shortages as they need access to water for tasks such as cooking, cleaning, and bathing children. In times of scarcity, they also restrict their own personal use, which can lead to psychological and physical discomfort during menstruation.

52. Climate change has a differential gender impacts on women and girls; the involvement of women on an equal basis with men in all climate and environment-related decision-making processes is essential to ensure a gender-responsive adaptation to climate change and resilience in the face of climate-induced disasters. Water and sanitation services for example, are often more effective and more sustainable if women have an active role in designing, planning, and operating facilities and programs. Women can also play an important role in educating their families and the community about good hygiene.

Social Structure and Conflict

53. **West Darfur,** has a population of more than 1.7 million is ethnically mixed although African groups predominate: in Geneina and Habila provinces the Masalit are the majority (60 percent), followed by the Arabs and other Africans, namely, Zaghawa, Erenga, Gimr, Dajo, Borgo and Fur. In Zalingei, Jebel Marra, and Wadi Salih provinces the Fur predominate. In Kulbus province approximately 50 percent is Gimr, 30 percent Erenga, 15 percent Zaghawa, and 5 percent Arab. Together the Fur and the Masalit comprise the majority of the population of West Darfur. Dar Masalit, or homeland of the Masalit,[58] is located around the state capital Geneina and north and south along the border.[59]

54. **Ouaddaï** is multi-ethnic retaining its historical Islamic identity, with the main ethnic groups being the Massalit; Assanghouris and other groups such as the Maba, Mimi, Tama as well as Zaghawa, Arab and Goran. Although the region is ethnically diverse, villages themselves are largely ethnically homogeneous.[60]

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[56] Patrick McCarty (2016) Case Study Chad, Abdi District of the Ouaddaï region 2015-2016. Action Against Hunger https://linknca.org/article/etude_de_cas_-_district_d_abdi_region_du_ouaddai_tchad.htm?lng=en&

[57] World Bank (2013) Brief overview of gender issues in Darfur http://documents1.worldbank.org/curated/en/715571468311372234/pdf/862970BRI0Box30ogica0DissNoteDarfur.pdf

[58] *Dar* roughly corresponds to homeland or home territory.

[59] Human Rights Watch (2004) https://www.hrw.org/reports/2004/sudan0504/4.htm#_ftn2

[60] Watson, C., Dnalbaye, E. and Nan-guer, B., 2018. REFUGEE AND HOST COMMUNITIES IN CHAD: DYNAMICS OF ECONOMIC AND SOCIAL INCLUSION. http://documents1.worldbank.org/curated/en/734861563057353544/pdf/Refugee-and-Host-Communities-in-Chad-Dynamics-of-Economic-and-Social-Inclusion-Report-of-Qualitative-Research-Findings.pdf

Conflict and Refugees

55. In a sign of the improving security situation in Darfur, the joint United Nations-African Union mission in the Darfur region of Sudan (UNAMID) confirmed the decision to close the mission, which followed the unanimous adoption of a Security Council resolution on 22 December 2020, and progress made by the transitional Government of Sudan in addressing the conflict in Darfur. This follows developments in October of the same year when a milestone peace agreement was reached between the Sudanese authorities and two armed groups in Darfur, some two years after the Sudanese Revolution, which led to the overthrow of longstanding leader, Omar Al-Bashir, in April 2019.[61]

56. Sudan has experienced nearly continuous conflict since independence in 1956, and has required external emergency assistance every year since 1984. Over the past fifty years, humanitarian crises in Sudan have been the result of inequality in the distribution of wealth and power between centre and periphery, of conflicts and displacement, as well as drought and economic crisis. The Sudan regime created famine and food crisis in the periphery of Darfur among others, in 1991, 1996, 2001, and a severe conflict-created humanitarian crisis in Darfur from 2003 onwards. The United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) estimates that 9.3 million people are in need of humanitarian assistance in 2020 including 1.9 million Internally Displaced People (IDP) and 1.1 million refugees with around 330,000 in Chad.[62,63]

57. The 2016 OCHA humanitarian profile for the region of Ouaddaï reports that refugees (numbering 116,687) make up 6.5% of the total regional population of 892,981[64]. They are installed in four camps: the first one opened in 2004 is Farchana (area of 1,720,000 m^2, with a population of 28,552 refugees, the majority Massalit (95%) in 6,814 households); the second, is Bredjing (population 45,558; third Treguine (area 1,270,000 m2, with a population of 24,471, also majority Massalit (98%) in 5,810 households; and the fourth is Gaga, opened in 2005, and the only one still accommodating incoming refugees, with a current population of 24,857, 85% Massalit, along with Zaghawa (4%) and Fur (4%) in 5,792 households.[65]

B. Project Objectives:

List the main objectives of the project

58. The project objective is to strengthen the regional agro-ecology and sanitation resilience to climate change and COVID-19 in the border area between Chad and Sudan, by enhancing early response capacity to drought and flood events, improving water availability, water use efficiency, and promoting adaptive agriculture production systems and multipurpose water technologies for Disaster Risk Reduction (DDR) improved livelihoods, food security and sanitation of rural households.

59. The project will be structured around four components:

i. Developing integrated water resource information systems for climate change adaptation in regional agriculture and food systems
ii. Reducing climate vulnerabilities through improved access to water for multiple uses
iii. Improving food security through climate-resilient agricultural practices and technologies
iv. Enhancing regional cooperation on water resource development-based food security and climate change adaptation in agricultural and policy development

[61] UNNEWS (2020) UN confirms closure of Darfur peacekeeping mission https://news.un.org/en/story/2020/12/1081122
[62] OCHA (2018) Sudan Humanitarian Overview https://www.humanitarianresponse.info/en/operations/sudan/infographic/darfur-humanitarian-overview-1-oct-2018
[63] Susanne Jaspars, Bedreldin Shutta (2020) One Year on: Sudan's Fragile Humanitarian Situation. https://www.ispionline.it/it/pubblicazione/one-year-sudans-fragile-humanitarian-situation-26283
[64] OCHA (2016) Profil humanitaire de la region du Ouaddai (août 2016) https://reliefweb.int/report/chad/tchad-profil-humanitaire-de-la-r-gion-du-ouaddai-ao-t-2016
[65] UNHCR Farchana (2018) 'Bredjing Camp Profile'

C. Project Components and Financing:

Fill in the table presenting the relationships among project components, outcomes, outputs and countries in which activities would be executed, and the corresponding budgets.

Project Components	Expected Outcomes	Expected Outputs	Countries	Amount (US$)
Component 1: Developing integrated water resource information systems for climate change adaptation in regional agriculture and food systems	**Outcome 1** Enhanced adaptive capacity through water resource assessment and monitoring to increase food security and agriculture preparedness	**Output 1.1** Regional tool developed and implemented for the identification and monitoring of water availability supporting decision making in drought and flooding planning and early response	Chad Sudan	300,000
		Output 1.2 Water monitoring system implemented and people-centred EWS plans developed	Chad Sudan	2,200,000
Component 2: Reducing climate vulnerabilities through improved access to water for multiple uses	**Outcome 2** Improved water supply augmentation and integrated water resource management through conjunctive and multiple water use	**Output 2.1** System-level water management implemented through conjunctive water use to improve sustainable access to water resources	Chad Sudan	4,000,000
		Output 2.2 On-farm and household climate adaptive water management enhanced through multiple water use systems to increase water efficiency	Chad Sudan	2,000,000
Component 3 Improving food security through climate-resilient agricultural practices and technologies	**Outcome 3** Livelihood activities made climate resilient through application of climate-resilient	**Output 3.1** Evidence-based climate-resilient agricultural practices capacity enhanced to increase productivity and production	Chad Sudan	680,000

Project Components	Expected Outcomes	Expected Outputs	Countries	Amount (US$)
	agricultural practices	**Output 3.2** Sustainable climate-resilient livelihoods promoted through integrated water management, improved climate resilient agricultural and livestock management and optimised water resource use	Chad Sudan	2,000,000
Component 4 Enhancing regional cooperation on water resource development-based food security and climate change adaptation in agricultural and policy development	**Outcome 4** Regional adaptive capacity for food security through regional cooperation increased	**Output 4.1** Role of integrated water management in climate change adaptation strengthened through regional platform	Chad Sudan	500,000
Project Cost				**11,680,000**
Project Execution Cost (9.5%)				1,225,000
Total Project Cost				**12,905,000**
Project Cycle Management Fee charged by the Implementing Entity (8.5%)				1,095,000
Amount of Financing Requested				**14,000,000**

D. Projected Calendar:

Indicate the dates of the following milestones for the proposed project

Milestones	Expected Dates
Start of Project Implementation	2022
Mid-term Review	2025
Project Closing	2027
Terminal Evaluation	2027

PART II: PROJECT JUSTIFICATION

A. Project Components

Describe the project components, particularly focusing on the concrete adaptation activities, how these activities would contribute to climate resilience, and how they would build added value through the regional approach, compared to implementing similar activities in each country individually.

60. The SCCIWM concept proposal places sustainable water management at the heart of this integrated water management (IWM) project. The project follows a four-pronged pilot approach aiming to i) develop a regional integrated water resource information system that identifies and monitors water harvesting sites; ii) improves access to, and storage of, river, rainfall and floodwater for improved agricultural productivity; iii) promotes climate-resilient agricultural and water saving techniques, and iv) promotes regional cooperation to mainstream the integrated water systems management pilots into national and regional platforms hereby reaping the full benefits of the potential spillover effects of a shared scale-up exit strategy. To achieve this, this AF-funded pilots, bring together and upscale proven technologies and innovative approaches from previous FAO pilot projects in Lebanon, Morocco, Uganda and Burkina Faso into one regional project applying the lessons learned and best practices to the regional context of the selected Sahelian countries.

61. The project will benefit from the lessons learned and will upscale a FAO pilot in Lebanon: The 'Improved Water Resources Monitoring System / Integrated Water Resources Management at regional level in Lebanon project'.[66] The aim of the Lebanon project was to improve the performance the capacity of regional water management institutions through the establishment of a multidimensional water monitoring system. This system brought together the four major aspects of water monitoring, namely the climate features, discharge, water quality and agricultural water use. The project enabled decision-makers to create an evidence-based management mechanism and to provide reliable and equitable water service to end-users. It also enhanced the adaptive capacities of the agricultural water users by providing spatial and real-time information on water scarcity. The AF project will benefit from the accumulated experience on creating complex data acquisition, monitoring and information system through combined approaches.

62. Secondly, the SCCIWM will also upscale the "Strengthening Agricultural Water Efficiency and Productivity on the African and Global Level (SAWEPAGL)"[67] project that focused on Improved Agriculture Water Management (AWM) and mainstreaming AWM in national frameworks and processes with the objective to reduce hunger and poverty in Burkina Faso, Morocco and Uganda. The programme covered 5 key areas: i) Water accounting; ii) Crop water productivity; iii) Water harvesting for agriculture; iv) Agricultural water policy; and v) Water use efficiency. The AF project will benefit from the knowledge that resulted from the SAWEPAGL through the guidelines that have been produced, these include a i) Field guide to improve crop water productivity in small-scale agriculture[68]; ii) Field guide to improve water use efficiency in small-scale agriculture;[69] iii) Policy guide to improve water productivity in small-scale agriculture;[70] iv) Policy guide to improve water use efficiency in small-scale agriculture;[71] and v) An assessment of the best practices relating to 42 water harvesting techniques already extensively applied in

[66] FAO, 2020. Improved Water Resources Monitoring System/Integrated Water Resources Management at regional level in Lebanon http://www.fao.org/3/cb1438en/cb1438en.pdf

[67] FAO (2014) Strengthening Agricultural Water Efficiency and Productivity on the African and Global Level http://www.fao.org/agwa/news-events/details/en/c/242109/

[68] Salman, M., Pek, E., Fereres, E., Garcia-Vila, M. 2020. Field guide to improve crop water productivity in small-scale agriculture. Rome. FAO. https://doi.org/10.4060/ca8443en

[69] Maher Salman, M., Pek, E. and Lamaddalena, N. 2019. Field guide to improve water use efficiency in small-scale agriculture – The case of Burkina Faso, Morocco and Uganda. Rome, FAO. http://www.fao.org/documents/card/en/c/ca5789en/

[70] Salman, M., Pek, E., Fereres, E. & García-Vila, M. 2020. Policy guide to improve water productivity in small-scale agriculture - The case of Burkina Faso, Morocco and Uganda. Rome, FAO. https://doi.org/10.4060/CA7596EN

[71] Salman, M., Pek, E. and Lamaddalena, N. 2019. Policy guide to improve water use efficiency in small-scale agriculture – The case of Burkina Faso, Morocco and Uganda. Rome, FAO. http://www.fao.org/documents/card/en/c/ca7144en/

Uganda, Burkina Faso and/or Morocco.[72] The project successfully piloted water-use efficiency and water harvesting measures in specific command areas in Sub-Saharan Africa. Given the fact that these measures involved mainly but not exclusively system-level development, they have high potential for upscaling and replication.

Component 1: Developing integrated water resource information systems for climate change adaptation in regional agriculture and food systems

Outcome 1 Enhanced adaptive capacity through water resource assessment and monitoring to increase food security and agriculture preparedness

63. Climate change affects global water resources by reducing the predictability of water availability and affecting water quality. Climate change also increases the occurrence and magnitude of extreme weather events, such as storms, floods and droughts harming ecosystems and societies, threatening biodiversity and sustainable social-economic development. This has major implications for water resources and the management of these water resources within a given country and across its borders. The world's poorest and most vulnerable women, men, children and elderly face the greatest risks associated with increased food insecurity, human health, energy production, and biodiversity hereby exacerbating existing social inequalities that can lead to further social strife, forced migration and conflict.

64. The impacts of climate change on the availability of water resources affect the poor disproportionately through their effects on agriculture, health and natural disasters. The rural poor largely rely on rainfed agriculture or livestock to sustain themselves and their families, all of which are highly climate- and water-dependent and therefore at risk to hydro-meteorological variability. With increased rainfall variability they will become increasingly vulnerable and their opportunities for rising out of poverty will be reduced. As a consequence, agricultural production shocks may trigger significant increases in the price of food and lead to food insecurity. As poorer households spend a significantly larger share of their income on food, they will be the most impacted.

65. Climate change generates additional risks to water-related infrastructure, revealing also pre-existing threats to water management. Increased weather uncertainties require enhanced resilience better water monitoring capacities that improves flexibility and is focused on addressing risks, especially for people most at risk from poverty and vulnerability. National and regional water information and monitoring systems are essential to water governance and are fundamental to address challenges in service delivery; information and monitoring are key elements of any effective water service mechanisms. While water monitoring allow users to see the quality of the services delivered and to rationalize and reduce water use, it also enables institutions to track progress across a range of indicators related to water availability. As they are grounded in context-specific data acquisition, advanced information and monitoring systems can be turned into forecasting, and eventually early-warning systems. These indicators and monitoring technologies need to be adapted, developed and tailored to those in need and best suited to the priorities and resources of the central and eastern Sahel region and each individual and country.

Output 1.1 Regional tool developed and implemented for the identification and monitoring of water availability supporting decision making in drought and flooding planning and early response.

66. Despite significant progress in strengthening early warning systems across the world, disasters are increasing in frequency and severity in most areas caused by climate change and increased climate variability. Many developing countries, have not benefited as much as they could have from advances in the science, technology and governance behind early warning systems. The societal benefits of early warning systems have until now been spread unevenly and significant gaps remain, especially in reaching the "last mile" - the most remote and vulnerable populations at the community level with timely, understandable and actionable warning information), including lack of capacities to make use of the information.

67. Through output 1.1, the Adaptation Fund will support a regional training programme hosted by the regional platform developed in component 4, for decision makers and water-sector actors (Non-Governmental Organisations 'NGOs' and civil society) on evidence-based decision making on water

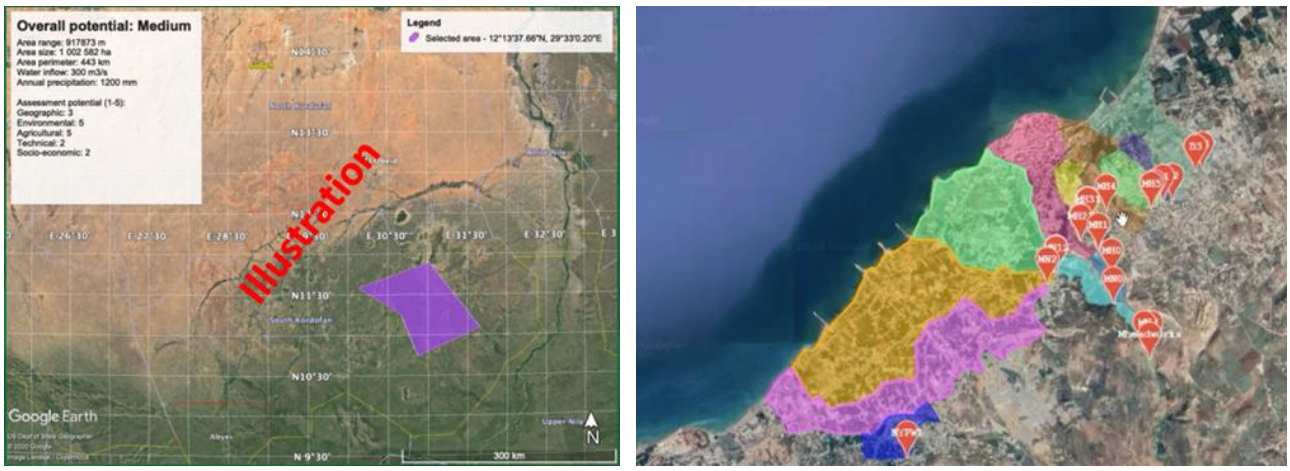
[72] Maher Salman, Lisa Bunclark & Motasem AbuKhalaf, 2016. Strengthening agricultural water eciency and productivity on the African and global level, FAO. http://www.fao.org/3/a-i5976e.pdf

harvesting development. Component 1 will also develop an EWS based on the extensive work already carried out in Lebanon on designing a water monitoring system and the Early Warning Early Action (EWEA) programme in Sudan. With AF support the SCCIWM will develop an integrated regional database of water usage and the potential for water harvesting that will form the basis of the innovative e-platform. The regional information system will function as a gap-filler and while there have been considerable efforts globally to exploit the water harvesting potential in particular in Africa, this project brings together the FAO-piloted approaches in a scalable platform into one.

68. Output 1.1 will develop a highly flexible tool to systematically analyse the relevant information retrieved from the activities of output 1.2 and also combine remote-sensed and crowed-sourced information on geography, hydrology, environment including climate, agriculture, technical and socio-economic dimensions. This will feed into a regional GIS-based information system storing project-specific information and convert it into a user-friendly assessment tool integrating the data coming from field devices (as part of output 1.2). Such a computer-based tool will be multiple purpose; it will form the foundation of a multicriteria system for developing water harvesting sites or structures, harvesting potential will be measured and these sets of information applied. The methodology would be integrated into a user-friendly platform, hosted for example, by the Google Earth engine and be used for early-warning through the provision of real-time data on climate, the environment and hydrology. The information will be shared amongst neighbouring areas and countries to support the coordination and preparedness for any hazard such as drought and floods.

69. Farmers will be supported by easy-to-understand information. Monitoring gives a picture about the current situation, and this pool of collected data will be converted into useful information for a people-centred EWS (output 1.2) as well as policy makers at the national and regional level and other national and international multilateral and bi-lateral development and humanitarian agencies. This user-friendly software integrates two modules: 1) highly accurate water monitoring directly for project beneficiaries and 2) assessment tool for water harvesting potential at regional scale. The monitoring module visualises the measurement points with an analysis function to facilitate the decision-making, and also with the function of high-frequency reporting. The reporting function is responsible to deliver information to communities through extension-services or for example water user associations. The tool will also form the core framework for scalable water harvesting assessment methodology that will guide decision-makers towards evidence-based water resource development. The obtained information will support the identification and prioritisation of water harvesting sites on the basis of their potential contribution to livelihood development. Remote assessment of water harvesting sites will greatly facilitate the planning processes, thus providing a robust tool for further project formulations. The project, therefore, will have a long-term impact on water-based multisector development.

Figure 1 Sample illustration of mapping (left) measurement sites in Lebanon – a map view (right)



Activities under output 1.1:

Activity 1.1.1 Regionally recognised training programme on evidence-based decision making on water harvesting development; training on water accounting and implications for national policy development.

Activity 1.1.2 Software developed and databases compiled and integrated on climate, water use and water harvesting potential (flood and rainwater) in the region.

Activity 1.1.3 A regional and national e-platform developed for climate services (agroclimatic; early-warning), water needs and flood and rainwater harvesting potential including existing facilities and condition; new facility assessment through geographical, environmental and socio-economic suitability assessments.

Output 1.2: Water monitoring system implemented and people-centred EWS plans developed

70. In output 1.2, the project will pilot a bottom-up approach for water monitoring. This kind of bottom-up monitoring system is established directly for informing communities in the selected pilot sites at micro-level. Each pilot site will be equipped with in-situ data acquisition devices, which will be directly connected to a local knowledge institution / NGO here referred to as Service Provider (SP). The SP will be responsible for the installation operation, monitoring and data generation to feed into output 1.1. An assessment will be conducted on the most appropriate technological solutions that will be implemented by the SP to ensure that the project does not fall into the sophistication trap whereby the technology used is too sophisticated for effective operation and maintenance.

71. The monitoring system will follow the water balance concept of matching water demand and water supply. These two elements are needed to create effective water distribution and to significantly improve sustainable water management. The monitoring devices will be selected based on their capacity to capture the entire water distribution system and integrate four interrelated aspects: water quantity, water quality, climate and multiple water use. The project is designed to facilitate multiple water use to increase overall efficiency, and the system will be configurated and calibrated based on the requirement of water uses and user-friendly technology. The project will use field devices that provide real-time data acquisition and through output 1.1 ensure the data can be utilised and interpreted to obtain readily available information that climate-vulnerable communities can use. The system will be fully integrated into the project components and also monitor the macro- and micro-level water infrastructure resulting from component 2.

72. **People-centred Early Warning Systems (EWS).** Thanks to significant technical and technological advances that bring about new ways to detect risks and issue warnings, EWS has more potential to save lives and livelihoods and contribute to building a more resilient community. However, if an EWS does not serve the people it is targeted to protect and empower, its effectiveness will be limited. It is essential that communities receive clear and relevant messages regarding hazards, which lead to practised and informed responses. Many sectors and levels of society should be involved in a people-centred system, in which education and awareness-raising are central.

73. To have an effective EWS, both of these approaches are crucial. Firstly, community participation is required to map needs, risks and vulnerabilities. Also, their involvement can lead to ownership and legitimacy to ensure that warnings lead to actions. Secondly, the early warning indications / messages from national, regional and global monitoring systems for specific risks, particularly those weather-related, need to reach the community level. Communities cannot achieve what these scientific systems can do, but on their own they are not effective unless they receive information from these risk monitoring systems and respond to the information appropriately.[73]

Activities under output 1.2:

Activity 1.2.1 Training and technical capacity building of Service Providers on water and climate related information acquisition.

[73] Yolanda Cowan et.al (2014) Community-Based Early Warning Systems – Key Practices for DRR Implementers. FAO and OCHA

Activity 1.2.2 Deploying real-time water monitoring systems for surface and groundwater resources with five dimensions of :crowed-sensed multiple water uses (irrigation, livestock, household), water quantity, water quality, and agro-meteorological service in pilot sites.

Activity 1.2.3 Advancing decentralized prototype water monitoring system for communities in 3 pilot sites incorporating the data acquisition from monitoring systems, data storing, data analysis and sharing, and m-learning module.

Activity 1.2.3 Community and SP capacity building for design and implementation of people-centred EWS response plans.

Component 2: Reducing climate vulnerabilities through improved access to water for multiple uses

Outcome 2 Improved water supply augmentation and integrated water resource management through conjunctive and multiple water use

74. The Sahel region has historically been characterised by increasing temperatures, severe droughts and intense rainfall; due to climate change these extremes are predicted to increase even further in intensity by mid-century. Extreme droughts in the Sahel region have caused extensive socio-economic and environmental damage as well as having been the cause of conflict. In the Sahel frequently insufficient rainfall and water extraction cause surface water tables to dry up leading to regular water shortages.[74]

75. Intense rainfall on semi-arid land causes flash flooding which also have devastating impacts destroying houses, infrastructure, property, cultivated crops, and threatens lives, especially in arid regions. Usually, flash floods are produced mostly in the absence of vegetation during a short time after a rainfall event. The risk and the intensity of flash floods are determined by different factors, such as the intensity of the rainfall, its location and distribution, vegetation cover and its type, and the soil water content and type. In the absence of vegetation and on dry land, intense rainfall does not replenish groundwater supplies and instead flows overland causing devastation. [75,76]

76. **Conjunctive Water Use (CWU).** The increasing acuteness of water scarcity problems, worldwide and in the Sahel in particular, requires the adoption of a double approach of balancing the management of water supply and demand. Communities are already using groundwater for multiple purposes in the area. However, groundwater resources are highly vulnerable and without effective recharge, they are prone to depletion. The shrinking aquifers are widespread phenomenon in semi-arid areas, where communities withdraw groundwater resources to supply their needs. Uncontrolled and unmonitored groundwater use, however, poses both environmental and social risks. There is an enormous need to balance water use between surface and groundwater, and assess the recharge needs and inflows of aquifers. Conjunctive use of surface and groundwater consists of harmoniously combining the use of both sources of water in order to minimise the undesirable physical, environmental and economic effects of each solution and to optimise the water demand / supply balance. In order to ensure underground water can be used as part of the Conjunctive Water Use without causing additional water stress, CWU includes the active augmenting of underground water supplies. The artificial recharge of aquifers can be achieved inter alia using two different methods, namely water harvesting and recharge wells. These include spate irrigation; check dams; water management and water harvesting.

77. **Multiple Water Use (MWU).** As part of CWU, is an innovative approach to adapting to water scarcity namely the multiple use of water. Multiple water use (MWU) can provide vulnerable users with low-cost services for domestic water, water for agriculture (irrigation, rain fed), homestead, garden, water for cattle, and rural enterprise water supplies. Multiple use systems also support important functions that are essential for local well-being and livelihoods including flood control, groundwater recharge, water harvesting and water purification. MWU is an essential strategic approach to increase water use efficiency, as multiple use allows for integrated management of resources. It is a closed system, whereas non-consumptive water needs can be re-used for other needs. Diversification of water sources and of productive activities is

[74] UNAMID (2016) https://unamid.unmissions.org/darfur-struggles-obtain-water-midsummer
[75] https://reliefweb.int/report/sudan/homes-roads-swept-away-central-darfur-flash-floods
[76] https://news.un.org/en/story/2020/08/1069502

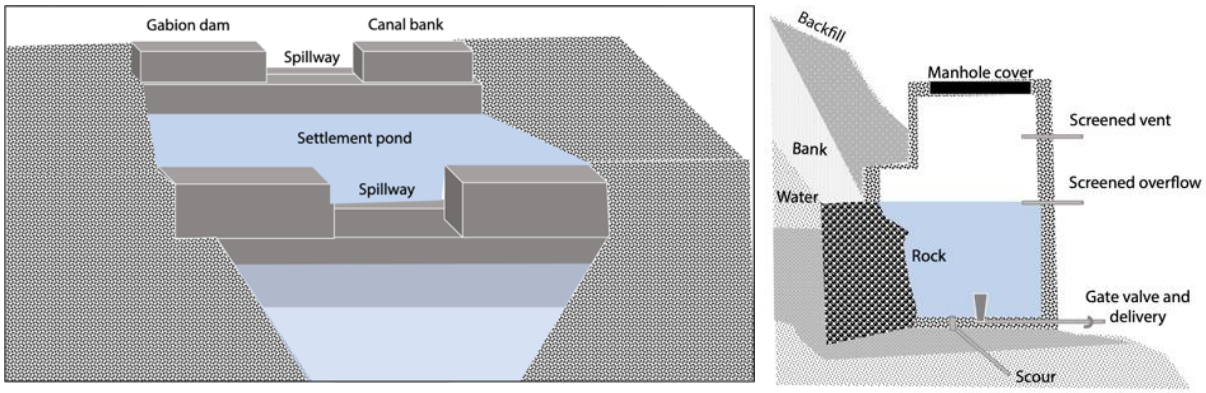
instrumental in increasing local community resilience and management to climate shocks.[77] In component 2 investment packages are divided into two levels of intervention, system level (output 2.1) and on-farm level (output 2.2). The system-level packages showcase possible engineering solutions aimed at water harvesting, groundwater augmentation and distribution. The on-farm packages will be aimed at providing engineering solutions to decrease evapotranspiration, hereby improving water productivity and water use efficiency without compromising yield productivity. In each case, investments in multiple water use combine on-farm and system-level solutions in order to enhance climate-resilience and the sustainability of SMART Irrigation – SMART WASH development.

Output 2.1 System-level water management implemented through conjunctive water use to improve sustainable access to water resources

78. In output 2.1 the project promotes the augmentation of underground water, water harvesting, and water use efficiency at macro / system-level and structures for water distribution. In order to be able to promote the MWU it is essential to identify the most efficient water allocation strategies whereby to supply sufficient water for any kind of use that in the context of this project, will be specifically for agriculture, livestock and non-drinking domestic use. To this end needs-assessments and feasibility studies will be conducted to identify and target appropriate technologies for the given geological, hydrological and socio-economic conditions; the SCCIWM will subsequently design and implement water infrastructure with multiple outlets. The infrastructure proposals will be screened based on selection criteria including water availability, investment need, the feasibility of the engineering design and socio-economic factors. The diagrammes below illustrate a number approaches ranging from traditional technologies such as water harvesting structures to innovative methodologies such MWU for irrigation and household use. These will include but not be limited to water harvesting in dams, ponds, hill lakes, retention basins as well as groundwater recharge in pilot areas.

79. A key element of this output as with all aspects of this proposal, is that of knowledge management in the form of awareness raising and capacity building at regional, national and local levels on system-level / macro-level CWU, MWU. Knowledge management, training and awareness raising about climate change and sustainable water use and reuse will be key to ensure project sustainability. The training will also cover operational and maintenance aspects of the CWU and MWU infrastructure; drought and flooding EWS training; awareness raising about need for the installation and operation of water-level monitoring technology; and basic sanitation and COVID-19 awareness raising.

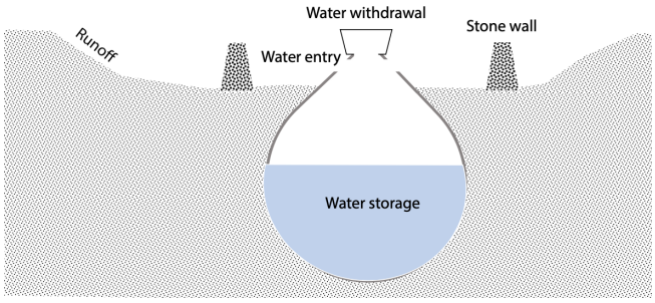
Figure 2 Check dam to control and store floodwater, combined with appended infiltration tank[78]



[77] FAO (2020) http://www.fao.org/land-water/world-water-day-2021/watergovernance/multiple-use-of-water/en/

[78] Salman, M., Pek, E. and Ahmad, W. 2020. *Smart irrigation – Smart wash. Solutions in response to the pandemic crisis in Africa*. FAO Land and Water No. 16. Rome, FAO. https://doi.org/10.4060/cb1306en

Figure 3 Traditional cisterns for rain harvesting[79]



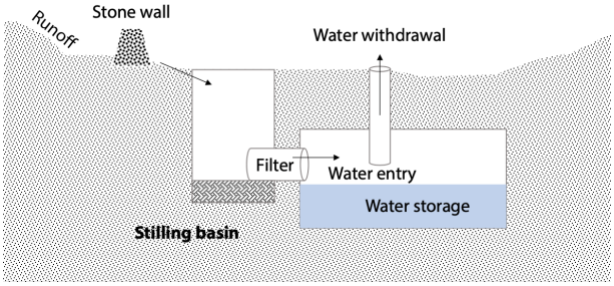
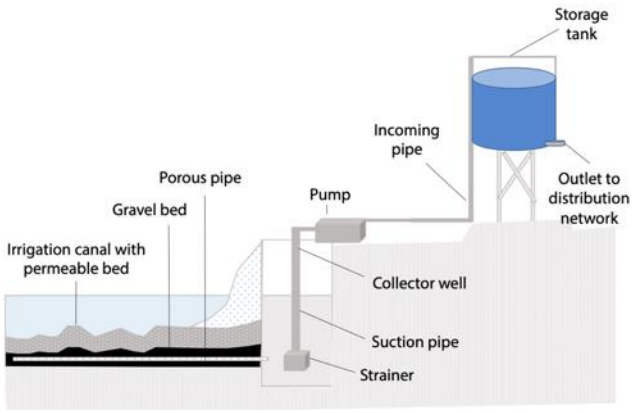


Figure 4 Infiltration gallery[80]



(left) Along a main irrigation canal, infiltration galleries are installed as multiple water source points for domestic water use. When used as a gravity-fed system, this eliminates the need for pumping.

Activities under Output 2.1.1 will include:

Activity 2.1.1 Regionally recognised training programme conducted on conjunctive and multiple water use techniques for climate-similar target areas to achieve impact-at-scale

Activity 2.1.2 Technical capacity of communities developed on participatory management of MWU structures and raising awareness about responsible groundwater use and resource conservation and management. The training will include community-wide consultations and awareness raising as well as community leaders, NGOs, extension service, technical staff, Water User Associations (Sudan) or Groupemnets (Chad).

Activity 2.1.3 Studies conducted and multiple water use structures designed and implemented (dams, ponds, check dams, hill lakes, retention basins etc.) for irrigation, livestock and household purposes, applying conjunctive water use of harvested flood- and rainwater and artificially recharged groundwater.

Activity 2.1.4 Experience-exchange on mainstreaming water-saving techniques through regionally recognized information campaign.

Output 2.2 On-farm and household climate adaptive water management enhanced through multiple water use systems to increase water efficiency

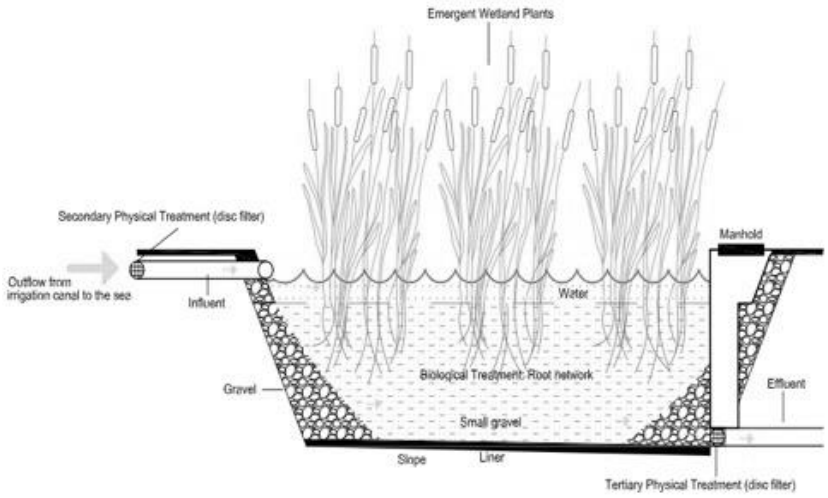
80. All components of the SCCIWM project will form part of the integrated water management approach being adopted. The project will complement efforts to build resilience to climate events such as irregular precipitation and drought. It will improve food security and basic sanitation hereby reducing the incidence of infectious diseases and COVID-19; output 2.2 will focus on the implementation of micro-level on-farm efficient water saving irrigation systems, such as among others the restoration of irrigation canals,

[79] Ibid
[80] Ibid

multipurpose irrigation systems and spate irrigation systems. Another innovation that this project will introduce is the previously piloted and tested root zone technology (see figure below). Following the required feasibility studies for location siting, the root zone technology involves an artificially constructed wetland for nature-based solutions to wastewater management. The innovative technology is effective for treating chemical as well as organic pollutants and for the filtering of physical particles. The approach is to divert the wastewater into the wetland where it acts on three levels involving rootzone, soil and gravel layers. Through aerobic processes in the rootzone it degrades organic and chemical components which are then further decomposed in the soil under the rootzone. Finally, the gravel layer acts as a mechanical filter, filtering any remaining small physical particles. The advantages of the root mechanical wetland root zone technology are multiple: it is easy and inexpensive to operate; it is unaffected by periods of temporal water scarcity as it can stand dry; and if well maintained, it can last for up to 60 – 70 years. Lastly a by-product of the root zone technology is that it produces significant amounts of biomass that can be used for carbon-neutral energy purposes. The rootzone technology contributes to safe environment, as increased water quality is suitable for fresh vegetable irrigation.

81. As with each output, output 2.2 will also have a knowledge management and capacity building activity. This will be focused on training and demonstrating the technology mainstreaming the other elements of the IWM system in this project including the EWS, awareness raising about climate change sustainable water use, sanitation and COVID-19. Training and consultations will be delivered to government extension services, water user associations (WUAs), NGO Service Providers, and members of the local communities through training sessions, workshops, demonstrations and townhall events.

Figure 5 Constructed wetland in surface system



Activities under Output 2.2 will include:

Activity 2.2.1 Developing resource-efficient water supply systems in pilot areas through the upgrade of existing irrigation systems (canals, spate systems, etc.) for multiple purposes of irrigation, livestock and household, applying water purifying nature-based solution (rootzone technology).

Activity 2.2.2 Training and technical capacity building of government extension services, Service Providers (NGOs, extension services and or other local knowledge institutions) and communities on multiple water use and the operation and management of rootzone technology. This will include the production of leaflets, awareness raising workshops, townhall events, community consultations.

Activity 2.2.3 Experience-exchange on mainstreaming water-saving techniques through regionally recognized information campaign.

Component 3 Improving food security through climate-resilient agricultural practices and technologies

Outcome 3 Livelihood activities made climate-resilient through the application of climate-resilient agricultural practices

82. Global temperature increases will adversely impact the project target areas and the vulnerable sectors including rainfed agriculture and surface and groundwater resources. This ultimately increases the vulnerability of certain communities, such as poor farmers, pastoralists and generally communities that rely on rainfed agriculture. The impact of climate change will not only be limited to temperature increases that are projected to increase by up to 3°C by 2050, but also increasing rainfall variability with increased frequency of both droughts and floods. [81] Communities that are most vulnerable to droughts and floods on the border area between West Darfur (western Sudan) and Ouaddaï (eastern Chad) are pastoralists, poor farmers, and generally poor families with senior members, children, and women.

83. Agriculture in the region is already inherently complex, and risk-prone, and farmers have long struggled to respond to challenging environmental conditions. Depending on the location and year, they face either moisture or soil fertility constraints as their primary challenge.[82] The majority of the adaptive crop-based agricultural technologies that have been applied in the region generally target these constraints and can be loosely clustered into three categories responsive to climate stressors: moisture capture; supplemental water supply; and soil fertility enhancement. Many of the technologies contribute to more than one core function, while others represent composite technology packages, composed of several related practices for example check dams, compost and manure applications, and conservation agriculture.[83]

Output 3.1 Evidence-based climate-resilient agricultural practices capacity enhanced to increase productivity and production

84. Output 3.1 will focus on the knowledge management and capacity building requirements of output 3.2, aiming to build the climate-resilience of the agricultural livelihoods of climate-vulnerable rural communities in Chad and Sudan. The output will build the adaptive capacity of key agriculture practitioners – farmers, farmers' organizations, and extension agents - to acquire a more professional profile for sustainable agricultural production and adopt proactive measures towards the adaptation of agronomic systems to climate risks and climate change predictions. The process will start with a mapping and conducting an inventory of existing and ongoing experiences on climate-resilient water harvesting, efficient irrigation and sustainable agriculture systems and techniques. The project will then develop the capacity and work with the Community-Based Organisations (CBOs) such as Village Development Committees (VDCs) and Groupements[84], government field extension agents and NGOs through farmer field schools. The project will ensure sustainability by training Village Agriculture Technicians (VAT) who will act as resource persons to provide extension and advice to local farmers. The AF project will empower VATs to effectively guide farmers in the process of mainstreaming climate change adaptation, improved water use practices and natural resource conservation as well as the diversification of livelihoods and income generation.

85. Training will focus on nutrition-sensitive and climate-resilient technologies such as grow-bags, wicking beds, drought tolerant crops, diversification in production and water efficient practices. It will also include the use of climate resilient practices such as low-cost greenhouse technology, drip irrigation and other water-efficient techniques. For women, the focus is expected to be on nutrition, small ruminants, poultry, kitchen gardening including support to smallholder beekeepers for honey production and processing. Training will furthermore focus on enhancing agriculture productivity, introduction of drought

[81] Sayed, M.A. and B. Abdala. 2013. Sudan Environmental and Climate Change Assessment. ECCA No. 3226-SD Rome: International Fund for Agricultural Development (IFAD).

[82] Brower, J. and J. Bouma, 1997. Soil and Crop Growth Variability in the Sahel: Highlights of Research (1990-95) at ICRISAT Sahelian Center. Information Bulletin No. 49. ICRISAT and the Agricultural University of Wageningen. Patancheru: ICRISAT.

[83] Siddig, Khalid; Stepanyan, Davit; Wiebelt, Manfred; Zhu, Tingju; and Grethe, Harald. 2018. Climate change and agriculture in the Sudan: Impact pathways beyond changes in mean rainfall and temperature. MENA RP Working Paper 13. Washington, DC and Cairo, Egypt: International Food Policy Research Institute (IFPRI). http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/132833

[84] Groupements are forms of association among families with the aim to improve the agricultural production so as to create self-sufficiency and entrance on the market. Each group is composed of 25 members, each member representing a family.

tolerant varieties, climate change adaptation and risk management in farming and sustainable livestock management practices, introduction of water efficient practices and technologies, sustainable livestock management and feed production, detection of animal disease symptoms and management.

86. In line with FAOs effort at developing guidance notes for the pilots in Lebanon, Morocco, Uganda and Burkina Faso, the project will learn from the best practices and develop guidance notes that will enable upscaling through component 4.

Activities under Output 3.1 will include:

Activity 3.1.1 Mapping of selected climate-resilient agricultural practices (use of climate-resilient varieties, crop residues retention, organic fertilizers, mulching, etc.)

Activity 3.1.2 Design and implement a training programme to build the capacity of key agriculture practitioners on climate-resilient agriculture production and on-farm water production ensuring VATs, VDCs (Sudan) and Groupements (Chad) have good understanding of climate risks and climate change adaptation measures are established and operational.

Activity 3.1.3 The adaptive capacity of farmers and other key agriculture practitioners on climate-resilient natural resources management and agriculture production is developed.

Activity 3.1.4 Based on the lessons learned and best practices guidelines on climate-resilient agricultural practices and mainstreaming guidelines are developed.

Activity 3.1.5 Experience-exchange on mainstreaming water-saving techniques through regionally recognized information campaign.

Output 3.2 Sustainable climate-resilient livelihoods promoted through integrated water management, improved climate resilient agricultural management and optimised water resource use

87. Under output 3.2 the SCCIWM project will support training programme for VATs, VDCs, Groupements, extension agents and Service Providers under output 3.1 with investments in climate change adaptation technologies, including suitable equipment and inputs for efficient irrigation, for sustainable drought-resistant on-farm agronomic systems. The introduction of innovative technologies will favour better soil moisture storage and retention capacity and optimal use of irrigation water, while ensuring a more stable and improved production, and preventing environmental problems such as drought and soil erosion. The project will support the identification and dissemination of drought-resistant crop and forage varieties, and more water efficient crop varieties that will better respond to limited water availability during the crop production period and will require lower water quantities under irrigation.

88. The project will identify, demonstrate, validate and disseminate efficient irrigation technologies and conservation agriculture management systems and technologies (crops rotation methods, soil fertility management, crop residue and mulch management, the selection of suitable crop varieties, and integrated pest management). Additionally, a diversified production based on a wider range of crops and complementary products (honey, aromatic and medicinal plants, small ruminants and the use of mesquite to combat the invasive species invasion etc) will help increase food and income security and resilience of rural communities to climate risks.

Activities under Output 3.2 will include:

Activity 3.2.1 Piloting selected climate-resilient agricultural practices (use of heat / drought tolerant, disease / pest tolerant climate-resilient varieties; crop residues retention; organic fertilizers).

Activity 3.2.2 The Provision of tools and equipment for adaptive farm management systems, such as conservation agriculture, introducing permanent soil cover, direct seeding (no tillage / reduced till), crop rotation and crop sequence that conserve / restore fertility.

Activity 3.2.3 Piloting and introducing water-saving techniques (water retainer, biostimulants, etc.) for yield stabilization and increase.

Activity 3.2.4 Measures to prevent soil erosion and floods, including the set-up of live shelterbelts of trees and shrubs, and construction of micro-fences using dead stems to build barrier fences that reduce sand encroachment and mitigate the impact of dust and windstorms.

Component 4 Enhancing regional cooperation on water resource development-based food security and climate change adaptation in agricultural and policy development

Outcome 4 Regional adaptive capacity for food security through regional cooperation increased

International cooperation is important to better enhance climate resilience and is an essential element for the success of the SCCIWM project. The countries of the Sahel region have many features in common including similar environmental, climatic and climate change environments hereby enhancing the added value of sharing of knowledge, expertise, and also good practices. In order to be able to develop such an international approach and foster cooperation in for example, developing a cross border Early Warning System (EWS) as well as learning from each other's experiences that will generate lessons and best practices. It is important to support the process of knowledge exchange, identify relevant regional experts who can train others and join the thematic expertise in groups that can be consolidated and evolve according to the emerging needs of each country. The western border of Sudan often involves transborder migration of refugees from Darfur to Ouaddaï and the project target area is also characterised by mutual dependence on the same ground and surface water supplies through the Bar Salamat river and its tributaries. At a regional level, the project needs to be implemented through an organisation with established project coordination and implementation experience at country- as well regional-level in central and eastern Sahel.

Output 4.1 Role of integrated water management in climate change adaptation strengthened through regional platform

89. By 2050, climate change is set to further aggravate extreme drought and flooding events in the central and eastern Sahel region, the impacts of which do not recognise borders as pressures on dwindling water supplies and impacts of severe flooding events will increase. Early warning systems (EWS) are essential tools to help mitigate the impact of droughts and floods and to adapt to climate change as needs are expanding and resources are limited. New tools and new ways of thinking and acting are essential to reduce the impact of these disasters as effectively as possible. The EWS piloted by the SCCIWM would build on existing efforts and would enable the identification and real-time monitoring of surface and groundwater levels across borders, both to mitigate the risk of drought as well as floods to save lives and make livelihoods more climate-resilient.

90. The regional platform developed as part of component 4, would facilitate dialogue enabling international cooperation through the AF project and enabling the upscaling of EWS cooperation at the national and international level. The regional platform would be multipurpose and bring together many international and national development and humanitarian partners such as the European Civil Protection and Humanitarian Aid Operations (ECHO) that already makes use of the FAO EWEA[85] in Sudan. Participation will be open to all national and international actors in Chad and Sudan that can benefit from an early warning system in disaster mitigation planning and the development of early response mechanisms hereby broadening the impact and cost-effectiveness of the SCCIWM. The regional platform will also offer the opportunity for showcasing, learning and the sharing of information on the effectiveness of the number of innovative technical solutions in water management being proposed by FAO with the support of the Adaptation Fund. Synergies will also be sought with other agencies and projects to install water monitoring equipment beyond the SCCIWM to broaden the early warning impact.

91. Component 4 also will showcase the achievements and successes of the SCCIWM and promote the upscaling of initiatives under the project beyond the SCCIWM, by assisting in the deployment of other bankable project proposals. It will provide an opportunity for workshops and knowledge sharing events to inter alia also improve the capacity of national and regional institutions to upgrade their respective early

[85] FAO (2019) The Sudan - Impact of Early Warning Early Action
http://www.fao.org/emergencies/resources/documents/resources-detail/en/c/1194946/

warning and early response mechanisms, for policy development and to work towards establishing links to national budget codes for future financing of the above services as cross-sectoral / inter-ministerial platforms are good platforms to advance such a dialogue.

Activities under Output 4.1

Activity 4.1.1 Establishing regional platform suitable for face-to-face and e-events to allow information flow and experience exchange

Activity 4.1.2 Preparing regional bankable project proposals to enhance systematic planning of result scale-up and improve harmonized decision-making on adaptation

Activity 4.1.3 Mainstreaming the developed water resource information systems into national and regional platforms, supporting national water policy development including in water accounting, improving water productivity and efficiency in small-scale agriculture.

Activity 4.1.4 Improving capacities of national and regional institutes to upgrade existing food security early warning systems with climate-proofing early action functions

B. Innovative Approaches, Technologies and Mechanisms

Describe how the project would promote new and innovative solutions to climate change adaptation, such as new approaches, technologies and mechanisms.

92. The SCCIWM will be promoting innovative solutions to climate change adaptation that have been tried and tested in previous FAO pilots in Lebanon, Uganda, Morocco and Burkina Faso. Under component 1 the project will upscale the GIS-based software developed in a previous FAO project in Lebanon and used to store project site-specific information converting it into a user-friendly assessment tool. This tool will be tailored to the needs and technical capacity in the project area. Early action is essential in Disaster Risk Reduction (DRR) and this innovative approach to be piloted in the two Sahelian countries through the SCCIWM, will be an essential tool to monitor and quickly identify climate hazards. The technology will be used to collect real-time water level data from upstream reservoirs that will be conveyed to the centralised database whereby life-saving decisions can be made in evacuating. It will also be able to reduce the impact of drought by monitoring available surface and ground water levels that will enable better planning and response mechanisms with the aim to reduce the impact and severity that future droughts will have on food security in the targeted areas. The project will develop site-specific combined drought indicators that will alert communities early on, farmers will then have sufficient time to be prepared and adopt strategies.

93. The SCCIWM in component one will have a two-pronged approach whereby the software is developed and the real-time data is gathered and uploaded, while also developing new transboundary cooperation and improved institutional capacity essential for an international EWS to work. The project will build on previous project experience in the development of international cooperation for flood and drought EWS and promote the development of regional cooperation through this project for improved climate-resilience. To achieve this, the project will promote regional and transboundary cooperation through the regional platform in component 4, but also identify local-level context-specific technical solutions that will enable the gathering of the required technical data for processing. The AF project will conduct technical assessments that will identify the required technologies, identify and work with appropriate ministries, water and meteorological authorities as well local-level knowledge institutions to train and install the required technological hardware and computer software. The second of the two-pronged approach will be the people-centred EWS whereby innovative community-driven response mechanisms will be developed for improved ownership through experienced NGOs or service providers (SP) with the aim to develop appropriate DRR information and communicate these effectively with the affected communities. The aim is to be eventually integrated into existing government and regional structures, frameworks and response mechanisms for enhanced sustainability.

94. Component 2 will promote the new FAO Smart Irrigation – Smart WASH initiative. This is an innovative approach to provide multiple-use water solutions that meet the needs of food production as well as sanitation in areas of water insecurity and characterised by an absence of basic sanitation. The project will be based on detailed assessments that will identify context-specific technical solutions already tried and tested in other FAO pilots in Morocco, Uganda and Burkina Faso. The aim is to enhance the climate-

resilience of the vulnerable rural communities through enhancing water efficiency, promoting ground water augmentation and promoting the reuse of waste water for improved agricultural and sanitation resilience. While linking up with the EWS system developed in component 1, the project will develop macro- and micro-level irrigation solutions that will have multiple uses in agriculture, for livestock and for basic sanitation requirements inter alia also needed to combat COVID-19 and other diseases. The AF project will develop affordable Conjunctive Water Use (CWU) and Multiple Water Use (MWU) technologies that aim to harmoniously combine surface and ground water supplies to optimise the balance in managing water demand and supply without causing additional water-stress. The combination of CWU and MWU will ensure the artificial recharging of aquifers through water harvesting and recharge wells, spate irrigation; check dams; water management and water harvesting.

95. The MWU will inter alia also ensure the reuse of waste water through an innovative, affordable, long-living, nature-based wetland or rootzone technology for water reuse. This innovative approach is an artificial technique that will further improve the water use efficiency by facilitating the water reuse and is a treatment technology of wastewater produced by the communities and is operated entirely through biological processes effective in neutralising chemical, organic pollutants in water and by filtering of physical particles. The resulting water will be utilisable for agricultural and cleaning purposes, but not for drinking.

96. The regional and transboundary cooperation being promoted through the project and in component 4 will also promote essential dialogue between communities that have historically experienced community conflict over scarce natural resources aggravated by climate change. The dialogue and cooperation promoted by this project at international / regional, national, and community levels will demonstrate the benefits of cooperation to improve natural resource availability and the benefits of cooperation to adapt to climate change and hereby reduce future social tensions.

C. Economic, Social and Environmental Benefits

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

Economic Benefits

97. Cross border drought and flooding in the Sahel have historically caused extensive economic damage both directly on livelihoods and human health, but also indirectly through the resulting community and regional conflict. An economic assessment conducted in 2011[86] on the impact of the historical droughts in Sudan in 1984 and 1990 but that also significantly affected the broader region, have shown that at the macroeconomic-level the two droughts have caused steep declines in national GDP. In 1984 the drought saw an 18% reduction in private income, a 19% reduction in in government income with reductions of 6% in total imports, and 8% in the total exports. The study shows that the 1984 drought caused a reduction of Sudan's GDP by 12%. The 1990 drought caused similar impacts with around 11% GDP loss. These losses are shown to be driven by significant declines in the domestic agricultural outputs not only the rain-fed agriculture, but also in the output of the irrigated agriculture. Agricultural output alone reduced in 1984 and 1990 by an average of 22.6% and 18% respectively. In economic terms this is equated to SDG 302 million (roughly USD 5.5 million dollars at today's exchange rate). The drought caused further damage at industrial and services sectors also.

98. Flooding also regularly causes extensive economic damage. Historical data is limited about the impact of climate events in Chad, however in 2020 alone floods have affected around 400,000 people, threating them with food insecurity.[87] FAO also estimates that in 2020 in Sudan nearly 530,000 households have been affected with an estimated agricultural production loss of around 1 million tonnes. The SCCIWM target area of West Darfur, have seen around 2,300 households impacted and a combined loss of around 8,300 tonnes in agricultural production in already one of the most vulnerable regions of the country.[88]

[86] Khalid H. A. Siddig (2011) Modeling the Impact of Drought on Agriculture and Food Security in Sudan. University of Khartoum
[87] Food Security Cluster (2020) https://fscluster.org/sites/default/files/chad_flood_advocacy_0.pdf
[88] FAO (2020) The Sudan 2020 Flood Impact Rapid Assessment. http://www.fao.org/resilience/resources/resources-detail/en/c/1312533/

99. The SCCIWM aims to mitigate these risks through: an Integrated Water Management (IWM) system including an innovative drought and flooding EWS tool; an innovative and efficient water system that aims to increase both surface and groundwater availability and water use-efficiency to help mitigate some of the effects of droughts; an improved climate-resilient and drought resistant crop and livestock management approaches; and an innovative regional platform that brings together all these elements of the IWM, fosters dialogue and the sharing of lessons learned and upscaling of the pilot projects across the neighbouring countries. The potential economic benefits of the EWS can be seen from FAOs existing efforts in piloting the Early Warning Early Action (EWEA) system in Sudan while upgrading it with real-time centralised water data management software and expanding it to include both neighbouring countries. FAO conducted an assessment to understand the impact that the EWEA has had on vulnerable agro-pastoralists that found out that for every USD 1 invested by FAO, households gained USD 6.7. This included the value of animals saved, the avoided drop in their value because of poor condition and the extra milk they produced. The FAO EWEA initiative is also being used by other international actors in Sudan namely the European Civil Protection and Humanitarian Aid Operations (ECHO) in the support of an additional 5,000 drought affected households and their animals. The proposed innovative EWS system and the integrated cross-sectoral approach of the SCCIWM has the potential to further catalyse and upscale these positive results.[89]

Social Benefits

100. The project focuses on the most vulnerable namely women, youth and vulnerable refugees. The region has been affected by recurrent conflict and forced migration both in the Darfur-Chad region as well as in eastern Sudan and the broader Horn of Africa. A study by the office of the United Nations High Commissioner for Refugees (UNHCR) on climate change and refugees in the East and Horn of Africa, have found that climatic trends and events not only had a negative impact on agricultural production and food security, but also led to deteriorating social cohesion and the occurrence of resource-use conflicts. Pastoralists and farmers, who are the most exposed groups to climatic stresses, have had to develop wide-ranging coping and adaptation mechanisms because of the negative impacts for example in the building of water reservoirs, changes in production practices, livelihood diversification as well as complete changes to livelihood strategies.[90]

101. The project will address the fundamental factors that are shown to force vulnerable communities to migrate or cause social conflicts to happen and are being aggravated by climate change. It will provide vulnerable communities with basic adaptive skills to increase water availability, respond sooner and better to the threat of drought or floods and improve their livelihoods through livelihood diversification, improved climate-resilient and drought-resistant crops, and better knowledge. It will enhance their capacity and knowledge about basic sanitation and provide them with the tools for improved sanitation that will reduce the incidence of disease and help combat COVID-19. In doing so it will promote the full participation of women in decision-making processes for identifying, planning and implementing climate change adaptation strategies and actions; it will strengthen community organisation and social cohesion and empower women, men, youth and the elderly to participate in activity planning and implementation; improve water access and quality for crop production and animal use; enhance the capacities of the target groups to rehabilitate and sustainably manage natural assets contributing to the protection of natural resources, risk reduction and livelihood strengthening; diversify diets and improve nutrition through the promotion of climate-resilient crops; and contribute to reconciliation and peace-building through trainings and events.

Environmental Benefits

102. Environmental benefits are at the foundation of the SCCIWM project made possible through Adaptation Fund support that help mitigate the identified adverse environmental and climate risks from a changing climate in terms of future water scarcity and flooding and the impact this will have on agricultural production, food security and sanitation. Through a participatory approach the project will ensure that appropriate and innovative Multiple Water Use (MWU) saving measures will be identified and adopted by climate-vulnerable smallholders. The project will promote innovative technologies that have been tested

[89] FAO (2019) The Sudan - Impact of Early Warning Early Action: Protecting Agropastoralists ahead of drought. http://www.fao.org/3/ca4653en/ca4653en.pdf

[90] Tamer Afifi, Radha Govil, Patrick Sakdapolrak and Koko Warner (2012) Climate Change, vulnerability and human mobility: perspectives from the East and Horn of Africa. UNHCR https://www.unhcr.org/protection/environment/4fe8538d9/climate-change-vulnerability-human-mobility-perspectives-refugees-east.html

and piloted in other FAO projects that will have direct environmental benefits in augmenting underground water supplies and making more efficient use of water for agricultural production as well as sanitation. The AF project will introduce micro-level on-farm efficient water saving irrigation systems, including the restoration of irrigation canals, multipurpose water for irrigation and household use. Beneficiaries will also benefit from water harvesting in dams, ponds, hill lakes, retention basins as well as groundwater recharge and the innovative rootzone technology for cost-effective and sustainable nature-based solutions to wastewater management and water reuse.

D. Cost-effectiveness

Describe or provide an analysis of the cost-effectiveness of the proposed project and explain how the regional approach would support cost-effectiveness.

103. The project will be cost-effective through the upscaling of best practices and lessons learned from the FAO pilots in Lebanon, Morocco, Uganda and Burkina Faso. The pilots demonstrated the potential of introducing innovative conjunctive and multiple-purpose water-use technologies as well as an innovative EWS through a water monitoring system that forms a central pillar of the EWS. By upscaling the FAO pilots, SCCIWM aims to create an enabling environment for a long-term sustainable approach to climate change adaptation. The pilots that the AF project is upscaling have in many ways already demonstrated cost-effectiveness. The EWS in Component 1 will be building on the national efforts in Sudan for the Early Warning Early Action (EWEA) initiative that is now also a global effort. It is aimed at building resilience to drought within the pastoral sector and was first piloted in the Sudan in 2016. A cost-benefit analysis that had been conducted by FAO demonstrated that it had been broadly cost-effective as it generated USD 6.7 for each household for ever USD 1 invested by FAO, the analysis included the value of animals saved, the avoided drop in their value because of poor condition and the extra milk they produced. The EWEA initiative was furthermore cost-effective as it is also being used by other international actors in Sudan such as ECHO in the support of an additional 5,000 drought affected households and their animals.

104. The remaining components will also be cost-effective as the investments in innovative water-efficient technologies will be recovered through improved productivity and reduced water consumption, but also by assisting in reducing future risks and financial impacts of increasingly frequent climate events; in Sudan alone, increased climate variability is expected to cause rural household losses of USD 64.3 billion over the 2018 to 2050 period.[91] The Project's cost-effectiveness will be further enhanced through the south-south cooperation promoted in component 4 which aims to reduce asymmetries between countries by national and local institutions receiving the assistance of international experts and the sharing of knowledge through regional or national workshops. This will have the catalytic effect of demonstrating cost-effective solutions to climate change adaptation and supporting their upscaling as well as building national institutional capacity in policy and project proposal development providing the means to achieve scalable and long-term results.

E. Strategic Alignment

Describe how the project is consistent with national or sub-national sustainable development strategies, including, where appropriate, national or sub-national development plans, poverty reduction strategies, national communications, or national adaptation programs of action, or other relevant instruments, where they exist. If applicable, please refer to relevant regional plans and strategies where they exist.

[91] Siddig, Khalid; Stepanyan, Davit; Wiebelt, Manfred; Zhu, Tingju; and Grethe, Harald. 2018. Climate change and agriculture in the Sudan: Impact pathways beyond changes in mean rainfall and temperature. MENA RP Working Paper 13. Washington, DC and Cairo, Egypt: International Food Policy Research Institute (IFPRI). http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/132833

Table 3 Project alignment with national policies and strategies

Country	Strategy / Plans	Project Alignment
Sudan	• Intended Nationally Determined Contributions (INDC) • 2015 National Adaptation Plan (NAP) 2014 • National Adaptation Programme of Action (NAPA) 2007	The project is aligned to the national climate change adaption strategies outlined in the NAPA, INDC and NAP by aiming to promote: • Crop diversification and introduction of improved drought-resistant varieties/early maturing varieties (both field and horticultural crops) in areas affected by rainfall decease/ variability. • Diversification of income-generating activities in order to increase adaptive capacity of vulnerable farmers' communities in order to achieve food security/reduce poverty. • Enhancing the participation of women and youth in activities related to adaptation and environmental conservation in order to empower them and enhance their adaptive capacity. • Integrated management of the water resources. • Water harvesting (dams, hafirs, etc.) to assist vulnerable communities to adapt and build their resilience facing increasing vulnerability of water sources/resources. • Construction of water-networks in rural areas for achieving water security. • Advance research related to climate change impacts on water sector e.g. Undertaking geophysical studies of the aquifers for sustainable ground water utilization. • Improve community sanitation services.
	Sudan Policy and Strategy on Integrated Water Resources Management (2007-2022)	The Strategy included the focus of water services provided by women in remote rural areas and their effect on small scale crop production and animal husbandry practices. The project will be in alignment through the focus on women equality and empowerment in the provision of WASH services as well as improved water availability for household and animal husbandry activities.
	National Plan for Development and Utilization of Water Resources (NPDUWR, 2014)	NPDUWR aims to establish water harvesting projects in rain-fed areas. The Plan also aims to improve crop production technology research and knowledge transfer. The project will be aligned with the National Plan by focusing on the provision of conjunctive water solutions and to enhance rain-fed water harvesting investments and promote drought-resistant crop varieties.
	Poverty Reduction Strategy Paper – PRSP (2012)	The PRSP aims to upgrade water-users-associations skills to increase use and improve management of irrigation water supplies, rehabilitate major and minor irrigation canals, expand pilot demonstration farms of innovative soil-moisture retention tillage operations, and expand improved water harvesting projects in dry areas of Sudan. The project will be aligned with the PRSP through the rehabilitation and establishment of improved irrigation water supplies, the rehabilitation of irrigation canals the establishment of farmer field schools to demonstrate innovative water and soil moisture management techniques.
	National Food Security Policy – NFSP (2011)	The NFSP aims to mitigate the effect of water-use waste on the environment and to transfer successful and improved water-users-associations (WUA) practices to other irrigation schemes to reduce water loss. It aims to incentivise the private sector to invest in manufacturing of water pumps, drilling equipment, water pipes and tanks, and supplies of spare parts. The project will be aligned with the NFSP through the strengthening of WUAs and sharing of best practices in irrigation schemes from other pilot projects to reduce water loss. The project will also promote the construction of water infrastructure for enhancing the capture and storage enhancing surface and underground water availability.

Country	Strategy / Plans	Project Alignment
	Water Supply and Environmental Sanitation Policy – WSESP (2010)	The overall goal of the WSESP is to improve the health status and living conditions of the population and the economic growth of the nation by providing all of the population with adequate and sustainable access to WASH basic services and hygienic practices. The project will be aligned with the WSESP through the focus on FAOs SMART-Irrigation SMART-WASH initiative. This initiative aims to promote multiple water use (MWU) services in order to minimise waste and maximise water use in water scarce environments. The MWU will ensure that more water is available for sanitation purposes and combined with health and sanitation awareness raising mainstreamed into the training programmes will help build resilience against disease including COVID-19 as well as future climate-induced water scarcity events.
	Sudan National Drought Plan (2018)	The goal of the National Drought Plan is to prepare at the national and state levels: (i) a drought preparedness system; (ii) regional efforts to reduce drought vulnerability and risk; and (iii) a toolbox to boost the resilience of people and ecosystems to drought. The project will be aligned with the National Drought Plan through the project's focus on helping the rural climate-vulnerable communities to adapt to future drought events as these are expected to increase in intensity due to climate change. The project will pilot a drought preparedness system by developing real-time water monitoring capacity of surface and underground water supplies. The data that is gathered will be processed centrally and translated into easy-to-understand information useful for the monitoring, planning and early action in case of water scarcity. This will be coupled with community-level response tools through the people-centred EWS output (1.2) of the project. Other elements of alignment include the regional approach to disaster risk reduction through the platform developed in component 4 that will enhance capacity building, knowledge sharing and policy development.
Chad	Vision 2030	Vision 2030 aims to ensure that Climate Change Adaptation (CCA) and mitigation actions and climate-related disaster risk reduction (DRR) are developed in a coordinated and efficient manner to develop resilience in the face of climate variability and adverse climate-related impact on agro -pastoral production systems in Chad and their contribution to food security and the well-being of populations. The project will be aligned with Vision 2030 through the promotion of climate resilient agro-pastoral production. The main focus will be around monitoring available water sources and development disaster response and resilience plans both at the community- as well as policy-level. The focus on increasing water availability through the Conjunctive water use (CWU) as well as the MWU will ensure enhanced capacity at storing and making more efficient use of scare water supplies. This will in turn enhance water availability to ensure increase sustainability of the agro-pastoral production. Through component 3 the project will also train beneficiaries on the need for sustainable natural resource management as well as climate-resilient agricultural techniques and approaches such as climate-resilient crops and techniques aimed at increasing soil moisture-levels.

Country	Strategy / Plans	Project Alignment
	National Strategy to Combat Climate Change in Chad – NSCCCC, (2017)	This NSCCCC aims for the sustainable and coherent integration of the challenges in CCA and mitigation into national development policies as well as improving effective coordination of initiatives aimed at the fight against climate change. The project will be aligned with the objectives to strengthen the resilience of agro-pastoral systems; promote actions to mitigate and adapt to climate change; prevent risks and manage extreme climatic phenomena; strengthen the capacity of institutions and actors in the fight against climatic change; and strengthen the instruments and capacities for mobilising climate-related finance.
	• National communications to the UNFCCC (2001 and 2012) • National Adaptation Programme of Action – NAPA, (2009) • Intended nationally determined contributions – INDC (2015)	The project will be aligned with the national priorities to adapt to climate change as detailed in the national communications to the UNFCCC, the NAPA and the INDC. This will be done through the focus on: i) managing water through the rehabilitation and /or creation and development of water harvesting and agricultural irrigation structures and the application of Integrated Water Resources Management (IWRM) and Water Governance; and ii) developing intensive and diverse cultivation, using improved inputs, (organic fertilisers including composts, adapted plant varieties), land and water conservation.
	National Development Plan – NDP (2017-2021)	The main objectives of the NDP that are in alignment with the SCCIWM is that of achieving food security through investments in the rural agro-pastoral sectors. The main sectors relevant to this project are those of agriculture, livestock, water and the environment. The NDP aims to ensure the sustainable management of natural resources and implement policies to adapt to climate change; to combat climate change and preserving biodiversity; implement climate-resilient agricultural practices; and develop a mechanism for the prevention and management of risks and natural disasters.
	National Poverty Reduction Strategy Paper (2008 – 2011)	The NPRSP aims to: (i) promote good governance; (ii) reduce poverty through growth based on the development of rural areas and basic infrastructure; (iii) ensuring the development of human resources, particularly through education and health; (iv)improving the protection of vulnerable segments of the population; and (v) protecting ecosystems. The project will have a strong focus on reducing poverty of marginal, rural climate-vulnerable smallholders. It will do this through addressing the main poverty-inducing factors such as water insecurity, lack of knowledge on climate-resilient agricultural practices, and increasing the capacity to mitigate drought and flood disasters that aggravate poverty.
	Interim Poverty Reduction Strategy Paper – IPRSP (2004)	The four pillars of the IPRSP are reinvigorating economic growth; creating income earning opportunities for the poor; enhancing access to, and utilisation of, essential services for human development; promoting political, economic and social participation of the population. The project will be focused on enhancing the capacity of the rural climate-vulnerable poor to enhance their ability to earn an income from scarce resources. This will be facilitated through improved availability of water, improved capacity to withstand drought and flood disasters, improved health and sanitation and improved climate-resilient crops and knowledge on the techniques needed to increase soil moisture.

F. National Technical Standards and Environmental and Social Policy

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

105. The project is aligned to the National Environmental and Climate Strategies of Chad and Sudan and will comply with national environmental standards. During the full design a thorough and detailed environmental screening will be conducted that will meet both the Adaptation Fund's requirements in accordance to the Fund's Environmental and Social Policy, Gender Policy as well as FAOs Environmental and Social Standards. These assessments will outline in detail, what the national environmental standards are and how the project will comply with them. In doing so it will also detail how the project will address the 15 ESP principles as well as design an Environmental and Social Management Plan (ESMP). Controls will be put in place to ensure that the project will not exacerbate inequalities, negatively impact marginalised populations or harm the environment.

G. Duplication

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

Other projects	Summary of project	Synergies with proposed project.
Chad		
AfDB / Green Climate Fund (GCF) – Programme for integrated development and adaptation to climate change in the Niger Basin (PIDACC/NB) USD 210 million (2018-2025)	This programme will implement a series of integrated and comprehensive actions that reduce the silting of the Niger River, improve natural resources management and enhance the population's ability to adapt to climate change. It also includes some mitigation activities, including through forestry and land use.	Multiple (9) countries but no geographical overlapping in Ouaddaï. Synergies or lessons learned may be explored during design consultations.
AfDB / GEF – Strengthening rural and urban resilience to climate change and variability by the provision of water supply and sanitation in Chad. USD 36.5 million (2020-2024)	The project aims to increase access to drinking water and sanitation services, as well as through job creation, especially for the youth and women. This will be achieved through the construction of boreholes, micro-irrigation systems, hand pumps, public latrines as well as the installation of piezometers and employment.	Potential synergy in sanitation and water-related activities, however the project is still in concept development stage and no geographical location has as yet been provided.
IFAD / GEF – Enhancing the Resilience of the Agricultural Ecosystems USD 32 million (2015-2022)	The overall goal is to contribute to the sustainable improvement of food security and incomes of rural households and improve the resilience of agricultural systems and the economy of rural households to climate chance and external shocks.	The project focuses on the Sahelian areas of Chari Baguirmi, Hadjer Lamis, Guéra and Batha. There is no geographical overlap with the SCCIWM project. Synergies or lessons learned may be explored during design consultations.
World Bank – Chad Local Development and Adaptation Project. USD 54.5 million (2020-2025)	The objective is to improve the management of natural resources and the livelihood of populations in selected climate vulnerable areas in and around the Ouadi Rime and Ouadi Achim (OROA) reserve in Chad.	The project is taking place in Ouadi Rime and Ouadi Achim in the centre and northern parts of Chad. There is no geographical overlap with the SCCIWM. Synergies or lessons learned

Other projects	Summary of project	Synergies with proposed project.
		may be explored during design consultations.
Sudan		
GCF / UNDP - Building resilience in the face of climate change within traditional rain fed agricultural and pastoral systems in Sudan USD 25.6 million (2021-2026)	The overall goal is to promote a paradigm shift in dryland pastoral and farming systems through i) an integrated approach by increasing resilience of food production systems; ii) improving availability / access to climate resilient water sources; and iii) strengthening capacities of institutions/communities on climate resilience.	Project locations include: West Darfur, Central Darfur, East Darfur, Western Kordofan, South Kordofan, Kassala, Red Sea , Northern and Khartoum state. There is a strong chance of overlap and synergies that will be further explored during full project design to minimise risks.
United Nations Environment Programme (UNEP) – The Wadi El Ku catchment management project – phase 2 USD 1,1934,000 (2017-2022) North Darfur	The project aims to expand and promote scientific information for improved integrated water resources management (IWRM) and early warning systems. It will also demonstrate and promote improved agricultural and natural resource management approaches and cooperation mechanisms.	North Darfur – no geographical overlap although synergies or lessons learned may be explored during design consultations.
AfDB – Sustainable Rural Water Supply and Sanitation Project for North and South Kordofan UA 25,2 million (2019-2024)	The objective of the project is to improve households' livelihoods and resilience against climate variability and change through provision of reliable water and sanitation services and economic empowerment.	North and South Kordofan – no overlap although synergies or lessons learned may be explored during design consultations.
GEF – World Bank Sustainable Natural Resources Management Project USD 23.5 million (2020-2023) in Gedarif and Khartoum	To increase the adoption of sustainable land and water management practices in targeted landscapes. Overarching goal: Reduce environmental degradation and vulnerability of rural poor and marginalized people to climatic impacts.	No geographical overlap although synergies or lessons learned may be explored during design consultations.

H. Learning, Knowledge Management and Lessons Learned

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

106. Knowledge management and knowledge generation will be an integral part of the project and fully mainstreamed throughout the project components. The project will introduce a number of innovative approaches and technologies as pilots that will have the purpose to demonstrate technology and will be showcased to other national and international partners. These will primarily involve the Early Warning System (EWS) and the Multiple water Use (MWU) technologies. Training will be provided under component 1 for the pilot EWS as well as the people-centred EWS element where community-based approaches will be developed to develop plans and strategies to mitigate against drought and flooding. EWS awareness will also mainstreamed through the other components as beneficiaries will be developing community disaster preparedness plans that involve all elements of the Integrated Water Management (IWM) approach of the SCCIWM. Through component 2 the project will be raising awareness about the importance of sustainable water management and use as well as about the importance of sanitation to combat disease

and COVID-19. Training and awareness raising will also be provided for the operation and maintenance of the rootzone technology for water reuse.

107. The training programmes and awareness raising activities will also be based on the lessons learned and best practices generated from previous FAO pilots. These produced guidelines for improving crop water productivity in small-scale agriculture, improving water-use efficiency (including water accounting) in small-scale agriculture, policy development in improving water productivity and efficiency in small-scale agriculture, and the best practices relating to 42 water harvesting techniques already extensively applied in Uganda, Burkina Faso and/or Morocco. The project will also aim to develop guidelines based on the lessons learned and best practices from the climate-resilient agricultural practices developed in component 3 as part of the broader IWM approach being developed by the SCCIWM.

108. While the project will have training and awareness raising on climate change and sustainable natural resource management (NRM) throughout the project, the regional platform in component 4 will be key for international training by experts to share lessons and demonstrate project results to national and international partners for future replication and upscaling. This platform will inter alia help raise awareness but also mainstream water resource information systems into national and regional platforms contribute to policy development and institutional strengthening.

I. Consultative Process

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

109. The consultation for the SCCIWM Concept Note was undertaken by FAO in close collaboration with FAO Country offices in Khartoum, Sudan and N'Jamena, Chad. Due to the global COVID-19 pandemic, the consultations have had to be conducted remotely through video conferences, over the phone interviews and through gender-responsive, questionnaire-based beneficiary consultations whilst ensuring that national and international COVID-19 safety requirements were being upheld. The consultations for both Sudan and Chad involved ministerial-level and civil society / NGO presentations of an initial pre-concept proposal that was shared in advance to ensure validation and participatory development. Video conference consultations were held with ministries and civil society in both countries, the attendance lists of which are presented in annex 3.

110. With regards to Sudan, the first roundtable meeting was attended by the Higher Council for Environment and Natural Resources; the Hydraulic Research Centre; Federal Ministry of Irrigation and Water Resources, the Groundwater and Wadis Directorate of the Federal Ministry of Irrigation and Water Resources; the Water Harvesting Research Institute, Agricultural Research Corporation; the Agriculture Production Administration, Federal Ministry of Agriculture and Natural Resources; the Undersecretary Office of the Federal Ministry of Agriculture and Natural Resources; the Ministry of Infrastructure and Urban Development; and the Ministry of Production and Economic Resources as well as the country and regional office specialists. A second meeting was held with civil society that was attended by the JAMAR (national NGO); the Sudanese Red Crescent; WHH (German Agro Action); the national NGO Abu Hadia Society for women and community development; Veterinarians Without Borders, Germany (VSFG); and the Sudanese Organisation for Research and Development (SORD). A national-consultation meeting with national stakeholders in Chad was held and was attended by the Ministry of Environment and Fisheries; the Ministry of Agriculture; the Ministry of Ministry of Livestock and Animal Production; the national NGO Badia and FAO country and regional experts. The consultations in chad were more challenging than in Sudan due to available technology and the remoteness of the proposed project area.

111. The meetings were constructive and productive in providing validation of the preparatory work that had been conducted by FAO in the preparation of the initial pre-concept. Some of the concerns that were raised and have been addressed in the development of the proposal included the strengthening of the link with COVID-19, the need to identify and promote synergies with other projects in the area and to avoid duplication such as with the GCF project in Darfur, which has been done through section II-G and will be further developed during full project design. Participants were keen to highlight the important impact that the project will have in helping vulnerable communities adapt to increasing temperatures and the stress this will cause on water availability and variability, making food production more challenging. It was also

reminded to focus on adaptation measures on reducing the sensitivity on rainfall levels; improving resilience to climate variability and improving heat tolerance; the importance of water efficiency in agricultural production and water harvesting, for which site selection is important.

112. The project also consulted with sample beneficiaries in the target area, because of COVID-19 and the limited internet availability in remote areas, these were done through questionnaires and telephone interviews. Questionnaires were designed and shared with FAO country offices who in turn shared them with regional offices and ultimately with community leaders in 9 sample villages with the instruction for consultations to be gender-responsive. The community leaders had the time to ask their respective communities and follow-up telephone calls were made to collect the information. The picture that emerges from the beneficiary survey in the target area is that all villages only have access to well or wadis as their sources of water and 1 out of the 9 villages only had wadis as their source of water. On average and as expected, the majority of women (70%) were involved in collecting water both from the wells and from the wadis compared to 30% of men. In terms of awareness about sanitation issues men responded 77% that they were aware about the importance of sanitation compared to 57% of women interviewed and 77% of men also understood the importance of sanitation to combat disease compared to 50% of women. With respect to the number of people that were affected by COVID-19 there was a 100% response rate with a unanimous response that the whole community is affected by COVID-19 due to an increase in the price of essential goods and severely reduced mobility to major centres to sell their local produce. All surveyed villages also demonstrated a 100% awareness about climate change with 8 out of 9 villages reporting reduced water availability; 6 out of 9 villages reported a feeling that drought events are becoming more frequent; 7 out of 9 villages report an increase in animal disease and 3 out of 9 villages report increases in severe flooding events as a major concern.

J. Justification for Funding

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

Table 4 Adaptation Fund Additionality

Baseline Scenario	Alternative benefits of Adaptation Fund Project
Climate disasters. Over the last 3 decades rainfall has decreased over eastern Africa and the Sahelian region is experiencing the full impact of climate change with rainfall deficits and severe droughts, but also heavy rains and severe flooding with devastating consequences on people's livelihoods. Insufficient rain-fed irrigation means that crops fail or are destroyed, while livestock struggle to find water for drinking and sufficient pasture. Historical drought events in Sudan in 1984 and 1990 have seen severe reductions in GDP of around 20% as agricultural production ground to a halt. The scarcity of natural resources is leading to conflict and migration as near surface temperatures have increased over the last 50 years and land is deteriorating and losing its fertility under the combined effects of drought and floods. In 2020 alone 400,000 people in Chad and around 500,000 in Sudan have been adversely affected by floods forcing many into food insecurity. Climate change forecasts predict an increased climate variability with more intense droughts and floods by 2050. In response to the repeated and increasing intensity of climate emergencies in Sudan, in 2016	The adaptation Fund will support the piloting of an innovative Early Warning System (EWS) based on proven technology from a previous FAO pilot in Lebanon. The EWS will enable the collection and centralisation of real-time ground and surface water monitoring as well as climate-risk data that will help in providing early warning of both drought and flood events. This will be an essential tool giving policy makers and communities on the ground the information required to make preventative plans and adaptive livelihood strategies and implement them ahead of future climate events, helping to save lives and livelihoods. This essential tool will be made available in a user-friendly format and at the regional and national levels and will help institutional capacity building and informed policy making while at community level, plans will be made for awareness raising and capacity building for a people-centred EWS.

Baseline Scenario	Alternative benefits of Adaptation Fund Project
FAO piloted the Early Warning Early Action (EWEA) initiative that has demonstrated to enable pastoralists to reduce the impact of drought and providing a return on investment of around USD 7 per household for every USD 1 invested.	
Water, Sanitation and COVID-19. Water insecurity is a main factor in the region's struggle to develop. Over the past half a century seasonal surface water availability has become less dependable, desertification has increased as well as rates of surface water run-off together with siltation rates and reduced rates of aquifer recharge. Climate change and conflict have resulted in unsustainable rates of local groundwater extraction in some areas. Extreme weather events and increasingly variable and unpredictable precipitation worsened by a changing climate, affect sanitation systems and the infrastructure, water resources, water services, and social and governance systems on which sanitation depends; the direct and indirect effects on sanitation pose a danger to human health and development. The water and sanitation situation in the project target areas is challenging as in the Ouaddaï region only 3% of households have access to a water source without risk of contamination and just 14% of women with children have knowledge of appropriate hand washing techniques. In West Darfur region around 17% of households have access to improved sanitation facilities. COVID-19 is a global pandemic with a significant mortality rate. Combating it requires awareness about sanitation, improved sanitation, safely managed water, and hygiene services but this is being challenged by the limited access.	As part of FAO's SMART irrigation – SMART WASH initiative, the project will be introducing innovative multiple water use (MWU) solutions aimed at providing vulnerable users with low-cost services for domestic water, water for irrigated and rainfed agriculture, household use, food gardens, cattle, and rural enterprise water supplies. Multiple use systems also support important functions that are essential for local well-being and livelihoods including flood control, groundwater recharge, water harvesting and water purification. Through output 2.1 the project will be creating multiple outlet structures such as dams, ponds, check dams, hill lakes, retention basins for irrigation, livestock and household purposes. This will be made possible by applying conjunctive water use technologies through harvested flood- and rainwater and artificially recharged groundwater. At on-farm level, output 2.2 will develop resource-efficient water supply systems through the upgrading of existing irrigation systems as well as the creation of new ones such as canals and spate irrigation systems for multiple purposes of irrigation subject to water scarcity and feasibility studies. The piloting of the innovative water purifying nature-based solution (rootzone technology) will further contribute to reducing water insecurity through the reuse of wastewater. Through the activities in component 2, the project will help ensure the climate-resilience of agriculture, livestock and households, improved sanitation and also help combat COVID-19.
Livelihoods. Farmers in the area have long struggled with challenging environmental conditions that include moisture or soil fertility constraints depending on the time of year. Additionally, climate change forecasts predict temperature increases of up to 3°C by 2050 in the region but also increasing rainfall variability with increased frequency of both droughts and floods further aggravating the precarious situations of already vulnerable communities. In the target area soil depletion is a major factor affecting production. During periods of poor production particularly during the lean season, locals are heavily dependent on local markets for food. As a baseline there is a fundamentally weak resilient capacity of communities to external shocks on livelihoods such	The project will identify existing and otherwise create new Village Development Committees (VCD), in Sudan and Groupements in Chad and train them as well as government field extension agents and NGOs through farmer field schools. The component will train the target groups on nutrition sensitive and climate resilient technologies such as grow-bags, wicking beds, drought tolerant crops, diversification in production and water efficient practices. It will also include the use of climate resilient practices such as conservation agriculture, low cost-green-house technology, drip irrigation and other water efficient techniques. Women will be taught about agricultural diversification with a focus on small ruminants, poultry, kitchen gardening including support to smallholder beekeepers for honey production and processing. Beneficiaries will also be trained on drought

Baseline Scenario	Alternative benefits of Adaptation Fund Project
as irregular rains and flooding which is aggravated by a changing climate. **COVID-19.** The response to the virus has caused limited availability and access to food through increased market prices, that is further aggravating food insecurity of communities that are already some of the most vulnerable in the respective countries. Vulnerable families are forced to resort to low quality and quantity of food resulting in undernutrition. It is expected that consumption patterns will shift towards lower quality and quantity increasing malnutrition.	tolerant crop varieties, climate change adaptation and risk management in farming and sustainable livestock management practices, water efficient practices and technologies, sustainable livestock management and feed production, detection of animal disease symptoms and management. Component 3 will furthermore provide investments in climate change adaptation technologies, including suitable equipment and inputs for efficient irrigation, conservation agriculture and sustainable drought-resistant farming. Activities will include use of heat / drought tolerant, disease / pest tolerant climate-resilient crop varieties, crop residues retention and organic fertilizers. This will promote better soil moisture storage and retention capacity and optimal use of irrigation water, while ensuring a more stable and improved production, while also preventing environmental problems such as drought and soil erosion.

K. Sustainability

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

113. The sustainability of the project stems from the participatory approach promoted throughout all project activities, that allow local communities and authorities to build ownership of the project and help ensure lasting results. The sustainability of the project is further enhanced through the combination of developing a community-based EWS supported through low-tech water monitoring equipment that is easy to operate, maintain and repair. Sustainability will be further enhanced through efforts at regional level to train and support national efforts in policy development in improving water productivity and efficiency in small-scale agriculture.

114. The project aims to influence IWM practices beyond project implementation. To achieve this, it builds on the successes and lessons learned of the pilot projects implemented by FAO in Lebanon, Morocco, Uganda and Burkina Faso. These technologies have been demonstrated to reduce water consumption, reduce labour costs, increase production for more and better-quality agricultural produce. Crucially however, the FAO pilots have shown that there is great appetite among farmers to adopt modern water efficient agricultural technologies. This project will upscale efforts by FAO that have been proven to be sustainable through a widely participatory and consultative approach that will welcome beneficiary inputs and ultimately ownership at the smallholder, extension worker, national and regional levels.

115. Project sustainability will be further strengthened through the training programmes that will be implemented for all components. The project area is one of environmental precariousness with significant stresses on limited water resources. The project will be environmentally sustainable as it will conduct detailed hydrological, geological studies and feasibility assessments and work to increase ground and surface water availability. A central tenet of the project will be to promote conjunctive and multiple water-use based on the principle of striking a water balance ensuring that the project will not extract more water than it is putting back underground or making available in surface storage.

L. Environmental and Social Impact Risks

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

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Compliance with the Law		**Low risk –** The full proposal will identify and ensure compliance with all relevant laws.
Access and Equity		**Low / no risk –**Through environmental, social and risk assessments, the full project will ensure that no activity will interfere with access to basic services. This project will promote the equitable access to activities by youth and women in targeted communities.
Marginalized and Vulnerable Groups		**Low / no risk -** Marginalized and vulnerable groups including internally displaced people and refugees, women and youth will be consulted during the proposal development process to ensure that their identified threats, priorities and mitigation measures are reflected. This project will empower vulnerable groups to make decisions on concrete adaptation actions, valuing their traditional and local knowledge. This project will encourage women, and youth to choose adaptation activities in a transparent and participatory manner. Additionally, this project will respect land, property and customary rights.
Human Rights		**No risk -** This project affirms the rights of all people and does not violate any pillar of human rights.
Gender Equity and Women's Empowerment		**Low/no risk -** Through targeted consultations project design and implementation will ensure that gender considerations are integrated in each activity. This project will promote women leadership in public spaces and decision-making power for climate change adaptation and food security and nutrition. During project formulation women machinery will be consulted at national and local level in both Chad and Sudan.
Core Labour Rights		**No risk -** The project will ensure respect for international and national labour laws and codes, as stated in FAO's policies.
Indigenous Peoples		**Low/no risk -** As part of the consultative process for the full project design, the project will identify and conduct consultations with any ethnic minority group in the event that they are living in the project area.
Involuntary Resettlement		N/A
Protection of Natural Habitats		**Low/no risk -** During the full project design FAO will identify and exclude national parks ensuring that they will not directly or indirectly adversely impact protected areas or high value conservation areas.
Conservation of Biological Diversity		**No risk –** The project foresees feasibility and risk assessment studies to ensure that project activities will not adversely impact the conservation of biological diversity.
Climate Change		**No risk -** All project components and activities contribute to increasing local capacities to face climate change in the long-term and climate variability in the short and medium terms.

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
		The project will not generate any significant emissions of greenhouse gases and will not contribute to climate change in any way.
Pollution Prevention and Resource Efficiency		**Low/no risk -** The project will not release pollutants. It is based on the principles of efficiency, minimization of material resource use.
Public Health		**no risk -** No adverse impact on public health related issues are foreseen. Through the improvement of access to water and sanitation, the project will be contributing positively to public health including combating COVID-19.
Physical and Cultural Heritage		**No risk –** The project foresees feasibility and risk assessment studies to ensure that project activities will not adversely impact the conservation of internationally, nationally and locally recognised cultural heritage sites.
Lands and Soil Conservation		**No risk –** The project will promote sustainable land management practices including sustainable water management and sustainable agricultural practices. The activities will not negatively affect land and soil conservation.

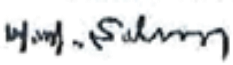
PART IV: ENDORSEMENT BY GOVERNMENTS AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. Record of endorsement on behalf of the government[92] *Provide the name and position of the government official and indicate date of endorsement for each country participating in the proposed project. Add more lines as necessary. The endorsement letters should be attached as an annex to the project proposal. Please attach the endorsement letters with this template; add as many participating governments if a regional project:*

Mrs Fatime Ousmane, Geographer and Environmentalist, Ministry of Environment and Fishery	Date*: January, 12, 2021*
Professor Rashid Mekki Hassan, Secretary General, Higher Council for Environment and Natural Resources (HCENR) and National UNFCCC Focal Point	Date*: January, 12, 2021*

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

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

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans and subject to the approval by the Adaptation Fund Board, commit to implementing the project 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.	
Maher Salman Implementing Entity Coordinator 	
Date: *January, 18, 2021*	Tel. and email: 0039 06 57054718 Maher.Salman@fao.org
Project Contact Person:	
Tel. And Email: 0039 0657054718; Maher.Salman@fao.org	

Annex 1 Endorsement Letters

ADAPTATION FUND

Letter of Endorsement by Government

Republic of Chad

January 12th, 2021

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: afbsec@adaptation-fund.org
Fax: 202 522 3240/5

Subject: Endorsement for ***Strengthening Resilience to Climate and Covid-19 shocks through Integrated Water Management on the Sudan – Chad Border area (SCCIWM)***

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

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by the Food and Agriculture Organization of the United Nations (FAO) and executed by the Ministry of Environment and Fisheries and the Ministry of Agriculture.

Sincerely,

Mrs. Fatime Ousmane
Geographer and Environmentalist
Ministry of Environment and Fishery

Republic of the Sudan
The Council of Minister's
جمهورية السودان
مجلس الوزراء
المجلس الأعلى للبيئة والموارد الطبيعية
The High Council for Environment & Natural Resources (HCENR)
HCENR
الأمين العام
Secretary General

12 January 2021

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: afbsec@adaptation-fund.org
Fax: 202 522 3240/5

Subject: Endorsement for ***Strengthening Resilience to Climate and Covid-19 shocks through Integrated Water Management on the Sudan – Chad Border area (SCCIWM)***

In my capacity as designated authority for the Adaptation Fund in Sudan, I confirm that the above regional project proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in the West Sudan (Kadja river watershed, along Chad border).

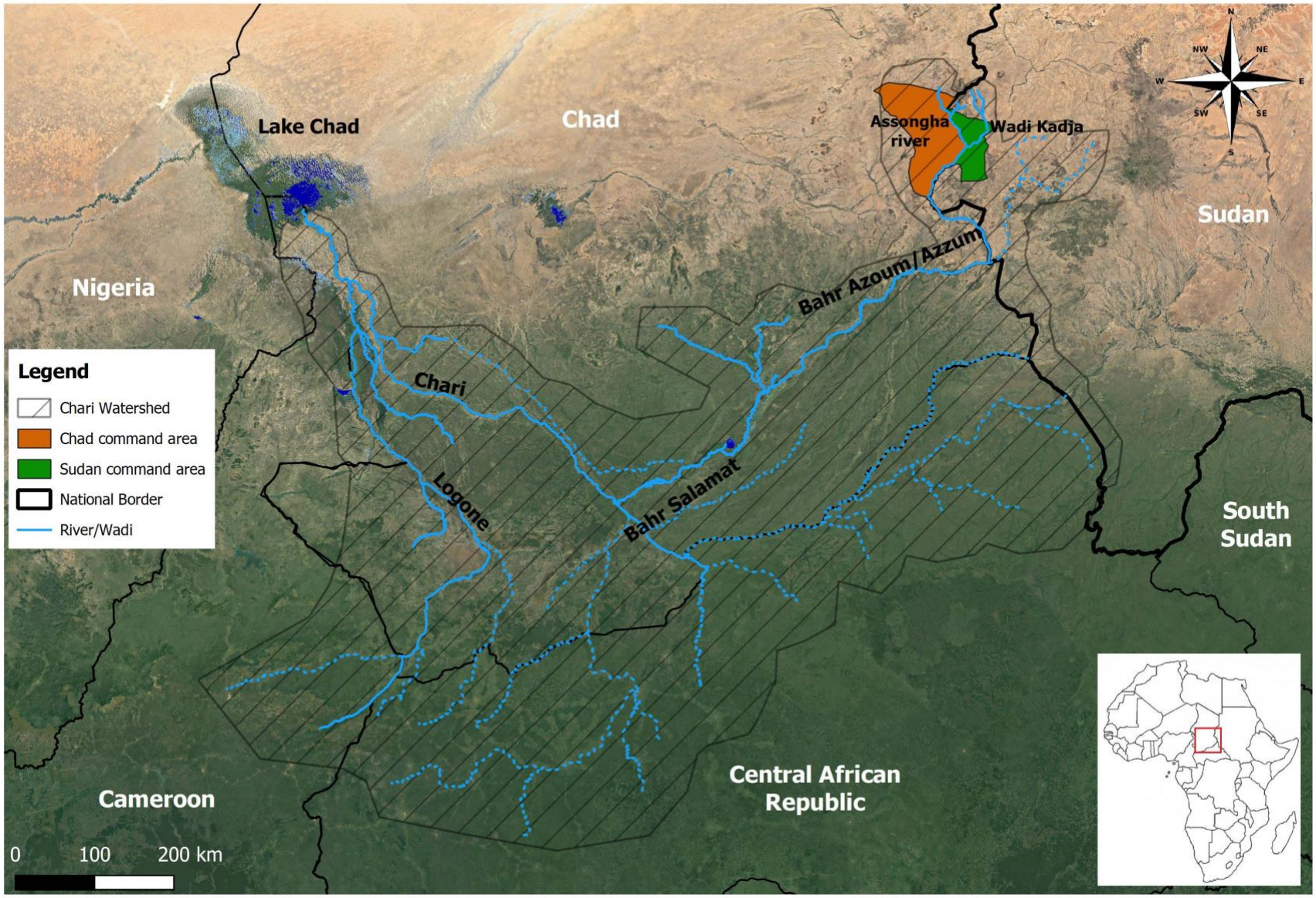
Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by the Food and Agriculture Organization of the United Nations (FAO) and executed by the Higher Council for Environment and Natural Resources, the Ministry of Agriculture and Natural Resources, and the Ministry of Irrigation and Water Resources of Sudan.

Sincerely,

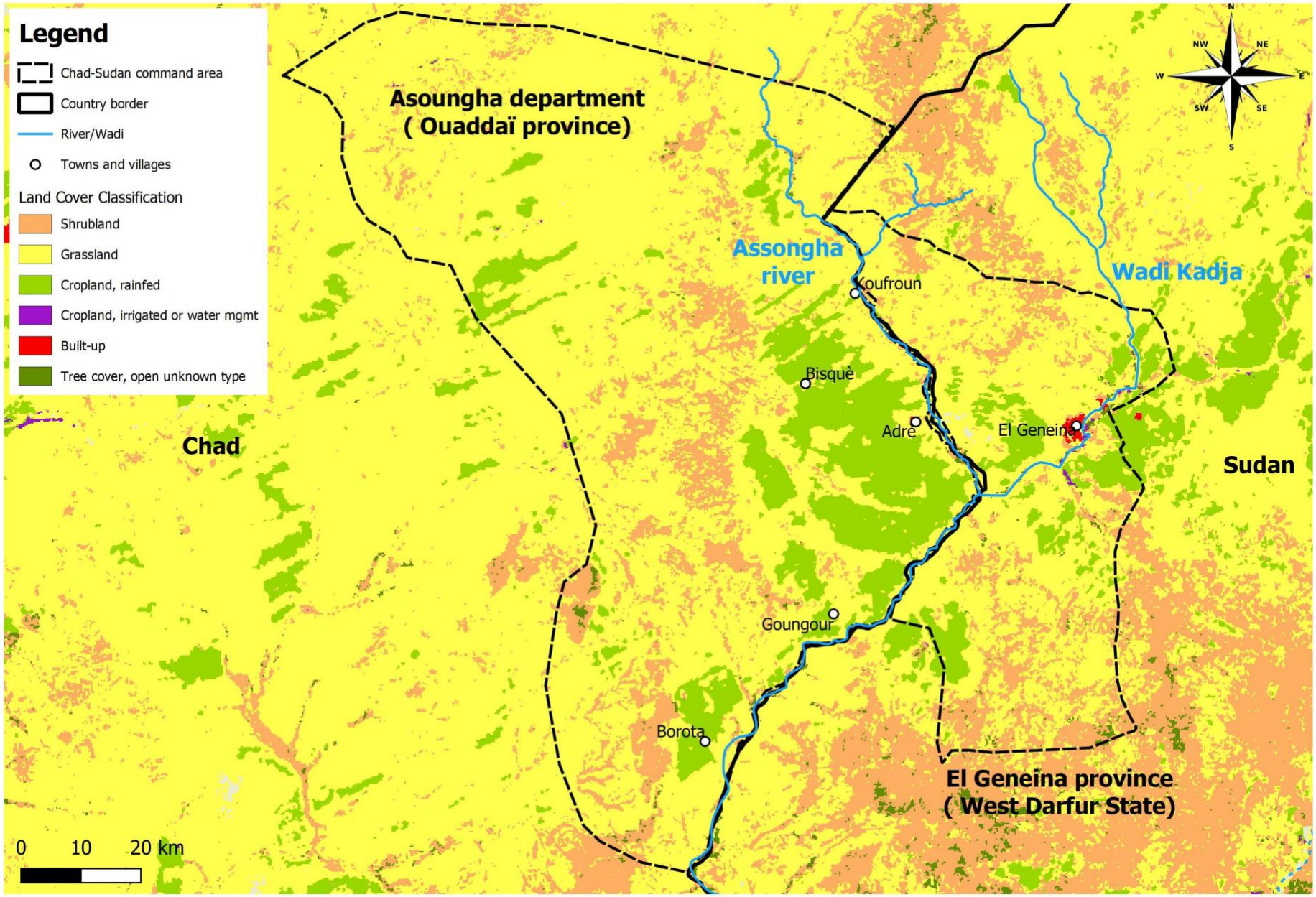
Professor Rashid Mekki Hassan
Secretary General, Higher Council for Environment and Natural Resources (HCENR), and
National UNFCCC Focal Point

Head Office / Mek Nimir Avenue, Khartoum, Suda
المقر / مباني مجلس الوزراء سابقاً - شارع المك نمر
هاتف: ٧٨٤٢٧٩ ١٨٣ ٢٤٩+ - فاكس: ٧٨٧٦١٧ ١٨٣ ٢٤٩+ - ص.ب: ١٠٤٨٨ الخرطوم
Tel: +249 183 784279 - Fax: +249 183 787617 P.O.Box: 10488 Khartoum
Web: www.hcenr.net E-mail: hcenr2005@yahoo.com

Annex 2 Project Command Area



Note: The size of Lake Chad is defined as per the EU Global Surface Water: https://global-surface-water.appspot.com/download. Water seasonality only extends to Lake Chad location and is defined as: "the intra-annual behaviour of water surfaces for a single year (2019) and shows permanent and seasonal water and the number of months water was present."


Legend
Chad-Sudan command area
Country border
River/Wadi
Towns and villages
Land Cover Classification
Shrubland
Grassland
Cropland, rainfed
Cropland, irrigated or water mgmt
Built-up
Tree cover, open unknown type
Asoungha department
(Ouaddaï province)
Assongha
river
Wadi Kadja
Koufroun
Bisquè
Adré
El Geneina
Chad
Sudan
Goungour
Borota
El Geneina province
(West Darfur State)
0 10 20 km
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Annex 3 List of People Met

Adaptation Fund – Consultative Meeting, Sudan 21st December 2020
Strengthening Resilience to Climate and Covid-19 shocks through Integrated Water Management on the Sudan – Chad Border area (SCCIWM)

List of participants

Name	Position	Organisation	Gender	Telephone / Email
Mr. Rashid Mekki Hassan	Secretary General	Higher Council for Environment and Natural Resources	Male	+249183784279 hcenr2005@yahoo.com
Mr. Nagmeldin Goutbi	Senior Researcher	Environment and Natural Resources Specialist, Higher Council for Environment and Natural Resources	Male	+249912252578 goutbi@yahoo.com
Ms. Rania Elsadig	Environment Inspector Assistant	Higher Council for Environment and Natural Resources	Female	+249912821181 ranosh2244@hotmail.com
Mr. Younis Abdalla	Senior Researcher	Hydraulic Research Centre, Federal Ministry of Irrigation and Water Resources	Male	+249122607967 hrs_younis@hotmail.com
Ms. Nahid Abdulrasoul	Geological Engineer	Groundwater and Wadis Directorate, Federal Ministry of Irrigation and Water Resources	Female	+249124932666 nahoda009@gmail.com
Mr. Khalid Elnoor	Irrigation Engineer	Federal Ministry of Irrigation and Water Resources	Male	+249122592797 hrs_khalid@yahoo.com
Mr. Elwaleed Mohamed Elamin	Director	Water Harvesting Research Institute, Agricultural Research Corporation	Male	+249912889300 melwaleed@yahoo.com
Mr. Abaelmagied M. Eltayeb	Director General	Agriculture Production Administration, Federal Ministry of Agriculture and Natural Resources	Male	+249915103572 mageedtayeb@yahoo.com
Mr. Ahmed Omer Ahmed	Executive Director	Undersecretary Office, Federal Ministry of Agriculture and Natural Resources	Male	+249912655091 ahmedomer181818@gmail.com
Mr. Adam Ali Ahmed	Director General	Ministry of Infrastructure and Urban Development – West Darfur State	Male	+249918010726
Mr. Osman Hussein	Director General	Ministry of Production and Economic Resources	Male	+249999991131 Osmanahmahussein@gmail.com

Continued from left

Name	Position	Organisation	Gender	Telephone / Email
Mr. Khaleel Zayed Ibrahim	State Coordinator	Food Security Technical Secretariat – Ministry of Production and Economic Resources	Male	+249118998938 atazay05@yahoo.com
Mr. Moawia Omer Mustafa	Director General	Ministry of Infrastructure and Urban Development	Male	+249915142959 muawiamustafa466@gmail.com
Mr. Mohamed Abdalla Tahir	Director General	Ministry of Production and Economic Resources	Male	
Mr. Ali Mohamed Salah	Chair	Higher Council for Management of Water Resources, and Director General – Ministry of Infrastructure and Urban Development	Male	+249911131483 3alisala71961@gmail.com
Mr. Elwathig Mukhtar	Assistant FAO Representative for Programme	FAO	Male	+249912396711 Elwathig.MukhtarHamid@fao.org
Ms. Aisha Oshiek	Senior Natural Resources Officer	FAO	Female	+249912299259 Aisha.Oshiek@fao.org
Mr. Mohammed Nour Maninai	National Technical Advisor	FAO	Male	+249912538531 Mohammed.Maninai@fao.org
Mr. Ibrahim Ahmed Mustafa	Social Mobilizer	FAO	Male	+249963236211 Siddig.Abufudda@fao.org
Mr. Siddig Abufudda	Technical Field Officer	FAO	Male	+249912396712 Siddig.Abufudda@fao.org

Adaptation Fund – Consultative Meeting, Sudan 31st December 2020
Strengthening Resilience to Climate and Covid-19 shocks through Integrated Water Management on the Sudan – Chad Border area (SCCIWM)

List of participants

Name	Position	Organization	Gender	Email
Ghada Batran	Head of Office	JASMAR (National NGO)	Female	ghadabatran2211@gmail.com
Elmutalib Ibrahim	Technical Consultant	Sudanese Red Crescent	Male	hashim_225@hotmail.com
Mahmoud Elhaj	Project Manager	WHH (German Agro Action)	Male	mahmoud.elhaj@Welthungerhilfe.de
Abdulqadir Ohaj	Chairman	Abu Hadia Society for women and community development (National NGO)	Male	abuhadia@yahoo.com
Abdalla Yahia	Programme Officer	Vétérinaires sans Frontieres Germany (VSFG)	Male	abdalla.adam@vsfg.org
Mustafa Ali	Project Manager	Sudanese Organisation for Research and Development (SORD)	Male	mustafato100@gmail.com
Elwathig Mukhtar	Assistant FAO Representative for Programme	FAO Sudan	Male	Elwathig.MukhtarHamid@fao.org
Aisha Oshiek	Senior Natural Resources Officer	FAO Sudan	Female	Aisha.Oshiek@fao.org
Hassan Mohamed	Technical Field Officer	FAO Sudan	Male	Hassan.Mohamed@fao.org
Mohammed Nour Maninai	National Technical Advisor	FAO Sudan	Male	Mohammed.Maninai@fao.org
Ibrahim Ahmed Mustafa	Social Mobilizer	FAO Sudan	Male	Ibrahim.AhmedMustafa@fao.org
Siddig Abufudda	Technical Field Officer	FAO Sudan	Male	Siddig.Abufudda@fao.org

Adaptation Fund – Consultative Meeting, Chad 21st December 2020
Strengthening Resilience to Climate and Covid-19 shocks through Integrated Water Management on the Sudan – Chad Border area (SCCIWM)

List of participants

Name	Position	Institution	Gender	contact
Fatimé Ousmane Daba	Deputy Director of the Fight against Climate Change and Environmental Education, National Focal Point of the Climate Change Adaptation Fund	Ministry of Environment and Fisheries	Female	ousmanefatime0@gmail.com
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Djarma Ali	National Consultant	FAO	Male	Ali.Djarma@fao.org

Project Formulation Grant (PFG)

Submission Date: 18 January 2021

Adaptation Fund Project ID:
Country/ies: Chad, Sudan
Title of Project/Programme: Strengthening Resilience to Climate and Covid-19 shocks through Integrated Water Management on the Sudan – Chad Border area (SCCIWM)
Type of IE (NIE/MIE): Multilateral Implementing Entity (MIE)
Implementing Entity: Food and Agriculture Organization of the United Nations (FAO)
Executing Entity/ies: Higher Council for Environment and Natural Resources (Sudan)
Ministry of Agriculture and Natural Resources (Sudan)
Ministry of Irrigation and Water Resources (Sudan)
Ministry of Environment and Fisheries (Chad)
Ministry of Agriculture (Chad)

A. Project Preparation Timeframe

Start date of PFG	**01 April 2021**
Completion date of PFG	**01 August 2021**

B. Proposed Project Preparation Activities ($)

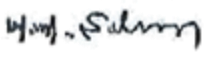
Describe the PFG activities and justifications:

List of Proposed Project Preparation Activities	Output of the PFG Activities	USD Amount
Consultation with local stakeholders and project beneficiaries. In order to ensure project activities will effectively address challenges faced by local communities, local-level gender-responsive consultations will be held in project target countries throughout the full project proposal design phase to enhance ownership and strengthen sustainability	Consultation and assessment tools and processes Stakeholders' consultation reports Indication of sustainable adaptation options for integrated water management in target areas	8 000.00 (Consultancy) 5 000.00 (Workshop) Sub-total: 13 000.00
Institutional capacity assessment. In order to identify institutional capacity gaps to be addressed and improved by the project, consultations will be held with national and local institutions in project target countries to strengthen collaboration, enhance sustainability, and promote scalability	Consultation and assessment tools and processes Institutional capacity reports	8 000.00 (Consultancy) 5 000.00 (Workshop) Sub-total: 13 000.00

Sub-national and national consultations. In order to raise awareness and report on progress toward project development, an inception meeting at regional level will be held, followed by a detailed mapping of project area to identify potential locations, and relevant baseline assessments, surveys and targeting exercises. Finally, a regional validation meeting will be conducted to finalize the full project proposal and strengthen the buying-in by authorities and implementing partners at all levels	1 Regional inception meeting 1 Detailed mapping of project area to identify potential project locations based on the assessment of water infrastructure and village clusters with agricultural potential 1 Social vulnerability survey (women, youth, vulnerable refugees) 1 Initial Gender Assessment (IGA) 1 Detailed vulnerability and food security targeting exercise 1 Regional validation meeting	20 000.00 (Meetings) 8 000 (Project area mapping) 4 000 (Social vulnerability survey) 5 000 IGA 7 000 (Targeting exercise) Sub-total: 44 000.00
Environmental and social risk assessment and management plan. In order to ensure full alignment with the AF Environmental and Social Policy, and environmental and social assessment will be carried out in project countries to develop the overall Environmental and Social risk management plan, to be included in the final project proposal	1 Environmental and climate-risk baseline assessment of the project area 1 Environmental and Social risk management plan	10 000 (Consultancy) Sub-total: 10 000.00
Project document development. Collection and coordination of inputs from technical teams. Based on consultation meetings, refinement of project design, including final formulation of project outcomes and outputs and project activities. Design of project logframe with relevant indicators, and implementation arrangements. Definition of project detailed budget	Full-project proposal document in 2 languages (English and French)	20 000.00 (Consultancy) Sub-total: 20 000.00
Total Project Formulation Grant		**100 000.00**

C. Implementing Entit

This request has been prepared in accordance with the Adaptation Fund Board's procedures and meets the Adaptation Fund's criteria for project identification and formulation

Implementing Entity Coordinator, IE Name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
					

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