ADAPTATION FUND

REGIONAL INNOVATION PROJECT/PROGRAMME PROPOSAL

PART I: PROJECT/PROGRAMME INFORMATION

Title of Project/Programme:	**Enhancing Hydromet Services through Regional Monitoring Innovation Hubs in Africa**
Country/ Countries:	The United Republic of Tanzania, The Gambia
Thematic Focal Area:	Disaster risk reduction and early warning systems
Type of Implementing Entity:	Multilateral Implementing Entities
Implementing Entity:	World Meteorological Organization (**WMO**)
Executing Entities:	National Meteorological and Hydrological Services (**NMHSs**) **of The United Republic of Tanzania and The Gambia**; UK Centre for Ecology & Hydrology (UKCEH)
Amount of Financing Requested:	4,998,000 (in U.S. Dollars Equivalent)

Project / Programme Background and Context:

1.1 PROJECT OVERVIEW AND JUSTIFICATION

The Global Risk Report 2022 (WEF, 2022) indicates that 'extreme weather' and 'climate action failure' are among the top three short-term risks to the world, particularly to Africa, and rank as the two most potentially severe risks for the next decade. According to the EM-DAT's international disasters database (EM-DAT, 2022), among these "extreme weather events" in Africa, water-related hazards such as floods and droughts jointly cause more economic damages and loss of life (over 625 million people affected and USD 45 billions of total damages over the 1964 – June 2022 period) than other disasters.

As indicated in Sixth Assessment Report of the Intergovernmental Panel for Climate Change (IPCC, 2021), most regions of Africa, particularly West and East Africa, are projected to experience: (a) further increases in hot climatic impact-drivers; for example, extreme heat threshold (and consequently the evaporation rates) relevant to agriculture and health are projected to be exceeded more frequently (*high confidence*); (b) more frequent and intensified heavy precipitation and associated flooding (*high confidence*); (c) an increase in frequency and/or severity of meteorological and hydrological droughts (*medium confidence*), and of agricultural and ecological droughts (*medium to high confidence)*; and (d) a continued sea level rise in the 21st century (*high confidence*). These increased and intensified extreme events will likely produce negative impacts on livelihood, food and water security, economic development, migration, and infrastructure. Underlying processes, including population growth, land use changes, and urbanization, mean that growing numbers of Africans face hydrometeorological hazards, especially in coastal areas, where the largest cities and economies are located. Most of the African countries depend on climate-sensitive agriculture, and much of its population and economic activity are located in flood-prone zones. Despite a long history of adaptation to weather, climate, hydrological (hydromet) variability, and extreme events, disaster risk management remains an ongoing challenge, which has been exacerbated in the last few years by the 'erosion of social cohesion' that resulted from the COVID-19 pandemic (WEF, 2022).

Recognizing the cross-sectoral nature of water and aware of the increasing water-related challenges around the world, including in Africa, many countries are now taking steps to address water security through, for example, sustainable water management, enhancing flood and drought resilience and improving water quality. These steps require reliable hydrological data and early warning information in order to support decision-making through the provision of hydromet and early warning services and to help build trust amongst stakeholders. However, the availability of hydrological data of adequate quantity and quality often remains a challenge, which constrains provision of high-quality and effective hydromet and early warning services.

The African continent has made significant achievements in development over the last few decades, but climate-related and disaster risks threaten present and future protection of people, economies, and development gains. These risks affect 10 million people annually, yet hydromet services are presently not equipped to meet the needs of society. Weather and climate related disasters are reversing development gains, setting countries 10 to 20 years back. As highlighted by the United Nations Secretary-General (UNSG) in his message on the World Meteorological Day 2022 (UN, 2022), today, one-third of the world's people are still not covered by early warning systems; and in Africa, this is even worse, with 60 per cent of people lack coverage, which is unacceptable. Early warnings and action save lives. To that end and recognizing the value of early warnings and early action as critical tools to reduce disaster risk and support climate adaptation, the UNSG announced the United Nations would spearhead new action to ensure every person on Earth is protected by early warning systems within five years; and asked the World Meteorological Organization (WMO) to lead this effort.

As climate change exacerbates current weather conditions, the increased frequency and intensity/severity of heavy rainfall events and subsequent increased risk of flooding, including in urban areas where changes in high intensity storms, combined with increased urbanisation, will lead to growing risks. In addition, sea levels will rise and flood into cities and salt water will contaminate aquifers and other fresh water sources, cyclones and storm surges will hit the coasts, and heat waves and droughts will hamper farming and agriculture, leaving millions food and water insecure and crippling economies. African countries face a combination of risks and effective data-driven hydromet services can offer adaptation solutions to these challenges (WB, 2022). To achieve this however, many hydromet monitoring systems need optimization of their efficiency, interoperability, and Operation & Maintenance (O&M) costs, together with a high level of harmonization, integration and complementarity within countries and regions. Here, existing and emerging innovative technologies and approaches offer new opportunities to develop cost-effective solutions to ensure sustainability

(Dixon et al., 2019). Their operational uptake by National Meteorological and Hydrological Services (NMHSs) is currently low due (see further details in sections 1.4 and 1.5 below) to: (1) insufficient collaboration between academia, private sector and Hydromet Services, (2) poor translation of research into operational tools, and/or (3) high costs of technologies and their operational maintenance (i.e. the total cost of ownership – TCO). Moreover, in order to sustainably operate hydromet monitoring systems, political commitment, viable financial models, qualified human resources, as well as effective engagements with the user community are a prerequisite.

The proposed project will execute a portfolio of activities through the Global Hydrometry Support Facility (WMO HydroHub) Phase II – that started in September 2021 for a period of 5 years – to advance innovation in the hydrometry agenda, which is one of its Pillars. Once Phase II of the WMO HydroHub Phase II is completed, the whole HydroHub framework is integrated as part of the regular WMO programmes and will continue to operate regularly. The project will deliver activities that accelerate the pull-through of new cost-effective approaches, innovative technologies (including Artificial Intelligence, Internet of Things, and Big Data analytics) and emerging monitoring schemes (e.g., crowdsourcing) into operational use by monitoring agencies within the target countries. It will develop new sustainable partnerships, through providing actors across the public (including communities), private and academic sectors at regional, national and sub-national levels with capacity, innovation, and engagement opportunities. Together, these actions will lead to an increase in availability and integrity of reliable hydrological data and information needed for the provision of hydromet services in the region. These improved hydromet services will support data-driven decisions in agriculture and food security, disaster risk reduction, water resources management and environmental protection, among others (see section 1.4 below for further details).

Through the proposed project, 'Regional Water Monitoring Innovation Hubs' will be established in Tanzania and The Gambia to support improved monitoring and early warning in their own and surrounding countries, with a particular focus on the use of innovative monitoring and data management approaches to support flood forecasting and drought risk management. The rationale for the establishment of the 'Regional Water Monitoring Innovation Hubs' in these two countries is presented in the section 1.2 below. Both Hubs will be established as regional partnerships through collaborations between NMHSs, relevant national and regional entities active in the field of hydrological monitoring, academia and private sector entities that could support the manufacturing and maintenance of new technological solutions (including Small and Medium Enterprises (SME) and start-ups). In Tanzania, synergies with the recently established Water Resources Centre of Excellence, Water Institute and Technical Colleges will be sought, in view of increasing the sustainability of project outcomes. At the same time, the East Africa Community (EAC) and South Africa Development

Community (SADC) initiatives, as well as those supported by the Lake/River Basins Secretariats will be capitalized. In The Gambia, the Economic Community of West African States (ECOWAS) Hydromet Initiative – that seeks to promote the modernization of Hydromet Services in ECOWAS member states – will be leveraged as well as the Gambia River Development Organization (OMVG).

1.2 RATIONALE FOR THE SELECTION OF THE UNITED REPUBLIC OF TANZANIA AND THE REPUBLIC OF THE GAMBIA AS THE 'REGIONAL WATER MONITORING INNOVATION HUBS'

The rationale for the selection of the United Republic of Tanzania (hereafter 'Tanzania') and the Republic of The Gambia (hereafter 'The Gambia') as the 'Regional Water Monitoring Innovation Hubs' is threefold. First, the geographical and regional context, especially in relation to water aspects, identify these two countries with special and different environments where project activities can be implemented as pilots and have a great potential for scaling-up across the borders with neighbouring countries and replication in other African regions, and/or elsewhere. Second, climate change affects all regions in Africa, with very serious threats in West and East Africa, including these two countries, with severe water-related hazards (e.g. floods and droughts), wherein adaptation measures are absolutely required. And third, these countries have been developing and implementing institutional and legal frameworks in the context of (i) water resource policy and governance, (ii) climate change adaptation and mitigation, and (iii) science, technology, and innovation; that combined provide a very positive environment for the implementation of the project. The sections below describe these aspects in detail.

1.2.1 GEOGRAPHICAL AND REGIONAL CONTEXT

TANZANIA

Tanzania is the second largest country in East Africa. It lies between the African Great Lakes of East Africa in the vicinity of the Great Rift Valleys, and the Indian Ocean; from 00°59' S to 11°45' S, and 40°29' E to 29°10' E. The coastline extends 1,424 km from 04°49' S at the border with Kenya to the border with Mozambique at latitude 10°28' S. Forests and woodland occupy 50 percent of the total area and 25 percent are comprised of wildlife reserves and national parks. Except for the coastal belt that comprises plains, most of the country is part of the Central African plateau lying between 1,000 to 3,000 metres above sea level. Kilimanjaro is the highest point in Africa (5,895 metres) and one of only two mountains on the continent that has glaciers.

Tanzania shares borders with eight countries: Kenya, Uganda, Burundi, Rwanda, Democratic Republic of Congo, Zambia, Malawi, and Mozambique. It has three main islands: Unguja and Pemba that make up the Zanzibar Archipelago; and the Mafia Archipelago. Tanzania's total area is 947,300 square km. Its continental area is 939,702 square km, with 881,289 square km of land coverage and 58,413 square km of lakes. Land cover is dominated by woodland, grassland and bushland which account for about 80 percent of the total area. Agricultural land is estimated to be about 396,500 square km, i.e. 42 percent of the total area (GoT, 2020).

Figure 1. Map of Tanzanian surface water resources, wetlands, and dams

Source: MoW (2019), Water Resources Atlas

In terms of surface water resources, Tanzania has nine major drainage basins (**Figure 1**) that are the basis for water resources management through nine corresponding basin water boards (MoW, 2019): Lake Victoria (part of the Nile river basin), Pangani, Wami/Ruvu, Rufiji, Ruvuma and Southern Coast, Lake Nyasa (part of the Zambezi river basin), Lake Tanganyika (part of the Congo river basin), Lake Rukwa, and the Internal Drainage (including Lake Natron, Eyasi, Manyara and Bubu Depression) (MOW, 2019). Therefore, Tanzania is part of the three continental Basins: The Nile, The Congo and The Zambezi; and also borders three major freshwater lakes: Lake Victoria, Lake Tanganyika and Lake Nyasa. Increasingly, Tanzania is part to six lakes, eight rivers and eight aquifers which are transboundary and therefore its management not only require data but also regional cooperation (Table 2)

Aligned with the precipitation annual variation, river discharge and lake levels start rising in November-December and generally reach their maximum in March-April with a recession period from May to October-November. Many of the larger rivers have flood plains, which extend far inland with grassy marshes, flooded forests, and ox-bow lakes (GoT, 2020).

The lakes and swamps cover 54,000 square km and comprise 5.8 percent of the country (MOW, 2020), in particular the three among the top ten largest lakes in the world by volume: Lake Victoria (the world's second-largest freshwater lake) in the north, Lake Tanganyika (the world's second deepest) in the west, and Lake Nyasa in the southwest (the world's eighth-largest freshwater lake); accounting for 31,000 million cubic metres of water, holding approximately 27 percent of the world's freshwater. These three lakes are the largest lakes on the African continent and form the Tanzania border to neighbouring countries; but in total, it has six prominent transboundary lakes. Other lakes in Tanzania include Lake Rukwa, Lake Eyasi, Lake Manyara, Lake Natron, Lake Balangida (GoT, 2020).

Table 1 summarizes key surface and groundwater resources data. Regarding surface water resources, the Rufiji basin is the most water abundant, with approximately 40,500 million cubic metres of annual total renewable water. The Lake Tanganyika, Ruvuma and Southern Coast, Lake Nyasa, Lake Victoria, and Lake Rukwa have between 10,000 and 15,000 million cubic metres whereas the Pangani, Internal Drainage and Wami Ruvu Basins have between 5,000 to 8,000 million cubic metres (MWI, 2019). In addition to the lakes, Tanzania has 776 dams that provide 5,462 million cubic metres in reservoir capacity (GoT, 2020), being the Julius Nyerere Dam the largest in Tanzania (34,000 million cubic metres).

Table 1. Water resources data. *Source: GoT, (2020)*

	Tanzania	**Sub-Saharan Africa (median)**
Average precipitation (mm/year)	921	1,032
Annual renewable freshwater resources (mcm[1]/year)	125,763	38,385
Annual renewable surface water (mcm/year)	104,568	36,970
Annual renewable groundwater (mcm/year)	21,195	7,470

Although the hydrogeologic characteristics in Tanzania vary significantly, groundwater primarily exists in fractured basement and unconsolidated alluvial layers in the north, and fractured sedimentary layers in the south (IGRAC & IGS, 2019). Total renewable groundwater supply is estimated to be 21,195 million cubic metres/year (MOW 2020) and average borehole depth is around 60 metres (m) (Baumann *et al*, 2005). According to Baumann *et al* (2005), the deepest boreholes (60m-100m) are found in the northeast and along the southeast coast, whereas boreholes are typically 40m-60m deep in all other regions. Recent studies (MOW 2020) indicate that the depth of boreholes has increased to 400m in some aquifers in the coast and northern regions. Shallow boreholes less than 30m are not uncommon, especially around Lake Victoria and Lake Tanganyika. Nationally, well yields are robust and sufficient for domestic use as boreholes yield an average 2.9 litres per second; though, boreholes tend to concentrate in more productive alluvial aquifers in the east, while the average yields in the north, west, and central Tanzania are closer to 1 litre per second.

In terms of transboundary aspects, Tanzania shares six international lakes (**Table 2.a.**), eight international rivers included in three of the largest African river basins – Nile, Congo and Zambezi (**Table 2.b.**) – and

[1] mcm (million cubic metres).

eight international aquifers (**Table 2.c.**) (adapted from FAO, 2016). This is more than any other nation in Africa. A large part of the country's international borders are water bodies: the Ruvuma River with Mozambique, Lake Tanganyika with the Democratic Republic of the Congo, Lake Nyasa and the Songwe river with Malawi, the Kagera river with Rwanda and Uganda and Lake Victoria with Uganda and Kenya. As a result, Tanzania is part of numerous transboundary institutions and agreements for the management of these shared water resources as detailed in Table 2 below, but integration of groundwater into Lake and River Basin Management plans is still needed.

Table 2. Transboundary lakes, rivers, and aquifers. *Source: Adapted from MOW (2020) and FAO (2016)*

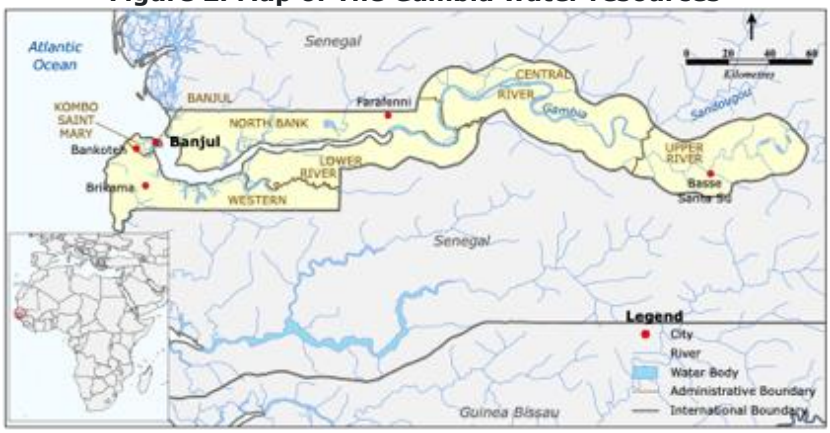
a. Transboundary lakes				
Lake	**Lake's area (square km)**	**Basin**	**Riparian countries and respective share**	**International management**
Victoria	68,800	Nile	Kenya (6 percent), Tanzania (51 percent), Uganda (42 percent)	Lake Victoria Basin Commission
Tanganyika	32,900	Congo	Burundi, Democratic Republic of Congo. Tanzania (41 percent), Zambia	Lake Tanganyika Authority
Nyasa	30,800	Zambezi	Malawi, Mozambique, Tanzania (18 percent)	Zambezi Basin Watercourse Commission (ZAMCOM)
Natron	1,040	Shebelle-Juba	Kenya, Tanzania	-
Jipe	30	East Central Coast	Kenya, Tanzania	-
Chala	4.2	-	Kenya, Tanzania	-
b. Transboundary rivers				
River	**Total basin area (square km)**		**Sharing countries and respective share**	**International management**
Kagera	59,800		Burundi, Rwanda, Tanzania, Uganda	Defunct Kagera Basin Organisation (KBO) up to 2004 Managed through Lake Victoria Basin Commission and Nile Basin Initiative
Mara	13,504		Kenya	Nile Basin Initiative
Ruvuma	152,200		Mozambique (65.3 percent), Tanzania (34.6 percent)	Ruvuma River Joint Water Commission
Songwe	4,200		Malawi, Tanzania	Songwe River Basin Developments Programme
Pagani (Umba/Ruvu)	43,650		Kenya (5 percent), Tanzania (95 percent)	Pangani Basin Water Board/Office (PBWB/O)
Momba River			Zambia and Tanzania	
Mwiruzi River			Tanzania and Burundi	
Malagarasi River			Tanzania, Burundi, Democratic Republic of Congo and Zambia	
c. Transboundary aquifers				
Aquifer	**Total aquifer area (square km)**		**Sharing countries and respective share**	
Coastal Sedimentary Basin III	23,075		Mozambique, Tanzania	
Karoo Sandstone Aquifer	40,007		Mozambique, Tanzania	
Weathered basement	25,842		Malawi, Tanzania, Zambia	
Tanganyika	222,297		Burundi, Democratic Republic of the Congo, Rwanda, Tanzania	
Coastal Sedimentary Basin I	16,801		Kenya, Tanzania	
Kilimanjaro Aquifer	14,579		Kenya, Tanzania	
Kagera Aquifer	5,779		Rwanda, Tanzania, Uganda	

THE GAMBIA

The Gambia is situated in the Sahelian zone on the West Coast of Africa. It is the smallest country on the African continent with a total area of 11,300 square km, of which about 20 percent is considered as wetland (USAid, 2022). It lies between latitudes 13°N and 14°N, and longitudes 13°W and 17°W; with Senegal surrounding the country on three sides: north, east, and south. On the west side, the coastline on the Atlantic Ocean extends from the Allahein river to a location between Buniadu Point and the Karenti Bolon; with a total length of 80 km. The country is less than 48 km wide at its greatest width, and its borders follow the configuration of The Gambia river, which runs from east to west, dividing the country in two strips of land 25 to 48 km wide and about 300 km long. Almost 50 percent of the country's land area is 20 metres or less above sea level and just 3.8 percent in the hinterland is above 50 metres; thereby the salinity intrusion is a major threat.

There are two primary sources of water within The Gambia: surface water and groundwater. Surface water in The Gambia comes from The Gambia river and its surrounding tributaries. The Gambia river (**Figure 2**) is a transboundary river shared with three other countries: Guinea Bissau, Guinea, and Senegal. The larger portion of the territory of The Gambia lies within The Gambia river Basin. Continuously saline conditions exist in the lower reaches of The Gambia river and its tributaries, where the population centres, industry, and tourism facilities are located (FAO, 2005).

Figure 2. Map of The Gambia water resources



Source: FAO, 2005

Two major geomorphological units may be distinguished in The Gambian landscape, the uplands and the lowlands (FAO, 2005):

- Weathered tropical soils are found on the upland plateaus. These soils have low intrinsic fertility and low water retention capacity, but their drainage conditions are good. The plateau is intersected by watercourses flowing downwards on the lowlands. These streams have formed narrow fluvio-colluvial Valleys (*Wulumbangos*);

- The lowlands include the floodplain of The Gambia river in the Upper Valley, and tidal plains (*Bantafaros*) in the Central Valley and Lower Valley. The soils of the lowlands are flat, fine textured and poorly drained. In the Lower Valley potentially acid sulphate soils occur, which can become acid sulphate soils unless waterlogging is prevented by drainage.

The vegetation of The Gambia is of the Savannah type with shrub and grass understoreys. Mangroves are found in the western half of the country in the floodplains of The Gambia river. The cultivable land area is estimated at about 4,300 square km, which is 38 percent of the total area (FAO, 2005).

The Gambia's total actual renewable water resources are estimated at 8 million cubic metres/year, of which about 3 million cubic metres/year are internally produced, and the remaining 5 million cubic metres/year represent the inflow of The Gambia river from Senegal (**Table 3**). It is estimated that internally produced groundwater amounts to about 0.5 million cubic metres/year, all of which is drained by The Gambia river and becomes the base flow of the river (WAH, 2022).

Table 3. Water resources data. *Source: FAO Aquastat (2022)*

	Year	The Gambia	Sub-Saharan Africa (median)
Long-terms average precipitation (mm/year)	2018	836	1,032
Total renewable surface water (mcm/year)	2018	8	36,970
Total renewable groundwater (mcm/year)	2018	0.5	7,470

The Gambia river basin is shared among four countries: 13.7 percent in The Gambia, 15.4 percent in Guinea, less than 1 percent in Guinea Bissau, and 70.9 percent in Senegal (CAMES, 2014). The Gambia river flows through Guinea, Senegal and The Gambia over a distance of 1,150 km, with a drainage area of 77,054 square km. This river is managed by the Organization for the Development of the Gambia River (OMVG) whose membership includes The Gambia, Guinea, Guinea-Bissau, and Senegal (**Table 4**).

Table 4. Transboundary rivers and aquifers. *Source: CAMES (2014)*

a. Transboundary rivers			
River	**Total basin area (square km)**	**Sharing countries and respective share**	**International management**
The Gambia	77,054	The Gambia (13.7 percent), Guinea (15.4 percent), Guinea-Bissau (<1.0 percent), Senegal (70.9 percent)	Organization for the Development of The Gambia River (OMVG)
a. Transboundary aquifers			
Aquifer	**Total aquifer area (square km)**	**Sharing countries and respective share**	
Senegal-Mauritanian Aquifer Basin (SMAB)	350,000	The Gambia, Guinea Bissau, Mauritania and Senegal	

Due to the salinization and contamination of surface waters, groundwater has become the most important water resource and the most heavily used by The Gambia population. With its buffering capacity (storage of runoff during periods of surplus, feed streams and/or levies in times of deficit), the reservoirs constituted by aquifer systems are likely to play an essential role in the adaptation to the effects of climate change. Groundwater is available in all parts of The Gambia. According to USAID assessment of groundwater management (2014), 83 percent of The Gambia's land area is underlain by continuous aquifer and the remaining 17 percent by an aquifer with mixed characteristics. The country is located in one of Africa's major sedimentary basins that is often referred to as the Senegal-Mauritanian Aquifer Basin (SMAB) shared by The Gambia, Guinea Bissau, Mauritania and Senegal. The SMAB is the largest basin on the Atlantic margin of northwest Africa. With an area extending over 350,000 square km, the basin is home to a strategic water resource that is highly important to the populations. The SMAB is located approximately between 10°N and 21°N (**Figure 3**). The SMAB extends over approximately 1,300 km with a surface area of 331,450 square km and an estimated population of over 15 million inhabitants. It is characterized by two main aquifer systems with water table depths varying from 10m to 450m (UNECE, 2021).

Figure 3. Map of the Senegal-Mauritanian Aquifer Basin (SMAB)

Source: IGRAC (2020)

BOTH COUNTRIES

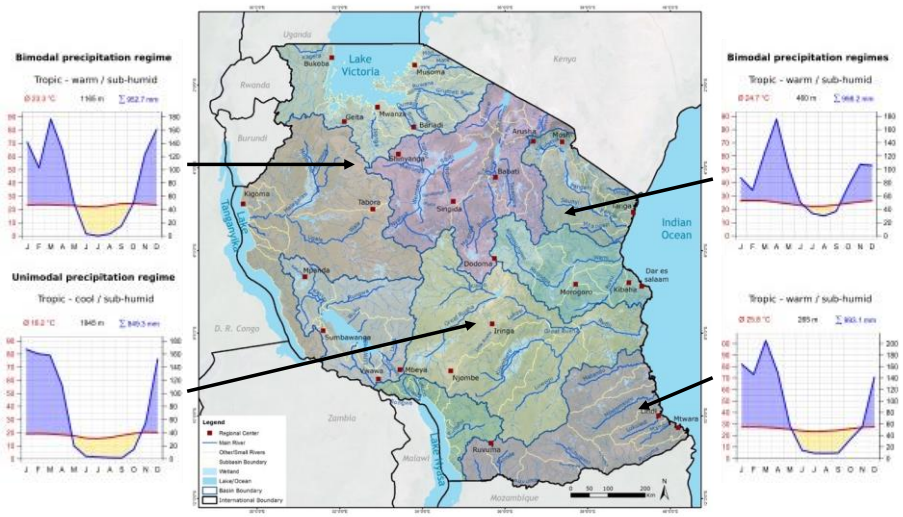
These water resources require a comprehensive hydrological monitoring system, particularly in the context of climate change (see section 1.2.2 below). Data is also important for transboundary water management among the countries in the Regional Water Monitoring Innovation Hubs'. The acquisition, operation and maintenance of such hydrological monitoring systems are costly; therefore, developing cost-effective solutions is critical. These solutions, primarily those for surface water monitoring in Tanzania and groundwater and water quality monitoring in The Gambia, can be implemented and scaled-up through the transboundary agreements and initiatives, as presented in **Tables 2 and 4**.

1.2.2 CLIMATE CHANGE AND ENVIRONMENTAL CONTEXT

TANZANIA

Tanzania's topographical diversity gives rise to four distinct climate zones: (1) hot and humid coastal belt, which has the warmest temperatures, averaging between 27°C and 30°C, and receives 750 mm to 1,250 mm of annual rainfall in Tanzania mainland; (2) hot and arid central plateau, which receives just 500 mm of rainfall; (3) cooler semi-temperate high lakes region in the north and west (home to the lakes and valleys of the East African Rift System), which receives 750 mm to 1,250 mm of rainfall annually; and (4) highlands of the northeast (i.e., Kilimanjaro) and southwest, which includes the coldest parts of the country with average temperatures of 20°C to 23°C. The southwest highlands and the Lake Tanganyika basin in the west receive the most rain, over 2,000 mm annually (USAid, 2018). Influenced by the Inter-Tropical Convergence Zone (ITCZ), rainfall is highly seasonal. The upper northern and the eastern parts of the country have two rainy seasons (bimodal precipitation regime), the main season from March to May and a secondary season from October to December. The southern, western, and central parts of the country have just one rainy season from October to May (**Figure 4**) (GIZ, 2021)

Figure 4. Topographic map of Tanzania with existing precipitation regimes

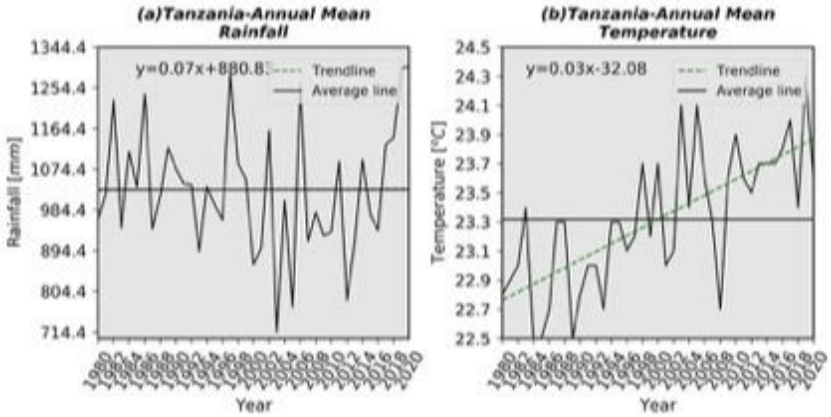


Source: Adapted from GoT (2020) and GIZ (2021)

Observed climate trends

The annual mean temperature in Tanzania has increased by 1.0°C between 1980 and 2020 (**Figure 5**) (TMA, 2022). This increase in temperature has been most rapid in January-February (JF) and slowest in June-July-August-September (JJAS). There is also a significant increased trend in the maximum and minimum temperatures. Observations over Tanzania show no significant increase nor decrease trends in annual mean rainfall (TMA, 2022).

Figure 5. (a) Annual Mean Temperature; and (b) Annual Mean Rainfall in Tanzania



Source: Courtesy of the Tanzania Meteorological Authority (TMA, 2022)

Available literature on model reconstructions of long-term sea level trends (1955-2003) shows a general rising trend in Tanzania (0.4 to 2.0 mm/year) (Mahongo, 2009). Sea level contributes to seawater intrusion into surface and groundwater in coastal aquifers in Tanzania.

Hazardous weather events

Tanzania is vulnerable to floods (both riverine and flash), droughts, tropical storms, storm surge, and sea level rise. According to the EM-DAT and DESINVENTAR's international disasters databases (EM-DAT, 2022; DESINVENTAR, 2022), Tanzania has experience forty-nine droughts and fifty-two major floods over the past six decades (**Table 5**). While droughts have caused significant damage and affected the largest number of people (over 90 percent of the total), floods occurred more often (nearly 90 percent of the total number of events) and caused 99 percent of the total number of depths.

Table 5. Natural disasters affecting Tanzania 1960-2021. *Source: EM-DAT (2022) and DESINVENTAR (2022)*

Nature of the event	Number of events	Number of people affected	Number of deaths
Droughts	49	12,737,483	12
Floods	52	1,275,664	887

TOTAL	**101**	**14,013,147**	**899**

The statement on the Status of Tanzania Climate in 2021 (TMA, 2022) highlights that 2021 was characterized by record breaking extreme rainfall events that caused widespread flooding in few parts of the country especially southern and western regions which resulted into destruction of infrastructures, settlements, and farm- fields among others. While prolonged dry spells that occurred at the end of 2021 caused devastating socio-economic impacts, particularly for pastoral communities, whereby large number of livestock were starved to death in some regions.

Climate projections

According to the climate risk profile of Tanzania (GIZ, 2021), temperature over Tanzania is projected to rise approximately 1.4°C by 2030, 1.7°C by 2050 and between 1.6°C and 2.5°C by 2080. In line with rising mean annual temperatures, the annual number of very hot days (days with daily maximum temperature above 35°C) is projected to rise substantially and with high certainty, in particular over eastern Tanzania.

Future projections of precipitation are less certain than projections of temperature change due to high natural year-to-year variability (Figure 5). Out of the three scenarios, none of the models projects a clear trend in mean annual precipitation over Tanzania (GIZ, 2021). However, in response to global warming, heavy precipitation events are expected to become more intense in Tanzania due to the increased water vapour holding capacity of a warmer atmosphere. At the same time, the number of days with heavy precipitation events is expected to increase.

The significant warning in Tanzania has been and will continue to direct impact freshwater. Soil moisture is an important indicator for drought conditions. In addition to soil parameters and management, it depends on both precipitation and evapotranspiration and therefore also on temperature, as higher temperatures translate into higher potential evapotranspiration, that is the amount of water that would be evaporated and transpired if sufficient water is available. It therefore contributes to the reduction of water levels in the lakes and rivers as warmer air can hold more water vapour, and constraints the replenishment of groundwater (USAID, 2014).

In response to globally increasing temperatures, the sea level off the coast of Tanzania is projected to rise by 11 cm in 2030, 21 cm in 2050 and 41 cm in 2080 (GIZ, 2021). This threatens Tanzania's coastal communities and may cause saline intrusion in coastal waterways and groundwater reservoirs, rendering water unusable for domestic use and harming biodiversity.

THE GAMBIA

The Gambia sits within the Sudan-Sahel, the meridional transition zone between the semi-arid Sahel with the Sahara Desert further north, and the more southerly forest regions of West Africa. Rainfall ranges between 800 and 1,200 mm annually; but it is largely seasonal, with 80 percent falling during the months of July to September at the time of the northward-most departure of the Inter-Tropical Convergence Zone (ITCZ) across Africa. August and September are the rainiest month in the year, when as much as 37 percent of the annual rainfall occurs (GoTG, 2019). The average annual rainfall has considerable spatial and temporal variation. Higher rainfall is received in the southwest part of the country with an estimated 1,200 mm annually. Average temperatures in The Gambia range from 18°C to 28°C in January to 23°C to 36°C in June (CIESIN, 2011).

Observed climate trends

Temperature measurements since 1950 reveal a rising trend in the order of 0.3°C per decade (**Figure 6**) (WB/CCKP, 2022). The lowest mean temperature of 25.8°C was recorded in 1947 whilst the highest mean temperature of 28.2°C was recorded in the year 2000 (DWR, 2016). There are insufficient observations to identify trends in most daily temperature extremes. However, the average number of 'hot' nights per year have been increasing (DWR, 2016).

From 1950 to 2000 annual rainfall amounts have decreased by about 37 percent (**Figure 6**) (WB/CCKP, 2022). This decrease has been evident in the reduction in the length of the rainy season and also the quantity of rainfall amounts recorded in the month of August, particularly during the significant intense

drought episodes of 1968, 1972, 1983, 2002, 2012 and 2015 (EM-DAT, 2022). An additional feature of the rainfall records is the extreme variability of low rainfall amounts around the long-term average over the last forty years (DWR, 2016), which also happened during the drought episodes.

The size of the area with average summer rainfall - cumulative July-August-September (JAS) - of less than 800 mm has increased from 36 percent in 1965 to 93 percent of the country (DWR, 2016). In addition, the linear trends indicate that wet season (JAS) rainfall in The Gambia has decreased significantly between 1960 and 2006, at an average rate of 8.8 mm per month per decade. The decline in rainfall is spatially variable across the country, with greater changes in the western half of the country (DWR, 2016).

Figure 6. Mean annual temperature trend (left) and mean annual precipitation trend (right) in The Gambia

Source: WB/CCKP, 2022

These rainfall trends are consistent with the most recent data from the Sahel region, which indicate a clear transition to a phase of great variability with abrupt alternation between wet and dry years, but with overall diminishing total rainfall. This rainfall pattern has led to devastating droughts during the last decades, alternating, however, with periods of intense rainfall that have also led to increasingly numerous flooding events (GoTG, 2019).

The Gambia with approximately 50 percent of the total land area being less than 20 m above sea level, and about 33 percent of the country below 10 m above mean sea level, is one of the most vulnerable countries in Africa to the adverse impacts of climate change. Any substantial global warming-induced sea level rise could immerse much of the country. About 20 percent of the country is currently flooded annually. The mangrove ecosystems, which is dilapidated through widespread logging are also affected by saline intrusion as well as flooding (GoTG & UNEP, 2015).

Hazardous weather events

The Gambia is vulnerable to floods (both riverine and flash), droughts, sand and dust storms, storm surges, and sea level rise. According to the EM-DAT and DESINVENTAR's international disasters databases (EM-DAT, 2022; DESINVENTAR, 2022), The Gambia has experience nine major droughts and fourteen flood events over the past five decades (**Table 6**). While droughts have affected the largest number of people (92 percent of the total), floods occurred much more often (99 percent of the total number of events) and caused 76 depths.

Table 6. Natural disasters affecting The Gambia from 1968 to 2021. *Source: EM-DAT (2022) and DESINVENTAR (2022)*

Nature of the event	Number of events	Number of people affected	Number of deaths
Droughts	9	1,321,100	-
Floods	14	108,069	76
TOTAL	**23**	**1,429,169**	**76**

According to The Gambia National Framework for Climate Services (NFCS-GAM, 2019), flash floods affect mostly the Greater Banjul Area where the drainage system is very poor, whilst riverine floods occur in part of Central and Upper River Region.

Climate projections

The current annual mean temperature of approximately 28°C is projected to increase by between 3°C and 4.5°C by 2100, indicating a significant heating trend. In addition, there will be an increase evapotranspiration within a range of 2 to 45 percent (GoTG, 2019).

Projections indicate a decrease in average annual rainfall. The average annual rainfall is projected to be less than 500 mm per year by 2100. This means that the rainfall total recorded in the drought year of 1982-83 of 480 mm will become the norm by 2100. The overall projected decreases in rainfall are most evident during the months of July, August and September, the wettest months in the year (GoTG, 2019).

However, variability in the amount and distribution of rainfall in the Gambia is projected to increase, resulting in more frequent extreme events, namely droughts and floods. Flooding events include flash floods immediately following an abnormally heavy rainfall event, which are compounded by inadequate planning and storm water management infrastructure in urban areas. Catastrophic seasonal floods may also occur along The Gambia river after an above average rainy season (GoTG, 2019).

Changes in temperature and rainfall will adversely affect forests. Modelling results suggest that the Gambia's forest cover will fit more into a dry forest and tropical dry forest categories which will have biodiversity impacts as well as impacts on sensitivity to fires and land degradation (GoTG, 2019).

Sea level off the coast of The Gambia is projected to rise 13 cm by 2025, 35 cm by 2050, 72 cm by 2075 and 1.23 m by 2100. A one metre rise in sea level would inundate 60 percent of mangrove forests, 33 percent of swamp area and 20 percent of rice growing areas, assuming no protection. Areas in the Upper River end of the country would also be affected. Saline water would infiltrate ground water aquifers, especially considering that The Gambia sits on top of a shallow sand aquifer with depths of between 4 m and 50 m (GoTG & UNEP, 2015). This also impairs water quality in The Gambia, having significant impacts in human being and biodiversity.

BOTH COUNTRIES

Both Tanzania and The Gambia are highly vulnerable to the impacts of climate change due to the dependency of the countries on agriculture and the natural resource base. Both countries are experiencing water-related hazards, such as droughts, floods, storm surges, and sea level rise, which are projected to increase in frequency and intensity/severity. Hydrological monitoring is a key element of early warning systems and hydromet services in support of socio-economic sectors (see section 1.4 below). This reinforces the importance of investing in a sustainable implementation of hydrological networks that countries can afford.

1.2.3 INSTITUTIONAL CONTEXT AND LEGAL FRAMEWORKS

WATER RESOURCES POLICY AND GOVERNANCE

Water resources policy and legal frameworks at national and sub-national levels in both countries (Tanzania, and The Gambia), as well as at the transboundary basin level and within the East and West Africa regions, are described in Part II, sections F and G.

CLIMATE CHANGE

Climate change plans and legal frameworks at national and sub-national levels in both countries (Tanzania, and The Gambia), as well as at the transboundary basin level and within the East and West Africa regions, are described in Part II, sections F and G.

SCIENCE, TECHNOLOGY, AND INNOVATION

Public-Private Engagement and collaboration with the private sector and academia to co-design, manufacture, and maintain hydrological instrumentation, data acquisition and management systems remain limited to a few countries around the world, mostly developed countries. However, new science and technology such as Artificial Intelligence, Internet of Things, crowdsourcing, and Big Data analytics, are being used in many scientific domains in Tanzania and The Gambia, that can support their application in hydromet services. These countries have regulatory frameworks in place that encourage public-private engagements and boost science, technology, and innovation (**Table 7**). In addition, both countries have a number of relevant stakeholders that have been engaged in the consultative process and are capable and

willing to apply their knowhow in the hydromet sector. Their proposed roles and responsibilities are described in Part II, section J.

Table 7. Regulatory frameworks in Tanzania and The Gambia that promote Science, Technology and Innovation, including R&D. *Source: OACPS (2022) for The Gambia*

Regulatory framework	Country	Description
Tanzania's Science Technology and Innovation (STI) Reform Programme	Tanzania	It is a platform where scientists and researchers can take a leading influence in developing the National Innovation System and later on in implementing the intended reforms towards changing our economy from being resource-based, into a knowledge-based economy. The Programme is implemented by the Government of Tanzania through the Ministry of Science and Technology and is co-funded by UNESCO. The process of designing and implementing the reforms is a very challenging task and support from all relevant actors in the country is needed.
Science, Technology and Innovation Policy for Tanzania	Tanzania	It is a tool to develop and manage Science and Technology in a manner consistent with physical and human endowments of Tanzania.
The Tanzania Commission for Science and Technology Act	Tanzania	It establishes the Commission as a parastatal organization with the responsibility of coordinating and promoting research and technology development activities in the country.
East African Science and Technology Commission	East Africa, including Tanzania	It establishes the Commission to promote and coordinate the development, management and application of Science and Technology in the Partner States.
The Public Private Partnership (Amendment) Act, 2023	Tanzania PPP Centre	It defines the Regulations associated with the Public-Private-Partnerships.
The Industrial Property (IP) Act (2015)	The Gambia	It covers industrial designs and property, the IP regulatory body, patents, utility models, trade names, trademarks and technology transfer, defines how owners can generate royalties on their creations and inventions, and how The Gambia relates with African Regional Intellectual Property Organisation (ARIPO) and World Intellectual Property Organisation (WIPO).
The Tertiary and Higher Education Act (2016)	The Gambia	It provides policy direction for Science, Technology and Innovation (STI) education at the tertiary and higher education levels.
The Information Communication Technology Act (2009)	The Gambia	It provides the restructuring, development and regulation of the Information and Communications Technology (ICT) sector, specifying the usage of ICT devices and accessories, bandwidth, internet connectivity and the conditions for registration as an internet service provider in The Gambia.
Trade Act (2011)	The Gambia	It provides policy guidance on trade and STI-related value chain innovation.
National Science, Technology and Innovation Policy (2013-2022)	The Gambia	It describes a ten-year (2013 – 2022) programme to move The Gambia into a more vibrant and sustainable socio-economic development-oriented nation by effectively utilizing STI for improved quality of life for all Gambians. This policy consolidates the actions of Gambia Government in ensuring that STI features effectively in the country's overall development agenda.
Strategy for Promoting technology-enabled Education and Science, Technology and Innovation 2021-2024	The Gambia	This Technology-enable education and Science Technology and Innovation Strategy encompasses measures to increase access to quality education and learning by supporting and implementing the policy formulation and innovation in the application of ICT in education, and the development of ICT skills for innovation. The transformative effect of ICTs on teaching, learning and innovations are recognised and enforced by this strategy. It is developed to accelerate skills development and innovation in the areas of ICTs to help government improves the livelihoods of our citizens and residents. It is a product of extensive engagement with other government ministries, institutions, the industry and academic institutions.
National Entrepreneurship Policy (2016)	The Gambia	It develops the national entrepreneurship ecosystems 2016-2026.
ECOWAS policy on science and technology (ECOPOST)	West Africa, including The Gambia	It promotes R&D across the borders.

1.3 ENVIRONMENTAL CONTEXT

TANZANIA

Tanzania is endowed with valuable renewable natural resources such as forests, freshwater, fisheries, abundant land, and unparalleled wildlife. Over 50 percent of total land area in Tanzania is covered by forests and woodlands (WB, 2019), which provide vital habitat for biodiversity, protect watersheds, and deliver ecosystem services. Tanzanian coastal forests are biodiversity hotspots that contain some of the highest densities of endemic plant and animal species in the world. Throughout the country, a network of freshwater rivers and lakes provide drinking water and nutrients, sustain agriculture, and enable hydropower. Tanzania hosts diverse, distinct, and iconic ecosystems and species. Lake Victoria, the largest lake in Africa, is recognized for its high levels of endemic fish species, supports a large fishing industry, and provides food security and jobs for surrounding residents. Tanzania's coastline hosts numerous fringing and patch reefs, important both ecologically and socio-economically as major fishing grounds and tourist attractions.

However, several trends suggest that the country might be shifting toward an unsustainable development trajectory. There are clear indications that natural resources are at serious risk, with four key forces identified as underlying causes of the country's natural resources degradation: rapid population growth, economic growth, increasing urbanization rate, and climate variability and change. The impact of these dynamic factors, which are geographically differentiated and intensifying, have resulted in three key negative trends: loss of ecosystems, competing demands for land and water, and environmental pollution. Climate change emerges as a strong "multiplier" across all paths and dimensions of natural resource issues, and as a driver of more complex urban management issues such as flooding, poor sanitation, and the growing threat of water pollution and toxic waste (WB, 2019).

THE GAMBIA

The country is located on the flood plain of The Gambia river, and flanked by savannah and low hills, with the highest elevation of 53 metres above sea level. It has 80 km of open ocean coast and approximately 200 km of sheltered coast within the tidal reaches of The Gambia river. Its rich biodiversity is due to the combination of its geographical position and the central presence of The Gambia river (GoTG, 2019).

The vegetation pattern of The Gambia river basin varies from its mouth to its source. Mangrove forests stretch inland for about 97 km from the mouth of the river. The middle of the course of the river supports freshland swamps and salt flats, and these serve as ideal breeding places for a large number of insects. Salt mud flats, Sudanian-Guinean riverine forests, and tall grasslands are also found along the course of the river. Around 1,500 plant species, 80 mammalian species, and 330 avian species inhabit The Gambia river basin. One hundred and fifty species of freshwater fish and 26 species of reptiles are also supported by the riverine habitat. A large number of semi-aquatic animal species, including reptilian crocodiles and mammalian spotted neck otters and hippopotamuses, inhabit the waters of The Gambia river. African sacred ibises, long-crested eagles, yellow-billed storks, and grass warblers are some of the bird species commonly sighted in the region (WA, 2022). However, habitat destruction as a result of climate change, urbanization, cultivation, deforestation, uncontrolled burning, and wood utilization has led to local species extinction and degradation of ecosystem services. Comparison of the most recent forest inventory against earlier records reveals a declining forest cover from 505,300 hectares in 1981/1982 to 423,000 hectares in the 2009/2010 forest inventory (GoTG, 2019).

1.4 SOCIOECONOMIC CONTEXT AND SECTORS

TANZANIA

Tanzania has a rapidly growing population and economy. The current population of Tanzania is 61.7 million in 2022 (GoT,2022), and is expected to increase to 130 million by 2050. Thirty-two percent of the population lives in urban areas, and 75 percent of that population lives in informal settlements that are increasingly at risk from water scarcity, flooding, and heat extremes. In the 2021 Global Hunger Index, Tanzania ranks 92nd, with a score of 24.7, which indicates that Tanzania has a level of hunger that is serious. In 2019, Tanzania was ranked in the performing group 3 according to the Gender Development Index that comprises countries with medium equality in Human Development Index achievements (i.e., a long and healthy life, access to knowledge, and a decent standard of living) between women and men (absolute deviation from gender parity of 5 to 7.5 percent).

In rural areas, there is high dependence on rainfed agriculture and limited access to health care, education, and electricity. Yields for critical crops, including maize, beans, sorghum, and rice, are projected to decrease in coming decades, endangering livelihoods, and food security (WB, 2019). Livelihoods and food supply also depend on coastal and inland fisheries, which are increasingly threatened by warming ocean and freshwater temperatures, and sedimentation after heavy rains. Sea level rise is putting coastal infrastructure, coastal populations (about 25 percent of the total population), and coastal ecosystems at risk of inundation, salinization, and storm surge (WB, 2019).

Tanzania has a 2020 Gross Domestic Product (GDP) of 64.2 billion USD; and a 2020 GDP per capita of 1,146.9 USD (GoT,2020). Natural resources form a core pillar of Tanzania's economy and play a pivotal role in sustaining the livelihoods of its population. Tanzania's economy is very dependent on sectors affected by climate variability and change. Agriculture, forestry, and fisheries represent about 28 percent of GDP. Tanzania's tourism sector, which is largely based on biodiversity and wildlife, generated USD 1 billion in 2020 when it was severely affected by the Covid-19 pandemic and its impact on international travel. The economics of climate change in the Tanzania has revealed that current climate change variability already costs around 1 percent of GDP annually and it could go up to 2 percent of GDP by 2030 (GoT & UKAid, 2011).

Hydromet sensitive sectors in Tanzania include (NFCS-TZ, 2018; NDMS-2022-2027, 2022) :

- *Agriculture, Livestock and Food Security*: about 80 percent of Tanzanians rely on subsistence agriculture, i.e. crop production, livestock keeping and fishing, as a means of livelihood. Agriculture is highly vulnerable to the adverse impacts of climate variability and change, with recurrent drought, floods and increased incidences of pests and diseases. People living at a subsistence level are easily trapped in poverty because they cannot recover from such shocks as readily as those with greater economic resources. Timely provision and access to hydromet information can help reduce these impacts through timely and data-driven decisions in preparedness and planning.

- *Disaster Risk Reduction:* as described in section 1.2.2, there has been an increase frequency and intensity of extreme hydromet events in Tanzania. Disaster preparedness managers need to have advance warning of hydromet extremes, including droughts and floods, to help communities to proactively plan their resource allocation for water, food, medication, and other core services. Development and dissemination of hydromet data and services contribute to availability and accessibility of multi-hazards early warning as stipulated in Sendai Framework for Disaster Risk Reduction (2015-2030) and requested by the United Nations Secretary General (UN, 2022).

- *Water:* water is a critical sector and underpins much of the Tanzanian economy. It supports the agriculture sector, is an input into industrial production, and can affect people's health. Climate variability and change has adverse impacts on the quality and quantity of water across the country. Hydromet data and services are important in planning effective and sustainable water resources management to achieve sustainable development.

- *Energy:* hydromet extremes have significant impacts on energy sector (including hydropower) in Tanzania, as they affect energy production, transmission, and supply. The country's power generation has been affected heavily by drought events in recent years. The protection of energy sector from an increasingly variable and changing climate is a priority for Tanzania. Hydromet data and information are crucial in supporting effective exploitation and use of renewable energy sources for climate resilience community.

THE GAMBIA

The current population of The Gambia is 2.5 million (WB, 2022) and is expected to increase to 4.6 million by 2050. It is also one of Africa's most densely populated countries. The Gambian population is mainly composed of ethnic African tribes like the Mandinka, the Fula, the Wolof, the Jola and the Serahuli. A few towns are located upriver, but most Gambians live in rural villages. In the 2021 Global Hunger Index, The Gambia ranks 72nd, with a score of 17.6, which indicates that The Gambia has a level of hunger that is moderate. In 2019, The Gambia was ranked in the performing group 5 according to the Gender Development Index that comprises countries with low equality in Human Development Index achievements (i.e., a long and healthy life, access to knowledge, and a decent standard of living) between women and men (absolute deviation from gender parity of more than 10 percent).

The Gambian economy is heavily dependent on agriculture production and export, as well as tourism. After a contraction of 0.2 percent in 2020 due to Covid-19 pandemic, economic growth rebounded to 5.5 percent in 2021, on the supply side, supported by construction, trade, and tourism. Growth is projected at 4.8 percent in 2022 and 5.8 percent in 2023, on the back of agriculture, transport, energy, tourism, finance, and the digital economy (AfDB, 2022).

Hydromet sensitive sectors in The Gambia include (NFCS-GAM, 2019):

- *Agriculture, Livestock and Food Security*: most of country's population depend on rain-fed agriculture, which is highly vulnerable to the adverse impacts of climate variability and change, with frequent dry spells in the middle of the rainy season that limit farming activities such as ploughing, sowing, and planting before the arrival of the dry spell. As a result, many areas of The Gambia with mixed crop-livestock systems with large number of animals have seen decreases in the quantity and quality of crop residues, putting further pressure on livestock feeding resources, increasing conflict between livestock keepers and farmers, and thus reducing food security. Agricultural decision-makers can make better informed decisions by using hydromet data and information.

- *Disaster Risk Reduction:* as described in section 1.2.2, there has been an increase frequency and intensity of extreme hydromet events in The Gambia. Hydromet data and services are crucial for prevention, preparedness and planning.

- *Water:* the increased temperature and variability in the amount and distribution of rainfall contribute to disruption of the water cycle in The Gambia, which affecting the soil water holding capacity, leading to longer periods of water deficit and more frequent floods. This affects rainfed farming, through increased variations in river runoff and groundwater recharge, as well as livestock feeding and watering. Any action that reduces sensitivity and exposure to these hazards, or increases the capacity to respond or react, will have a positive impact on resilience of The Gambian communities. In addition, groundwater in western Gambia is at risk of increased salinization, while coastal aquifers may become reduced, which would affect fresh water supplies and peri-urban agriculture. The impact of sea level rise and coastal erosion on tourism and the artisanal fisheries sector is likely to be significant. Ecosystems will be impacted through the combination of rising temperatures and changing rainfall, largely in negative ways. Hydromet data and services are important in planning effective and sustainable water resources management to achieve sustainable development.

- *Energy:* The renewable energy sector occupies a prominent place in the National Development Plan (NDP, 2018). It is considered a major tool in the fight against poverty through its ability to create jobs and boost the economy. Hydromet data and information are crucial in supporting effective exploitation and use of renewable energy sources for climate resilience community.

1.5 STATUS OF HYDROLOGICAL MONITORING SYSTEMS

National Meteorological and Hydrological Services (NMHSs) are the authoritative and main providers of weather, climate, water, and environmental-related data and services for a range of users to respond to relevant sub-national, national, regional, and global needs. NMHS assist them in reducing the risks of and deriving economic benefits from the associated conditions. Across all countries, National Meteorological Services (NMS) observe, understand, and predict the weather and climate and provide services in support of users. National Hydrological Services (NHS) are responsible for monitoring water resources and providing services such as hydrometric data for decision-making.

A categorization of the status of the hydrological monitoring systems and services in Tanzania and The Gambia was conducted as per the WMO standards. WMO (2015) defines four service levels: (a) basic, (b) essential, (c) advanced, and (d) full. A more detailed assessment of the hydrological monitoring systems in Tanzania and The Gambia will be conducted at the inception phase of the proposed project.

TANZANIA

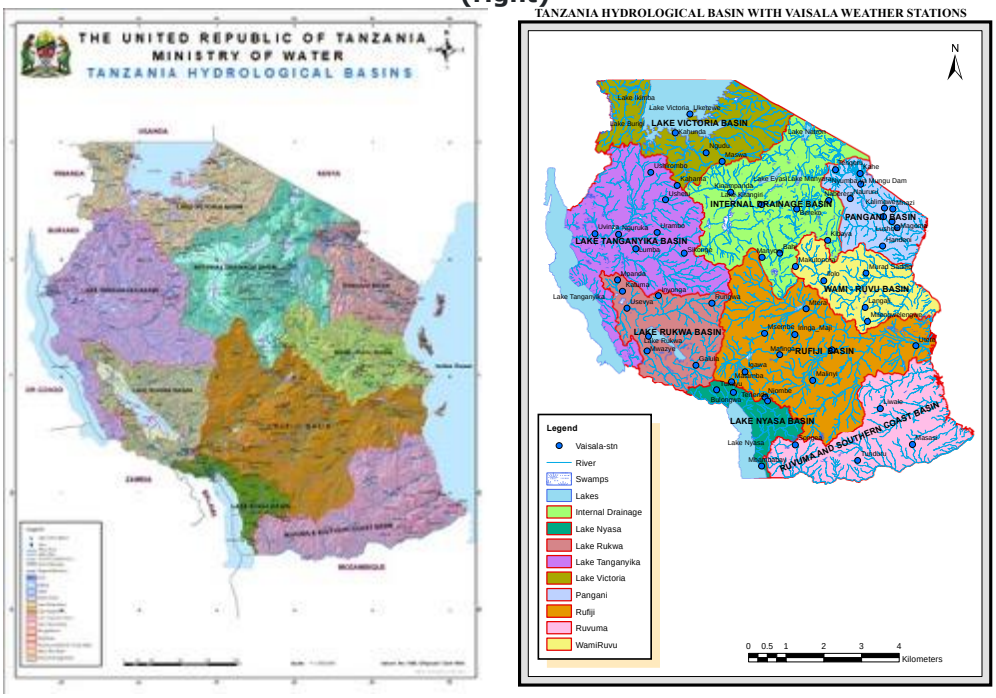
In Tanzania, the NHS is the Department of Water Resources under the Ministry of Water (WB, 2021). **Figure 7** shows the Tanzania hydrometric network (left) and the weather stations in Tanzania hydrological basins (right). These are not fully operational, and they don't cover the entire country effectively. In order to enhance operational and maintenance of hydrological measurement equipment, establishing facilities for

calibrating hydrological equipment is required in East Africa. The qualification of the observation network is considered 'Essential' for Tanzania in the WMO categorization (WB, 2021).

THE GAMBIA

In The Gambia, the NHS is the Department of Water Resources under the Ministry of Fisheries, Water Resources and National Assembly Matters (ECOWAS, 2021). **Figure 8** shows The Gambia hydrometric network. This new network was rehabilitated or upgraded through the Water Sector Reform Project (2011-2015), supported by the African Development Bank (AfDB). Most of the stations were relocated and new cat-walk structures were constructed and installed with Ecolog 800 sensors. However, most of the sensors are faulty and can only be repaired through sending them to the manufacturer. These has created huge data gaps and thus reduced ability to provide the much-needed Early Warning Service.

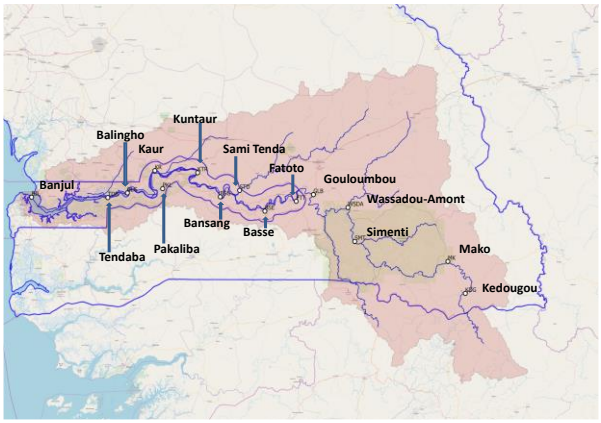
Figure 7. Tanzania hydrometric network (left); and weather stations in Tanzania hydrological basins (right)



Source: Courtesy of the Department of Water Resources, Tanzania

On the other hand, the data from the groundwater monitoring network is manually collected through inconsistent monthly data retrieval exercises. This is as a result of the dysfunctional 38 groundwater sensors (Orpheus Mini), installed within the network during 2014 – 2015 period. Both networks do not currently have a data quality management system in place, and there are many data gaps. Data is made available through the Global Groundwater Monitoring Network (GGMN) Portal managed by the International Groundwater Resources Assessment Centre (IGRAC). A calibration hydrological lab needs to be established in West Africa to ensure that sensors are calibrated. The qualification of the observation network is considered 'Basic' for The Gambia in the WMO categorization (ECOWAS, 2021).

Figure 8. The Gambia hydrometric network



Source: Courtesy of the Department of Water Resources, The Gambia

1.6 MAIN ISSUES AND CHALLENGES

Based on an analysis of the service level of the National Hydromet and Early Warning Services and discussions with stakeholders in Tanzania and The Gambia, commonalities that limit the provision of adequate services to beneficiaries at the country level have been identified. These challenges and opportunities of the National Hydromet and Early Warning Services relate to (a) governance, institutional arrangements, and capacity building; (b) observation infrastructure and Information and Communications Technology (ICT); and (c) service provision. Regardless of the investments, African countries including Tanzania and The Gambia, have not been able to maintain the equipment after project lifetime due to lack of spare parts that are costly, and capacity to operate and maintain the equipment. Cost-effective solutions and capacity building must be implemented to ensure sustainability of investments.

The key priorities for the water sector in Tanzania are: strengthening of the human and infrastructure capacities of sector institutions, improvement and modernization of the hydrometric network for surface water monitoring, integration of the existing networks, establishment of a hydrological calibration lab, enhance sustainability of hydrological functions through enabling environment including locally available or domesticated technologies, enhance hydro-technological capacity; and empowerment of communities to participate effectively in water management.

The key priorities for the water sector in The Gambia are: operationalization of the National Water Policy to ensure integrated water resource management, strengthening of the human and infrastructure capacities of sector institutions, improvement of groundwater management (the main source of domestic water supply throughout the country), and empowerment of communities to participate effectively in water management. Existing legislation (National Water Resources Council Act, 1979) is not able to leave up to the expectation due to the complexity of water and related resources sector players. Thus, the proposed legal and institutional reform with draft bills, should be given the much-needed support and attention for sustainability of the investments.

1.7 BENEFICIARIES OF THE PROPOSED PROJECT

Hydrological data, information and products have a direct and indirect impact to the community, which are beneficiaries of the proposed project. For example, across the nine Water Basins of Tanzania, there are about 180 Water Users Associations with an average of 40 people each. Each association is managed by a team of five people among them, at least one-third are women. Similar groups exist in The Gambia. These water users need water information to plan and manage their uses. As the project will enhance data collection, it will support data availability and information on water status for water allocation.

Communities in Tanzania, The Gambia and neighbouring countries are affected by climate shocks such as floods, droughts, and inadequate water allocation. The project will support their Government initiatives such the Tanzania National Disaster Risk Reduction 2020-2025 and The Gambia National Disaster Management Policy that aim at achieving a safer, resilient, and sustainable Tanzania and The Gambia, respectively. This situation will be realized through empowerment of communities and institutions on taking appropriate actions to reduce disaster risks, vulnerabilities, and human sufferings in disaster situations through data-driven decisions. This will go concurrently with reduction of loss of life, properties, and environment degradation as a result of getting early warning information on weather and water.

In particular, with regard to the vulnerable communities, groups, and end-users that will be the beneficiaries of the proposed project through improved hydromet services, nine main groups have been identified:

1) Local communities affected by hydrological disasters including those living in flood prone areas in Tanzania and along the lower reaches of The Gambia river basin;

2) National and sub-national disaster management agencies;

3) Agriculture sector, including farmers working in irrigation schemes/field such as paddy rice farms, small holder tidal irrigation farmers, women oyster farmers in the Tanbi Wetland Complex;

4) Women, as a vulnerable group, yet being the pillars of the family economy through subsistence farming;

5) Students and researchers, through the provision of data for climate change and sea level rise modeling and the potential for employment of graduates in the area of innovation for hydromet;

6) Regional data collection and research programs, international partners and initiatives;

7) Government agencies and private sector working in Hydropower, extractive industries, urban planning, and insurance;

8) Transboundary Water Organizations which coordinate management of transboundary resources; and,

9) Technical Colleges and Centres of Excellences (produce jobs).

Project / Programme Objectives:

The overall aim of the project is to improve hydromet services through two "Regional Water Monitoring Innovation Hubs" in Africa by advancing the uptake of innovative hydrometric approaches by the NMHSs in Tanzania, The Gambia and surrounding countries. By enhancing the provision of hydrological data that serves as basis for information that is vital to effective water resources management and the provision of safe and reliable water supplies, the proposed project will contribute to the 2030 Agenda for Sustainable Development and its Sustainable Development Goal (SDG) 6 on Global Acceleration Framework, adopted by the United Nations Assembly in 2015. Other SDGs such as SDGs 1, 2, 3, 7, 9, 11, 13, 15 and 17 also depend on reliable hydrological data for their implementation. For example, water information, stemming from SDG 6, is needed to monitor hydrological risks and forecast hazards as outlined in SDG 13 target 1 – to strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.

Project activities will build on existing frameworks and initiatives and will complement and establish synergies with other completed and on-going projects (see Part II, section H). Aligned with the WMO's eight long-term ambitious on hydrology and World Water Data Initiative, the proposed project will benefit from (i) results of the successful implementation of the Phase I of the WMO HydroHub (February 2017 – August 2021) and early results of the activities supported through the WMO HydroHub Phase II – *that started in September 2021* – to advance innovation in the hydrometry agenda; and (ii) technical capabilities from WMO programmes and systems, such as the WMO Hydrological Observing System (WHOS), the World Hydrological Cycle Observing System (WHYCOS), the WMO Integrated Global Observing System (WIGOS), and the WMO Information System (WIS). All these programmes and systems will contribute to (1) the development, operation and maintenance of tailored, robust, innovative and sustainable solutions for water monitoring that would comply with WMO standards and (2) interoperable data exchange among riparian countries. The proposed project will also be able to leverage the skills and expertise of the WMO Community, benefiting from the global network of WMO experts as well as drawing upon those directly involved in the WMO HydroHub through its Think Tank.

As described in **Table 8**, the specific objectives of the project are:

- Increase operational capacity of the NMHSs to deploy and maintain innovative hydrometeorological observation, data and metadata exchange, calibration and data processing technologies (e.g. Artificial Intelligence, innovative water level sensors, locally manufactured data loggers, locally innovated hydrometeorological infrastructure) through collaborative Innovation Call projects,

training interventions (both train-the-trainer and short/long course trainings) and support for Regional Technical Champions;

- Develop two 'Regional Water Monitoring Innovation Hubs' in hydrological monitoring and data processing, which use novel mechanisms (such as Innovation Camps and International Twinning, coaching and mentoring) to bring together public and private entities, and the academia, to support the development, manufacturing and maintenance of digital and physical monitoring technologies;

- Enhance regional cooperation for mutual technical assistance among NMHSs and other monitoring organizations within the region where the 'Regional Water Monitoring Innovation Hubs' are established;

- Increase political and institutional commitment for operational hydrology through improved stakeholder collaboration and engagement, including co-production of hydromet services.

Specific needs and capacity assessment of Tanzania and The Gambia at national and sub-national levels, aligned with the competences required as per the WMO framework, will be conducted at the initial phase of the project with the support of the UK Centre for Ecology & Hydrology (UKCEH), on behalf of WMO, due to its leadership in WMO programmes and initiatives (see Part III for further information on the proposed roles and responsibilities of UKCEH in the proposed project). UKCEH will ensure that such assessment will be carried out according to WMO practices.

Project / Programme Components and Financing:

The proposed project will implement a portfolio of activities to address identified needs. **Table 8** below provides an overview of project components, expected outcomes and outputs, and associated budget allocations.

Table 8. Project Components and Financing

Project/Programme Components	Expected Outcomes	Expected Outputs	Countries	Amount (US$)
1. Increased operational capacity of the NMHSs to provide fit for purpose hydrological data through the use of innovative monitoring approaches	Improved and sustained technical expertise of NMHSs staff and uptake of innovative technologies	**1.1** Enhanced local trainings capacity, research and tailored technical guidance material to addressing specific technical expertise deficits related to hydrometric monitoring within the Regional Water Monitoring Innovation Hub (e.g. linked to the use of new instrumentation) **1.2** Enhanced management and operationalization of instrumentation/ hydrological equipment and other hydrometric monitoring aspects through Innovation Calls projects (involving collaborations between in-region and international operational and research partners) implemented to find and operationalize innovative water monitoring solutions to NMHSs hydrometric challenges within the Regional Water Monitoring Innovation Hub	Tanzania, The Gambia	1,705,000
2. Enhanced public-private engagement in hydrometry leading to a strengthened commercial environment for local companies	Locally designed, manufactured and maintained capabilities exist in both countries to service water monitoring	**2.1.** International twinning/mentoring, events bring together hydro monitoring institutions and startups that innovate from across the world to assess their suitability to address identified hydrometric challenges in The Gambia and Tanzania. Selected startups will benefit from pump priming grants to grow both public and private sector capability and linkages	Tanzania, The Gambia	876,500

	needs across their regions	with the research sector, with the potential to lead to job creation **2.2** Innovation Camps and other activities established to bring together public and private entities to support the development, manufacturing and maintenance of digital and physical monitoring technologies		
3. Enhanced regional cooperation for mutual technical assistance among NMHSs and other monitoring organizations within the region where the Innovation Hubs are established	Improved dialogues and exchanges within Regional Innovation Hubs and beyond	**3.1** Organization of Learning Staff Exchanges to facilitate and guide learning exchanges among NMHSs within a Regional Water Monitoring Innovation Hub in view of addressing specific common hydrometric challenges **3.2.** Organization of Innovation Workshops to bring together NMHSs, academia, private sector (solution providers) and others, and facilitate targeted interactions among them in a way that allows NMHSs to express their operational challenges and needs, and the private sector to tailor their solutions to operational realities of NMHSs	Tanzania, The Gambia	771,500
4. Increased political and institutional commitment for operational hydrology through improved stakeholder collaboration and engagement, including co-production of hydromet services.	Increased support to NMHSs through budget and Water Legislations, and fit-for-purpose innovative hydrometric technologies and user-oriented hydromet services	**4.1** Organization of Ministerial Roundtables in each country of the Regional Water Monitoring Innovation Hubs that will showcase the comprehensive results and recommendations of national cost-benefit analysis of hydrological data investments **4.2** Organization of User-provider Workshops and Webinars, to bring together NMHSs, public and private sectors (users of hydromet services) and facilitate targeted interactions among them, including for identifying and developing new markets for NMHSs services	Tanzania, The Gambia	737,000
5. Project/Programme Execution cost				454,000
6. Total Project/Programme Cost				4,544,000
7. Project/Programme Cycle Management Fee charged by the Implementing Entity (if applicable)				454,000
Amount of Financing Requested				4,998,000

Project Duration: 5 years (60 months)

Projected Calendar:

The proposed dates for the different phases of the project are presented in **Table 9** below:

Table 9. Project Calendar

Milestones	Expected Dates
Start of Project/Programme Implementation	July 2025
Mid-term Review (if planned)	December 2027
Project/Programme Closing	July 2030
Terminal Evaluation	July 2030

PART II: PROJECT / PROGRAMME JUSTIFICATION

A. Describe the project / programme components, particularly focusing on the concrete adaptation activities, how these activities would contribute to climate resilience. For regional projects describe also how they would build added value through the regional approach, compared to implementing similar activities in each country individually. For the case of a programme, show how the combination of individual projects would contribute to the overall increase in resilience.

The project will advance the provision of hydromet services in Africa by establishing 'Regional Water Monitoring Innovation Hubs' in Tanzania and The Gambia to advance sustainable water monitoring through the delivery of outputs under Components 1, 2, 3 and 4.

The proposed project is developed within the framework of the WMO Global Hydrometry Support Facility (WMO HydroHub), whose overall goal is enhanced and sustainable monitoring and information support NMHSs' effective delivery of hydrological services for disaster risk reduction, social and economic development, and environmental protection. Throughout the Phase I of the WMO HydroHub (February 2017 – August 2021) active engagement with the NMHSs of The Gambia and Tanzania took place with both countries proactively expressing interests in scaling up their involvement in future WMO HydroHub activities. In Tanzania, a successful innovation project was implemented by the Trans-African Hydro-Meteorological Observatory (TAHMO) in the framework of the 2nd WMO HydroHub Innovation Call, specifically looking at open-source non-contact river flow observations with cameras. In The Gambia, the participation of an NMHS representative in WMO HydroHub Innovation Workshops highlighted the need for innovation to address some of the country's most pressing hydrometric challenges, and helped the design of solutions in a way that integrated some of the realities on the ground e.g. short battery lifespan in data loggers.

Building on this previous engagement with the WMO HydroHub, the project will develop 'Regional Water Monitoring Innovation Hubs' in Tanzania and The Gambia that will play the role of incubators for innovation both locally and in neighbouring countries. During the stakeholder consultation process, potential private sector entities and academic institutions to be engaged in the proposed project have been identified (see Table 14) and these are listed as potential partners in the project proposal (see Part III below).

The 'Regional Water Monitoring Innovation Hub's will change the way hydromet data is collected, managed and disseminated through (1) progressive operationalization of emerging cost-effective technologies, (2) integration of non-traditional data sources such as citizen science, (3) improved sustainability of hydromet monitoring through, for example, mentoring and learning exchanges activities, and (4) enhancing engagement with stakeholders in the hydromet data user community. The enhanced hydrological data collection and management capacity acquired during the project will help improve the delivery of hydromet services in the regions (e.g. enhancing the collection and management of observation of floods to underpin improvements in flood forecasting), hence improve decision-making in water management. The proposed project will ensure effective service delivery to stakeholders by (1) integrating the development of interoperable web-services or smartphone-based services for dissemination of the new generated data as part of the Innovation Calls; (2) involving citizens in water monitoring programmes which has a potential to improve service delivery to local-level actors; and (3) establishing synergies with ongoing national and regional projects and government initiatives addressing hydromet services and early warning systems (see Table 13 below). In particular (but not limited to):

- In Tanzania, government initiatives, such as the "Operational Decision support System", and regional/basin initiatives like the "Zambezi Water Information System". Both systems need to be fed with hydrometeorological data for decision-making in water resource management and early warning systems.
- In the Gambia, government and development partners' projects such as "The Gambia Inclusive and Resilient Agricultural Value Chain Development", and "strengthening climate services and early warning systems in The Gambia for climate resilient development and adaptation to climate change".

Based on stakeholders' consultations, the following gaps and needs to improve hydrological monitoring systems were identified:

- Lack of real time data for disaster risk reduction and flood early warning systems;
- Limited capacity in operational hydrology;
- Lack of capacity in instrumentation (fabrication, calibration, maintenance);
- Lack of connection with end-users; and

- Inadequate government support

To address these identified needs, the proposed project will implement a set of activities through four project components that are described below and aligned with the Theory of Change presented in **Figure 9**.

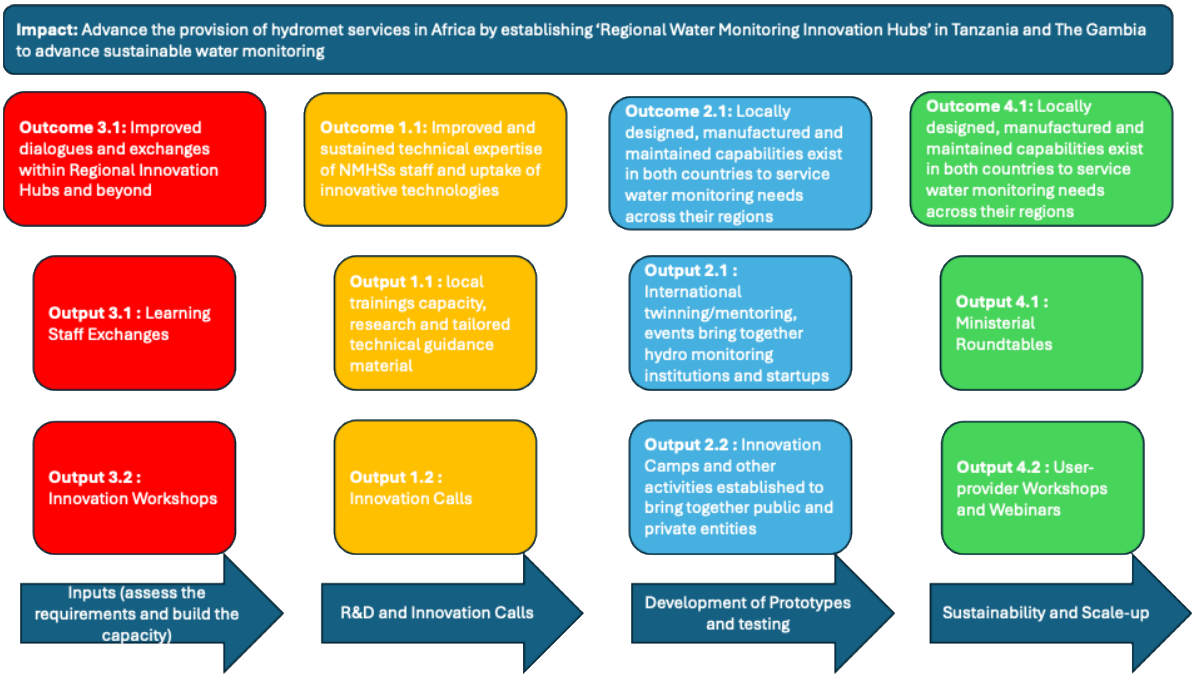


Figure 9. Theory of Change.

Component 1. Increased operational capacity of the NMHSs to provide fit for purpose hydrological data through the use of innovative monitoring approaches

Component 1 focus on building the capacity both at the academia and support the development and operationalization of instrumentation/hydrological equipment and other hydrometric monitoring aspects. It will support the improvement and sustainability of technical expertise of NMHSs staff and uptake of innovative technologies (**Outcome 1.1**). Local trainings capacity, research and tailored technical guidance material will be enhanced to addressing specific technical expertise deficits related to hydrometric monitoring within the Regional Water Monitoring Innovation Hub (e.g. linked to the use of new instrumentation) (**Output 1.1**). The following activities will be implemented:

- **Activity 1.1.1** - Undertake a detailed analysis of the training capacities related to hydrometric monitoring and related fields in the academia sector in Tanzania and The Gambia, and develop supportive courses (e.g. using digital and Innovation Hub) to address the specific scientific, technical, and operational expertise deficits related to hydrometric monitoring.

- **Activity 1.1.2** - Organize (1) twinning arrangements between the academic sector within the countries covered by each Regional Water Monitoring Innovation Hub and relevant international partners (e.g. WMO Regional Training Centres based at other universities), and (2) training-of trainers to ensure that all required human capacities in the academic sector are built and/or enhanced, considering gender equity. *[Note: (1) Both North-South twinning and South-South twinning are considered; (2) The international partner, provide technical guidance and supervision to ensure that the academic sector within the Regional Water Monitoring Innovation Hub delivers high quality and tailored trainings and courses].*

- **Activity 1.1.3** - Organize twinning arrangements between the academic and the private sector within the countries covered by each Regional Water Monitoring Innovation Hub, with technical guidance and supervision by an international partner, for research and co-design of the innovative solutions, and development of training courses and materials to support their operationalization by NMHSs. In particular, organize mentorship and knowledge exchange training with the equipment manufacturing companies that are commonly used in Tanzania and The Gambia.

- **Activity 1.1.4** - Develop a capacity development plan and collaborative agreements/ MoU between the NMHS and the academic sector to ensure regular training/ retraining of NMHS staff for sustainability of the investments.

Local stakeholders will be empowered to maintain and scale the innovations through Academia for the skills required by NMHSs. The project will build the capacity of the local/regional Academia to ensure sustainability. In addition, the project will facilitate the engagement with the WMO broader community for support and development of standards, which also help empower NMHSs.

Enhancement of management and operationalization of instrumentation/hydrological equipment and other hydrometric monitoring aspects will be pursued through Innovation Calls projects (involving collaborations between in-region and international operational and research partners) implemented to find and operationalize innovative water monitoring solutions to NMHSs hydrometric challenges within the Regional Water Monitoring Innovation Hub (**Output 1.2**). The following activities will be implemented:

- **Activity 1.2.1** - Undertake a detailed assessment of the hydrometric monitoring systems in Tanzania and The Gambia, as well as in transboundary Lake Basins and transboundary Aquifers, and prepare an inventory of the available station equipment and data acquisition, transmission and processing systems. In particular, assess requirements to revamp incubation, mentorship, innovation, training and equipment calibration centre at Nyumba ya Mungu dam and establish the design. *[Note: (1) Engagement of national and transboundary institutions will be sought; (2) the assessment will include, but is not limited to, aspects related to instrumentation and management of hydrological equipment; and software for data acquisition, processing and analysis; (3) this applies for both rehabilitation and upgrading of existing stations, as well as installation of new stations].*

- **Activity 1.2.2** - Assess and identify vulnerable indigenous communities (considering the gender equity) that could engage in (i) innovative approaches for data acquisition (e.g. crowdsourcing indigenous knowledge that could be blended with scientific knowledge for data-driven decision-making); and (ii) equipment security, operation and maintenance – these would contribute to a people-centred early warning system (EWS) that supports climate change adaptation and disaster risk reduction.

- **Activity 1.2.3** - Develop and implement six (6) WMO HydroHub Innovation Calls (of which 3 are new Calls; 3 are solutions that will be leveraged), which includes the following process:

    - Development of Terms of Reference (ToR) of the Innovation Calls Projects aligned with the assessments and requirements identified by NMHSs in other activities for purely technological solutions *[Note: (1) the preliminary assessment done during project preparation identifies groundwater and water quality as the priorities for The Gambia, while surface transboundary waters are the main aspect for consideration in Tanzania; (2) innovative methods and technologies include, but it is not limited to, artificial intelligence, internet of things, crowdsourcing, big data analytics, and cloud-services; (3) the development of interoperable web-services or smartphone-based services for the dissemination of the new generated data will also be included in the ToR of the Innovation Calls; (4) The ToR and selection criteria will include cost competitiveness as a priority to ensure financial sustainability of the solutions; (5) The NMHSs and other key stakeholders are members of the Project Steering Committee, who will define the scope of the Innovation Calls. In addition, they will be consulted as part of the assessment of the requirements, which will also be an input for the development of the Terms of Reference for the Innovation Calls].*

    - Carrying out the tender process (see section B. below) to select the companies or consortia that will implement the Innovation Calls Projects. Selection/eligibility criteria is provided in section B. below.

    - Implementing Innovation Calls Projects as per the ToR by the awarded companies or consortia. Selected winners are expected to develop prototypes of innovative and cost-effective observation technologies or monitoring approaches. Major outcome will be the capacity to develop innovative and cost-effective observation technologies or monitoring approaches within the Regional Hub created. Selected winners will be hired by the IE to develop the prototype solutions. EEs (NMHSs of Tanzania and The Gambia will monitor and

report on their progress as part of the Project Management Unit) and EE (UKCEH) will mentor and coach the selected winners to ensure they fully understand the requirements and develop the prototypes accordingly. accordingly. Selected winners will not be acting as EEs. NMHSs of Tanzania and The Gambia will be the owners of the data.

- Providing regular technical assistance to Innovation Calls Projects by international partners on behalf of WMO (e.g. UKCEH and others; see further information in Part III, section A. below).

- Undertaking regular monitoring and evaluation of the awarded Innovation Calls Projects. *[Note: The NMHSs will also be monitoring the progress of the work being developed by the Innovation Calls selected winners.]*

- Documenting processes and results to serve as lessons learned from these Innovation Calls Projects into (a) the new training material developed in Output 1.1 and (b) guidance material and communications tools that promote future uptake within and outside the 'Regional Water Monitoring Innovation Hubs'. Lessons learned from the testing of innovations will be shared through the IE and EEs' websites. *[Note: There are synergies between this and other activities of the proposed project, and revising and updating WMO Regulatory materials and standards, which is supported by the WMO HydroHub under a different funding mechanism].*

Component 2. Enhanced public-private engagement in hydrometry leading to a strengthened commercial environment for local companies

Component 2 focus on the establishment or enhancement of partnerships between the public and private sector in hydrometry. It will support the creation of capabilities for design, manufacture and maintain hydrometric monitoring equipment and tools locally in both countries to service water monitoring needs across their regions (**Outcome 2.1**). In order to address identified hydrometric challenges in The Gambia and Tanzania, international twinning/mentoring will be put in place to bring together hydro monitoring institutions and startups that innovate from across the world to assess their suitability. Selected startups will benefit from pump priming grants to grow both public and private sector capability and linkages with the research sector, with the potential to lead to job creation (**Output 2.1**). The following activities will be implemented:

- **Activity 2.1.1** - Undertake an assessment of the 'innovation environment' in both Hubs *[Note: This assessment has an objective understanding, for example, what other support is already in place within the innovation ecosystem, how startups can successfully be stimulated in the Region (e.g. are there existing innovation incubators that could be used) and are there other companies that exist who, with support from the project, could move into hydrometric technologies].*

- **Activity 2.1.2** - Provide international twinning/mentoring to assist suitable entrepreneurs in developing the required capacities in relation to hydrometric monitoring and building their business case/model for potential grow and job creation *[Note: A gender equity will be promoted and youth to support early career innovators].*

- **Activity 2.1.3** - Develop and provide technical guidance materials to assist suitable institutions building their business case/model.

Innovation Camps and other activities will be established to bring together public and private entities to support the development, manufacturing and maintenance of digital and physical monitoring technologies (**Output 2.2**). The following activities will be implemented:

- **Activity 2.2.1** - Based on the results of activity 3.2.2, launch Calls for Expressions of Interest (EoI) for the establishment of the Innovation Camps and organize them with a focus on coming up with ideas for solutions to one/a small number of monitoring problem(s) *[Note: (1) Engagement of different stakeholders is promoted as they would have differing interests: (a) Policy-makers: to mobilize self-organizing capacities of cities, villages, communities and regions to address local societal challenges; (b) Business/entrepreneurs: to match/join interests, capacities and forces locally to compete innovatively in a globalised market; (c) academia: to identify locally-meaningful research an innovation capacities to be developed in the long run in cooperation with business and government, while working with and for the local society; and (d) civil society: to empower citizens*

(especially women and youth) to gain ownership and conceive solutions to societal issues of their concern; and (2) Neighbouring countries will be invited to participate in the Innovation Camps in order to learn directly from the experience and scale up the pilots to their own countries within the Regional Water Monitoring Innovation Hubs. Other regions may also be invited to help replication].

- **Activity 2.2.2** - Implement two (2) follow-on projects (similar to 'Innovation Calls Projects') from the Innovation Camps for the realization of the ideas *[Notes: (1) At the end of the Innovation Camp the groups 'pitch' their solution to a panel and then if any of them look like they have potential, the proposed project invests by giving them a grant to develop the idea into a full prototype over the next few months. (2) Follow-on projects consider the requirements from NMHSs, but will integrate the indigenous knowledge and citizens' big data for innovative integrated solutions. (3) Neighbouring countries of Tanzania that share the same water body will be invited to participate in the Innovation Camps; (4) Indigenous communities will be engaged in the Innovation Camps as they have hydromet-related knowledge based on cultural and on-the-ground experience; and therefore will be part of the design of the innovative solution/prototype that will be developed. Once developed, this solution will be installed and the head of the community will be in charge of basic maintenance and security – this will give them also a sense of ownership. (5) A gender-strategy is developed as part of the project to ensure gender-responsive and inclusive approaches.].*

Component 3. Enhanced regional cooperation for mutual technical assistance among NMHSs and other monitoring organizations within the region where the Innovation Hubs are established

This component focus on improving dialogues and exchanges within 'Regional Water Monitoring Innovation Hubs' and beyond (**Outcome 3.1**), which is supported by the organization of Learning Staff Exchanges to facilitate and guide learning exchanges among NMHSs within a Regional Water Monitoring Innovation Hub in view of addressing specific common hydrometric challenges (**Outcome 3.1**). This will be achieved through the implementation of the following activities:

- **Activity 3.1.1** - Undertake an organizational assessment of NMHSs and regional organizational arrangements for hydrometric monitoring and data sharing within the Regional Water Monitoring Innovation Hub, and develop and organize training and learning staff exchanges to facilitate and guide learning exchanges among NMHSs within a Regional Water Monitoring Innovation Hub.

- **Activity 3.1.2** - Set up to the 'Regional Water Monitoring Innovation Hubs', and develop 'Regional Technical Champions'/long-term Centres of Excellence in hydrometry.

- **Activity 3.1.3** - Undertake assessment of capacity needs and investment requirement for establishment of calibration facility and services for hydromet equipment.

The organization of Innovation Workshops to bring together NMHSs, academia, private sector (solution providers) and others will facilitate targeted interactions among them in a way that allows NMHSs to express their operational challenges and needs, and the private sector to tailor their solutions to operational realities of NMHSs (**Output 3.2**). The following activities will be implemented:

- **Activity 3.2.1** - Organize workshops among public, privates and academic sectors, with the support of international partners, to identify the skills needs in relation to hydrometric innovation, ensuring gender equity.

Activity 3.2.2 - Organize stakeholders' workshops to discuss and agree on real challenges and needs to be addressed at Innovation Camps in the context of adaptation to climate change *[Note: Challenges can include (but are not limited to): the development, manufacturing and maintenance of digital and physical monitoring technologies, the engagement of civil society, and the use of hydromet data in decision-making in the context of climate change adaptation]*.**4. Increased political and institutional commitment for operational hydrology through improved stakeholder collaboration and engagement, including co-production of hydromet services**

Awareness raising and stakeholder engagement are important components of the adaptation process to manage the impacts of climate change, enhance adaptive capacity, and reduce overall vulnerability. A deliberate approach and mechanisms to ensure stakeholders engagement and regional cooperation are important to ensure that the project responds to stakeholders concerns and needs, is relevant, generates

enthusiasm and support, and that chances of success are maximized. Special attention should also be placed on raising political awareness as policy makers and politicians are key actors in the policy process of adaptation and in sustaining changes made. Through **Outcome 4.1**, stakeholder engagement approaches and awareness programmes will be increased to support NMHSs through budget and Water Legislations, and fit-for-purpose innovative hydrometric technologies and user-oriented hydromet services. In particular, awareness will be raised for decision makers and lawmakers through the organization of Ministerial Roundtables in each country of the 'Regional Water Monitoring Innovation Hubs' that will showcase the comprehensive results and recommendations of national cost-benefit analysis of hydrological data investments (**Output 4.1**), and the following activities:

- **Activity 4.1.1** - Undertake national cost-benefit analysis of the hydrological data-related investments within each Regional Water Monitoring Innovation Hub.

- **Activity 4.1.2** - Undertake an assessment of the legal and regulatory frameworks related to integrated water resources management and innovation and propose any required changes based on the results of the Innovation Calls projects and the Innovation Camps.

- **Activity 4.1.3** - Organize awareness-raising activities for decision-makers, legislators, and water users, including Ministerial Roundtables that will showcase the comprehensive results and recommendations of national cost-benefit analysis of hydrological data investments

- **Activity 4.1.4** - Develop a gender-responsive stakeholder engagement strategy for continuous including government departments, private sector, academia, and local community representatives, and implement and institutionalize it to ensure continued engagement beyond project implementation

The WMO HydroHub Use-Provider workshops and/or webinars can be used to foster the dialogue between users and providers of hydromet services. They bring together bring together NMHSs, public and private sectors (users of hydromet services) and facilitate targeted interactions among them, including for identifying and developing new markets for NMHSs services. As part of these activities, user needs and requirements will be gathered in order to help establishing a common understanding among NMHSs, public and private sectors (**Output 4.2**). In order to achieve this result, the following activities will be implemented:

- **Activity 4.2.1** - Carry out a consultative survey for NMHSs to analyse various aspects of their data services provision, and for existing and potential new users of NMHSs' data services. Based on the results, map and identify existing and potential users of NMHSs' data services that should take part of the User-Provider Workshops and Webinars.

- **Activity 4.2.2 -** Organize User-Provider Webinars; and hold Workshops to bring together NMHSs, public and private sectors and facilitate targeted interactions among them for awareness, integration and uptake of new data-driven services stemmed from Innovation Calls projects and Camps in other projects and initiatives; as well as for identifying and developing new markets for NMHSs' data services *[Note: this requires coordination and collaboration with development partners to ensure that ongoing projects focused on service delivery and Early Warning Systems (EWS) integrate the new data generated through this proposed project]*.

Regional partners and stakeholders are members of the Project Steering Committee and therefore will be engaged in the steering of the project and oversight. They will also participate in various project activities such as the assessment of the NMHSs' requirements and capacities, in knowledge exchange regarding the lessons learned from the innovative solutions, in Trainings, etc. Noting that these NMHSs are WMO Members and already collaborate within the existing WMO structures (e.g. technical commissions, working groups, etc.), there will not be a need to establish other mechanisms for collaboration.

There could be Public-Private Partnerships (PPPs) in the WMO Innovation Calls depending on the technology to be developed; however, a major goal of this project is to lay out the groundwork for PPPs.
Involvement of the private sector will also be done through: (1) the HydroHub Think Thank that members from the private sector; (2) the involvement of the Hydro-Meteorological Environmental Association (HMEI); and (3) involvement of small enterprises for repairs at the regional level. The Innovation Camps will promote

a community-driven development in find the solution. There will also be partnerships established with the Academia to ensure sustainability and the required skills in the Regional Hubs.

All project activities, including communities of practice, innovation hubs, and knowledge-sharing platforms will be sustained beyond the project's lifetime through their integration as part of WMO structures.

The innovations tested in The Gambia and Tanzania will be replicated and scaled to other regions through the WMO HydroHub framework and also through the WMO Regional Associations, Technical Commissions and Working Groups.

The ongoing operation and scaling of the innovation hubs will be funded (once the initial project funds are exhausted) will be financed by the Governments. Ministerial Roundtables will be organized to review national cost-benefit analysis of hydrological data investments and make recommendations to Ministries that are responsible for NMHSs budget allocations, related national policies and regional agreements. In addition, the integration into the WMO existing structures will also support the financial sustainability. At the same time, Western Countries will leverage funding from multilateral development banks (like World Bank and African Development Bank) towards projects for strengthening hydrometeorological networks and services. In particular, this project proposal will be linked with the World Bank Development, Resilience and Valorization of Transboundary Water for West Africa (DREVE).

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

Innovative solutions will be promoted through the project, notably through Innovation Calls Projects (Component 1) and Innovation Camps (Component 2) that will address regional hydrometric challenges common to all countries within a 'Regional Water Monitoring Innovation Hub' and enhanced linkages with academia and research sectors to support co-design of new innovative solutions. Major lessons learned from previous Innovation Calls include: (1) multiple technologies can be used to leverage a more cost-effective solution that can be implemented locally; (2) innovative solutions that bring new technologies are less tested compared with mature technologies; (3) accuracy of data from new technological solutions may be lower than from mature ones; and (4) total cost of ownership is lower for new technological solutions implemented locally than from mature ones coming from abroad. This proposed project will make sure that an adequate period for testing the new technological solutions is in place, alongside with improvements to increase data accuracy. In addition to the consideration of the lessons learned from the WMO HydroHub described in CR5, the proposed project considers the UNDP Innovation/Accelerator Labs learning cycle (sense, explore, test and grow) in the design of the WMO Innovation Calls and Innovation Camps.

The innovative solutions that will be leveraged in the project would have already been through proof-of-concept testing such as those implemented in the context of the WMO HydroHub:

(i) Open-source non-contact river flow observations with cameras for Africa;
(ii) Inexpensive open source dataloggers and sensors for water levels and hydrological measurements in least developed countries;
(iii) Lidar-based non-contact hydrometry for Mountainous Terrain;
(iv) Development of a rainfall and stream water level quality control subsystem for Belize climate data management systems (CDMS).

But there is a need for further assistance to, for example: (1) tailor them to the needs of hydromet services in West and East Africa, (2) build the support infrastructure (e.g., local manufacturers and maintenance providers), and/or (3) help operational services transition to the new technology.

The Innovation Calls projects (Component 1) will be implemented in both Hubs through provision of financial and technical support to project proposed via open calls. Innovation Call applications will be technically evaluated based on a set of criteria including: a low total cost of ownership; cost effectiveness of the solution; innovativeness; open source; scalability to other countries and regions; possibility for local manufacturing; involvement of youth, women and vulnerable communities in the project scoping and design (see section A. for details). An established mechanism for this exists and has been demonstration in WMO HydroHub Innovation Calls in its Phase I, as follows:

Tender process: The tender process to select a company or a consortium that submits a project application to fit the requirements outlined in the ToR of the Innovation Call shall go through the WMO procurement process and rules. A schematic of the process is provided in **Figure 10** below.

Selection/eligibility criteria: The following criteria will be used to assess the quality of the applications submitted. Criteria can be mandatory, scored or both (details will be included in the evaluation criteria template):

- Only applications that strictly follow the ToR will be considered and will be evaluated using measurable objective evaluation criteria;
- Projects focus on an innovative observation technology or monitoring approach which is within the scope of the ToR and has been proven to work;
- Cost competitiveness will be key selection criteria to ensure financial sustainability of the solutions;
- Projects will be required to explain in their applications how their impact will be sustained beyond the life of the project (scored);
- Criteria based on long-term O&M cost of the proposed solution (scored);
- Criteria based on the provision of necessary trainings for local technical staff (scored);
- Degree of scalability to other environments and NMHSs (scored);
- Criteria based on geographical focus (scored);
- Projects should be focused on supporting implementation and scaling of innovative approaches/technologies within operational hydrology, including web-services or smartphone-based services for dissemination of the data and information (scored);
- Projects must include at least one National Meteorological and Hydrological Services (NMHS) from targeted region as either the lead or a main partner and explain how the projects will enhance NMHS monitoring capacities and other sectoral institutions as users (mandatory);
- Applications must include a track record of implementing at least one similar project in targeted region either directly or in collaboration with other institutions;
- The budgets and activity plans in the project proposals should clearly demonstrate that the project is an equitable partnership between NMHS and the other partners (i.e. the NMHS should receive some of the funding and undertake a good proportion of the activities) (scored);
- Project proposals must outline Risk Logs and how they will mitigate these – including suggesting possible alternate deliverables if appropriate (scored).

Figure 10. Tender process

Source: WMO

The Gambia and Tanzania were thought to be suitable locations in which to support the growth of innovation ecosystems around water monitoring (see rationale in Part I, section 1.2 above). In The Gambia, the government has made strong commitments to entrepreneurship and several technological incubators/accelerators have been established in recent years, that could provide useful synergies with the proposed Regional Water Monitoring Innovation Hub – they have been engaged in the consultative process for the preparation of this project proposal (see Part II, section J. below). An active innovation ecosystem also exists in Tanzania, with several other incubators and accelerators (also consulted throughout the process – see Part II, section J. below) established across different sectors that could provide useful linkages with the hydrometry Innovation Hubs. In developing this Project Proposal, other initiatives such as UNDP

Innovation/Accelerator Labs have also been considered, noting that both tap into local innovations to create actionable insights and reimagine sustainable development for the 21st century. They help closing the gap between the current practices of international development and an accelerated pace of change. Similarly, the proposed project is closing the gap between the advances being made in hydrometry in developing countries and the little capacity to follow such scientific and technological advances in developing countries due to limited resources; so, there is a need to focus on hydrometric innovative solutions. The Lessons learnt from the approaches being implemented through UNDP Innovation/Accelerator Labs (I/ALabs) will be taken into consideration and will be further explored during the preparation of the full project proposal. In particular, the learning cycle process used in the UNDP Innovation/Accelerator Labs (i.e. 'sensing', 'exploring', 'testing' and 'growing') has inspired the proposed development process for establishing the 'Regional Water Monitoring Innovation Hubs', which includes (a) 'User-Provider workshops' and 'Innovation Workshops' that permits understanding what are emerging challenges and opportunities in the local context and determining where we need to focus our attention (similar to the I/ALabs 'sensing') and looking for solutions (similar to the I/Alabs 'exploring'); (b) 'Innovation Camps' and 'Innovation Workshops' that allow designing a portfolio of potential solutions to intervene at multiple points in the system and continuously testing them (similar to the I/ALabs 'testing'); and (c) 'Innovation Calls', 'Capacity Building of NMHSs', 'Ministerial Round-tables', 'Improved Legislation' and 'Public-Private Engagement' which allow handing over of the portfolio of solutions, advocacy for policy change and spinning solutions off (similar to 'growing').

The Innovation Camps are a two to five day activity that brings together internal and external experts to solve a specific problem on the ground. National or regional teams provide and sponsor an urgent challenge that needs time and external expertise to be resolved. The HydroHub then provides support for the organization, access to its extensive network of experts and, if available, financial support to conduct the local innovation camp.

Expected partnerships that will emerge from the 'Regional Water Monitoring Innovation Hubs' and help bring about transformative change include:

(i) private sector technology providers and academia (for collaborative research and development of technologies) (Component 1);
(ii) NMHSs private sector technology providers (for the development and uptake of innovative solutions that meet NMHSs' needs) (Component 2);
(iii) among existing innovators from various sectors (for improved business incubation and acceleration) (Component 2);
(iv) among NMHSs of various countries (for continuous learning, mentoring and collaboration) (Components 1 and 3);
(v) NMHSs and citizen science groups, including youth, women, vulnerable and indigenous communities (for the integration and blending of non-traditional data sources into NMHSs operations) (Components 2 and 4); and,
(vi) NMHSs and hydromet data users, both private and public sectors such as agriculture, civil protection (for the improvement of user-oriented data provision) (Component 4).

A major innovation in this proposed project is the consideration of the academia, public, and private sectors' capacity building, and formal cooperation agreements, in order to ensure continuity of services (in case of staff rotation). In addition, the joint trainings, twinning and mentoring among the various sectors, and guidance materials, will support hand-over and operationalization, and well as continuous technological infusion. Awareness raising of users on the added value that data-driven services can bring to their activities is also an important aspect of the project. These capacity building approaches will support sustainability of the investments under all project Components.

In addition to the geographic, technical, and legal/innovation positioning of the two countries, the project aims to establish the two 'Regional Water Monitoring Innovation Hubs' in two different regions in Africa i.e., East and West Africa, as these could then support hydrometric monitoring innovation across other countries in the region. For example, in West Africa, The Gambia's membership of ECOWAS should simplify regional trade for any start-ups that might stem from the Hub. Similarly for Tanzania as member of the East Africa Community (EAC) and the South African Development Community (SADC). Looking further ahead, it is envisaged that the 'Regional Water Monitoring Innovation Hub' model of supporting improvements in water monitoring could be replicated in other regions e.g., North and Southern Africa should the project be successful.

C. Describe how the project/programme aims to roll out successful innovative adaptation practices, tools, and technologies and/or describe how the project aims to scale up viable innovative adaptation practices, tools, and technologies.

For the innovative solutions that will be leveraged in the project that have already been through proof-of-concept testing (such as those listed in Part II, section B. above), the starting point is the assessment for their alignment to the local/regional conditions. Clearly defining the purpose of the hydromet observation network or system is important, as this determines what information is needed, when and how often, where, and to what level of uncertainty. NMHSs have an important role in the selection of the test sites as locations for installation of hydromet monitoring stations should be representative of the climate of the region (i.e. spatial representativeness), and not heavily influenced by unique local factors. In addition, socio-economic sectors have their own specific needs for hydromet information, and that's why it is important to organize user-provider workshops and webinars (as planned in Output 4.2 of the proposed project) in order to identify such needs and select the most appropriate locations for installation of hydromet monitoring stations. Typical users are: agriculture, water resource management, disaster risk management, and energy. There are also other criteria for selection of the locations which involve considerations to whether the area surrounding the site is likely to experience major change within 50 to 100 years (i.e. temporal site stability). Finally, secondary criteria involve naturally occurring risks and variability, and logistical concerns. Further considerations for network design will be considered during full project proposal preparation, taking into account WMO guidance materials.

The proposed project supports assessments in Component 1 in relation to the academia sector, Component 2 in relation to the private sector and the 'innovation environment', and Component 3 in relation to the NMHSs and regional organizations. Through the Innovation Camps (Component 2), there will be a possibility to backlog and develop sprints, through structuring of the rollout process and definition of roles and responsibilities. Then, under Component 1, twinning arrangements (that can be both North-South twinning and South-South twinning) will be organized to support the validation and rolling out processes.

For the innovative hydrometric solutions implemented and validated in Tanzania and The Gambia, these will be designed in a way that makes the innovations applicable to other countries or regions facing the same or similar hydrometric challenges. The participation of other countries and regions in the Innovation Camps organized under Component 2, will facilitate direct learning from experience and scaling up the prototypes being developed under this proposed project. At the same time, Component 3 of the proposed project supports the organization of learning staff exchanges among NMHSs addressing specific common hydrometric challenges, which facilitates regional knowledge sharing. In addition, the documentation of the processes and results (supported under Component 1) will serve as lessons learned from the Innovation Calls Projects into (a) new training material and (b) guidance material and communications tools that promote future uptake within and outside the Regional Water Monitoring Innovation Hubs. The latter will also contribute to the review, revision, and update of WMO Regulatory materials and standards, which is supported by the WMO HydroHub under a different funding mechanism.

D. Describe how the project / programme 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 / programme would avoid or mitigate negative impacts, in compliance with the Environmental and Social Policy and Gender Policy of the Adaptation Fund.

Part I, section 1.7 describes the main beneficiaries of the proposed projects, which range from water-related vulnerable indigenous communities to government agencies and private sector associated with weather- and -climate-sensitive socio-economic sectors in the countries and regions. **Table 10** provides information on the social, economic, and environmental co-benefits based on the outcomes of initial consultations with beneficiary groups.

Table 10. Summary of Economic, Social and Environment co-benefits of the Project per component

Component	Economic benefits	Social benefits	Environmental benefits
1. Increased operational capacity of the NMHSs to provide fit for purpose hydrological data through	• Reduction in economic losses from floods and droughts as a result of	• Increased resilience of local communities (especially of the vulnerable groups	• Increased use of quality hydromet data to inform environmental

the use of innovative monitoring approaches	improved hydrometeorological data made available to DRM agencies • Improved data availability for private sector use, such as for Hydropower, extractive industries, urban planning, and insurance • Enhanced operational efficiency of National Hydrological and Meteorological Services (NHMS)	such as women) to extreme climate impacts as a result of improved hydrometeorological data • Strengthened gender and social inclusion in hydromet networks in the target regions (guarding stations and making observations) • Improved food and water security as well as agriculture practices/irrigation schemes through measurements (water quantity/quality related) • Strengthened youth inclusion in hydromet-related R&D	management of water resources by Government agencies and private sector under climate change conditions • Better planning of nature-based solutions e.g. for flood protection with better measurements
2. Enhanced public-private engagement in hydrometry leading to a strengthened commercial environment for local companies	• Reduction in economic losses from floods and droughts as a result of improved monitoring • Economic opportunities in the development of hydrometeorological monitoring systems	• Improved monitoring capacities to guide responsiveness for extreme climatic events • Improved food and water security as a result of improved monitoring	• Improved environmental protection through timely provision of relevant information and better services to sectors working in Hydropower, extractive industries, and urban planning
3. Enhanced regional cooperation for mutual technical assistance among NMHSs and other monitoring organizations within the region where the Innovation Hubs are established	• Enhanced operational efficiency of National Hydrological and Meteorological Services (NHMS) • Improved data availability and data sharing to facilitate a region-wide collaboration	• Strengthened capacity of NHMS staff through regional partnerships • Implementation of a gender and socially inclusive approach within NHMS and other relevant stakeholders	• Increased environmental protection through improved information capacity and better service provision to sectors working in Hydropower, extractive industries, and urban planning
4. Increased political and institutional commitment for operational hydrology through improved stakeholder collaboration and engagement, including co-production of hydromet services	• Reduced economic losses as a result of improved hydromet monitoring • Better water resource and agriculture management through hydromet monitoring • Improved data availability and data sharing to facilitate a region-wide collaboration	• Reduced illness and loss of life as a result of improved hydromet monitoring • Reduction of flood induced and post-flood illnesses • Strengthened gender and social inclusion in hydromet networks in the target regions	• Improved efficiency in water use at all levels • Enhanced sustainability of hydrometeorological monitoring through its regular funding by policy makers and users who better understand its importance • Enhanced environmental management practices as a result of integration of improved hydromet data quality into climate change adaptation practices

The proposed project will bring economic, social, and environmental benefits to the countries within the 'Regional Water Monitoring Innovation Hubs' through improved hydromet services that will allow for improved data-driven decision-making, save lives and protect the environment. This is particularly relevant for vulnerable communities. Initial consultations with public institutions and non-governmental organizations dealing with communities recognized indigenous knowledge/capacity and recommended working with the community to harness key information and data. In particular, it was indicated that the proposed project should incorporate indigenous knowledge in the early warning system which can be built on the Early Warning System Project in The Gambia which piloted this approach, therefore there is an opportunity to utilize the existing skills especially in proposed pilot areas. So, in terms of social benefits, the proposed project, through Component 1, Expected Output 1.1, will assess and identify vulnerable indigenous communities (considering gender equity) that could engage in (i) innovative approaches for data acquisition (e.g. crowdsourcing indigenous knowledge that could be blended with scientific knowledge for improved data-driven decision-making); and (ii) equipment security, operation and maintenance. However, further consultations, in particular with the indigenous communities, are required and will be done during the preparation of the full project proposal. Through Component 2, Expected Output 2.2, the proposed project will establish Innovative Camps involving civil society, to ensure that the interests of the vulnerable communities are considered and well address, to empower citizens (especially women and youth) to gain ownership and to conceive water data-driven solutions to societal issues of their concern such as the impacts of extreme events, health effects due to water quality, food and water security due to water availability, and other related risks. Through Component 4, Expected Outputs 4.1 and 4.2, the project will develop and implement a gender-responsive stakeholder engagement strategy, involving government departments, private sector, academia, and local community for awareness, integration and uptake of new data-driven services stemming from Innovation Calls projects and Camps in disaster risk preparedness and response in case of floods and droughts that are increasing in frequency and intensity/severity due to climate change (see Part I, section 1.2.2).

As for environmental benefits, the proposed project, through Component 2, Expected Outputs 1.1 and 2.2, will support and implement Innovation Calls Projects and will establish Innovative Camps involving policymakers in order to mobilize self-organizing capacities of cities, villages, communities and regions to address local societal challenges. The activities under these Expected Outputs will give especial attention to improved water quality for increases in biodiversity and habitat protection.

The project brings various economic benefits. These include: (i) improving hydromet services that will allow improved data-driven decision-making in agriculture, disaster risk reduction, water resources management and environmental protection among others (Components 2, 3 and 4); (ii) identifying and developing new markets for NMHSs' data services (Component 4); and (iii) creating an 'innovation ecosystem' that would promote gender equity and job creation (Component 2). The benefits to women and young will be assessed through the relevant associations in place that have already systems in place to evaluate entrepreneurship opportunities and job creation.

In particular, the National Five-Year Development Plan 2021/22-2025/26 indicates that, in Tanzania, 75 percent of its population is under the age of 35. Besides, it is estimated that about one million young people enter the labour market each year while 200,000 of them successfully find employment immediately, the remaining 800,000 are not guaranteed with official employment. Thus, entrepreneurship is becoming a major way for these young people to develop themselves, especially by starting small and medium enterprises (Start-ups, Small and Medium enterprises, and Social Enterprises), while focusing more on using digital technology and innovation in solving socio-economic challenges. The Gambia National Science, Technology and Innovation Policy (2015-2025) describes a similar situation. As the plans in both countries aim to accelerate inclusive economic growth through poverty reduction and social development strategies as well as productive capacity for youth, women and people with disabilities, the proposed project will provide an opportunity to youth, women and the general community through in innovation.

Annex 1 provides social, environmental and gender assessments to check compliance with the Adaptation Fund's Environmental and Social Policy and Gender Policy. According to the Adaptation Fund's classification, this project is expected to not have negative environmental or social impacts in most of the activities; however, it is categorized as Category B as it includes Unidentified Sub-projects (USPs) in Activities 1.2.3, 2.2.1 and 2.2.2, and minor negative environmental or social impacts may be expected. The necessary detailed studies will be carried out as part of the development of the fully developed project proposal to

ensure compliance with the environmental and social policies and principles of the Adaptation Fund. Where appropriate, an environmental and social risk management plan aligned with the Adaptation Fund requirements would be developed, which should be adopted by stakeholders during project implementation. A grievance mechanism would then be provided to address potential social and environmental effects during project implementation.

Annex 2 provides the gender assessment. All project Component activities will promote gender equity and youth engagement to support early career innovators. In addition, meaningful participation of women in decision-making processes will enable them to contribute as agents of change in all circumstances, with climate change actions then benefiting from the ideas, knowledge, and other resources they bring to bear in developing effective and sustainable climate change adaptation and mitigation measures. Such meaningful participation will be ensured as the project interventions will be designed in accordance with the results of the gender baseline analysis. When preparing fully developed proposal, a logical framework will be prepared, including gender and social inclusion indicators Key Performance Indicators (KPIs), aligned with the Gender Policy and Gender Action Plan of the Adaptation Fund.

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

The project is designed in a cost-effective way with a high return on investments. Implemented activities are such that they will have a long-term impact (estimated in 15 years, based on the average life cycle of the infrastructure (hydrological equipment) and will build on existing WMO programmes and initiatives. The project being developed in the broader framework of the WMO HydroHub Phase II will leverage investments by other donors in the tools and networks that have been developed through e.g. the proposed Innovation Calls Projects.

An economic analysis is necessary to estimate both the costs and benefits of the proposed project and thus justify its relevance. This involves a quantitative assessment of the costs and benefits of the activities envisaged under the project, taking into account the economic, social and political context of the countries involved. Assessing the benefits associated with hydrometric monitoring services is complex; however, many studies have been carried out on the benefits of investing in the development of hydrometeorological infrastructure and services, including by Hallegatte (2012), WMO et al. (2015), Hallegatte et al. (2017), Gardner et al. (2017) and Kull et al. (2021), which led to benefit-cost ratios between 2 and 36. In the context of the proposed project, a cost-benefit analysis (CBA) was carried out in association with reduced disaster losses and increased agricultural production. **Annex 3** describes the approaches and results of the quantitative assessment of the socio-economic benefits and cost-benefit analysis (CBA). The CBA indicates that the investment is economically efficient, meaning they will produce socioeconomic benefits greater than their costs. The generated benefits are significantly greater than the costs (10:1) for a discount rate of 5 percent. Considering the very conservative approach and assumptions applied throughout the analysis, the results are considered robust. The investment is economically efficient. Considering that such investment is relatively low in cost, is economically efficient, protect lives and property, and contribute to economic development and resilience, it should be considered for priority financing. A much more comprehensive and detailed analysis would be carried out to include the benefits to other important sectors in the region, including energy, water resource management, construction, transport and insurance. This is planned to be done during project implementation as part of the WMO HydroHub Ministerial Roundtables and other high-level and decision-making activities (under Output 4.1). It is anticipated that the benefits are much higher.

The above-mentioned CBA was done only for Tanzania and The Gambia, while there are project components that will engage neighbouring countries within the cost estimate (Components 3 and 4), or will contribute to scaling up the innovative solution (e.g. the documentation of process and results under Component 1; and the Innovation Camps in Component 2). These are at no additional costs (i.e. the total costs of the activities could be divided by all countries within the 'Regional Water Monitoring Innovation Hub'), being individually less costly, while the benefits will be much higher as they are directly linked to the contributions of the weather- and climate-sensitive sectors to each country GDP. This is also confirmed by the United Nations Economic Commission for Europe (UNECE) Policy Brief on the Benefits of Transboundary Water Cooperation, where it is described the expected benefits of projects taking water-related regional approach.

The innovation solutions that will be leverage in the project are also cost-effective from the perspective of scaling up potential beyond the lifetime of the proposed project as equipment and systems will be manufactured at the local level and new markets will be established within the regions covered by 'Regional

Water Monitoring Innovation Hubs', noting that Components 3 and 4 of the proposed project engage neighbouring countries and gather their needs through the transboundary basin commissions. The Gambia, Tanzania and neighbouring countries will be able to acquire the new and innovative equipment and systems at very competitive prices. At the same time, a pool of expert (Components 1 and 3) will be available within the regions that establish a new community of practice for these new and innovative technologies, and support can be provided in a longer run operation and maintenance within the region at lower costs than internationally. This will be facilitated through the learning exchanges (Component 3).

F. Describe how the project / programme 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.

The proposed project is consistent with national and sub-national strategies and plans in Tanzania and The Gambia, as presented respectively in **Tables 11.a. and 11.b.** below. At the same time, the project is aligned and will build on Tanzania, The Gambia and neighbouring countries strategies, plans and initiatives at regional level, as also presented respectively in **Tables 11.a. and 11.b.** below. The proposed project will also build synergies with all other ongoing and planned initiative in collaboration with other development partners (see Part II, section H. below).

At the international level, the project is aligned with the African Ministerial Conference on Meteorology (AMCOMET) Integrated Strategy (2021), and its five strategic pillars: (SP1) increased political support and recognition of NMHSs, as well as implementation of WMO and African Union (AU) gender policies; (SP2) improved observational networks, data access and processing; (SP3) enhanced capacities for the production and delivery of tailored weather, water, climate and climate change services as well as early warning systems for sustainable development; (SP4) research, innovation development and training; and (SP5) strengthened partnerships with relevant institutions, the private sector and civil society. In addition, both Tanzania and The Gambia have signed and ratified the United Nations Framework Convention on Climate Change (UNFCCC) and subsequently developed national communications on climate change in accordance with the relevant provisions and agreements of the UNFCCC. Both countries have also recently submitted an update of their Nationally Determined Contribution (NDCs), wherein they outlined their proposed adaptation measures to achieve greenhouse gas emission reduction targets, including through scientific research, technological development and transfer, capacity building, and engagement of the public, private and academia sectors for systematic observations.

Table 11. Relevant strategies and plans

11.a. Tanzania	
National	
Tanzania National Adaptation Programme of Action (NAPA)	The proposed project responds to the Tanzania's NAPA through aims to address issues of increase in frequency and intensity of extreme events that are devastating socio-economic impacts including loss of life and properties, and destruction of infrastructure.
National Five-Year Development Plan 2021/22-2025/26	This Plan focuses on industry and private sector development issues, describes the concept of building a competitive economy, industrial and human development; specifies the steps to be taken in the priority areas of the Plan, including aspects related to dealing with extreme hydromet events. The proposed project aims to address these issues.
National Climate Change Response Strategy 2021-2026	Similarly, the proposed project responds to the National Climate Change Response Strategy through aims to address issues of increase in frequency and intensity of extreme events.
National Environmental Master Plan for Strategic Interventions (2022-2032)	The National Environmental Master Plan describe strategic interventions for addressing deterioration of water resources, including enhancement of catchment management to ensure stable flows, promotion efficient water use, and enhancement of water quality control. It also highlights the climate change impacts due to flash, riverine and coastal floods. Improvements of the hydrometric monitoring system (to be implemented as part of the proposed project) are absolutely required to allow Tanzania to achieve these goals.
The Tanzania National Development Vision 2025	The objective of the Vision 2025 is to build a globally competitive and resilient economy and to increase the quality of life for all citizens. Realizing the Vision will create the enabling environment for socio-economic development in Tanzania. One of the barriers identified to achieve the Vision is the limitation of good governance. The proposed project, through the innovation calls and improved legal frameworks, will address these issues.

Tanzania National Strategy for Growth and Reduction of Poverty	The National Strategy for Growth and Reduction of Poverty in Tanzania gives high priority to eradicating extreme poverty and promoting broad-based growth. The proposed project, through the innovation calls, capacity building and improved legal frameworks, promotes the economic growth, creation of jobs and gender equality.
Tanzania – Country Strategy Paper 2021-2025	The Country Strategy Paper 2021-2025 defines a framework to implement the Tanzania's development vision of transforming the country into a competitive and inclusive economy by 2025. Expected outcomes include: (a) increased access to sustainable and quality economic and social infrastructure; and (b) improved enabling business and investment climate for private sector activity. The proposed project, through the innovation calls, improved legal frameworks, will contribute to achieving these outcomes.
Technology Needs Assessment (TNA) Report – Climate Change Adaptation (2016)	The multi-stakeholder process for the preparation of the TNA report on adaptation allowed prioritization in adaptation for water and agriculture sectors, basing on the vulnerability to climate change and their contribution to the country's development agenda. It further allowed for identifying climate change technology options for the priority sectors. Water and agriculture sectors are two of the beneficiary sectors of the proposed project as it will generate and provide critical hydromet data for improved water resource management and agricultural practices.
Technology Action Plan (TAP) Report – Climate Change Adaptation (2018)	The TAP report on adaptation in agriculture and water sectors identified the required technologies and action plan for implementation in these two sectors. Technologies in agriculture sector include improved seed varieties, system of rice intensification and drip irrigation. In the water sector include rainwater harvesting, smart water meter and waste stabilization pond. All these technologies aim at efficient use of water which is threatened by changes in climate. Monitoring the water availability and quality (as planned in the proposed project) is critical to implement TAP.
Regional	
Lake Victoria Basin Climate Change Adaptation Strategy and Action Plan 2018-2023	This strategy summarizes the expected regional impacts of climate change and identifies key measures to effectively address the climate vulnerabilities in five sectors (agriculture and food security; water; terrestrial ecosystems; health; and energy and infrastructure). Many of the potential adverse impacts of climate change can be avoided by improving risk management and implementing integrated adaptive strategies that build resilience across sectors. Improvements and optimization of the hydrometric monitoring system (to be implemented as part of the proposed project) are absolutely required to allow countries bordering Lake Victoria, including Tanzania, to achieve the goals set in this document. In addition, the establishment of 'Regional Water Monitoring Innovation Hubs' will allow cooperation among institutions in the region and implementation of harmonized and integrated approaches.
Lake Tanganyika Authority Strategic Action Programme	This strategy was designed to facilitate the implementation of the Convention on the Sustainable Management of Lake Tanganyika. The program falls within the policies of the Poverty Reduction Strategy Papers which were developed by each of the four governments of bordering countries to provide sustainable economic growth for poverty reduction. Similarly, the proposed project responds to such strategy, through the establishment of 'Regional Water Monitoring Innovation Hubs'.
Strategic Plan for the Zambezi Watercourse	This strategic plan establishes development paths and adaptation measures for climate change resilience. Similarly, the proposed project responds to such strategy, by optimizing and improving the hydrometric monitoring network.
Nile Basin Initiative – Climate Change Strategy	The Climate Change Strategy identifies present gaps and future threats, determines inherent weaknesses and vulnerability impacts and analyzes trends and risks. It also defines requirements and constituents of climate change resilience basin-wide, sets out proper strategic objectives and outputs, introduces effective mitigation and adaptation measures and describes appropriate institutional set-ups. Similarly, the proposed project responds to such strategy, through the establishment of 'Regional Water Monitoring Innovation Hubs'.
East Africa Community (EAC) Climate Change Policy and the EAC Climate Change Master Plan and the Climate Strategy	The overall objective of the EAC Climate Change Policy is to guide Partner States and other stakeholders on the preparation and implementation of collective measures to address Climate Change in the region while assuring sustainable social and economic development. The Master Plan provides a long-term vision and a basis for them to operationalize a comprehensive framework for adapting to and mitigating Climate Change. The EAC Climate Change Strategy guides the implementation of the EAC Climate Change Policy. The proposed project responds to these documents through the establishment of 'Regional Water Monitoring Innovation Hubs' will allow cooperation among institutions in the region and implementation of harmonized and integrated approaches.
11.b. The Gambia	
National	
Gambia National Adaptation Programme	The Gambian NAPA on Climate Change recognizes the inadequate knowledge between the climate and biophysical process within the Gambia. It stresses the risk of the

of Action (NAPA) on Climate Change	disappearance of freshwater swamps and salinization resulting from the effect of sea-level rise. Furthermore, it emphasizes that the combination of sea-level rise, global warming and changes in rainfall patterns, could impact freshwater resources qualitatively and quantitatively. Surface evaporation is expected to increase, whilst groundwater recharge is expected to take the reverse trend. Thus, the NAPA recommended the preparation and implementation of strategic and effective water resources management tools such as policies, legislations and action plans; as well as investment in research and development. The proposed project addresses all these aspects.
The Gambia Agriculture and Natural Resources (ANR) Policy (2017 - 2026)	The Gambia ANR Policy calls for regional cooperation in the sustainable management of shared water resources. It also emphasizes the need to expedite the water sector reform with a draft Gambia Water bill, that would enhance effective water policy implementation to minimize water conflict and promote cooperation among the various users and uses. The proposed project will address such legal framework aspects.
The Gambia National Development Plan (2018-2021)	The Gambia National Development Plan identifies key measures/interventions to ensure sustainable management of water resources. The proposed project, through improved hydrometric monitoring, will support data-driven and informed decisions for an integrated water resource management.
Technology Needs Assessment (TNA) Report – Adaptation Technologies (2016)	The multi-stakeholder process for the preparation of the TNA report on adaptation allowed prioritization in adaptation for water resources, coastal resources and agriculture sectors, basing on the vulnerability to climate change and their contribution to the country's development agenda. It further allowed for identifying climate change technology options for the priority sectors. Water resources, coastal resources and agriculture sectors are three of the beneficiary sectors of the proposed project as it will generate and provide critical hydromet data for improved water and coastal resource management and agricultural practices.
Technology Action Plan (TAP) – Adaptation and Mitigation (2017)	The TAP report on adaptation identified the required technologies and action plan for implementation in six sectors: agriculture, coastal resources, water resources, energy, transport and waste management. Technologies identified for these sectors aim at efficient use of water which is threatened by climate change. Monitoring the water availability and quality (as planned in the proposed project) is critical to implement TAP.
Regional	
ECOWAS Disaster Risk Reduction Gender Strategy and Action Plan 2020-2030	The Strategy and Action Plan aims to help member states build resilience to natural hazards that is inclusive of all segments of society. The proposed project promotes gender equality aligned with these documents.
ECOWAS Regional Climate Strategy 2020-2030	The Regional Climate Strategy contains sectoral objectives for adaptation – a priority issue for the region – and contribution to climate change mitigation by a multi sectoral approach i.e. (transport, agriculture, energy, land use, water, health etc.). These sectors with be beneficiaries of the outputs of the proposed project.
ECOWAS Hydromet Initiative	This initiative seeks to promote the modernization of Hydromet Services in ECOWAS member states. The establishment of 'Regional Water Monitoring Innovation Hubs' will allow cooperation among institutions in the region and implementation of harmonized and integrated approaches, that contribute to the implementation of this Initiative.
Gambia River Development Organization (OMVG) Convention	The OMVG promotes and coordinates the studies and works for the development of the Gambia River Basin within the national territories of the member States of the organization. In July 2023, OMVG validates its Integrated Development Masterplan and Joint Investment Plan. Coordination with OMVG will be done throughout the proposed project implementation.

G. Describe how the project / programme 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.

The proposed project will bring economic, social, and environmental benefits to the regions through improved hydromet services that will allow for improved decision-making, save lives and protect the environment. It is compliant with the fifteen principles of the Adaptation Fund's Environmental and Social Policy (ESP) and does not have the potential to cause environmental or social harm throughout its implementation (see Part II, section N. below for further details); however, there will be Unidentified Sub-Projects (USPs) that still need to be assessed throughout the implementation of the project. WMO, as the implementing agency accredited by the Adaptation Fund, as well as the executing entities and other relevant national partners, will ensure that the proposed project follows the procedures described in the ESP. This includes the requirement that activities financed by the Adaptation Fund reflect local needs and circumstances, build on national players and their capacities (including vulnerable communities and indigenous people), preserve the environment and cultures, address climate change and promote equality.

Regional, national, and sub-national partners and stakeholders, as well as organizations representing communities (such as those representing women and youth), were consulted during the development of this project proposal (see section J. below for the list of stakeholders consulted). As indicated above, environmental impact assessments of project activities 1.2.3, 2.2.1 and 2.2.2 (which are USPs) in the field will be carried out. This document has also been validated by national stakeholders, including, inter alia, the Adaptation Fund's in-country Focal Points (Designated Authorities), the Permanent Representatives and Hydrological Advisers of Tanzania and The Gambia with WMO, and other partner institutions in the implementation of the project in the participating countries.

The proposed project will involve the Ministries that implement project-relevant national technical standards and will engage the East Africa Community (EAC) and the Economic Community of West African States (ECOWAS) that will support the implementation of the project activities and will track compliance against the national, regional and international technical standards, including the WMO Technical Regulations.

In addition to those listed in Part I, section 1.2.3 above, other the key laws, policies, and plans of particular relevance to this proposal are listed in **Table 12** below, together with their date of promulgation and purpose, for both Tanzania and The Gambia. Additional laws and regulations are listed in Annex 1, in relation land acquisition and waste management, social protection and labour code.

Table 12. Key laws, policies and plans in Tanzania and The Gambia

Law/Regulation	Year	Purpose
Tanzania		
National Water Policy	2002	This Policy outlines a national Integrated Water Resources Management approach for surface and groundwater management at the basin-level and the development of water supply services and sewerage systems.
Water Resources Management Act No. 11	2009	This Act defines the institutional framework and responsibilities for water resources management through the National Water Board, Basin Water Boards, and Catchment/Sub-catchment Committees. Outlines principles for controlling water pollution, conservation, and stakeholder engagement.
National Water Quality Management and Pollution Control Strategy	2010	This National Strategy outlining principles, threats, priorities, and sectoral recommendations for water quality protection and monitoring for surface and groundwater.
Water Supply and Sanitation Act No. 5	2019	This Act details the institutional framework and policies for urban and rural water, sanitation, and hygiene service delivery and regulation.
National Water Sector Development Strategy	2006	This National-level Strategy that defines pathways and timelines for achieving poverty-reduction and development targets, aligned with the Tanzania Development Vision 2025.
Water Sector Development Program (2006-2025)	2006	This Program defines priority interventions and investment needs in the areas of water resources management, urban water supply and sewerage services, and rural water services, with a focus on institutional strengthening and capacity building.
The Gambia		
National Water Resources Council Act	1979	This Act establishes the National Water Resources Council and the National Water Resources Committee, defines the duties of the Department of Water Resources. Despite this legal framework, there is no administrative record showing evidence that either the National Water Resources Council or the Committee has ever met as provided for in the Act. Therefore, there has led to uncoordinated programmes and activities in the water sector. And, the Department of Water Resources is reduced to its most basic mandate i.e., hydrological and hydrometeorological data collection and archiving. Nonetheless, there were attempts to review the Act, however, there was little success.
Draft Water Bill	1993	It could not get through.
Draft Water Bill	2001	It could not get through.
Draft Water Bill	2004	It could not get through.
National Water Resources Policy	2006	So far, it is only policy that is running up to now.
Integrated Water Resources Management Roadmap	2009	Proposed a sector reform which was implemented through a project funded by the AfDB from 2011 – 2015.
National Water Resources Management Strategic Plan	2014	This Plan was proposed to be implemented from 2015 – 2019 but that did not materialized because the new institution was not established through the bills. The same goes for the Gambia Meteorological Authority Business Plan.

The Gambia Water Bill	2020	All the three bills suffered severe delay, but they were validated since October 2014 and are ready for enactment. They form part of the deliverables of the Water Sector Reform Project.
National Water Resources Management Authority Bill	2019	
The Gambia Meteorological Authority Bill	2018	

As a specialized agency of the United Nations, WMO is dedicated to international cooperation and coordination on the state and behaviour of the Earth's atmosphere, its interaction with the land and oceans, the weather and climate it produces, and the resulting distribution of water resources. WMO facilitates and promotes: (i) the establishment of an integrated Earth System observation network to provide weather, climate and water-related data; (ii) the establishment and maintenance of data management centres and telecommunication systems for the provision and rapid exchange of weather, climate and water-related data; (iii) the creation of standards for observation and monitoring in order to ensure adequate uniformity in the practices and procedures employed worldwide and, thereby, ascertain the homogeneity of data and statistics; (iv) the provision of weather, climate and water-related services – through the application of science and technology in operational meteorology and hydrology – to reduce disaster risks and contribute to climate change adaptation, as well as for sectors such water resources management, agriculture, health, energy, among others; (v) activities in operational hydrology as well as closer cooperation between National Meteorological and Hydrological Services in states and territories where they are separate; and (vi) the coordination of research and training in meteorology, hydrology and related fields. Both Tanzania and The Gambia are Members of WMO. Therefore, WMO expertise will be leveraged and WMO regulatory material will be applied, including most recent developments on ecological impact of monitoring systems, for better project solutions.

At the same time, international standards and regulations – including those published by WMO – can be a potential barrier or a catalyser to innovation on the ground, especially in developing countries. While it is important to formulate well established rules to achieve comparability of hydrological data around the world or facilitate data exchange, standards can hamper improvements or exclude innovative solutions in procurement, when not formulated in an appropriate manner. Stakeholders have expressed such concerns during the consultative process. In view of this, the WMO HydroHub supports the update of standards and regulatory material in a way that reflects the realities of hydrometry on the ground, thus facilitating the agile development of NMHSs monitoring systems, including through operational uptake of innovative solutions. The goal is to allow NMHSs to gain trust in innovative solutions, while putting forward the most appropriate ones. Technical Regulations should allow to build bridges between well-known technical and emerging ones. This activity is supported by other funding mechanism, thereby not included in this project proposal, however these complementary developments will be a great contribution to the activities of the proposed project and to ensuring sustainability of investments.

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

The project will not duplicate activities being carried out in the framework of other projects, but its outputs can act as inputs to them. During the project preparation, a mapping of ongoing and planned activities was made, in view of identifying synergies and ensuring coherence with regional programmes and seeking collaboration with regional and national institutions in the region. A summary of the main projects, based on existing reports, publications and discussions with stakeholders and partners, is presented in **Table 13** below.

Table 13. Other ongoing and planned projects and initiatives in Tanzania and The Gambia, as well as regional and neighbouring countries projects/initiatives

Activity or Projects/ Organization/ Donor	Objectives	Possible synergies/ complementarities
13.a. Tanzania		
National		
Development of an Operational Decision Support System (ODSS) through Enhanced Hydro-Meteorological Service	The ODSS comprises the following key components to support water resources decision making across Tanzania: (i) a Water Resources Information System for exchanging water datasets and knowledge products with linkage to a hydromet monitoring system for all nine basins in Tanzania;	The proposed project will enhance operationalization of ODSS through the integration of hydrological data being generated from the innovative and cost-effective hydrometric

Organization: Ministry of Water Donor: World Bank	(ii) Flood Forecasting Early Warning System in the Wami/Ruvu Basin; (iii) Water Use Permitting Analysis tool for water allocation in the Pangani and Rufiji Basins; and (iv) Dam Operation Support tool for the Nyumba ya Mungu Dam in the Pangani Basin and Mtera Dam and Kidatu Dam in the Rufiji Basin. These components support the Ministry of Water, Basin Water Boards and other stakeholders in making decisions related to flood emergency response, water use permits and dam operation.	monitoring network, which is key to sustainability of ODSS.
Modernization of Hydrometeorological Network Organization: Ministry of Water Donor: World Bank	The objectives of the Project are modernization and improvement of the water resources monitoring networks (surface hydrology, weather, precipitation, and groundwater) in Tanzania and favour for a sustainable and long-term operation. It will also upgrade and rehabilitate the faulty of existing monitoring stations and will use automated telemetry system.	The WB project will procure hydrometric monitoring stations. Companies that will be award the Innovation Calls Projects (Output 1.2) under this proposed project would be able to bid. The integration of these innovative and cost-effective solutions in other development partners projects would contribute to sustainability of investments under both the proposed project, and the development partners projects, as it will be manufactured and maintained locally at competitive costs.
The Water Resources Centre of Excellency Strategic Plan for 2019/2020 to 2024/2035 Organization: Ministry of Water Donor: World Bank	The Centre will conduct multi-sector analysis that: (i) will support decisions on allocation of water, water use and demand management, water security infrastructure development; (ii) provide strategic policy support for Integrated Water Resources Management and Development, investment planning and prioritization on water, energy and food security; (iii) collaborate with the multi-sectoral forum to bring professionals to address complex multi-sectoral problems in water resources management and development, and (iv) provide technical expertise to support calibration services of hydrogeological and hydromet equipment.	The Centre will strengthen technical expertise to support calibration services of hydrogeological and hydromet equipment. In the context of the proposed project, this Centre should be engaged in Outputs 1.1 in order for its staff to be trained in O&M of the innovative solutions stemming from the Innovation Calls Projects, and become trainers of the NMHS' staff that will operate the innovative networks (Output 3.1).
Higher Education for Economic Transformation (HEET) Project Organization: Ministry of Education, Science and Technology Donor: World Bank	The HEET Project supports the higher education sector as part of the country's bid to allow the sector to be an enabler for economic transformation. This is in keeping with the national aspiration for achieving industrial revolution, consolidating the national grip on being a middle-income country and in unleashing employment opportunities for youth, who constitute the biggest segment of the national population. The HEET Project seeks to enable Universities and colleges/schools to be in the driving seat for the envisaged economic transformation, whereas three Ministry agencies, namely Tanzania Commission for Universities (TCU), the Commission for Science and Technology (COSTECH) and the Higher Education Students Loan Board (HESLB) are expected to create the needed enabling environment. As a means of creating innovation in the higher education supply chain, the implementation of the HEET Project is premised on the principle of the "Theory of Change", for which the medium-term outcome is "to strengthen the learning environment and labour market alignment of priority programs at beneficiary higher education institutions and improve the management of the higher education system". The focus areas funded under the project relate to: (i) construction or rehabilitation of	The following areas (a) updating and developing new curriculum; (b) promoting applied research and innovation capacity; (c) building functional linkages with private sector/industry; (d) strengthening use of digital technology; appear to be aligned with the proposed project. The HEET Project is setting up the 'innovation environment' that would serve as an innovation incubator/accelerator that could be used in the context of the proposed project Components 1 and 2.

	infrastructure, (ii) building capacity of academic staff and university leadership; (iii) updating and developing new curriculum; (iv) promoting applied research and innovation capacity; (v) building functional linkages with private sector/industry; (vi) strengthening use of digital technology; and (vii) developing options for self-generated income.	
WISE Futures – Water Infrastructure and Sustainable Energy Organization: The Nelson Mandela African Institution of Science and Technology (NM-AIST) Donor: WISE Futures	The Centre has conducted research in remote monitoring of drinking water supply system, river level and weather stations. Specifically, the innovation centred on how to remotely collect and transmit real time data for further analysis. In drinking water supply monitoring, the project is developing water level loggers in tanks. For now, a proprietary version has been installed which uses GSM module. WISE Futures is testing other modules for data acquisition. This system uses non-contact technique to monitor water level in river or canal and then transmit to server. As proof concept it was found to be effective, however, it faced vandalism. The local community destroyed deployed version, trying to get the solar battery used for other purposes. Low-cost rainfall and temperature data collection: this version is testing the concept of collecting data for agricultural use. It particularly focuses on collecting rainfall and temperature data, although it can integrate soil moisture. As a proof concept, it is working well. It will need further improvement in the communication system, energy, etc.	WISE Futures would be interested in working with youth group to develop this technology under the proposed project, eventually through the Innovation Calls Projects (Output 1.2).
Tanzania Water Partnership Strategic Plan 2022-2027 Organization: GWP Tanzania Donor: GWP Tanzania	The Strategic Plan with seven Strategic Objectives include strategic partnership; strengthening resource mobilization; establish Water Knowledge and Exchange Hub; and Enhancing Mentorship Programme	This will complement the proposed project through engaging in attending call for proposals; develop project ideas and engage potential partners to fund them; and carry out youth mentorship programmes. It will work as an incubator/accelerator for the implementation of Outputs 1 and 2 of the proposed project.
National Intergovernmental Hydrology Programme (IHP) Committee Five Years Strategic Plan 2021-2025 Organization: IHP National Committee Donor: IHP	The strategy is structured along five (5) objectives including: (i) Enhanced sustainable management of wetlands and groundwater to improve water security and build resilient communities; (ii) Support cutting-edge research and technological innovations in the water sector; (iii) Improved hydromet, and water quality data (acquisition, storage and analysis) to support water resource management; (iv) Enhanced management of water related disasters (floods and drought) as an adaptation to climate change; and (v) Enhanced water governance, education and professional capability in water sector.	The Strategy complements the proposed project through responding to main questions of modern hydrology specific on measurements and data. The questions include: (i) How to use innovative technologies to measure surface and subsurface properties, states and fluxes, at a range of spatial and temporal scales? (ii) What is the relative value of traditional hydrological observations vs soft data (qualitative observations from lay-persons, from data mining etc.), and under what conditions can we substitute space for time?
Regional		

Zambezi Water Information System (ZAMWIS) Organization: Zambezi Watercourse Commission (ZAMCOM)	The Zambezi Water Information System (ZAMWIS) is the centre-point of data and information sharing and exchange between eight (8) Member States in the Zambezi Basin. The ZAMWIS is the software tool used for the actual exchange and sharing of the data and information. ZAMWIS is a Water Resources Information System (WRIS), which later will be extended to include a Decision Support System (DSS) that will facilitate the use of the shared data and information for strategic planning and utilisation of the water resources in the Basin.	Making use of this ZAMWIS which is used in Tanzania Lake Nyasa/Malawi Basin requires data input from monitoring networks that could be built under the proposed project (Output 1.2).
Strengthening Transboundary Cooperation and Integrated Natural Resources Management in the Songwe River Basin Project Organization: Joint Songwe River Basin Commission (SONGWECOM) for Tanzania and Malawi	The four years (2019–2023) project has a component of Improving Early Warning and Disaster Risk Management. The outcomes of the project include percentage of the population in the flood plain benefitting from the Flood Early Warning System (FEWS). The flood emergency and evacuation plan for Lower Songwe Flood plains (Karonga and Kyela) was developed, Flood early warning system (FEWS) was developed and is operational, and a number of hydrological & meteorological stations were installed. In order for these outcomes to be achieved, hydrometric monitoring is an integral part of the project. The project will upgrade hydrometric monitoring stations so that they are able to transmit automated data to server that will be housed at SONGWECOM.	This project will procure hydrometric monitoring stations. Companies that will be award the Innovation Calls Projects (Output 1.2) under this proposed project would be able to bid. The integration of these innovative and cost-effective solutions in other development partners projects would contribute to sustainability of investments under both the proposed project, and the development partners projects, as it will be manufactured and maintained locally at competitive costs.
The Nile Basin Data and Analytics Services Organization: Nile Basin Initiative for 10 Member States	The project enhances data and analytic services for climate-resilient water resources management in the Nile Basin's 10 Member States through innovative information services for climate – resilient investment planning.	This requires data input from operational hydrology (that can be generated by the proposed project), which in turn improves data-driven hydromet services.
Drought Monitoring and Forecasting System Organization: Nile Basin Initiative	This component contains drought indices suitable for hydrological and meteorological drought that are based on climate information.	From both ends, the project depends on data availability from monitoring network and innovations as visioned in the proposed project.
The Nile Basin River Flow Forecasting Organization: Nile Basin Initiative	The System is an integrated real-time multi-functional forecasting system that supports the Nile Basin Initiative and its stakeholders in river flow forecasting, providing short-term to seasonal river flow forecasts for the entire Nile basin. Furthermore, it supports investigating the consequences of alternative infrastructure operation rules for dams and key water users using the flow forecasts generated.	This initiative especially in Tanzania is suffering from malfunctioning of hydromet network and services in specific catchments. The proposed project will complement this initiative to enable it to take place and endure.
Water Security and Climate Resilience in Urban Areas in Tanzania 2019 to 2022 and the Next Phase: once commissioned (2022 to 2025) Organization: GIZ Water Programme	Providing technical support to Basin officers in carrying out hydrometric measurement and data processing in areas that require to improve partly due to new technology, including how to access remote sensing data on vegetation, land use and land cover. Support the implementation of Quality Management System in the hydrological services in all the basins (national level) with attention in the Basins that receive GIZ support. Data collection is one of the key processes.	Output 1.2 of the proposed project can contribute to putting into use knowledge management processes and citizen science developed by the 'Regional Water Monitoring Innovation Hub' in selected water catchments in Lake Rukwa basin and from other Water Basins that will be supported by GIZ. GIZ to support effective use of existing frameworks (catchment meeting, basin forum, National Forums, Maji week, etc.) to provide opportunities to share/exchange good

		practices lessons with basin experts (through Output 3.1 of the proposed project). Possibility of using GIZ programmes within EAC and SADC to spread the products of the Regional Water Monitoring Innovation Hub through workshops provided it contributes to the goals of the partners especially in transboundary water resources management (through Output 4.2 of the proposed project).
Simiyu Climate Resilience Project Organization: KfW Tanzania	Addresses climate change and its impact through the Steering Committee where several ministries participate. Also, there will be an ICT-Climate Change Information Platform for farmers to receive information on weather.	Participation in the Steering Committee or taking up the lessons learned from the Steering Committee (through Output 4.1 of the proposed project). Link the proposed project measures to the planned ICT-Climate Change Information Platform.
13.b. The Gambia		
National		
Climate Smart Rural Wash Development Project Organization: Ministry of Fisheries and Water Resources (MoFWR)/ Department of Water Resources (DWR)	The overall goal of this project is to improve access sustainably and equitably to safe and affordable water supply and sanitation including good hygiene practices. The project through its capacity enhancement for sustainable services delivery component is expected to support groundwater monitoring and protection and mitigating the effect of floods in vulnerable communities through developing management tools and information systems for effective and sustainable development and monitoring of water resources in a climate change context. CSRWASHDEP is expected to finance provision of observation wells equipped with monitoring devices, gauging stations equipped with GSM based data relay equipment, development of floods maps, groundwater maps for the Gambia, and a web-based M&E system with user interfaces.	This project will procure hydrometric monitoring stations. Companies that will be awarded the Innovation Calls Projects (Output 1.2) under this proposed project would be able to bid. The integration of these innovative and cost-effective solutions in other development partners projects would contribute to sustainability of investments under both the proposed project, and the development partners projects, as it will be manufactured and maintained locally at competitive costs.
Strengthening climate services and early warning systems in the Gambia for climate resilient development and adaptation to climate change – 2nd Phase of the GOTG/GEF/UNEP LDCF NAPA Early Warning Project Implemented [2015-2022] Organization: Ministry of Fisheries and Water Resources (MoFWR)/ Department of Water Resources (DWR)	This project addresses existing early warning gaps which include a limited understanding of risks; limited monitoring and forecasting of climate-related hazards; inappropriate communication and packaging of warnings. The project has invested in strengthening current systems to lead to a fully operational Early Warning System for the Gambia at the institutional level, to serve local communities in remote and vulnerable regions. Activities included improving national capabilities to generate and use climate information in the planning for and management of climate induced hazard risks, developing core skills and competencies, acquiring relevant technologies, improving early warning dissemination and advisory communications; and promoting the uptake of climate information at the local level.	This project is close to completion. It has provided some dataloggers, training and has built provincial office complex to improve hydrological services. The proposed project can assist with innovative approaches for maintenance of these investments.
Building the Gambia's capacities and resilience to Climate Change related Disasters, environmental protection and	The objectives of this project are: (i) climate change resilience and disaster risk reduction capacities of vulnerable women, youths and physically disabled stakeholders are built, strengthened and sustained; (ii) strengthened and integrated functional climate information and response system established; and (iii) existing	Through the Innovation Calls Projects (Output 1.2) and Innovation Camps (Output 2.2), there will be engagement of the vulnerable communities. Coordination with this project is sought in order to facilitate the community's engagement

enhanced livelihoods through effective, and efficient climate actions, access to energy services, disaster risk and sustainable natural resources management Organization: Ministry of Environment, Climate Change and Natural Resources (MECCNAR)/ National Environmental Agency (NEA)	early warning systems related to climate change hazards and disaster risk management are replicated and up-scaled.	through mechanisms already established.
Robotics Hub The Gambia Organization: Ministry of Higher Education Research Science and Technology / Directorate of Science, Technology and Innovation	Robotics Hub The Gambia is a legally registered non-profit organisation in The Gambia. The Hub was founded by tech experts along with the first and second Gambian Team that represented the country for the first time in the international world through the office of the directorate of science technology and innovation of Ministry of Higher Education.	Members are engaged in robotics and are willing to collaborate on hydromet research. This could be done under Output 1.2 of the proposed project (Innovation Calls Projects) and participation in the Innovation Camps (Output 2.2).
Resilience of Organizations for Transformative smallholder Agriculture Project (ROOTS) Organization: Ministry of Agriculture (MOA) Donors: IFAD – International Fund for Agricultural Development GEF – Global Environment Facility OFID – OPEC fund for International Development AFD – Agence Française de Développent	The Project Goal is to improve food security, nutrition and smallholder farmers' resilience to climate change in The Gambia. Activities include: (i) hydrology and hydrogeological stations inventory and gap study; (ii) support Water Resources Management Database; and (iii) capacity development. Based on the inventory, a report was prepared with recommendation for rehabilitation and sustainability of gauging stations (hydrology and hydrogeological). The ROOTS project intervention is expected to enhance the capacities of the NHMS for improved water resource monitoring and informed planning and management of resilient rice production schemes.	This project will procure hydrometric monitoring stations or parts of the stations. Companies that will be awarded the Innovation Calls Projects (Output 1.2) under this proposed project would be able to bid. The integration of these innovative and cost-effective solutions in other development partners projects would contribute to sustainability of investments under both the proposed project, and the development partners projects, as it will be manufactured and maintained locally at competitive costs.
Building Resilience Against Food and Nutrition Insecurity in The Sahel (P2RS) Organization: Ministry of Agriculture (MOA)	The project goals are to build the resilience of vulnerable communities to food and nutrition insecurity in The Gambia and the Sahel as a whole. The project in The Gambia aims to enable the beneficiaries resist shock of acute food, respond effectively, and adapt sustainably to climate change by the development of stock breeding, irrigation schemes and regional markets for agricultural and livestock inputs and products. The project plans to support hydrological equipment and related capacity building.	This project will procure hydrometric monitoring stations. Companies that will be awarded the Innovation Calls Projects (Output 1.2) under this proposed project would be able to bid. The integration of these innovative and cost-effective solutions in other development partners projects would contribute to sustainability of investments under both the proposed project, and the development partners projects, as it will be manufactured and maintained locally at competitive costs.

Using Drones and Early Warning Systems for Pre and Post-Floods Disaster Management in The Gambia (UNESCO+NDMA) Organization: Office of the Vice President; National Disaster Management Agency	Under the UNESCO supported project, the Department of Water Resources (DWR) is being supported with the establishment of flood monitoring devices across the country installed at flood prone areas. The data generated is planned to be transferal to a web-based system where it can be accessed and manipulated. The objective is to support the establishment of an Early Warning System to mitigate disasters such as urban flash floods. The project trained several staff of the DWR, and other stakeholders on data integration and analysis software and models.	This project has procured hydrometric monitoring stations. Companies that will be awarded the Innovation Calls Projects (Output 1.2) under this proposed project would need to coordinate. The integration of these innovative and cost-effective solutions in other development partners projects would contribute to sustainability of investments under both the proposed project, and the development partners projects, as it will be manufactured and maintained locally at competitive costs.
The Africa Centres of Excellence (ACE) Project Donor: World Bank Organisation: Ministry of Higher Education Research Science and Technology	The project seeks to produce a critical mass of intellectually talented and skilled professionals that will help in meeting the human capital needs for The Gambia's socio-economic development. The Project's main focus is on building capacities in Science, Technology, Engineering, Mathematics, Health and Agriculture.	The project is transforming the Gambia Technical Training Institute (GTTI) into the University of Applied Science, Engineering and Technology (USET). This university is a potential candidate for the Innovative Calls Project, and this centre can support manufacturing and training components.
Large-Scale Ecosystem-base Adaptation in The Gambia: Developing a Climate Resilient, Natural Resources-Base Economy Donor: Green Climate Fund & UNEP Organisation: Ministry of Environment, Climate Change and Natural Resources	The project is a six-year project that target to develop a climate resilient natural resource-based economy and build the climate resilience for Gambian communities and facilitate the development of a sustainable green economy.	Initially the Department of Water Resources was not supported by the Project but recently UNEP has instructed the Project to extend support to the NMHSs. The proposed project will coordinate and establish synergies (if appropriate) with the GCF&UNEP Project, once the GCF&UNEP project support is identified.
Strengthening Adaptative Capacities to Climate Change through Capacity Building for Small Scale Enterprises and Communities Dependent on Coastal Fisheries in The Gambia Donor: GEF/UNIDO Organisation: Ministry of Fisheries, Water Resources and National Assembly Matters / Department of Fisheries	The Project aims to increase the adaptive capacities for The Gambia coastal fish processing value chains and promote climate-resilient business models focusing on improved post-harvest fisheries food systems to vulnerable communities. The Project would enhance sectoral policies and development strategies relevant to climate resilient regulatory in the fisheries sector and vulnerable communities.	This project seeks to enhance the institutional capacity of the NMHSs for effective climate change adaptation. Through the Innovation Calls Projects (Output 1.2) and Innovation Camps (Output 2.2), there will be engagement of the vulnerable communities. Coordination with this project is sought in order to facilitate the community's engagement through mechanisms already established.
Regional		
Enhancing the sustainable management of Senegal-Mauritanian Aquifer Basin to ensure access to	This UNEP led project has as main objective the strengthening of the long-term sustainability of the aquifer resources and introduce conjunctive management of surface and groundwater in the region. It will do so by adopting the methodology of the International Waters focal area of the GEF,	This project requires groundwater data that can be generated under the context of the proposed project.

water for populations facing climate change (SMAB) Organization: countries, OSS, OMVS, OMVG Donors: UNEP led GEF IW Limited budget	blended with pilot demonstrations and capacity building. The regional Strategic Action Program (SAP) that to be developed will be endorsed at the ministerial level by all countries.	
CREWS-West Africa	The main objective of this project is an operational severe weather, flood and climate forecast system, underpinned by on-going observations and continuously updated historical data, that provides monitoring and forecast outputs and products, as well as related knowledge, in support of CREWS-related activities in West Africa.	This project requires hydrological data that can be generated under the context of the proposed project.
Governance of Groundwater Resources in Transboundary Aquifers (GGRETA) - Phase 3 Organisation: UNESCO and IGRAC	The aims to developed guidelines for the prioritization of actions in Transboundary Aquifers and identify priority areas and issues within transboundary aquifers in order to enhance informed decision-making on the need/necessity for management intervention.	This project will feed into the ministerial conference for decision makers that is part of the proposed project.
OMVG Integrated Development Master Plan (PDDI) Donor: UNCDF, Swiss Agency for Development and Cooperation Organisation: OMVG and Member States	OMVG Integrated Development Master Plan – A Strategic Planning Framework for Sustainable Development of the three (3) river basins and coherent basin-wide programme for the integrated and concerted management of water resources and ecosystems. The work commenced since 2021 and various deliverables were produced including: Six sectoral plans under Phase 2 of the Master Plan: 1. Agriculture – Livestock - Forestry – Fisheries 2. Energy – Mining – Industry – Handicrafts 3. Transport and Communications 4. Drinking water supply – Sanitation – Health – Education 5. Protection of the Environment and Ecosystems, development of Tourism 6. Knowledge, Management and Governance of Water Resources	The proposed project will partner and/or build synergies in the implementation of the relevant sectoral plans. Through the Innovation Calls Projects (Output 1.2) and Innovation Camps (Output 2.2), there will be engagement of the vulnerable communities. Coordination with this project is sought in order to facilitate the community's engagement through mechanisms already established.

Synergies with the AF project under development 'Integrated water resources management and early warning system for climate change resilience in the Lake Chad Basin' will be established. In particular, the innovative solutions from the proposed project will be consider for implementation as part of the Lake Chad project.

The proposed project will also establish links and synergies with other projects and financing mechanisms like the Systematic Observations Financing Facility (SOFF), the Alliance for Hydromet Development, the UN Initiative of Early Warnings for All (EW4ALL) and other EWS funding mechanisms, for better integration of the activities and avoid overlaps, thereby contributing to reducing costs and ensuring long-term operation and maintenance. On the other hand, Western Countries will leverage funding from multilateral development banks (like World Bank and African Development Bank) towards projects for strengthening hydrometeorological networks and services. In particular, this project proposal will be linked with the World Bank Development, Resilience and Valorization of Transboundary Water for West Africa (DREVE). In all these initiates and projects, it will be promoted the use of the prototype equipment and system being developed under the proposed project.

l. Describe the learning and knowledge management component to capture and disseminate lessons learned.

1) Knowledge management and experience sharing

The processes and results of the proposed project will be documented (Output 1.2) to serve as lessons learned from the Innovation Calls Projects into (a) the new training material developed in Output 1.1 and (b) guidance material and communications tools that promote future uptake within and outside the 'Regional Water Monitoring Innovation Hubs', including through (i) learning exchanges in Output 3.1, (ii) the results of cost-benefit analysis presented in the context of Ministerial Roundtables in Output 4.1; and (iii) the User-Provider Workshops and Webinars in Output 4.2.

The Innovation Workshops in Output 2.2 will also provide an 'environment' to share information and lessons learned with the proposed project among policymakers, business/entrepreneurs, academia, and civil society, including the most vulnerable, women and youth.

The proposed project will be implemented in the context of the WMO HydroHub, the Global Hydrometry Support Facility of WMO, and therefore the project will be monitored and evaluated throughout its implementation and lessons learnt will be considered for adapting and improving the project, in consultation with and support of the WMO HydroHub Think Tank experts and shared broadly with global hydrometric community. By adopting such participatory and collaborative process of collecting, analysing, and sharing project results, there is an opportunity to learn from other Innovation Calls and to introduce adjustments to the project through the feedback mechanism from the WMO HydroHub Think Tank to the Project Steering Committee via the WMO Secretariat. This allows improvements of the project.

Moreover, every quarter, the Project Management Unit (PMU) in collaboration with the knowledge management and communication experts in the IEs and EEs, will be responsible to highlight good practices and/or lessons learned to be discussed during annuals Project Steering Committee meetings.

2) Public dissemination

The long-term sustainability of the project's achievements will be supported by training for NMHSs on communication and effective awareness raising on the benefits of hydrometeorological products and services especially with financial policy- and decision-makers (Output 4.1). Appropriate means of communication (e.g., WMO, participating NMHSs websites) will be used to publicize the results of the project to current and potential users of hydromet services, and to promote the socio-economic benefits of sustainable hydrometric monitoring.

3) Organization of and participation in meetings, conferences and other events

Annual meetings of the Project Steering Committee at each 'Regional Water Monitoring Innovation Hub' (involving partners, key stakeholders, end-users, beneficiaries and international partners) will be organized to present the progress of the project and to refocus, where necessary, the implementation of activities to achieve the expected results. Participation in conferences and scientific meetings is also foreseen in order to present and discuss the project results; this is part of the capacity development through "exposure".

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

The project proposal was developed by the NMHSs in Tanzania and The Gambia together with WMO, with the advice of CEH. In Tanzania and The Gambia, there were broad consultative processes that involved a number of stakeholders (**Table 14**) in the public, private and academia sectors, as well as last mile communities (taking into account gender, youth and disable people), non-government organizations (NGOs), UN agencies, other development partners, and neighbouring countries. Throughout the whole consultative process, gender equity was sought, but noting that science and technology is traditionally carried out by men, the participation was unbalanced. However, there were a number of organizations representing women and children at the Workshops and meetings.

The consultation techniques used included:

(1) The introduction of the proposed project through individual meetings, and when this was not possible, via email communication and phone calls.

(2) A questionnaire sent to all stakeholders and received written responses and comments by email before and after the Consultation Workshop; these responses were compiled and used in the Consultative Workshop and also in the preparation of the project proposal.

(3) A hybrid (physical/virtual) Consultation Workshop held on 20 June 2022 in Tanzania and on 14 June 2022 in The Gambia for the preparation of the project concept note. In Tanzania, participants in the Workshop were 28 male and 6 female. In the Gambia, there were 25 male and 13 female. These workshops help identifying gaps and needs in terms of hydrological monitoring and related legislation in Tanzania, The Gambia and neighbouring countries, as well as the ongoing and planned projects, the requirements of user communities (with especial attention to women, children and disabled people), the capacities of the private and academic sectors, and capacity building.

(4) Follow up discussions with key stakeholders included 6 male and 2 female in Tanzania; while in The Gambia, there were 9 male and 3 female, of which 1 female is the Deputy Major of the largest Municipality in the country.

(5) Individual meetings and workshops were carried in July-August 2023 for the Environment and Social Impact Assessment, and Gender Assessment, that allowed the preparation of the action plans, as presented in **Annexes 1 and 2**, respectively.

(6) Peer-review of the project concept note by relevant NMHSs' staff and countries' authorities, WMO Technical Departments, WMO HydroHub Think Tank members and selected WMO experts.

Table 14. Stakeholders consulted by main categories in Tanzania and The Gambia

Main category of the Stakeholders	List of Stakeholders and Role (where required)
14.a. Tanzania	
Hydro-related institutions	- Nine basins water boards in Tanzania (see Part I, section 1.2, Table 2 for the list) - Ministry of Water/Department of Water Resources - Ministry of Water/Water Resources Centre of Excellence - Water Institute
Meteorological Service	- Tanzania Meteorological Authority
Public Institutions and NGOs dealing with last mile communities (taking into account gender, children and disabled people)	- Prime Minister's office – Labour, youth empowerment and disabled persons - Vice President's Office (National Designated Authority) - Maasai Women Development Organization (MWEDO), which is a non-governmental women-led organization. MWEDO empowers women to enhance sustainable equitable and human development for grassroots Maasai women through access to Education, Women Economic Empowerment and maternal health and HIV/AIDS education - National Environment Management Council (NEMC) - Ministry of Community Development, Gender, Women and Special Groups
Other Non-government organizations	- Tanzania Water Partnership (TWP) - Nile Basin Discourse - Regional Basin Water Boards, including the Wami/Ruvu Basin Water Board - Catchment and Sub-catchment Water Committes - Community-based Water Supply Organizations - Water Users Associations - Tanzania Water and Sanitation Networks (TAWASANET) - Saadani National Park - Water Resources Board of Urban and Built Up Areas (WRBUB) - Shahidi Wa Maji Civil Society Organization - Association of Tanzania Water Suppliers
UN agencies working in the country in related subjects	- UNESCO – Natural Science Programme - UNESCO – Intergovernmental Hydrological Programme (IHP) Committee
Other development partners / donors and initiatives that are implementing related projects in the country	- Trans-African Hydro-Meteorological Observatory (TAHMO) - German Development Agency (GIZ) - African Development Bank (AfDB) - World Wildlife Fund (WWF) - KFW Development Bank - African Wildlife Foundation (AWF)

Innovators/Manufacturers (public and private / startups)	- Private innovators such as (i) Ennovate ventures and (ii) Sahara ventures, as the private organization dealing with innovation/software development - Other incubators/accelerators such as (i) WISE Futures and (ii) GWP Tanzania - Public institutions, represented by (i) Dar es Salaam Institute of Technology (DIT) and (ii) Arusha Technical College (ATC)
Academia	- Tanzania Commission for Science and Technology - University of Dar es Salaam/Water Resources Engineering Department - Sokoine University of Agriculture - Water Institute - Nelson Mandera
Neighbouring countries	- Nile Equatorial Lakes Subsidiary Action Programme (NELSAP) - Joint Songwe River Basin Commission (Tanzania and Malawi) - Nile Basin Secretariat (Nile Sec)- Entebbe, Uganda - Zambezi Water Course Commission (ZAMCOM) – covering Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia and Zimbabwe
Local communities	- Communities surrounding Dodoma - Communities in Morogoro - Communities surrounding Dar-es-Salaam
14.b. The Gambia	
Hydro-related institutions	- Ministry of Fisheries and Water Resources/Department of Water Resources - Hydrology Division
Meteorological Service	- Ministry of Fisheries and Water Resources/Department of Water Resources - Meteorology Division
Public Institutions	- Ministry of Fisheries and Water Resources and National Assembly Matters - Ministry of Environment, Climate Change & Natural Resources - Ministry of Petroleum and Energy - Ministry of Agriculture - Ministry of Gender, Children and Social Welfare - Department of Fisheries - Ministry of Trade, Industry, Regional Integration and Employment - Ministry of Higher Education, Research, Science and Technology - Directorate of Development Planning under the Ministry of Finance and Economic Affairs - Gambia River Development Organization (OMVG) - Kanifing Municipal Council (KMC) - National Environmental Agency (NEA) - National Water & Electricity Company (NAWEC) - Public Utility Regulatory Authority (PURA) - National Disaster Management Agency (NDMA) - Banjul City Council (BCC)
Last mile communities (taking into account gender, children and disabled people)	- National Women Farmers' Association (NAWFA - National Farmers Platform The Gambia (NFPG) - Youth Volunteers for Environment (YVE) - Ministry of Gender, Children & Social Welfare - Kanifing Municipal Council (KMC) - National Water and Electricity Company Limited (NAWEC) - The Gambia Red Cross Society (GRCS)
Non-government organizations	- ActionAid International The Gambia - The Gambia Red Cross Society (GRCS) - National Rice Growers Association - The Gambia Country Water Partnership - The Central River Region – North
UN agencies working in the country in related subjects	- United Nations International Children's Emergency Fund (UNICEF) - World Health Organization (WHO) - UNESCO NATCOM - Food and Agriculture Organization of the United Nations (FAO) - United Nations Development Programme (UNDP) - World Food Programme (WFP)
Innovators/Manufacturers (public and private / startups) – incubators/ accelerators	- Sterling Consortium - Make3D Company Limited - Startup Incubator - The Gambia Chamber of Commerce and Industry (GCCI) - Gomindz start-up
Academia	- Kwame Nkrumah University of Science and Technology (KNUST) - Chamen Technical Training Center

	- The University of The Gambia (UTG) - QuantumNET Institute of Technology (QIT) - National Agricultural Research Institute (NARI) - The Gambia Technical Training Institute (GTTI) that being transformed into the University of Science, Engineering and Technology (USET) under the Africa Centre of Excellence programme
Neighbouring countries	- Department of Water Resources Planning and Management of Senegal (DGPRE) - Cheikh Anta Diop University of Dakar - University of Energy and Natural Resources of Ghana (UENR) - AGRHYMET Centre in Niger
Local communities	- Communities surrounding Banjul

K. Describe how the project/programme draws on multiple perspectives on innovation from e.g., communities that are vulnerable to climate change, research organizations, or other partners in the innovation space, in the context in which the project/programme would take place.

The proposed project draws on multiple perspectives on innovation, as follows:

From communities that are vulnerable to climate change: The specific needs of vulnerable communities, and the indigenous knowledge tend to be neglected in the preparation and implementation of projects. A people-centred approach is required to ensure that nobody is left behind. Through the 'Innovation Camps' (Component 2), civil society will be empowered (especially women and youth) to gain ownership and conceive solutions to societal issues of their concern. At the same time, crowdsourcing that is promoted under Component 1 ('Innovative Calls Project') can be used to gather indigenous knowledge and blend it with scientific data for decision-making. All these innovative aspects can be brought to the attention of the government and included in the legal framework (Component 4).

Academia and research organizations: There is a tendency of disconnect between the academia sector and public and private sectors; being the academia sector usually seen as the resource for getting an academic degree, or a source of an academic study without practical application. The proposed project, through Components 1 and 2, will support co-design of solutions with the private sector. These solutions will be developed based on operational requirements expressed by NMHSs (Component 3). At the same time, academia sector will be tasked to support the continuous technology infusion at NMHSs through a comprehensive training program (Component 3), and to do that, the capacity of the academia sector will be strengthen through Component 1.

Private sector: Components 1 ('Innovation Calls Projects' and co-design with the academia sector), 2 ('Innovation Camps') and 3 ('Innovation workshops' to facilitate interaction between NMHSs, academia and private sector) in hydromet is new for the local private sector, who has been developing such approaches in other topics/domains.

NMHSs: NMHSs for many years have been struggling to operate and maintain very sophisticated and costly networks; firstly, due to the high costs of the equipment and spare parts. Secondly, due to the need to acquire these equipment and spare parts from abroad, which again is costly and procurement processes are complex. Thirdly, due to the lack of expertise to operate and maintain such developed equipment. The 'Innovation Calls Projects' under Component 1 of the proposed project will support innovative, locally self-manufactured and with a low total cost of ownership of the equipment, parts and systems – this addresses the first two points. The continuous training through the support of the local academia sector (under Component 1) will allow continuous technology infusion at the NMHS. In addition, the acquired equipment abroad not always meet the requirements of the NMHS, so through Component 4, NMHSs have the possibility to express their requirements to the local research and private sectors.

Government stakeholders: A comprehensive and detailed cost-benefit analysis of hydromet services is critical to raise awareness of the NMHSs capacities and how their products and services support weather- and climate-sensitive sectors that are managed by other Government stakeholders – this will be done under Component 4.

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

The Adaptation Fund Results Framework Outcomes 1, 2, 3, 4, 7 and 8 are covered by the proposed project. A detailed table linking each component, outcomes and outputs is found in Part III, section F. below.

Component 1: Increased operational capacity of the NMHSs to provide fit for purpose hydrological data through the use of innovative monitoring approaches

Baseline scenario (without AF funding)

As indicated in section K. above, NMHSs for many years have been struggling to operate and maintain very sophisticated and costly networks. In addition, the academia sector has been teaching students on traditional monitoring approaches have been used. However, the advances in science and technology allow the development of new methods and technologies, but the countries in East and West Africa have not been making use of these methods and technologies in hydromet, in particular in hydrometric monitoring systems that are critical for early warning of extreme events (such as floods and droughts) that have been increasing in frequency and intensity/severity due to climate change.

Additionally (with AF funding)

AF resources will be used to: (i) enhance local trainings capacity, research and tailored technical guidance material to addressing specific technical expertise deficits related to hydrometric monitoring within the Regional Water Monitoring Innovation Hub, especially linked to the use of new instrumentation and methods; and (ii) support Innovation Calls Projects (involving collaborations between in-region and international operational and research partners) with a view of designing and prototyping innovative water monitoring solutions to NMHSs hydrometric challenges in countries within the 'Regional Water Monitoring Innovation Hub'. These innovative water monitoring solutions will be cost-effective, as they will be manufactured locally, and expertise will be built to support their operation and maintenance. Data generated from the innovative water monitoring solutions will support NMHSs' hydromet services, which in turn help governments take informed climate adaptation decisions.

Component 2: Enhanced public-private engagement in hydrometry leading to a strengthened commercial environment for local companies

Baseline scenario (without AF funding)

Public-private engagement has been growing in Tanzania and The Gambia, however, there have been very limited use of the new science and technologies in hydromet in both countries and also in East and West Africa. The private sector has limited knowledge of the needs of the NMHSs, and similarly, the NMHSs have limited knowledge on the capacities of the private sector. At the same time, the needs of the policy-makers and civil society, who have a significant role in the adaptation to climate change, have not been properly addressed.

Additionally (with AF funding)

AF resources will be used to: (i) assess the 'innovation environment' in both Hubs in order to understand how startups can successfully be stimulated in the Region (e.g. are there existing innovation incubators that could be used) and are there other companies that exist who, with support from the project, could move into hydrometric technologies; and (ii) establish Innovation Camps engaging Policy-makers in climate change adaptation, business/entrepreneurs (e.g. those identified from the assessment), academia to build research and innovation capacities in cooperation with business and government (while working with and for the local society in climate change adaptation), and civil society to empower citizens (especially women and youth) to gain ownership and conceive solutions to societal issues of their concern related to climate change adaptation.

Component 3: Enhanced regional cooperation for mutual technical assistance among NMHSs and other monitoring organizations within the region where the Innovation Hubs are established

Baseline scenario (without AF funding)

Weather and climate have no borders and extreme events can affect multiple countries in a region that share a similar climate. While agreements are in place for collaboration, the innovative solutions need to be brought to the attention of all countries in the regions where the Innovative Hubs are established.

Additionally (with AF funding)

AF resources will be used to (i) assess the capacities of NMHSs in the regions where the Innovative Hubs are established, and (ii) support the implementation of a training programme and learning staff exchanges.

Component 4: Increased political and institutional commitment for operational hydrology through improved stakeholder collaboration and engagement, including co-production of hydromet services

Baseline scenario (without AF funding)

Currently, there is limited understanding by decision-makers, legislators and water users of the actual benefits of the hydrological data-related investments in the context of climate change adaptation, and the potential use of such data for socioeconomic growth.

Additionally (with AF funding)

AF resources will be used to carry out a detailed cost-benefit analysis of the hydrological data-related investments with a view of developing business models/plans in support of climate change adaptation and socioeconomic sectors. Awareness-raising activities will also be supported.

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

The sustainability of the project will be ensured by the 'Regional Water Monitoring Innovation Hubs' and the full range of stakeholders who encompasses them. All Components of the proposed project have long-term impact potential and are designed in a sustainable way. Below there is a preliminary analysis of the sustainability of project outcomes; further details will be elaborated in the full project proposal.

Environmental sustainability: The project interventions support environmental sustainability via the generation of critical data for the integrated water resource management and restoring environmental resilience. In Component 2, a specific focus will be placed on enhancing peer-to-peer support across water monitoring organizations in each supported region as well as growing a network of research collaborations, private sector SMEs and start-ups with the capabilities to support monitoring operations that will generate the above-mentioned critical data.

Social sustainability: Social sustainability is ensured by developing skills (through all project Components), including gender considerations and maintaining close communication with local and national stakeholders. Under Component 2, there will be engagement of civil society/communities through the Innovation Camps. These will empower citizens (especially women and youth) to gain ownership and conceive solutions to societal issues of their concern. A gender-responsive stakeholder engagement strategy and action plan will be developed for continuous engagements with key stakeholders, including Civil Society Organizations (CSOs), private sector, government departments and local community representatives.

Technological sustainability: The development of the project is part of the WMO HydroHub and therefore its innovation solutions will be promoted among WMO Members.

Institutional sustainability: Under Output 1.1, there will be an enhancement of local training and research capacity, by empower the academic sector through (1) training-of-trainers; (2) reviewing and revising the curricula to of the academic sector to address the specific scientific, technical, and operational expertise deficits related to hydrometric monitoring. This will build a pool of local experts that would support training of new/future NMHSs' staff and retrain existing staff but introducing the innovative technologies and methods; and (3) encouraging and guiding joint NMHSs-private sector-academia research.

Component 3 will support learning staff exchange, which are critical due to the usual staff turn around in developing countries, and the need to ensure continuation of services.

Through component 4, the proposed project will support awareness-raising and visibility, which are important for government, sectors and communities to understand the benefits of hydromet services. This will help integrating hydromet services within bigger agendas in the countries, such as those related to climate change, disaster risk reduction, and socioeconomic growth.

Economic and Financial sustainability: Under Output 1.2, the 'Innovation Calls Projects' will support locally self-manufactured and with a low total cost of ownership of the equipment, parts and systems, which

will address a main issue for NMHSs regarding operation of the equipment and systems that are acquired abroad and stop to operate after the project lifetime, noting that their acquisition and maintenance are expensive, and developing countries cannot afford. Local private engagement will also contribute to sustainable investment.

The proposed project will also establish links and synergies with other projects for better integration of the activities and avoid overlaps, thereby contributing to reducing costs and ensuring long-term operation and maintenance.

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

As indicated in Part II, section D. above, the project activities have been screened for environmental and social risks in accordance with the 15 principles set out in the Adaptation Fund's Environmental and Social Policy (see **Annex 1**). According to the Adaptation Fund's classification, this project is expected to be Category B, noting that it includes Activities 1.2.3, 2.2.1 and 2.2.2 (which are USPs) that might have minor negative environmental or social impacts, but these still need to be assessed. As indicated in **Table 15** below, the principles were analysed based on consultations and meetings with all stakeholders, including local communities.

Table 15. Screening of the Environmental and social policy principles of the Adaptation Fund

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	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance. This will be assured by being a condition in the Terms of Reference (TOR) that will be launched for the 'WMO HydroHub Innovation Calls' and 'Innovation Camps'. The implementation of these activities will be monitored to ensure that existing national and transboundary laws, policies, and guidelines are respected when implementing innovative solutions, adaptation measures and capacity development activities (the USPs). The project will not require any prior legal and regulatory approvals for environmental and construction issues as no physical or structural construction is foreseen during the implementation of the project. So, no additional assessment is required.	Risk: Low Potential impact: Low
Access and Equity	The project will allow impartial and equitable access to its benefits. The project is designed to enable representatives of vulnerable and indigenous groups to participate in the development of the innovative solutions (through the 'Innovation Camps', USP) and in the implementation of crowdsourcing solutions (through the 'Innovative Calls Projects', USP). The selection of participants in these activities will be done in consultation with local practices and traditions. Pilot testing will ensure that all stakeholders, including vulnerable and indigenous groups, are involved. Even though these are USPs, no additional assessment is required.	Risk: Low Potential impact: Low

Marginalized and Vulnerable Groups	Local community members will be provided with information and explanation of the systems that will be put in place in order to participate in their development and contribute to their security, operation and maintenance. The benefits of the use of these systems will also be explained to them. Engagement of civil society in the 'Innovation Camps' will support the participation of marginalized and vulnerable groups and their ownership of the benefits of the project. Further assessment will be done during the implementation of the USPs.	Risk: Moderate Potential impact: Moderate There is a risk that vulnerable and marginalized groups do not have sufficient knowledge and access to technological devices such as mobile phones or lack of good telephone connection especially required for participating in engaging civil society. To avoid the exclusion of marginalized and vulnerable communities, several communication means must be explored in the 'Innovation Calls Projects' (USPs) in order to reach these groups, particularly women, girls, the elderly and disabled people. Further assessment will be done during the implementation of the USPs.
Human Rights	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance. So, no additional assessment is required. The proposed activities will not violate any of the established human rights. Besides, the proposed project will promote access to water and information, which are basic human rights. The project will also allow open discussion where everybody can give their opinion and express their needs.	Risk: Low Potential impact: Low
Gender Equity and Women's Empowerment	A Gender Assessment was realised in line with the Fund's Gender Policy (see **Annex 2**). The proposed project will promote gender equity and women's empowerment in all Components. Further assessment will be done during the implementation of the USPs (Activities 1.2.3, 2.2.1 and 2.2.2.).	Risk: Moderate Potential impact: Moderate The proposed project targets science and technology development, where men tend to hold most of the leadership positions. Women's participation is often limited due to cultural and social norms. The gender-responsive stakeholder engagement strategy included as one activity of this project will ensure that women and representatives of women's groups are fully involved. Nevertheless, further assessment will be done during the implementation of the USPs (Activities 1.2.3, 2.2.1 and 2.2.2.).
Core Labour Rights	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance. So, no additional assessment is required. The project will be implemented and managed in accordance with the labour laws of the target countries.	Risk: Low Potential impact: Low
Indigenous Peoples	The proposed project will engage with Indigenous people in Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs. Insufficient consideration of local communities' knowledge, practices, and needs when implementing follow-on projects could lead to a lack of community ownership, participation, and alignment with their priorities. In addition, inadequate consultation and engagement with relevant stakeholders, including vulnerable groups, during the implementation of follow-on projects may result in exclusion, negative perceptions, and resistance to project activities. Further assessment will be done during the implementation of the USPs (Activities 1.2.3, 2.2.1 and 2.2.2.).	Risk: Moderate Potential impact: Moderate The indigenous population of the area will be consulted and involved during the design and implementation of the project activities. The traditional knowledge of indigenous people on floods and droughts will be useful in decision-making. Nevertheless, further assessment will be done during the implementation of the USPs (Activities 1.2.3, 2.2.1 and 2.2.2.).

Involuntary Resettlement	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance. So, no additional assessment is required. The project will not create direct involuntary resettlement of communities.	Risk: Low Potential impact: Low
Protection of Natural Habitats	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance. So, no additional assessment is required. There are no potential direct risks to the protection of ecosystems, their natural habitats and biological diversity through project activities. On the contrary, the proposed project will generate data that can support protection of natural habitats.	Risk: Low Potential impact: Low
Conservation of Biological Diversity	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance. So, no additional assessment is required. There will be no direct risks associated with the conservation of biological diversity as the project will not involve any physical action on natural resources and will not introduce any known invasive species. On the contrary, the proposed project will generate data that can support conservation of biological diversity. The project activities will ensure that the principles of the Convention on Biological Diversity which has been signed by the participating countries are followed and supported.	Risk: Low Potential impact: Low
Climate Change	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance. So, no additional assessment is required. The project will not result in the emission of greenhouse gases into the atmosphere or deforestation, so there will be no impact on climate change. On the contrary, the proposed project will generate data that can support actions aimed at increasing the resilience of populations at the local level.	Risk: Low Potential impact: Low
Pollution Prevention and Resource Efficiency	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance. So, no additional assessment is required. The project activities are not expected to result in water, air, and soil pollution. The project will build technical and organisational capacity for water resource management with guidelines, policies, and action plans contributing to green and blue economies.	Risk: Low Potential impact: Low
Public Health	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance. So, no additional assessment is required. The project is not expected to have a negative impact on public health. On the contrary, it will contribute to monitoring the water quality to assist decision-makers in water supply, and preventing the population from hydromet disasters.	Risk: Low Potential impact: Low
Physical and Cultural Heritage	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance. So, no additional assessment is required. The project does not affect the physical and cultural heritage. The aim of the project is to develop better management of natural resources and to have traditional and cultural integration from civil society.	Risk: Low Potential impact: Low
Lands and Soil Conservation	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance. So, no additional assessment is required. The project	Risk: Low Potential impact: Low

	will help to improve agricultural practices through water data-driven decision-making.	

PART III: IMPLEMENTATION ARRANGEMENTS

A. Describe the arrangements for project / programme management at the regional and national level, including coordination arrangements within countries and among them. Describe how the potential to partner with national institutions, and when possible, national implementing entities (NIEs), has been considered, and included in the management arrangements.

The AF will provide resources to the WMO as the project Implementing Entity (IE) to effectively mobilize the NMHSs of Tanzania and The Gambia, and the UK Centre for Ecology & Hydrology (UKCEH) as Executing Entities (EE) for the activities. Roles and responsibilities are described below in **Table 16**.

Table 16. Roles and responsibilities of project Partners and other relevant entities.

Entity	Status	Project responsibilities
WMO	Implementing Entity (IE)	WMO is the Implementing Entity (IE) for the proposed project and will be responsible for overseeing the implementation, financial management, evaluation, reporting and closure of the activities under the project. WMO will monitor and supervise the execution of the project and ensure the proper management, application, and use of the AF funds by the Executing Entities. WMO will have the overall responsibility of the Project implementation and will ensure that the AF funds are utilized in accordance with the terms of the Agreement between the AF and WMO. International experts from across the WMO Membership will be deployed where appropriate (for example, as innovation mentors or deliver of train-the-trainer interventions). Also, synergies with universities and WMO Regional Training Centres (potentially the National Water Research Center (NWRC) in Cairo, AGRHYMET Centre in Niamey, among others) will be sought to ensure innovations can get supported both at the demonstration, instrument maintenance, calibration and operational levels. Compliance and quality control will be ensured through appropriate WMO Bodies e.g. the Commission for Observation, Infrastructure and Information Systems.
NMHSs of Tanzania and The Gambia	Executing Entities (EE)	The NMHSs of Tanzania and The Gambia will act as Executing Entities (EEs) for the proposed project, in their respective 'Regional Water Monitoring Innovation Hubs'. The NMHSs of Tanzania and The Gambia will play a key role in developing partnerships – with the other NMHSs and relevant organizations – within the 'Regional Water Monitoring Innovation Hubs' by taking the lead on consultations and hosting activities such as Learning Exchanges. They will also ensure cross-border coordination of activities and links with national structures.
UK Centre for Ecology & Hydrology (UKCEH) and its office in Africa	Executing Entity (EE)	The UK Centre for Ecology & Hydrology (UKCEH) office in Africa will act as other Executing Entity (EE) for the proposed project. The UKCEH will support specific needs and capacity assessments of Tanzania and The Gambia at national and sub-national levels, aligned with the competences required as per the WMO technical regulations, and will have an advisory role. The UKCEH involvement will be limited to technical support, while the actual implementation of activities will be done by the NMHSs of Tanzania and The Gambia. The UKCEH has a unique position in this process as it leads a number of WMO technical programmes and initiatives related to hydrometry, and therefore will ensure that proposed activities under the project are carried out according to WMO practices. For example, UKCEH is leading the implementation of HydroSOS in LVB basin, where Tanzania is participating, and where the status component of HydroSOS is linked to hydrometry. In addition, the UKCEH has a strong hydrometeorological experience and presence in East and West Africa, wherein it leads a few programmes and projects, and will work in partnership with the East Africa Community (EAC) and the Economic Community of West Africa States (ECOWAS) for the implementation on the ground. Noting that hydrometry is a very specialized subject and there aren't that many organisations around the world with such expertise and very few/none in Africa, it is expected that with UKCEH mentorship and technical

		assistance, through the successful implementation of the proposed project, in 5 years, we would build the expertise and capacities in hydrometry in Africa.
Private sector entities and Academia	National Partners	Potential private sector entities and academic institutions to be engaged in the proposed project have been identified. These are: • In Tanzania: o Private sector entities: "Ennovate Ventures" and "Sahara Ventures". These entities have a good background in system development, in-house team of system designers, system developers, copywriters, graphic designers work in synergy to uphold the highest standards for project planning and execution and are dedicated when it comes to building good systems for clients and beneficiaries (organizations, startups and companies) on-time and on-budget. These entities have built different systems (management, Internet of Things (IoT), websites, software etc.) for several brands in Tanzania with great success. o Academic institutions: "Water Institute", "University of Dar es Salaam", "Dar es Salaam Institute of Technology", "Arusha Technical College", and "Nelson Mandela African Institution of Science and Technology". These institutions run Vocation Programs, Diploma and have modules/programs that are directly related to hydrometeorology, including new technologies, artificial intelligence, and hydrometric instrumentation. • In The Gambia: o Private sector entities: "Gomindz" which is a Startup that focuses on bridging the gap between business and technology by leveraging innovative solutions to empower enterprises, provide data-driven infrastructures and solutions to optimize business operations. In addition, "The Gambia Chamber of Commerce and Industry (GCCI)" (which is a non-profit private sector organization whose membership is made up of companies from all sectors of the Gambian business community) has committed to be the focal point for the private sector in the proposed project. At the same time, the "Startup Incubator Center" (which is a co-working space for young entrepreneurs) has expressed the willingness in participate in the proposed project. o Academic institutions: "The Gambia Technical Training Institute (GTTI) / University of Science, Engineering and Technology (USET)" has expressed commitment to serve as a Hub for continuous training and the manufacturing of innovative monitoring sensors. These partners will be engaged in the project through Letters of Agreement, and specific role and budget have been allocated, as described in Table 26 below.
Riparian countries and joint Basin Commissions	Regional Partners	The NMHSs of riparian countries and joint Basin Commissions will act as Regional Partners for the proposed project, in their respective 'Regional Water Monitoring Innovation Hubs'. They will play a key role in providing inputs, gather requirements, participate in consultations and in Learning Exchanges within the 'Regional Water Monitoring Innovation Hubs'. They will also ensure cross-border coordination of activities and links with national structures. They will be beneficiaries of capacity building.
Local communities	Local partners	Local communities will play a key role in ensuring project ownership, efficiency, participatory and demand-driven development of hydrometric monitoring infrastructure and tools. They will be engaged through the 'Innovation Camps'.

A Project Management Unit (PMU) will be set up to support the development and implementation of the project activities, and to act as the Secretariat for the national Technical Working Groups (TWGs) in Tanzania and The Gambia, as well as the Project Steering Committee (PSC). The PMU will include the Project Manager to be placed at the WMO Regional Office of the UKCEH Office in Africa, and two National Project Coordinators to be placed at the NMHSs of Tanzania and The Gambia, all to be recruited by/for the project. An additional staff will be recruited for Environment and Social Impact Assessment of the USPs. The National Project Coordinators should have strong technical expertise and capacity in project management. They will be responsible for the overall project implementation and coordination at national and regional levels in their

respective 'Regional Water Monitoring Innovation Hub'. Amongst its mandate, the National Project Coordinators will: i) liaise with and report to project Partners (WMO, UKCEH, and NMHSs of Tanzania and The Gambia); ii) liaise and coordinate with the National Partners (academia, private sector and local communities) on specific interventions in each 'Regional Water Monitoring Innovation Hub'; iii) provide administrative and technical expertise; iv) be responsible for the day-to-day implementation and management of the project, and v) serve as the focal point for interactions between the project stakeholders and other partner organizations. In addition, every quarter, the PMU will be responsible to highlight good practices and/or lessons learned to be discussed during annual Project Steering Committee meetings.

A Project Steering Committee (PSC) will be set up to oversee and validate the implementation of the project activities in line with the expected results. It will be composed of representatives of the project partners (WMO, UKCEH, and NMHSs of Tanzania and The Gambia), Permanent Representatives of Tanzania and The Gambia with WMO, Hydrological Advisors, representatives of the Designated National AF Authorities, representative of the private sector from the HydroMeteorological and Environmental Industry, (HMEI), representatives of the WMO HydroHub Think-tank, representatives from Academia, representatives of Lake Commissions, and the representative of the WMO Regional Association I (Africa) Hydro Working Group. Other partners (e.g. research institutions) will be invited depending on the agenda of the meeting. Other stakeholders and development partners' representatives may also be invited as per the agenda of the meetings, as observers and at no-cost, to identify common synergies. The PSC will meet every year either face-to-face alternatively in Tanzania and The Gambia or virtually, preferably in conjunction with other activities for cost savings.

A Selection Committee for the 'WMO HydroHub Innocation Calls' and the 'Innovation Camps' will be comprised of the Project Manager, the National Project Coordinators, the representatives of the IE and EEs, the representatives of the Designated National AF Authorities, and an external/invited expert depending on the topic of the Calls and Camps.

The national Technical Working Groups (TWGs) in Tanzania and The Gambia (at no-cost) will also be set up. It will be composed of representatives of the national and regional stakeholders, and the staff of the PMU. The TWGs will be chaired by the National Project Coordinators and should meet virtually or in an hybrid format every 3 months and any other time, as required.

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

The WMO Secretariat, Technical Commissions, Regional Association I (Africa, RA I) Hydrology and Water Coordination Panel, and the RA I Committee on Infrastructure will provide support to the project team to carry out regular risk monitoring. Similarly, project activities and recorded results will be monitored, evaluated, and reported in the WMO internal monitoring system by Monitoring, Evaluation, Risk and Performance Unit of WMO. Financial and project risk measures will be assessed as a continuous process throughout the development of the project activities. The potential financial and project risks identified are listed in **Table 17**.

Table 17. Financial and project risks and possible mitigation measures

Risks	Rating	Risk Mitigation Measures
Political environment, including lack of political support and national/regional commitments	Low	Tanzania is the most politically stable country in East Africa; while The Gambia has experienced signific developments in its pollical situation in the last few years. Nevertheless, the risk of political volatility and civil unrest interrupting the project is low. Other political-related risks could include a lack of national governments' commitments to the project throughout its implementation, as different Presidents and Parliaments will be in place after the national elections in 2025 in Tanzania and 2026/2027 (President/Parliament) in The Gambia. This is unlikely as the project responds directly to key policy priorities in both countries that are not expected to be changed with the presence of a Cabinets. In addition, the project will be implemented through strong operational partnerships with a range of responsible partners, comprising government entities, academia and research institutions, private sector and civil society at different levels. Frequent interactions between the PMU, the TWGs in each 'Regional Monitoring Innovation Hubs', and the PSC, described in Part III – section A, will ensure a sentiment of full ownership amongst governments and other stakeholders. However, there is a risk that the Governments of

		Tanzania and The Gambia may not fully appreciate the need for sustained capacity development as an integral part of the project's sustainability strategy. To address this risk, the project will: (a) support the development of capacity at the national/regional academia, to be self-sustained, and ensuring continuous integration of skilled people in the market; (b) provide international twinning/mentoring to assist suitable entrepreneurs in developing the required capacities in relation to hydrometric monitoring and building their business case/model for potential grow and job creation; and (c) undertake detailed cost benefit analysis of the innovative solutions, showcase their results through the organization of awareness-raising activities for decision-makers, legislators, and water users, including through the 'WMO HydroHub Ministerial Roundtables', and provide recommendations for improved legal and regulatory frameworks. In addition, the project will deepen its ongoing capacity strengthening role to support key executing partners to deploy adaptive management in the event of any disruptive political risk.
Economic environment	Low	While the economies in Tanzania and The Gambia have started to grow again, they have not yet recovered from the stringent COVID-19 pandemic containment measures, including the prolonged lockdowns that immensely slowed progress in economic activities across sectors. Other external factor is the Russia-Ukraine War that has a global economic impact as it presents critical challenges that country leaders must resolve to limit yet more suffering through poverty, food shortages and the cost-of-living crisis. While these conditions create a difficult economic environment for business and for citizens, the project activities will assist in this regard by enhancing economic activities, developing the required capacities in relation to hydrometric monitoring and building suitable entrepreneurs' business case/model for potential grow and job creation. In addition, the project will not need to procure any equipment or large volume of inputs using foreign exchange. In the opposite, the project will support building the manufacture capacity on the ground in the two 'Regional Monitoring Innovation Hubs'.
COVID-19 Pandemic	Low	WHO declared the end of the Covid-19 pandemic in May 2023, as a global health emergency. However, the risk remains as new variants emerging that cause new surges in cases and even deaths. Should such a variant emerge, there is a chance that that borders could be temporarily closed and domestic movement restricted to reduce the risk of transmission, as happened with previous pandemic 'waves'. This could cause delays in the implementation of project activities. This risk will be mitigated by ensuring that appropriate local partnerships are managed for efficient implementation and employing remote working, virtual meetings and digital collaboration platforms, when possible. In addition, 2 of the EEs (NMHSs in Tanzania and The Gambia) are situated locally which helps in the event of international travel restrictions.
Financial management	Medium	Delays in the release of funds can result in the late start of the project as well as delays in its implementation. Financial management structures and processes at the Governments of Tanzania and The Gambia could cause inefficiency in project management and implementation. Procurement processes could be delayed, thus delaying recruitment of project staff and consultants needed for technical assistance. Procurement processes by the EEs are consistent with international standards and prescribed procedures to reduce mismanagement of funds. Mandatory checks and quality assurances at all levels of the project will also ensure implementation quality is maintained.
Inadequacies faced by NMHSs in Tanzania and The Gambia in the area of institutional management	Low	NMHSs in Tanzania and The Gambia have limited experience in managing projects with a large envelope. Therefore, the project will recruit additional staff as national project coordinators and use consultants to carry out some of the project's activities. In addition, the project will assess gaps and needs in the institutional, policy and legal frameworks and provide relevant support. The project will also assess training needs and ensure targeted skills are development.
Lack of human resources and skills at national level	Medium	The capacity of national partners needs to be assessed. Identify their difficulties and put in place the necessary technical assistance (external consultant), advisory support (by CEH and other WMO experts), provide capacity building (on-the-job training) to ensure support in the development of activities. The involvement of the academia and research institutions will support capacity building of the staff concerned, including innovations.
Lack of cooperation between NMHSs and other Project	Low/Medium	There are multiple benefits accrued from cooperation and collaboration between the various agencies at both national and regional/international levels. To ensure proper cooperation between required partners, the project

Executing Entities and national partners/stakeholders		will make it develops a project communication plan to get technical units involved and informed. The project will also establish focal points and national coordination units, with clarified roles and responsibilities at the start of the project.
Technology acceptance	Low	The technologies developed could not be accepted by all groups in the community, including gender, age or minority aspects and this hinders equality (or technologies not suitable for the region). To address this issue, the project includes a socially inclusive and gender, age and minority responsive approach in all activities. Where necessary, non-technological or traditional methods will be adopted to reach and involve each group in the community. The project will also use local expertise and knowledge. Communities will be involved in the project and consulted, especially through the 'Innovation Camps', to ensure that innovations and technologies are suitable for local conditions.
Adverse hydromet effects or extreme hydromet events that could delay the implementation of the project	Medium	There is a risk that increased occurrence of extreme weather events that will impact the implementation of the project. Therefore, the project will ensure that hydromet information is communicated and correctly interpreted by national partners and local communities. 'Innovation Camps' and any other field work in both countries will be planned to avoid the rainy seasons due to floods.

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

A detailed Environment and Social Impact Assessment (ESIA) was carried out to examine the proposed project activities against the 15 principles of the Adaptation Fund's Environmental and Social Policy. The project is categorized B, which indicates a few adverse impacts. This type of project is generally nonthreatening. However, a cross-analysis of the activities planned by the project and field surveys in Tanzania and The Gambia made it possible to identify the positive and negative impacts of the project, and propose mitigation or improvement measures according to the impact categories. The ESIA report is provided in **Annex 1**.

Environment and social risk management plan

The cross-analysis of the activities planned by the project and field surveys in the two countries made it possible to identify the positive and negative impacts of the project, and propose mitigation, compensation, or improvement measures according to the impact categories. The **Table 18** presents the identified risks and the mitigation measures.

Table 18. Identified risks and possible mitigation measures.

Checklist of environmental and social principles	Identified Risk	Level (Low, Medium, High)	Mitigation measures
1. Compliance with the Law	The project activities will be implemented in compliance with relevant laws, regulations and acts of the participating countries.	Low	Project activities do not need mitigation measures since they generate no risks.
2. Access and Equity	There is a risk that all project stakeholders will not have equal access to project benefits.	Low	The stakeholder mobilization activities envisaged by the project will enable vulnerable groups to benefit from the project. The project will promote the equitable access to activities and assets by women, youth, elders and people with disabilities in targeted communities as well as equal and inclusive participation from both men and women in decision making processes.
3. Marginalized and Vulnerable Groups	Vulnerable groups, in particular women and people with disabilities, expressed during the consultations their fears of being excluded from the benefits of the project, if appropriate inclusion measures are not taken by the project. This is particularly important in association with USPs.	Medium	The project will empower marginalized and vulnerable groups to make decisions on concrete adaptation actions, while strengthening their skills. Ensure in-depth consultations with communities and stakeholders are conducted throughout project implementation to ensure that there is broad buy-in to the targeting approach and that any barriers can be overcome in line with the AF's ESP.
4. Human Rights	Human Rights are inherent to everyone, regardless of gender,	Low	The project will mainstream training on Human Rights into all training activities.

	ethnicity, religion, and other status. All project activities will be implemented with strict respect for Human Rights.		
5. Gender Equity and Women's Empowerment	Due to their weak economic power and social prejudices, there is a risk that women will not participate in the same way as men in project activities.	Medium	The gender-responsive stakeholder engagement strategy included as one activity of this project will ensure that women and representatives of women's groups are fully involved. In addition, a gender plan has been prepared (**Annex 2**) to strengthen gender equality and project interventions will focus on promoting fair and equal development in the intervention areas.
6. Core Labor Rights	In response to any risk of mistreatment or discrimination, the project will at all times ensure workers' rights are respected at all times and upheld to international and national labor laws and codes. However, there might be a low risk associated with the USPs.	Low	The project will respect all labor agreements and ensure that its workers are treated fairly, while guaranteeing them safe and healthy working conditions. Ensure in-depth consultations with communities and stakeholders are conducted throughout project implementation to ensure that there is broad buy-in to the targeting approach and that any barriers can be overcome in line with the AF's ESP.
7. Indigenous People	There is a risk that Indigenous people will not participate in project activities due to lack of understanding. This is particular important in association with USPs.	Medium	The indigenous population of the area will be consulted and involved during the design and implementation of the project activities. The traditional knowledge of indigenous people on floods and droughts will be useful in decision-making. Ensure in-depth consultations with communities and stakeholders are conducted throughout project implementation to ensure that there is broad buy-in to the targeting approach and that any barriers can be overcome in line with the AF's ESP.
8. Involuntary Resettlement	The project will not create direct involuntary resettlement of communities.	Low	Project activities do not need mitigation measures since they generate no risks.
9. Protection of Natural Habitats	The project will not intervene in protected areas or implement activities that could fragment ecological corridors as nesting, refuge, feeding or resting sites.	Low	Project activities do not need mitigation measures since they generate no risks.
10. Conservation of Biological Diversity	The project will not intervene in protected sites and will aim to preserve biodiversity through better management of water resources.	Low	Project activities do not need mitigation measures since they generate no risks.
11. Climate Change	The project will not have any negative impact on climate change. The project does not promote any drivers of climate change. However, there might be a low to medium risk associated with: (a) The results or outcomes (false alarm or not sufficiently accurate warnings) of the proposed activity might occur after floods or drought events, and therefore, citizens and stakeholders will show less preparedness and interest in future events; (b) The lack of coordination between various stakeholders at different levels in flood or drought management, and therefore, the potential	Low	(a) Stakeholders and citizens will be consulted and provided with the short and long-term benefits of the project activities and with highlights of the lesson learnt and the ways in which it could be improved over the time; (b) The project partners will ensure the stakeholders are involved into coordination at all levels; (c) The data availability will be ensured through the involvement of stakeholders and communities, and through building synergies with the ongoing and future national and international projects (see list in Part II, section K.) on floods and drought management; (d) The project partners will provide support to manage and collect all the new information for drafting the (Return of Experience) report.

	benefits of project activities will be lower than expected; (c) Insufficient data on areas at risk of flooding or drought, and therefore, citizens and stakeholders will show less preparedness. The multiple recurrence of flood or drought events in some areas of Tanzania and The Gambia, and therefore, project activities will be hampered due to the involvement of stakeholders in response and recovery activities.		
12. Pollution Prevention and Resource Efficiency	The project will not pose any risks to resource efficiency or pollution for water, land or and other environmental components. However, there might be a low risk associated with the USPs.	Low	The project will build technical and organizational capacity for water resource management with guidelines, policies, and action plans contributing to green and blue economies. Targeting and implementation approaches that are highly tailored to each community.
13. Public Health	The project is aiming at reducing climate vulnerabilities and increase coping capacities of targeted communities through a climate risk management integrated approach. There is no risk that the project will cause public health issues.	Low	Project activities do not need mitigation measures since they generate no risks.
14. Physical and Cultural Heritage	The project does not involve activities likely to affect Physical and Cultural Heritage.	Low	Project activities do not need mitigation measures since they generate no risks.
15. Land and Soil Conservation	The project will not have negative impacts on lands and soil conservation.	Low	Project activities do not need mitigation measures since they generate no risks.

Environment and Social Compliance Plan

The Environment and Social Compliance Plan (ESCP) is presented in Table A.1.2.2., which proposes measures to comply with the ESP in general and specifically for the project Activities 1.2.3, 2.2.1 and 2.2.2 under E&S Category B. The ESCP is characterised by a meticulous strategy to integrate and uphold the 15 AF's ESP principles. Both the Project Manager and a specific staff at PMU will be responsible for oversight and compliance, including capacity building and awareness raising, and coordination with stakeholders and focal points at vulnerable communities.

Table A.1.2.2. Environment and Social Compliance Plan.

Project Activities under Category B	Measures to Avoid, Manage or Mitigate Risks
Overall Project	• A firm commitment to compliance with local, national and regional laws will be maintained, ensuring adherence to all relevant regional, national and local environmental and social regulations, and obtaining necessary Environmental Approvals for the activities 1.2.3, 2.2.1 and 2.2.2 (USPs); thus, establishing a robust legal foundation for the project. • The project will use or develop checklists as required, in particular for the implementation of activities 1.2.3, 2.2.1 and 2.2.2 (USPs). • The project will make sure that the beneficiary communities are actively engaged in planning, implementation and monitoring of the activities to ensure ownership and sustainability. • The project will comply with the AF's ESP principles throughout the implementation period and will continuously monitor compliance, reporting regularly and be ready for any course correction required. • An activity-specific ESIA and mitigation planning will be conducted for USPs, as elaborated below. • The compliance of ESP and implementation ESMP will be particularly evaluated through both Mid-Term Review and Terminal Evaluation.
Activity 1.2.3, 2.2.1 and 2.2.2	• A checklist will be used during the project implementation to assess the risks of proposed innovative monitoring solutions on sites where a prototype will be installed and

	identify/implement mitigation measures, in order to ensure that all USPs comply with the Adaptation Fund Environment and Social Policies. Regular monitoring and reporting to the Adaptation Fund will be in place. In particular, the 'WMO HydroHub Innovation Calls' have been identified to be "fully unidentified, within fixed framework", as there is a defined eligibility and criteria for the activities that are based on considerations for ESP and gender compliance. • A waste management plan will be developed, as appropriate/required. • Guidelines will be issued on the preparation of the action plans to ensure that they do not include actions that could have some negative social or environmental impacts and the action plans will be vetted by the project team; the action plans will prioritize nature-based solutions; in addition, support to implementation will be limited to soft support to assist the communities in advancing towards implementation and no hard infrastructure investment will be supported. • In-depth consultations with indigenous communities will be conducted for the locations where there will be Innovation Camps and installation of equipment. • The project will mainstream training to empower vulnerable communities. • The triggered AF's ESP principles 3, 6 and 7 will be fully complied with and reported for compliance, and any chance find issues.

E&S Impact Assessment (ESIA) and Risk Management for Unidentified Sub-Projects (USPs)

The ESIA of the project activities has been undertaken to ensure that potential impacts are identified, their significance assessed, and appropriate mitigation measures proposed to avoid or minimize such impacts within a reasonable timeframe, considering the necessary investment. However, the project includes a few activities identified as Unidentified Sub-Projects (USPs) that are not yet developed enough in terms of scope and geography for effective E&S impact assessment and mitigation planning. These USPs are related mainly to new solutions from the Innovation Calls, definition of locations for hydromet monitoring installation of prototypes and follow-on projects (Activities 1.2.3, 2.2.1 and 2.2.2) that may have some E&S impacts, though manageable. Nevertheless, the EEs will be responsible for undertaking meticulous mitigation planning and implementing the ESMP under the guidance of IE. In line with the AF, the following ESIA process will be adhered to regarding these USPs and will be implemented once the innovative solutions from the WMO Innovation Calls have been identified:

- **Screening:** Conducting a high-level analysis to determine whether a full scale ESIA is necessary. This step will help anticipating/predicting potential impacts and assessing if a detailed ESIA is required.
- **Scoping:** If a full scale ESIA will be needed, the required studies will be defined, identifying data gaps, determining the appropriate assessment scope, and suggesting suitable methodologies. In particular, for the installation of the new stations a checklist will be used during the project implementation/inception to assess the risks of the stations' sites and identify/implement mitigation measures.
- **Impact Anticipation/Prediction and Evaluation:** Analyzing the impacts identified during scoping to understand their nature, scale, extent and effect involving experts from relevant fields and consultations with local stakeholders, especially vulnerable communities. The significance of each impact will be judged to decide on the mitigation needs.
- **Mitigation:** Proposing measures to eliminate or reduce negative impacts of the USPs.
- **ESMP Implementation and Monitoring:** Developing an ESMP that outlines resources, roles, and responsibilities for managing impacts and implementing the mitigation measures. It will also include a timeline, resource identification, and a communication plan for progress disclosure. The monitoring requirements and indicators to assess mitigation success will also be defined.
- **Timeline:** Assessment is done immediately after the solutions from the Innovation Call have been identified.

A detailed grievance redness mechanism (see below) has also been included in this proposal to comply with AF's USP guidance. M&E arrangements are in alignment with the Fund's results Framework (see below).

Monitoring and evaluation program

Project Monitoring and Evaluation (M&E) will be under the oversight of the Project Management Unit (PMU) and the Project Manager and led by the M&E officers who will work closely with the implementing, executing and national partners. The M&E system should: (i) collect gender-disaggregated data in meeting the gender targets in compliance with the AF Gender Policy; collect data on the AF indicators; produce, organize and disseminate the information needed for the strategic management of the project; (ii) document the results

and lessons learned for internal use and for public dissemination on the achievements, and (iii) respond to the information needs of Adaptation Fund, Partners and the Governments on the activities, immediate outcomes and impact of the project. A Project Implementation Manual (PIM) including monitoring and evaluation will describe a simple and effective system for collecting, processing, analyzing and disseminating data. The PIM will be prepared project inception, i.e. within the first 6 months of project implementation.

Monitoring and Evaluation aims, on the one hand, to inform that the proposed actions are implemented as planned and within the established deadlines and, on the other hand, that the expected results are achieved. When deficiencies or difficulties are observed, Monitoring and Evaluation will make it possible to initiate the appropriate corrective measures. A monitoring plan will be drawn up which will indicate the monitoring parameters, benchmarks and designate the persons or institutions who will be in charge of the monitoring activities.

Arrangements for the monitoring and evaluation of environmental and social activities will be part of the overall monitoring program for the entire project.

Major responsibilities for actors for Environmental and Social Risks monitoring for project and sub-project activities as well as for implementing adequate measures through ESRMP are presented in **Table 19**.

Table 19. Responsibility for Actors for Environmental and Social Risks monitoring for project and sub-project activities as well as for implementing adequate measures through ESRMP.

Actor involved	Responsibility/Assignments for risks identification and monitoring under project/sub-project activities	Supporting Entity	Responsibility/Assignments for implementing measures
PMU, with the support of project Partners	Development of Environment and Social Management systems (ESMS) comprising: (i) identification (screening of compliance with ESP of AF and national laws) environment and social risks for the sub-project activities; (ii) preparation of ESIA and ESRMP for the sub-projects prior to the start of the sub- projects activities; and, (iii) regular monitoring and dissemination of the ESIA and ESRMP (with grievance mechanism) for the sub- projects and projects.	- Executing Entities - External consultant - National Environment and Social agencies in each country	- Ensure safeguard action are defined in compliance with the national regulations and implemented for the activities which can create social and environmental risks - Supervise the implementation of the response activities under the ESRMP in coordination with the bodies responsible for the management of water, environment and social welfare of each country - Monitor the progress of the risks minimizing actions or measures with the executing partners - Carry out further assessment for the risks which have been encountered to avoid similar cases in other activities
Project Partners	- Support for the study - Contact lists of people to consult for ESIA in the countries - Inception and validation meeting of the ESIA report - Distribution and awareness of the ESIA and ESRMP report to the stakeholders - Ensure USPs comply with the Environment and social principles and policies	- Executing Entities - National Environment and Social agencies in each country - Implementing Entity (Environment and Social Expert)	- Follow-up of the study and implementation of the activities of the ESRMP in relation to the bodies responsible for the management of water and environment of each country - Monitor the progress of the risks minimizing actions and measures with the help of checklists or consultation - Carry out Environment and Social Impact Assessments for USPs (Activity 1.1.2)
National Public Partners	- Provide support for the study - Divulge information on the potential risks which could result - Inception and validation of the ESIA report - Track performance, adoption and impact of the winning solutions from the Innovation Calls; this will be assessed either by accuracy of the data produced, leadtime for generating data, etc.	- Executing Entities - External consultant	- Identify potential risks which could result from the activities at the very initial stages especially at the design or planning stage - Monitor the implementation of the activities during and after the completion - Implement supportive actions to the populations in order to leverage the impact
Private sector and Academia	- Provide support for the study - Contribution to identification of the safeguard action through evidence-based knowledge - Divulge information on the potential risks which could result	- Executing Entities - External consultant	- Implement supportive actions in order to leverage the impact

	- Assess economic benefits and quantified based on number of job created and number of entrepreneurship opportunities		

Grievance Redress Mechanism (GRM)

AF's Grievance Redress Mechanism

The Adaptation Fund Board established the Ad Hoc Complaint Handling Mechanism (ACHM) to promote accountability of the Fund and help respond to complaints raised against a project or programme financed by the Adaptation Fund through a participatory approach. The ACHM complements the Fund's risk management framework, including the Grievance Redress Mechanism of Implementing Entity (IE). Ideally, the IE's grievance mechanism should be used as a first step; however, the ACHM of the Adaptation Fund can be directly used in cases where the Parties have failed to reach a mutually satisfactory solution through the IE's' grievance mechanism within a year. The complaints can also be directly submitted to the secretariat of the Adaptation Fund at the following address:

Adaptation Fund Secretariat/Board
c/o Global Environment Facility
MSN P-4-400 1818 H Street NW Washington DC 20433 USA
Tel: +1.202.478.7347
Fax: +1.202.522.3240
Email: afbsec@adaptation-fund.org

IE's Grievance Redress Mechanism applied to projects

WMO will implement a grievance mechanism in the target areas, which will allow an accessible, transparent, fair and effective means of communicating if there are any concerns regarding project design and implementation. This is relevant to all project activities, but particularly important in association with Activities 1.2.3, 2.2.1 and 2.2.2, which are USPs. The Grievance mechanism will be in place for the project employees, beneficiaries of and people affected (non-beneficiaries) by the project to address or report any criticism, complaints or discrimination.

This mechanism considers the special needs of different groups as well as gender considerations and potential environmental and social risks. The objectives of this mechanism are:

- To establish a transparent and responsive grievance mechanism that ensures the meaningful participation of all community members, regardless of gender.
- To make all stakeholders aware of the grievance mechanism and how to file a grievance if needed.
- To address and resolve grievances in a fair, timely, and equitable manner.
- To use the grievances and feedback received as an opportunity for continuous improvement in project implementation.

There are several means through which one can report the concerns they may have or find during activity design and implementation, or any suggestion for improvement. These are: i) anonymous mailboxes at community level; ii) a trained local facilitator in each community who can listen to grievances while assuring anonymity; iii) regular mail directly to the Designated Authorities, Implementing Entity (WMO), Executing Entities (CEH and NMHSs of Tanzania and the Gambia), and Funding Agency (Adaptation Fund); and iv) a dedicated telephone number will be available so that the concerns are reported anonymously anytime and can be addressed in a short time. In addition, complaints/grievances books will be provided at the level of the focal point of NMHSs, the main towns of rural communities, the sub-prefectures, prefectures office. These options allow people to make their grievance in their own language, with options for illiterate people or people with low levels of literacy. This approach recognizes that internet and smart phone penetration is not universal in the region. There will be a process to send all level grievances to IE' grievance focal point.

Any stakeholder involved with the project can use any event, workshop, training or any other initiative organized by the project, either in public (i.e., through open floor discussion) or in private (i.e., discretely with WMO or executing entity staff involved with the workshop) to raise a grievance verbally. In addition, at the end of every activity, there will be a feedback mechanism through short survey questionnaire to receive comments or suggestions from the participants (individually or in groups) to improve the shortcomings in future activities. The response and feedback to any concerns will be carried out in a transparent and effective manner, making sure that the identity of the person will be kept confidential. The redress process will be carried out by the Grievance Committee established within the Project Management Unit (PMU), which will hear the complaints, provide solutions, and reduce unnecessary litigation by resolving disputes through mediation. The Committee will be responsible for preparing and explaining to the communities the potential project impacts and negotiating with the project proponent on any matter that may be of interest at the implementation stage. Members of the Grievance Committee include the Project Manager, representatives of each EE, the expert on GRM hired by the project and representatives of the communities. In particular, the communities shall play a role in the Committee through representatives headed by Chief/Head of the Community, who will carry out the following as regards redressing grievances:

- Hear the grievances of the targeted people and provide early solutions to those they are able to;
- Immediately bring any serious matters to the attention of the Grievance Redressing Committee/Focal Points;
- Inform the aggrieved parties about the progress of their grievances and the decisions of the Grievance Redressing Committee/Focal Points, and Grievance Redressing Committee/Focal Points address grievances.

The complaints reported or received will be handled by the Grievance Committee, who will investigate firstly through an on-site visit. The visiting team may invite other relevant agencies (local/national/transboundary) to participate in the investigation. During the investigation, the root causes of the risks or issues will be identified and the concerned individuals or agencies responsible for correcting or resolving the issue will be assigned. The Committee will produce a report of its findings such as causes of issues, involvement of concern agencies, time taken to resolve, recommendations and actions. Complainants may request or will be sent a copy of the reports related to the complaint. All the complaints (if received any) and measures taken will be stored in a database of the PMU and will also be reported to the Adaptation Fund along with the yearly progress report provided by the Implementing Entity.

The overall process includes six steps, as follows:

- *Step 1: Grievance reception/acceptance* – directly to IE, EEs, PMU, Grievance Committee, or box at the communities. Whoever receives, will send to IE, who is the ultimate responsible for the GRM process.
- *Step 2: Acknowledgment, assessment and record* – The plaintiff receives confirmation that his grievance has been received. The grievance is entered in the database using a grievance registry form, and relevant management is notified.
- *Step 3: Investigation* – Appropriate investigation is decided by IE, in consultation with the EEs, at the assessment stage. If deemed necessary, the investigation can include a risk assessment. The investigation may include follow-up meetings between stakeholders and PMU (lead by the IE), where an impartial party is present. Minutes are recorded and added to the grievance database.
- *Step 4: Decision-making* – Depending on the findings and their severity, a resolution is often decided immediately. In cases where the resolution does not follow predetermined criteria, the case must be presented to management at the IE for review and advice.
- *Step 5: Complaint satisfaction* – **Yes:** The process concludes with a written agreement signed by the plaintiff(s) and Project Manager. **No:** The issue is shared with senior management at the IE. If unresolved, it is taken to the WMO Oversight Office. If unresolved, it is taken up to an impartial mediator. If it remains unresolved, legal action may be taken.
- *Step 6: Documentation management* – Throughout the procedure, it is of the highest importance that documentation is kept at PMU and in the WMO database.

To comply with national law and ensure compatibility between the grievance mechanism adopted by the project, and the national requirements for grievance mechanisms, a higher level for grievance redress (for country of the complaint and the IE) is the Court of Law. When all the forms of alternative dispute resolution fail, the law courts represent the last resort for an aggrieved person. Under this project the courts also represent the last resort when the Grievance Committee fail to bring a satisfactory outcome.

At the Implementing Entity level, the grievance mechanism will be regularly monitored for the complaints from the beneficiaries or stakeholders who will share their feedback directly through regular mail, phone, fax or email using the details below.

World Meteorological Organization (WMO)
7bis, avenue de la Paix
Case Postale No. 2300
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Furthermore, there is an online form can be filled in for reporting and to receive prompt action or fulfil the needs of the beneficiaries.

D. Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan.

Monitoring and evaluation measure the progress and overall impact of project activities through developed key performance indicators for all the key aspects of the project including gender equality and social inclusion. The programme of actions to be carried out within the framework of the project will include a list of indicators of achievement of these actions as well as the means of verification.

Monitoring and Evaluation arrangements for Project Activities

The overall responsibility for project monitoring, evaluation and reporting will rest with WMO, who will guide the Monitoring and Evaluation (M&E) in each Regional Monitoring Innovation Hub. M&E arrangements for project activities, including responsible actors are provided in **Table 20**. These arrangements will support the Project Steering Committee in implementing and adjusting the project activities, as appropriate. The M&E system will be based on a gender disaggregated data collection (wherein the baseline and target to be achieved are defined in the Results Framework of the Project – see Part 3, section E. below) and reported against each project Component, Outcome and Output.

Table 20. M&E arrangements for project activities, including responsible actors.

Institutional level	By whom / responsible actors	End-result and means of verification
National/ Regional level M&E activities / EEs (NMHSs in Tanzania and The Gambia)	National Project Coordinators, local staff of NMHSs, Water Resources Units, National/ Regional External M&E experts	Updated M&E checklists with the national project progress reports through interviews and target groups discussions, field visits, consultations and activity reports
Other EE (CEH) and IE (WMO)	Project Manager, Internal and External M&E experts	National project progress reports, interviews and target groups discussions, field visits, consultation, activity reports, 'WMO HydroHub Innovation Calls' Announcements and Reports

Monitoring and Evaluation arrangements for Project Management

The Project Management Unit (PMU) will be made available with monitoring and evaluation tools of project activities and resources. The PMU under the Implementing Entity (IE, WMO) will ensure that the Executing Entities (EEs) have adequate resources and capacity to measure and monitor results at the local, national and regional levels. The quarterly monitoring and annual evaluation reports of the EEs (NMHSs of Tanzania and The Gambia) along with the financial statements and resource management will be submitted to the IE and further to the Adaptation Fund Secretariat for the review (**Table 21**).

The following will be the key project monitoring and evaluation and reporting activities:

- **Inception planning:** The project will begin with an inception period of six months. Inception activities will include developing and signing agreements with the relevant stakeholders and partners, recruitment and introduction of key staff. The inception period will also involve: (i) planning and stakeholder engagement for setting up / activating the relevant coordination mechanisms/structures including the PSC and the national TWGs; (ii) setting up of project accounts; and (iii) holding an inception workshop. The inception workshop will be held to develop the first year workplan and detailed budget, and further refine implementation approaches, including targeting approaches; and develop systems/tools including for M&E, community engagement, academia involvement, private sector arrangements, tailoring the grievance/complaints and feedback mechanisms, and approving standard operating procedures (SOPs) to clarify roles of the stakeholders and partners that will be developed before the inception workshop. All planning, monitoring and reporting templates shall be validated during the inception workshop and endorsed by the Project Steering Committee.
- **Baseline Report:** The project baseline assessment will be conducted within the first months of the project to establish necessary baseline values for measuring indicators set out in the results framework. As part of the baseline assessment, there will be a full stakeholders' mapping to ensure that any projects, programmes or other initiatives, or stakeholders that may be critical to project success, are captured and incorporated into the plan for project implementation. The planning for the baseline assessment will be done as part of the inception process.
- **Quarterly reports:** Monitoring will be carried out after each trimester and reports will be prepared with key results achieved, issues encountered or potential problems and proposed solutions.
- **Annual Reports:** Annual report will be prepared to monitor the progress in the time period of twelve months. This will be useful to monitor progress made in different activities. The annual report will be presented by the programme leader to the Steering committee to assess the overall progress and provide their suggestions or feedback.

- **Mid-term Assessment Report:** The project will conduct the mid-term review after 2,5 years of kick-off to get the feedback of external experts. Adjustments and/or reorientations of certain activities will then be made if necessary.
- **Final Evaluation or Project Termination Report:** Two months prior to the completion of the project, an independent evaluation will be conducted to check the overall impact of the project. The final evaluation report will be developed and presented to the Adaptation Fund secretariat, project steering committee and other stakeholders.

Table 21. Monitoring and evaluation activities (Budget estimates are provided as part of the EEs' fees presented in Part III, section G., Table 26)

Monitoring & Evaluation Activity List	Calendar Year																			
	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q 1	*Q 2*	*Q 3*	*Q 4*	*Q 1*	*Q 2*	*Q 3*	*Q 4*	*Q 1*	*Q 2*	*Q 3*	*Q 4*	*Q 1*	*Q 2*	*Q 3*	*Q 4*	*Q 1*	*Q 2*	*Q 3*	*Q 4*
Baseline, design, development and review of Monitoring & Evaluation tools	■																			
Monitoring the programme activities and outputs		■		■		■		■		■		■		■		■		■		
Mid-term Evaluation										■										
Improvement or additional changes in Evaluation tool											■									
Final evaluation																				■
Final Project Audit																				■

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

Table 22 provides the results framework for the overall project at the Component impact level, while **Table 23** provides the detailed results framework of the project, which defines the key performance indicators and means of verification for each component, outcome, output, and activity.

Table 22. Results framework for the overall project at the Component impact level

Project Impact	Key Performance Indicators (KPIs) with Gender disaggregation	Baseline (2024)	Target Achievements	Means of Verification	Assumptions
Increased resilience of the population in Africa by improving hydromet services through two "Regional Water Monitoring Innovation Hubs" in Africa with advanced uptake of innovative hydrometric approaches	"Regional Water Monitoring Innovation Hubs" established in Africa (Tanzania and The Gambia) [Yes/No] Number (#) of new, adapted or improved hydrometric monitoring solutions developed through the WMO HydroHub Innovation Calls (~AF8.1) Number (#) of individuals or organizations (disaggregated by gender and by youth/non-youth) that submit an application to WMO HydroHub Innovation Calls (~AF8.3) Number (#) of key findings on effective, efficient hydrometric monitoring practices, tools, and technologies generated from the Innovation Camps (~AF8.2) Flood and drought related information generated and disseminated to stakeholders [Yes/No] (~AF1.) Capacity of staff to monitor climate-related events from NMHSs increased [Yes/No] (~AF2.1)	No "Regional Water Monitoring Innovation Hubs" in Africa One WMO HydroHub Innovation Calls issued and implemented in Tanzania (2021-2022) that needs to be scalled up; no WMO HydroHub Innovation Calls issued and implemented in The Gambia No Innovation Camps on hydrometric monitoring in place Limited capacity to generate, monitor and disseminate hazard information to stakeholders	"Regional Water Monitoring Innovation Hubs" in Africa (Tanzania and The Gambia) At least 4 WMO HydroHub Innovation Calls issued and rolled out in Tanzania (2) and The Gambia (2) At least 8 individuals or organizations *[of which 30% are women and 50% are youth]* submitted an application to WMO HydroHub Innovation Calls At least 4 key findings on effective, efficient hydrometric monitoring practices, tools, and technologies generated from the Innovation Camps Flood and drought related information generated and disseminated to stakeholders Capacity of staff to monitor climate-related events from NMHSs increased	Progress reports Monitoring and Evaluation Reports WMO HydroHub Innovation Calls Announcements and Reports Reports of the Innovation Camps Reports of Training events; surveys at beginning and end of Training events; List of participants	Government support; strong involvement and ownership of key actors Active involvement of stakeholders, including communities Risks: lack of engagement of communities
Component 1. Increased operational capacity of the NMHSs to provide fit for purpose hydrological data through the use of innovative monitoring approaches	Number (#) of new, adapted or improved hydrometric monitoring solutions developed through the WMO HydroHub Innovation Calls (~AF8.1) Number (#) of individuals	No "Regional Water Monitoring Innovation Hubs" in Africa One WMO HydroHub Innovation Calls issued and implemented in Tanzania (2021-2022) that needs to be scalled up; no	2 "Regional Water Monitoring Innovation Hubs" in Africa (Tanzania and The Gambia) At least 4 WMO HydroHub Innovation Calls issued and rolled out in Tanzania (2) and The Gambia (2)	Progress reports Monitoring and Evaluation Reports WMO HydroHub Innovation Calls Announcements and Reports	Government support; strong involvement and ownership of key actors Active involvement of stakeholders, including communities

	or organizations (disaggregated by gender and by youth/non-youth) that submit an application to WMO HydroHub Innovation Calls (~AF8.3) Flood and drought related information generated and disseminated to stakeholders [Yes/No] (~AF1.) Capacity of staff to monitor climate-related events from NMHSs increased [Yes/No] (~AF2.1)	WMO HydroHub Innovation Calls issued and implemented in The Gambia Limited capacity to generate, monitor and disseminate hazard information to stakeholders	At least 8 individuals or organizations *[of which 30% are women and 50% are youth]* submitted an application to WMO HydroHub Innovation Calls Flood and drought related information generated and disseminated to stakeholders Capacity of staff to monitor climate-related events from NMHSs increased	Reports of the Innovation Camps Reports of Training events; surveys at beginning and end of Training events; List of participants	Risks: lack of engagement of communities
Component 2. Enhanced public-private engagement in hydrometry leading to a strengthened commercial environment for local companies	Number (#) of "learning and sharing" innovation initiatives (Innovation Camps) undertaken to improve dialogues and exchanges within the Regional Water Monitoring Innovation Hubs and beyond (~AF8.2) Number (#) of individuals or organizations (disaggregated by gender and by youth/non-youth) that submit an application to WMO HydroHub Innovation Calls (~AF8.3) Capacity of staff to monitor climate-related events from NMHSs increased [Yes/No] (~AF2.1)	No Innovation Camps related to hydrometric monitoring established and organized in the Hubs Limited institutional and human capacities in hydrometric monitoring	At least 2 Innovation Camps established and organized in the Hubs *[in which 30% of the participants are women and 50% are youth]* At least 4 key findings generated from the Innovation Camps At least 4 institutions (2 NMHSs and 2 entrepreneurs) with increased capacity in hydrometric monitoring	Progress reports Monitoring and Evaluation Reports Reports of the Innovation Camps in both Hubs Reports of Training events; surveys at beginning and end of Training events; List of participants	Government support; strong involvement and ownership of key actors Active involvement of stakeholders, including communities Risks: lack of engagement of communities
Component 3. Enhanced regional cooperation for mutual technical assistance among NMHSs and other monitoring organizations within the region where the Innovation Hubs are established	"Regional Water Monitoring Innovation Hubs" established in Africa (Tanzania and The Gambia) [Yes/No] Number (#) of key findings on effective, efficient hydrometric monitoring practices, tools, and technologies generated from the dialogue between public, private and academic	No "Regional Water Monitoring Innovation Hubs" in Africa Limited dialogue between public, private and academic sectors on hydrometric monitoring practices, tools, and technologies	"Regional Water Monitoring Innovation Hubs" in Africa (Tanzania and The Gambia) At least 4 key findings on effective, efficient hydrometric monitoring practices, tools, and technologies generated from the dialogue between public, private and academic sectors in the "Regional Water	Progress reports Monitoring and Evaluation Reports Reports of Workshops and other events in both Hubs	Government support; strong involvement and ownership of key actors Active involvement of stakeholders, including communities Risks: lack of engagement of communities

	sectors in the "Regional Water Monitoring Innovation Hubs" and beyond (~AF8.2)		Monitoring Innovation Hubs" and beyond		
Component 4. Increased political and institutional commitment for operational hydrology through improved stakeholder collaboration and engagement, including co-production of hydromet services	Number (#) of key findings on effective, efficient hydrometric monitoring practices, tools, and technologies generated from the WMO HydroHub Ministerial Roundtables in the "Regional Water Monitoring Innovation Hubs" and beyond (~AF8.2) Proposed recommendations for improved NMHSs' roles and responsibilities in national climate change related policies and strategies [Yes/No] (~AF7)	No WMO HydroHub Ministerial Roundtables in place in the "Regional Water Monitoring Innovation Hubs"	At least 4 key findings on effective, efficient hydrometric monitoring practices, tools, and technologies generated from the WMO HydroHub Ministerial Roundtables in the "Regional Water Monitoring Innovation Hubs" and beyond Proposed recommendations for improved NMHSs' roles and responsibilities in national climate change related policies and strategies	Progress reports Monitoring and Evaluation Reports Reports of Workshops and other events in both Hubs	Government support; strong involvement and ownership of key actors Active involvement of stakeholders, including communities Risks: lack of engagement of communities

Table 23. Results framework of the project in association with the outcomes and outputs

Outcomes/ Outputs	Key Performance Indicators (KPIs) with Gender disaggregation	Baseline (2024)	Target Achievements	Means of Verification	Assumptions
Component 1. Increased operational capacity of the NMHSs to provide fit for purpose hydrological data through the use of innovative monitoring approaches					
Outcome 1. Improved and sustained technical expertise of NMHSs staff and uptake of innovative technologies	Number (#) of new, adapted or improved hydrometric monitoring solutions developed through the WMO HydroHub Innovation Calls (~AF8.1) Number (#) of individuals or organizations (disaggregated by gender and by youth/non-youth) that submit an application to WMO HydroHub Innovation Calls (~AF8.3) Number (#) and type of institutions with increased capacity in hydrometric monitoring that contribute to minimize exposure to climate variability risks (~AF2.1)	One WMO HydroHub Innovation Calls issued and implemented in Tanzania (2021-2022) that needs to be scalled up; no WMO HydroHub Innovation Calls issued and implemented in The Gambia Limited institutional and human capacities to maintain and operate hydrometric monitoring infrastructure and tools	At least 4 WMO HydroHub Innovation Calls issued and rolled out in Tanzania (2) and The Gambia (2) At least 8 individuals or organizations *[of which 30% are women and 50% are youth]* submitted an application to WMO HydroHub Innovation Calls At least 4 institutions (2 NMHSs and 2 academia) with increased capacity in hydrometric monitoring	Progress reports Monitoring and Evaluation Reports WMO HydroHub Innovation Calls Announcements and Reports	Government support; strong involvement and ownership of key actors Active involvement of stakeholders, including communities Risks: lack of engagement of communities
Output 1.1 Enhanced local trainings capacity, research and tailored technical guidance	Number (#) of training course curricula developed that address scientific, technical and operational aspects of	Limited institutional and human capacities to maintain and operate	At least 2 training course curricula developed At least 4 innovation	Training course curricula Progress reports	Government support; strong involvement and ownership of key actors

material to addressing specific technical expertise deficits related to hydrometric monitoring within the Regional Water Monitoring Innovation Hub (e.g. linked to the use of new instrumentation)	innovative hydrometric monitoring solutions Number (#) of innovation related partnerships leveraged for exchange of services or ideas, consultations, and assistance between grantee and stakeholder/s (private sector, academia, NMHSs, EEs) (~AF8.1.2) Number (#) of trainings delivered Percentage (#) of staff trained (disaggregated by gender and by youth/non-youth) (~AF2.1)	hydrometric monitoring infrastructure and tools	related partnerships established At least 4 innovation-related trainings delivered At least 80% of the NMHS staff dealing with hydrometric monitoring trained *[of which 30% are women and 50% are youth]*	Monitoring and Evaluation Reports Training reports, materials and list of participants	Active involvement of stakeholders
Output 1.2 Enhanced management and operationalization of instrumentation/hydrological equipment and other hydrometric monitoring aspects through Innovation Calls projects (involving collaborations between in-region and international operational and research partners) implemented to find and operationalize innovative water monitoring solutions to NMHSs hydrometric challenges within the Regional Water Monitoring Innovation Hub	Number (#) of comprehensive and detailed assessments and inventories of the hydrometric monitoring systems Number (#) of applications (individuals or organizations) to WMO HydroHub Innovation Calls under the project/programme (~AF8.3.1) Number (#) of learning materials from the implementation of the WMO HydroHub Innovation Calls (~AF8.2.2) Relevant hazard information generated and disseminated to stakeholders [Yes/No] (~AF1.) Number (#) of Early Warning Systems Number (#) of beneficiaries Assets produced, developed, improved, or strengthened [Yes/No] Increased income, or avoided decrease in income [Yes/No]	Assessment of elements of the hydrometric monitoring systems exist in Tanzania and The Gambia, as well as in transboundary Lake Basins and transboundary Aquifers; however, there is lack of comprehensive and detailed assessments and inventories covering surface water, groundwater and water quality One WMO HydroHub Innovation Calls issued and implemented in Tanzania (2021-2022) that needs to be scalled up; no WMO HydroHub Innovation Calls issued and implemented in The Gambia Limited capacity to generate and disseminate hazard information to stakeholders	At least 2 comprehensive and detailed assessments and inventories of the hydrometric monitoring systems At least 4 applications to WMO HydroHub Innovation Calls At least 4 WMO HydroHub Innovation Calls issued in Tanzania (2) and The Gambia (2) Relevant hazard information generated and disseminated to stakeholders At least 1 Early Warning System established in each Hub At least 6 direct beneficiaries (the selected winners of the WMO Innovation calls) and total population of The Gambia and Tanzania, and their neighbouring countries as indirect beneficiaries Assets produced, developed, improved, or strengthened	Reports of the comprehensive and detailed assessments and inventories of the hydrometric monitoring systems Progress reports Monitoring and Evaluation Reports	Government support; strong involvement and ownership of key actors Active involvement of stakeholders

	Natural assets protected or rehabilitated [Yes/No]		Increased income, or avoided decrease in income Natural assets protected or rehabilitated		
Component 2. Enhanced public-private engagement in hydrometry leading to a strengthened commercial environment for local companies					
Outcome 2. Locally designed, manufactured and maintained capabilities exist in both countries to service water monitoring needs across their regions	Number (#) of new, adapted or improved adaptation solutions (Innovation Camps) developed contextually and with the inclusion of the communities most vulnerable to climate change (disaggregated by gender and by youth/non-youth) (~AF8.1) Number (#) of "learning and sharing" innovation initiatives (Innovation Camps) undertaken to improve dialogues and exchanges within the Regional Water Monitoring Innovation Hubs and beyond (~AF8.2) Number (#) and type of institutions with increased capacity in hydrometric monitoring that contribute to minimize exposure to climate variability risks (~AF2.1)	No Innovation Camps related to hydrometric monitoring established and organized in the Hubs Limited institutional and human capacities in hydrometric monitoring	At least 2 Innovation Camps established and organized in the Hubs *[in which 30% of the participants are women and 50% are youth]* At least 4 key findings generated from the Innovation Camps At least 4 institutions (2 NMHSs and 2 entrepreneurs) with increased capacity in hydrometric monitoring	Reports of the Innovation Camps in both Hubs Progress reports Monitoring and Evaluation Reports	Government support; strong involvement and ownership of key actors Active involvement of stakeholders, including communities Risks: lack of engagement of communities
Output 2.1. International twinning/mentoring bring together hydro monitoring institutions and startups that innovate from across the world to assess their suitability to address identified hydrometric challenges in The Gambia and Tanzania. Selected startups will benefit from pump priming grants to grow both public and private sector capability and linkages with the research sector, with the potential to lead to job creation	Number (#) of key findings generated from the assessments of the 'innovation environment' in both Hubs Number (#) of innovation related partnerships leveraged for exchange of services or ideas, consultations, and assistance between grantee and stakeholder/s (NMHSs, EEs) (~AF8.1.2)	Limited understanding of the 'innovation environment' in both Hubs Limited institutional and human capacities in hydrometric monitoring	At least 4 key findings generated from the assessments of the 'innovation environment' in both Hubs At least 2 innovation related partnerships established	Reports of the assessments of the 'innovation environment' in both Hubs Progress reports Monitoring and Evaluation Reports	Government support; strong involvement and ownership of key actors Active involvement of stakeholders
Output 2.2 Innovation Camps and other activities established to	Number (#) of Innovation Camps related to hydrometric monitoring established and	No Innovation Camps related to hydrometric monitoring established	At least 2 Innovation Camps established and organized in the Hubs	Reports of the Innovation Camps in both Hubs	Government support; strong involvement and ownership of key actors

bring together public and private entities to support the development, manufacturing and maintenance of digital and physical monitoring technologies	organized in the Hubs Number (#) of key findings generated from Innovation Camps related to Hydrometric monitoring (~AF8.2.1) Modification of behavior of the population of the communities involved in the Innovation Camps in relation to the Hydrometric monitoring [Yes/No] (~AF3.2)	and organized in the Hubs Limited understanding and knowledge of the communities regarding hydrometric monitoring	At least 4 key findings generated from the Innovation Camps Behavior of the population of the communities involved in the Innovation Camps modified in relation to the Hydrometric monitoring	Progress reports Monitoring and Evaluation Reports	Active involvement of stakeholders, including communities Risks: lack of engagement of communities
Component 3. Enhanced regional cooperation for mutual technical assistance among NMHSs and other monitoring organizations within the region where the Innovation Hubs are established					
Outcome 3. Improved dialogues and exchanges within Regional Water Monitoring Innovation Hubs and beyond	Number (#) of key findings on effective, efficient hydrometric monitoring practices, tools, and technologies generated from the dialogue between public, private and academic sectors in the "Regional Water Monitoring Innovation Hubs" and beyond (~AF8.2) "Regional Water Monitoring Innovation Hubs" established in Africa (Tanzania and The Gambia) [Yes/No]	Limited understanding and knowledge of innovative solutions for hydrometric monitoring within the Regional Water Monitoring Innovation Hubs	At least 4 key findings generated from the dialogues and exchanges within the Regional Water Monitoring Innovation Hubs and beyond	Reports of events Progress reports Monitoring and Evaluation Reports	Government support; strong involvement and ownership of key actors Active involvement of stakeholders
Output 3.1 Organization of Learning Staff Exchanges to facilitate and guide learning exchanges among NMHSs within a Regional Water Monitoring Innovation Hub in view of addressing specific common hydrometric challenges	Number (#) of learning and sharing initiatives (Training and Learning Staff Exchanges on hydrometric monitoring) undertaken (disaggregated by gender and by youth/non-youth) (~AF8.2.2) Centres of Excelence in hydrometry established within the Regional Water Monitoring Innovation Hub Capacity of staff on hydrometric monitoring that contribute to mitigate impacts of climate-related events increased [Yes/No] (~AF2.1.2)	Limited understanding and knowledge of innovative solutions for hydrometric monitoring within the Regional Water Monitoring Innovation Hubs	At least 2 Training and Learning Staff Exchanges on hydrometric monitoring delivered/implemented *[in which 30% of the participants are women and 50% are youth]* Capacity of staff on hydrometric monitoring that contribute to mitigate impacts of climate-related events increased	Reports of the Training and Learning Staff Exchanges on hydrometric monitoring, materials and lists of participants Progress reports Monitoring and Evaluation Reports	Government support; strong involvement and ownership of key actors Active involvement of stakeholders
Output 3.2. Organization of Innovation Workshops to bring together NMHSs, academia, private sector (solution providers) and others, and facilitate targeted interactions	Number (#) of learning and sharing initiatives (Innovation Workshops among public, private and academic sectors to identify challenges to be addressed by Innovation Calls) undertaken	Limited understanding and knowledge of innovative solutions for hydrometric monitoring within the Regional Water Monitoring Innovation Hubs	At least 4 Innovation Workshops among public, private and academic sectors to identify challenges to be addressed by Innovation Calls	Reports of the Innovation Workshops, and lists of participants	Government support; strong involvement and ownership of key actors Active involvement of stakeholders

among them in a way that allows NMHSs to express their operational challenges and needs, and the private sector to tailor their solutions to operational realities of NMHSs	(disaggregated by gender and by youth/non-youth) (~AF8.2.2)				
Component 4. Increased political and institutional commitment for operational hydrology through improved stakeholder collaboration and engagement, including co-production of hydromet services					
Outcome 4. Increased support to NMHSs through budget and Water Legislations, and fit-for-purpose innovative hydrometric technologies and user-oriented hydromet services	Number (#) of key findings on effective, efficient hydrometric monitoring practices, tools, and technologies generated from the WMO HydroHub Ministerial Roundtables in the "Regional Water Monitoring Innovation Hubs" and beyond (~AF8.2) Number (#) of recommendations for improved NMHSs' roles and responsibilities in national climate change related policies and strategies (~AF7.1)	Limited understanding and knowledge of the infrastructure and services needs	At least 4 key findings generated from the WMO HydroHub Ministerial Roundtables and the WMO Regional HydroHub User-provider Workshops	Reports of events Progress reports Monitoring and Evaluation Reports	Government support; strong involvement and ownership of key actors Active involvement of stakeholders
Output 4.1 Organization of Ministerial Roundtables in each country of the Regional Water Monitoring Innovation Hubs that will showcase the comprehensive results and recommendations of national cost-benefit analysis of hydrological data investments	Number (#) of Cost-Benefit Analysis (CBA) of the innovation project/programme in the Hubs and of the hydrological data investments Number (#) of learning and sharing initiatives (WMO HydroHub Ministerial Roundtables) undertaken, including communication initiatives (disaggregated by gender and by youth/non-youth) (~AF8.2.2)	No CBA of the innovation project/programme in the Hubs developed No WMO HydroHub Ministerial Roundtables undertaken in the Hubs	2 CBA developed At least 2 WMO HydroHub Ministerial Roundtables undertaken *[in which 30% of the participants are women and 50% are youth]*	CBA documents Reports of the WMO HydroHub Ministerial Roundtables; and lists of participants	Government support; strong involvement and ownership of key actors Active involvement of stakeholders
Output 4.2 Organization of User-provider Workshops and Webinars, to bring together NMHSs, public and private sectors (users of hydromet services) and facilitate targeted interactions among them, including for identifying and developing new markets for NMHSs services	Number (#) of learning and sharing initiatives (WMO Regional HydroHub User-provider Workshops and webinars) undertaken (disaggregated by gender and by youth/non-youth) (~AF8.2.2)	Limited understanding and knowledge of the infrastructure and services needs	At least 2 WMO Regional HydroHub User-provider Workshops, involving NMHSs, public and private sectors (users of hydromet services) [in which 30% of the participants are women and 50% are youth] At least 2 WMO HydroHub User-Provider webinars [in which 30% of the	Reports of the WMO Regional HydroHub User-provider Workshops and webinars; list of participants	Government support; strong involvement and ownership of key actors Active involvement of stakeholders

			participants are women and 50% are youth]		

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

The Adaptation Fund Results Framework Outcomes 1, 2, 3, 4, 7 and 8 are covered by the project. **Table 24** provides the links between each component, outcome and output with the Results Framework of the Adaptation Fund.

Table 24. Alignment of the project components, outcomes and outputs with the Results Framework of the Adaptation Fund.

Project Impact and Components	Project Objective Indicator(s)	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
Component 1. Increased operational capacity of the NMHSs to provide fit for purpose hydrological data through the use of innovative monitoring approaches	Number (#) of new, adapted or improved hydrometric monitoring solutions developed through the WMO HydroHub Innovation Calls (~AF8.1)	**Outcome 8:** Support the development and diffusion of innovative adaptation practices, tools and technologies	8. Innovative adaptation practices are rolled out, scaled up, encouraged and/or accelerated at regional, national and/or subnational level	$ 1 705 000,00
	Number (#) of individuals or organizations (disaggregated by gender and by youth/non-youth) that submit an application to WMO HydroHub Innovation Calls (~AF8.3)			
	Flood and drought related information generated and disseminated to stakeholders [Yes/No] (~AF1.)	**Outcome 1:** Reduced exposure to climate-related hazards and threats	1. Relevant threat and hazard information generated and disseminated to stakeholders on a timely basis	
	Number (#) and type of institutions with increased capacity in hydrometric monitoring that contribute to minimize exposure to climate variability risks (~AF2.1)	**Outcome 2:** Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	2.1. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	
Component 2. Enhanced public-private engagement in hydrometry leading to a strengthened commercial environment for local companies	Number (#) of new, adapted or improved adaptation solutions (Innovation Camps) developed contextually and with the inclusion of the communities most vulnerable to climate change (disaggregated by gender and by youth/non-youth) (~AF8.1)	**Outcome 4:** Increased adaptive capacity within relevant development sector services and infrastructure assets	4.1. Responsiveness of development sector services to evolving needs from changing and variable climate	$ 876 500,00
		Outcome 8: Support the development and diffusion of innovative adaptation practices, tools and technologies	8. Innovative adaptation practices are rolled out, scaled up, encouraged and/or accelerated at regional, national and/or subnational level	
	Number (#) of "learning and sharing" innovation initiatives (Innovation Camps) undertaken to improve dialogues and exchanges within the Regional Water Monitoring Innovation Hubs and beyond (~AF8.2)	**Outcome 3:** Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.1. Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses	
	Capacity of staff to monitor climate-related events from NMHSs increased [Yes/No] (~AF2.1)	**Outcome 1:** Reduced exposure to climate-related hazards and threats	1. Relevant threat and hazard information generated and disseminated to stakeholders on a timely basis	
		Outcome 2: Strengthened institutional capacity to reduce	2.1. Capacity of staff to respond to, and mitigate impacts of, climate-	

		risks associated with climate-induced socioeconomic and environmental losses	related events from targeted institutions increased	
Component 3. Enhanced regional cooperation for mutual technical assistance among NMHSs and other monitoring organizations within the region where the Innovation Hubs are established	Number (#) of key findings on effective, efficient hydrometric monitoring practices, tools, and technologies generated from the dialogue between public, private and academic sectors in the "Regional Water Monitoring Innovation Hubs" and beyond (~AF8.2)	**Outcome 8:** Support the development and diffusion of innovative adaptation practices, tools and technologies	8. Innovative adaptation practices are rolled out, scaled up, encouraged and/or accelerated at regional, national and/or subnational level	$ 771 500,00
		Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.1. Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses	
		Outcome 4: Increased adaptive capacity within relevant development sector services and infrastructure assets	4.1. Responsiveness of development sector services to evolving needs from changing and variable climate	
	"Regional Water Monitoring Innovation Hubs" established in Africa (Tanzania and The Gambia) [Yes/No]	**Outcome 2:** Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	2.1. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	
Component 4. Increased political and institutional commitment for operational hydrology through improved stakeholder collaboration and engagement, including co-production of hydromet services	Number (#) of key findings on effective, efficient hydrometric monitoring practices, tools, and technologies generated from the WMO HydroHub Ministerial Roundtables in the "Regional Water Monitoring Innovation Hubs" and beyond (~AF8.2)	**Outcome 8:** Support the development and diffusion of innovative adaptation practices, tools and technologies	8. Innovative adaptation practices are rolled out, scaled up, encouraged and/or accelerated at regional, national and/or subnational level	$ 737 000,00
	Recommendations for improved NMHSs' roles and responsibilities in national climate change related policies and strategies [Yes/No] (~AF7)	**Outcome 3:** Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.1. Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses	
		Outcome 7: Improved policies and regulations that promote and enforce resilience measures	7. Climate change priorities are integrated into national development strategy	
Project Outcome(s)	**Project Outcome Indicator(s)**	**Fund Output**	**Fund Output Indicator**	**Grant Amount (USD)**
Outcome 1. Improved and sustained technical expertise of NMHSs staff and uptake of innovative technologies	Number (#) of new, adapted or improved adaptation solutions (WMO HydroHub Innovation Calls) developed contextually and with the inclusion of the communities most vulnerable to climate change (~AF8.1)	**Output 8:** Viable innovations are rolled out, scaled up, encouraged and/or accelerated and/or evidence base generated at regional, national, and/or subnational level	8.1.1 No. of innovators supported (disaggregated by gender (male/female/other) and youth status (youth/non-youth))	$ 1 705 000,00
	Number (#) of individuals or organizations (disaggregated by gender and by youth/non-youth) that submit an application to WMO HydroHub Innovation Calls (~AF8.3)		8.3.1 No. of applications (individuals or organizations) to innovation calls under the project or programme	

	Number (#) and type of institutions with increased capacity in hydrometric monitoring that contribute to minimize exposure to climate variability risks (~AF2.1)	**Output 1.1:** Risk and vulnerability assessments conducted and updated	1.1.2. No. of early warning systems (by scale) and no. of beneficiaries covered	
		Output 2.1: Strengthened capacity of national and sub-national centres and networks to respond rapidly to extreme weather events	2.1.2 No. of targeted institutions with increased capacity to minimize exposure to climate variability risks (by type, sector and scale)	
Outcome 2. Locally designed, manufactured and maintained capabilities exist in both countries to service water monitoring needs across their regions	Number (#) of new, adapted or improved adaptation solutions (Innovation Camps) developed contextually and with the inclusion of the communities most vulnerable to climate change (disaggregated by gender and by youth/non-youth) (~AF8.1)	**Output 4:** Vulnerable development sector services and infrastructure assets strengthened in response to climate change impacts, including variability	4.1.1. No. and type of development sector services modified to respond to new conditions resulting from climate variability and change (by sector and scale)	$ 876 500,00
		Output 8: Viable innovations are rolled out, scaled up, encouraged and/or accelerated and/or evidence base generated at regional, national, and/or subnational level	8.1.1 No. of innovators supported (disaggregated by gender (male/female/other) and youth status (youth/non-youth))	
	Number (#) of "learning and sharing" innovation initiatives (Innovation Camps) undertaken to improve dialogues and exchanges within the Regional Water Monitoring Innovation Hubs and beyond (~AF8.2)		8.2.2 No. of learning and sharing initiatives undertaken, including communication initiatives	
		Output 3.2: Strengthened capacity of national and subnational stakeholders and entities to capture and disseminate knowledge and learning	3.2.1 No. of technical committees/associations formed to ensure transfer of knowledge	
	Number (#) and type of institutions with increased capacity in hydrometric monitoring that contribute to minimize exposure to climate variability risks (~AF2.1)	**Output 1.1:** Risk and vulnerability assessments conducted and updated	1.1.2. No. of early warning systems (by scale) and no. of beneficiaries covered	
		Output 2.1: Strengthened capacity of national and sub-national centres and networks to respond rapidly to extreme weather events	2.1.2 No. of targeted institutions with increased capacity to minimize exposure to climate variability risks (by type, sector and scale)	
Outcome 3. Improved dialogues and exchanges within Regional Water Monitoring Innovation Hubs and beyond	Number (#) of key findings on effective, efficient hydrometric monitoring practices, tools, and technologies generated from the dialogue between public, private and academic sectors in the "Regional Water Monitoring Innovation Hubs" and beyond (~AF8.2)	**Output 8:** Viable innovations are rolled out, scaled up, encouraged and/or accelerated and/or evidence base generated at regional, national, and/or subnational level	8.2.1 No. of key findings generated from an innovation practice, tool, and/or technology	$ 771 500,00
		Output 3.2: Strengthened capacity of national and subnational stakeholders and entities to capture and disseminate knowledge and learning	3.2.1 No. of technical committees/associations formed to ensure transfer of knowledge	
		Output 4: Vulnerable development sector services and infrastructure assets strengthened in response to climate change impacts, including variability	4.1.1. No. and type of development sector services modified to respond to new conditions resulting from climate variability and change (by sector and scale)	

	"Regional Water Monitoring Innovation Hubs" established in Africa (Tanzania and The Gambia) [Yes/No]	**Output 2.1:** Strengthened capacity of national and sub-national centres and networks to respond rapidly to extreme weather events	2.1.2 No. of targeted institutions with increased capacity to minimize exposure to climate variability risks (by type, sector and scale)	
Outcome 4. Increased support to NMHSs through budget and Water Legislations, and fit-for-purpose innovative hydrometric technologies and user-oriented hydromet services	Number (#) of key findings on effective, efficient hydrometric monitoring practices, tools, and technologies generated from the WMO HydroHub Ministerial Roundtables in the "Regional Water Monitoring Innovation Hubs" and beyond (~AF8.2)	**Output 8:** Viable innovations are rolled out, scaled up, encouraged and/or accelerated and/or evidence base generated at regional, national, and/or subnational level	8.2.1 No. of key findings generated from an innovation practice, tool, and/or technology	$ 737 000,00
		Output 3.2: Strengthened capacity of national and subnational stakeholders and entities to capture and disseminate knowledge and learning	3.2.1 No. of technical committees/associations formed to ensure transfer of knowledge	
	Number (#) of recommendations for improved NMHSs' roles and responsibilities in national climate change related policies and strategies (~AF7.1)	**Output 7:** Improved integration of climate-resilience strategies into country development plans	7.1. No. of policies introduced or adjusted to address climate change risks (by sector)	
			7.2. No. of targeted development strategies with incorporated climate change priorities enforced	

G. Include a detailed budget with budget notes, broken down by country as applicable, a budget on the Implementing Entity management fee use, and an explanation and a breakdown of the execution costs.

The total budget of the proposed project is estimated at USD 5,269 Million for the development of activities in the two 'WMO Regional Monitoring Innovation Hubs', including an amount of USD 478,000 for project execution and an amount of USD 479,000 to cover the expenses of the implementing entity. The detailed budget for the activities is provided in **Table 25**, the breakdown of the project cycle management fees charged by the Implementing Entity is provided in **Table 26**, and the breakdown of the project Execution costs is provided in **Table 27**. The budget allocations for WMO, NMHS of Tanzania and the Gambia, and UKCEH related to project activities are distributed as follows:

- WMO: 1 216 000 USD (who runs the WMO Innovation Calls)
- NMHS of Tanzania: 1 093 000 USD
- NMHS of The Gambia: 1 093 000 USD
- UKCEH: 688 000 USD

Table 25. Detailed budget for the activities.

Outcome/Output	Activities	Budget Category	Budget Year 1 (USD)	Budget Year 2 (USD)	Budget Year 3 (USD)	Budget Year 4 (USD)	Budget Year 5 (USD)	Total Budget of the Activity (USD)	Budget Notes
Component 1. Increased operational capacity of the NMHSs to provide fit for purpose hydrological data through the use of innovative monitoring approaches									
Outcome 1. Improved and sustained technical expertise of NMHSs staff and uptake of innovative technologies									
Output 1.1 Enhanced local trainings capacity, research and tailored technical guidance material to addressing specific	**1.1.1** Undertake a detailed analysis of the training capacities related to hydrometric monitoring and related fields in the	National consultations	$ 20 000,00					$ 20 000,00	Meetings and workshops with stakeholders
		Technical Assistance	$ 20 000,00	$ 20 000,00				$ 40 000,00	Contractual services with Academia
		Advisory Support	$ 10 000,00	$ 10 000,00				$ 20 000,00	By CEH and other WMO experts

technical expertise deficits related to hydrometric monitoring within the Regional Water Monitoring Innovation Hub (e.g. linked to the use of new instrumentation)	academia sector in Tanzania and The Gambia, and develop supportive courses (e.g. using digital and Innovation Hub) to address the specific scientific, technical, and operational expertise deficits related to hydrometric monitoring	Travel	$ 2 500,00	$ 2 500,00				$ 5 000,00	Travel of CEH and other WMO experts
		Miscellaneous		$ 1 000,00				$ 1 000,00	Publications, communication materials, etc.
	1.1.2 Organize (1) twinning arrangements between the academic sector within the countries covered by each Regional Water Monitoring Innovation Hub and relevant international partners (e.g. WMO Regional Training Centres based at other universities), and (2) training-of trainers to ensure that all required human capacities in the academic sector are built and/or enhanced, considering gender equity (Training and R&D activity)	National consultations	$ 20 000,00					$ 20 000,00	Meetings and workshops with stakeholders
		Technical Assistance	$ 20 000,00	$ 20 000,00	$ 20 000,00	$ 20 000,00		$ 80 000,00	Contractual services with Academia
		Advisory Support	$ 10 000,00		$ 10 000,00			$ 20 000,00	By CEH and other WMO experts
		Travel	$ 2 500,00		$ 2 500,00			$ 5 000,00	Travel of CEH and other WMO experts
		Training		$ 60 000,00	$ 60 000,00	$ 60 000,00		$ 180 000,00	Training workshops
		Miscellaneous	$ 1 000,00	$ 1 000,00	$ 1 000,00	$ 1 000,00		$ 4 000,00	Publications, communication materials, etc.
	1.1.3 Organize twinning arrangements between the academic and the private sector within the countries covered by each Regional Water Monitoring Innovation Hub, with technical guidance and supervision by an international partner, for research and co-design of the innovative solutions, and development of training courses and materials to support their	National consultations	$ 20 000,00					$ 20 000,00	Meetings and workshops with stakeholders
		Technical Assistance	$ 20 000,00	$ 20 000,00	$ 20 000,00	$ 20 000,00		$ 80 000,00	Contractual services with Academia
		Advisory Support	$ 10 000,00		$ 10 000,00			$ 20 000,00	By CEH and other WMO experts
		Travel	$ 2 500,00		$ 2 500,00			$ 5 000,00	Travel of CEH and other WMO experts
		Training		$ 60 000,00	$ 60 000,00	$ 60 000,00		$ 180 000,00	Training workshops
		Miscellaneous	$ 1 000,00	$ 1 000,00	$ 1 000,00	$ 1 000,00		$ 4 000,00	Publications, communication materials, etc.

	operationalization by NMHSs (Training and R&D activity)								
	1.1.4 Develop a capacity development plan and collaborative agreements/ MoU between the NMHS and the academic sector to ensure regular training/ retraining of NMHS staff for sustainability of the investments (Training and R&D activity)	Technical Assistance	$ 30 000,00					$ 30 000,00	Contractual services with Academia
		Advisory Support	$ 10 000,00					$ 10 000,00	By CEH and other WMO experts
		Miscellaneous	$ 1 000,00					$ 1 000,00	Publications, communication materials, etc.
Output 1.2 Enhanced management and operationalization of instrumentation/hydrological equipment and other hydrometric monitoring aspects through Innovation Calls projects (involving collaborations between in-region and international operational and research partners) implemented to find and operationalize innovative water monitoring solutions to NMHSs hydrometric challenges within the Regional Water Monitoring Innovation Hub	**1.2.1** Undertake a detailed assessment of the hydrometric monitoring systems in Tanzania and The Gambia, as well as in transboundary Lake Basins and transboundary Aquifers, and prepare an inventory of the available station equipment and data acquisition, transmission and processing systems	Field Visists	$ 10 000,00					$ 10 000,00	By national expert(s)
		National consultations	$ 20 000,00					$ 20 000,00	Meetings and workshops with stakeholders
		Technical Assistance	$ 30 000,00	$ 30 000,00				$ 60 000,00	Contractual services with individual expert
		Advisory Support	$ 10 000,00	$ 10 000,00				$ 20 000,00	By CEH and other WMO experts
		Travel	$ 2 500,00	$ 2 500,00				$ 5 000,00	Travel of CEH and other WMO experts
		Miscellaneous		$ 1 000,00				$ 1 000,00	Publications, communication materials, etc.
	1.2.2 Assess and identify vulnerable indigenous communities that could engage in (i) innovative approaches for data acquisition; and (ii) equipment security, operation and maintenance	Field Visists	$ 10 000,00					$ 10 000,00	By national expert(s)
		National consultations	$ 20 000,00					$ 20 000,00	Meetings and workshops with stakeholders
		Technical Assistance	$ 30 000,00	$ 30 000,00				$ 60 000,00	Contractual services
		Advisory Support	$ 10 000,00	$ 10 000,00				$ 20 000,00	By CEH and other WMO experts
		Travel	$ 2 500,00	$ 2 500,00				$ 5 000,00	Travel of CEH and other WMO experts
		Miscellaneous		$ 1 000,00				$ 1 000,00	Publications, communication materials, etc.
	1.2.3 Develop and implement WMO HydroHub Innovation Calls (Hardware and Software – development and testing of prototypes – please see Note below)	WMO HydroHub Innovation Calls (New Calls)	$ 15 000,00	$150 000,00	$150 000,00	$150 000,00		$ 465 000,00	Grants to be provided to the WMO HydroHub Innovation Calls Winners
		WMO HydroHub Innovation Calls (solutions	$ 15 000,00	$ 50 000,00	$ 50 000,00	$ 50 000,00		$ 165 000,00	Grants to be provided to the WMO HydroHub Innovation Calls Winners

		that will be leveraged)							
		Environment and Social Assessment, and ESMP implementation for USPs	$ 15 000,00	$ 15 000,00	$ 15 000,00	$ 15 000,00		$ 60 000,00	Technical assistance provided by na Environment and Social Impact Assessment Expert (for Unidentified Sub-projects)
		Advisory Support	$ 5 000,00	$ 10 000,00	$ 10 000,00	$ 10 000,00		$ 35 000,00	By CEH and other WMO experts
		Miscellaneous		$ 1 000,00	$ 1 000,00	$ 1 000,00		$ 3 000,00	Publications, communication materials, etc.
Component 2. Enhanced public-private engagement in hydrometry leading to a strengthened commercial environment for local companies									
Outcome 2. Locally designed, manufactured and maintained capabilities exist in both countries to service water monitoring needs across their regions									
Output 2.1. International twinning/mentoring bring together hydro monitoring institutions and startups that innovate from across the world to assess their suitability to address identified hydrometric challenges in The Gambia and Tanzania. Selected startups will benefit from pump priming grants to grow both public and private sector capability and linkages with the research sector, with the potential to lead to job creation	**2.1.1** Undertake an assessment of the 'innovation environment' in both Hubs	National consultations	$ 20 000,00					$ 20 000,00	Meetings and workshops with stakeholders
		Technical Assistance	$ 20 000,00	$ 20 000,00				$ 40 000,00	Contractual services with incubators/accelerators
		Advisory Support	$ 10 000,00	$ 10 000,00				$ 20 000,00	By CEH and other WMO experts
		Travel	$ 2 500,00	$ 2 500,00				$ 5 000,00	Travel of CEH and other WMO experts
		Miscellaneous		$ 1 000,00				$ 1 000,00	Publications, communication materials, etc.
	2.1.2 Provide international twinning/mentoring to assist suitable entrepreneurs in developing the required capacities in relation to hydrometric monitoring and building their business case/model for potential grow and job creation (Training and R&D activity)	Technical Assistance	$ 20 000,00	$ 20 000,00				$ 40 000,00	Contractual services with incubators/accelerators
		Advisory Support	$ 30 000,00	$ 30 000,00	$ 30 000,00	$ 30 000,00		$ 120 000,00	By CEH and other WMO experts
		Travel	$ 2 500,00	$ 2 500,00	$ 2 500,00	$ 2 500,00		$ 10 000,00	Travel of CEH and other WMO experts
	2.1.3 Develop and provide technical guidance materials to assist suitable institutions building their business case/model (Training and R&D activity)	Technical Assistance	$ 30 000,00	$ 30 000,00				$ 60 000,00	Contractual services with incubators/accelerators
		Advisory Support	$ 20 000,00	$ 20 000,00				$ 40 000,00	By CEH and other WMO experts
		Travel	$ 2 500,00	$ 2 500,00				$ 5 000,00	Travel of CEH and other WMO experts
Output 2.2 Innovation Camps and other activities	**2.2.1** Based on the results of activity 3.2.2, launch Calls	Innovation Camps	$ 15 000,00	$100 000,00				$ 115 000,00	Meetings and workshops with stakeholders

established to bring together public and private entities to support the development, manufacturing and maintenance of digital and physical monitoring technologies	for Expressions of Interest (EoI) for the establishment of the Innovation Camps and organize them with a focus on coming up with ideas for solutions to one/a small number of monitoring problem(s) (Hardware and Software – development and testing of prototypes – please see Note below)	Environment and Social Assessment, and ESMP implementation for USPs	$ 15 000,00	$ 15 000,00				$ 30 000,00	Technical assistance provided by na Environment and Social Impact Assessment Expert (for Unidentified Sub-projects)
		Advisory Support	$ 5 000,00	$ 10 000,00				$ 15 000,00	By CEH and other WMO experts
		Travel		$ 2 500,00				$ 2 500,00	Travel of CEH and other WMO experts
		Miscellaneous		$ 1 000,00				$ 1 000,00	Publications, communication materials, etc.
	2.2.2 Implement follow-on projects (similar to 'Innovation Calls Projects') from the Innovation Camps for the realization of the ideas (Hardware and Software – development and testing of prototypes – please see Note below)	WMO HydroHub Innovation Calls (New Calls)			$150 000,00	$150 000,00		$ 300 000,00	Grants to be provided to the WMO HydroHub Innovation Calls Winners
		Environment and Social Assessment, and ESMP implementation for USPs			$ 15 000,00	$ 15 000,00		$ 30 000,00	Technical assistance provided by na Environment and Social Impact Assessment Expert (for Unidentified Sub-projects)
		Advisory Support			$ 10 000,00	$ 10 000,00		$ 20 000,00	By CEH and other WMO experts
		Miscellaneous			$ 1 000,00	$ 1 000,00		$ 2 000,00	Publications, communication materials, etc.
Component 3. Enhanced regional cooperation for mutual technical assistance among NMHSs and other monitoring organizations within the region where the Innovation Hubs are established									
Outcome 3. Improved dialogues and exchanges within Regional Water Monitoring Innovation Hubs and beyond									
Output 3.1 Organization of Learning Staff Exchanges to facilitate and guide learning exchanges among NMHSs within a Regional Water Monitoring Innovation Hub in view of addressing specific common hydrometric challenges	**3.1.1** Undertake an organizational assessment of NMHSs and regional organizational arrangements for hydrometric monitoring and data sharing within the Regional Water Monitoring Innovation Hub, and develop and organize training and learning staff exchanges to facilitate and guide learning exchanges among NMHSs within a Regional Water Monitoring Innovation Hub	National consultations	$ 20 000,00					$ 20 000,00	Meetings and workshops with stakeholders
		Technical Assistance	$ 20 000,00	$ 20 000,00	$ 20 000,00	$ 20 000,00	$ 30 000,00	$ 110 000,00	Contractual services with invidual expert
		Advisory Support	$ 10 000,00		$ 10 000,00		$ 10 000,00	$ 30 000,00	By CEH and other WMO experts
		Travel	$ 2 500,00		$ 2 500,00		$ 2 500,00	$ 7 500,00	Travel of CEH and other WMO experts
		Training		$ 60 000,00	$ 60 000,00	$ 60 000,00	$ 60 000,00	$ 240 000,00	Training workshops
		Miscellaneous	$ 1 000,00	$ 1 000,00	$ 1 000,00	$ 1 000,00	$ 1 000,00	$ 5 000,00	Publications, communication materials, etc.

	3.1.2 Set up to the 'Regional Water Monitoring Innovation Hubs', and develop 'Regional Technical Champions'/long-term Centres of Excellence in hydrometry	Technical Assistance				$ 30 000,00		$ 30 000,00	Contractual services with incubators/accelerators
		Advisory Support				$ 10 000,00		$ 10 000,00	By CEH and other WMO experts
		Miscellaneous				$ 1 000,00		$ 1 000,00	Publications, communication materials, etc.
	3.1.3 Undertake assessment of capacity needs and investment requirement for establishment of calibration facility and services for hydromet equipment	National consultations			$ 20 000,00			$ 20 000,00	Meetings and workshops with stakeholders
		Technical Assistance			$ 30 000,00	$ 30 000,00		$ 60 000,00	Contractual services with invidual expert
		Advisory Support			$ 10 000,00	$ 10 000,00		$ 20 000,00	By CEH and other WMO experts
		Travel			$ 2 500,00	$ 2 500,00		$ 5 000,00	Travel of CEH and other WMO experts
		Miscellaneous				$ 1 000,00		$ 1 000,00	Publications, communication materials, etc.
Output 3.2. Organization of Innovation Workshops to bring together NMHSs, academia, private sector (solution providers) and others, and facilitate targeted interactions among them in a way that allows NMHSs to express their operational challenges and needs, and the private sector to tailor their solutions to operational realities of NMHSs	**3.2.1** Organize workshops among public, privates and academic sectors, with the support of international partners, to identify the skills needs in relation to hydrometric innovation, ensuring gender equity (Training and R&D activity)	National consultations	$ 20 000,00					$ 20 000,00	Meetings and workshops with stakeholders
		Technical Assistance	$ 30 000,00	$ 30 000,00				$ 60 000,00	Contractual services with invidual expert
		Advisory Support	$ 10 000,00	$ 10 000,00				$ 20 000,00	By CEH and other WMO experts
		Travel	$ 2 500,00	$ 2 500,00				$ 5 000,00	Travel of CEH and other WMO experts
		Miscellaneous		$ 1 000,00				$ 1 000,00	Publications, communication materials, etc.
	3.2.2 Organize stakeholders' workshops to discuss and agree on real challenges and needs to be addressed at Innovation Camps in the context of adaptation to climate change (Training and R&D activity)	National consultations	$ 20 000,00					$ 20 000,00	Meetings and workshops with stakeholders
		Technical Assistance	$ 30 000,00	$ 30 000,00				$ 60 000,00	Contractual services with invidual expert
		Advisory Support	$ 10 000,00	$ 10 000,00				$ 20 000,00	By CEH and other WMO experts
		Travel	$ 2 500,00	$ 2 500,00				$ 5 000,00	Travel of CEH and other WMO experts
		Miscellaneous		$ 1 000,00				$ 1 000,00	Publications, communication materials, etc.
Component 4. Increased political and institutional commitment for operational hydrology through improved stakeholder collaboration and engagement, including co-production of hydromet services									
Outcome 4. Increased support to NMHSs through budget and Water Legislations, and fit-for-purpose innovative hydrometric technologies and user-oriented hydromet services									
Output 4.1 Organization of Ministerial Roundtables in each country of the	**4.1.1** Undertake national cost-benefit analysis of the hydrological data-related investments	National consultations				$ 20 000,00		$ 20 000,00	Meetings and workshops with stakeholders
		Technical Assistance				$ 30 000,00		$ 30 000,00	Contractual services with invidual expert

Regional Water Monitoring Innovation Hubs that will showcase the comprehensive results and recommendations of national cost-benefit analysis of hydrological data investments	within each Regional Water Monitoring Innovation Hub	Advisory Support				$ 10 000,00		$ 10 000,00	By CEH and other WMO experts
		Travel				$ 2 500,00		$ 2 500,00	Travel of CEH and other WMO experts
		Miscellaneous				$ 1 000,00		$ 1 000,00	Publications, communication materials, etc.
	4.1.2 Undertake an assessment of the legal and regulatory frameworks related to integrated water resources management and innovation and propose any required changes based on the results of the Innovation Calls projects and the Innovation Camps	National consultations				$ 20 000,00		$ 20 000,00	Meetings and workshops with stakeholders
		Technical Assistance				$ 30 000,00		$ 30 000,00	Contractual services with invidual expert
		Advisory Support				$ 10 000,00		$ 10 000,00	By CEH and other WMO experts
		Travel				$ 2 500,00		$ 2 500,00	Travel of CEH and other WMO experts
		Miscellaneous				$ 1 000,00		$ 1 000,00	Publications, communication materials, etc.
	4.1.3 Organize awareness-raising activities for decision-makers, legislators, and water users, including Ministerial Roundtables that will showcase the comprehensive results and recommendations of national cost-benefit analysis of hydrological data investments (Training and R&D activity)	Workshops					$160 000,00	$ 160 000,00	Ministerial meetings
		Technical Assistance					$ 30 000,00	$ 30 000,00	Contractual services with invidual expert
		Advisory Support					$ 10 000,00	$ 10 000,00	By CEH and other WMO experts
		Travel					$ 5 000,00	$ 5 000,00	Travel of CEH and other WMO experts
		Miscellaneous					$ 3 000,00	$ 3 000,00	Publications, communication materials, etc.
	4.1.4 Develop a gender-responsive stakeholder engagement strategy for continuous including government departments, private sector, academia, and local community representatives, implement and institutionalize it to ensure continued engagement beyond project implementation	National consultations			$ 20 000,00			$ 20 000,00	Meetings and workshops with stakeholders
		Technical Assistance			$ 30 000,00	$ 30 000,00	$ 30 000,00	$ 90 000,00	Contractual services with invidual expert
		Advisory Support			$ 10 000,00	$ 10 000,00	$ 8 000,00	$ 28 000,00	By CEH and other WMO experts
		Travel			$ 2 500,00	$ 2 500,00	$ 2 500,00	$ 7 500,00	Travel of CEH and other WMO experts
		Miscellaneous			$ 1 000,00	$ 1 000,00	$ 1 000,00	$ 3 000,00	Publications, communication materials, etc.

Output 4.2 Organization of User-provider Workshops and Webinars, to bring together NMHSs, public and private sectors (users of hydromet services) and facilitate targeted interactions among them, including for identifying and developing new markets for NMHSs services	**4.2.1** Carry out a consultative survey for NMHSs to analyse various aspects of their data services provision, and for existing and potential new users of NMHSs' data services. Based on the results, map and identify existing and potential users of NMHSs' data services that should take part of the User-Provider Workshops and Webinars	National consultations		$ 20 000,00				$ 20 000,00	Meetings and workshops with stakeholders
		Technical Assistance		$ 30 000,00				$ 30 000,00	Contractual services with invidual expert
		Advisory Support		$ 10 000,00				$ 10 000,00	By CEH and other WMO experts
		Travel		$ 2 500,00				$ 2 500,00	Travel of CEH and other WMO experts
		Miscellaneous		$ 1 000,00				$ 1 000,00	Publications, communication materials, etc.
	4.2.2 Organize User-Provider Webinars; and hold Workshops to bring together NMHSs, public and private sectors and facilitate targeted interactions among them for awareness, integration and uptake of new data-driven services stemmed from Innovation Calls projects and Camps in other projects and initiatives (Training and R&D activity)	National consultations		$ 5 000,00	$ 5 000,00	$ 5 000,00	$ 80 000,00	$ 95 000,00	Webinars and workshops
		Technical Assistance		$ 10 000,00	$ 10 000,00	$ 10 000,00	$ 30 000,00	$ 60 000,00	Contractual services with invidual expert
		Advisory Support		$ 5 000,00	$ 5 000,00	$ 5 000,00	$ 10 000,00	$ 25 000,00	By CEH and other WMO experts
		Travel					$ 5 000,00	$ 5 000,00	Travel of CEH and other WMO experts
		Miscellaneous		$ 1 000,00	$ 1 000,00	$ 1 000,00	$ 2 000,00	$ 5 000,00	Publications, communication materials, etc.
Total			**$766 500,00**	**$ 1028000,00**	**$862 000,00**	**$953 500,00**	**$480 000,00**	**$4090000,00**	

Note: New instruments and monitoring systems consist of 30 percent of the total project activities budget, and is associated with the installation of prototypes of monitoring equipment, data acquisition software, and other related innovative solutions coming out from the WMO Innovation Calls. This does not consist of a establishment of a physical monitoring network as part of this proposed project, but the research and development of prototypes that then will be considered for implementation by NMHSs in the Western and Eastern countries covered by the 'Regional Monitoring Innovation Hubs'. Development, installation and maintenance of these prototypes depend of the type of solution that will come from the WMO Innovation Calls and cannot be ascertain at this stage.

Table 25. Breakdown of the Project Cycle Management Fee charged by the Implementing Entity.

Implementing Entity Fee Breakdown								
Activities		**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**TOTAL**	**Notes**
Overall coordination and management with Adaptation Fund Secretariat; management of project implementation with the Executing agencies and project development		$ 62 000,00	$ 62 000,00	$ 62 000,00	$ 62 000,00	$ 62 000,00	**$310 000,00**	Project Coordinator/ Manager (40% of P3 = 155'000 x 0,4 = 62'000/year x 5 years) will be based in the region (either WMO Regional Office or CEH Office in Africa, TBC)
Financial management, including accounting and grant management to Executing entities and third parties		$ 5 000,00	$ 5 000,00	$ 5 000,00	$ 5 000,00	$ 5 000,00	**$ 25 000,00**	
Information and communication management		$ 2 000,00	$ 2 000,00	$ 2 000,00	$ 2 000,00	$ 2 000,00	**$ 10 000,00**	
Quality assurance including internal and external audits		$ 5 000,00	$ 5 000,00	$ 5 000,00	$ 5 000,00	$ 5 000,00	**$ 25 000,00**	One time per year
Participation of WMO staff and technical experts to the project activities and Project Steering Committee meetings (organization/logistics and WMO staff)		$ 7 000,00	$ 7 000,00	$ 7 000,00	$ 7 000,00	$ 7 000,00	**$ 35 000,00**	
Monitoring and Evaluation	Baseline data report and associated work	$9 000,00					**$ 9 000,00**	These include any required travel and engagement of independent experts
	Mid-term Review (MTR) report and associated work			$20 000,00			**$ 20 000,00**	
	Final Project Evaluation and associated work					$20 000,00	**$ 20 000,00**	
TOTAL		**$90 000,00**	**$81 000,00**	**$101000,00**	**$81 000,00**	**$101000,00**	**$454 000,00**	

Table 26. Breakdown of the Project Execution costs.

Executing Fee breakdown								
		Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**TOTAL**	**Notes**
NMHSs	Inception meeting, including launch of activities	$ 50 000,00					**$ 50 000,00**	Planned for launching the project with country (Tanzania and The Gambia) partners and stakeholders, including facilitation costs; in conjunction with the Project Steering Committee meeting
NMHSs	Project Steering Committee meetings (country participants in Tanzania and The Gambia)		$ 32 000,00	$ 32 000,00	$ 32 000,00	$ 32 000,00	**$128 000,00**	Planned to be held yearly through face-to-face meetings in each Regional Water Monitoring Innovation Hub alternatively. Cost estimate for country participants:

								32 000 USD per meeting; try to have it back-to-back with other activities
NMHSs	Project coordination and management in Tanzania and The Gambia	$ 45 200,00	$ 45 200,00	$ 45 200,00	$ 45 200,00	$ 45 200,00	**$226 000,00**	Staff costs: 25 000 USD/year for each project technical officer in Tanzania and The Gambia
NMHSs	Administration (including finance management, audits, etc.) and communication costs	$ 10 000,00	$ 10 000,00	$ 10 000,00	$ 10 000,00	$ 10 000,00	**$ 50 000,00**	
TOTAL		**$105 200,00**	**$ 87 200,00**	**$ 87 200,00**	**$ 87 200,00**	**$ 87 200,00**	**$454 000,00**	

While UKCEH is listed as EE, it's role is uniquely related to advisory services and training to the NMHSs of the Gambia and Tanzania in the implementation at the activities, and therefore there are no fees associated. The Project Execution costs are equally distributed between the NMHSs of Tanzania and the Gambia.

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

The disbursement schedule (based on the detailed budget provided in **Tables 25 and 26**) is provided in **Table 27**.

Table 27. Project Disbursement Matrix

Project Disbursement Matrix						
	Upon signature of the Agreement	**One year after Project Start**	**Year 3**	**Year 4**	**Year 5**	**TOTAL (USD)**
Schedule date	jan/25	jan/26	jan/27	jan/28	jan/29	
Project Funds (USD)	$ 871 700	$ 1 115 200	$ 949 200	$ 1 040 700	$ 567 200	$ 4 544 000
IE Fees (10%) (USD)	$ 95 000,00	$ 82 000,00	$ 110 000,00	$ 82 000,00	$ 110 000,00	$ 479 000,00
TOTAL (USD)	**$ 961 700**	**$ 1 196 200**	**$ 1 050 200**	**$ 1 121 700**	**$ 668 200**	**$ 4 998 000**

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

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

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

TANZANIA Mr. Mohammed Khamis Abdulla Deputy Permanent Secretary Vice President's Office	Date: 3 October 2024
GAMBIA (The Republic of) Mr. Bubacar Zaidi Jallow Director Central Project Coordinating Unit Ministry of Environment, Climate	Date: 6 November 2024

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.

Change and Natural Resources (MECCNAR)	

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

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans in Tanzania and The Gambia and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.	
Moyenda Chaponda *Development Partnerships Office, WMO* Implementing Entity Coordinator	
Date: 19 January 2025	Tel. and email: mchaponda@wmo.int
Project Contact Person: Sophia Sandström	
Tel. And Email: +41227308501, ssandstrom@wmo.int	

Annex 1: Environment and Social Impact Assessment
Annex 2: Gender Assessment ang Action Plan
Annex 3: Cost-benefit Analysis
Annex 4: Reports of the validation workshops in Tanzania and The Gambia

ANNEX 1 – ENVIRONMENT SOCIAL IMPACT ASSESSMENT (ESIA) AND ENVIRONMENT AND SOCIAL RISK MANAGEMENT PLAN (ESRMP)

The Environment and Social Policy (ESP) of the Adaptation Fund (AF) requires that all projects be screened against the 15 principles. This includes the identification of risks in all the component activities with possible mitigation measures to ensure that the projects supported by the AF promote positive environment and social benefits and mitigate or avoid adverse environmental and social risks and impacts.

This Annex therefore presents a detailed environment and social impact assessment (A1.1), which includes the literature review and the results of the consultative process with stakeholders in the field for the risk identification and categorization. Based on these results, an environment and social risk management plan (ESRMP) with mitigation measures, a grievance mechanism, and monitoring and evaluation program have been developed and included as part of the project proposal (Part III, section C.).

A1.1 Environment and Social Impact Assessment (ESIA)

Environment and social impact assessment methodology

The screening process serves to identify potential environmental and social impacts and risks, taking into consideration the Adaptation Fund's environmental and social principles. The Environmental and Social Impact Assessment (ESIA) is an instrument to identify and assess the potential environment and social impacts of a proposed project, evaluate alternatives, and design appropriate mitigation, management, and monitoring measures. This assessment provided the based for the development of the environment and social risk management plan (ESRMP) presented in A3.2 below. For the preparation of the ESIA, the following methodology was applied:

- Literature review – a review of the literature about the project and its sector of activity was conducted before the field visits to the two countries concerned. The literature review focused on: (i) review of relevant documents of the project to get the understanding of the project activities and its scope; (ii) review the relevant national legislation relating to environmental and social issues and the Environmental and Social Policy of the Adaptation Fund that the project must conform with; and (iii) review of other relevant documents related to the project preparation. Information gathered at this stage were used to conduct the consultation process. The project concept note presented the geographical and hydroclimatic context of the project intervention area and gave a good idea of the natural resources exploited by populations.

- Field missions and stakeholder consultation – the purpose of the field consultation was: (i) to understand and characterize potential environmental, social and economic impacts of the project; (ii) to generate a good understanding of the project by all stakeholders; (iii) to understand people's expectations about the project; and (iv) to enable stakeholders involved in the project to provide their views and recommendations. In addition, site-specific investigations were also conducted to gain insight to the likely impacts of the project to the environment. Survey questionnaires were used to gather the information.

The ESIA involved meetings and exchanges with several stakeholders, including government bodies, academic and research institutions, water management entities, and private entities in both Tanzania and The Gambia. Field visits to communities dependent on water resources and prone to climate variability and change events were also conducted. A summary of the consultations is presented below.

Consultative process and results

Consultation is the process of gathering information or advice from stakeholders and taking their views into account when making project decisions and/or setting targets and defining strategies.

These visits allowed broad consultations with the local populations, the technical services, the administrative and traditional authorities. In summary, during the field consultation process, 74 people were met (23 people in The Gambia and 51 in Tanzania, of which 24.3% were women (**Table A1.1.1**). List of stakeholders consulted, and field mission pictures are provided at the end of this Annex.

Table A1.1.1. Consultation statistics.

Country	Number of Men	Number of Women	Percentage (%) of Women	Total
The Gambia	20	3	13.0%	23
Tanzania	37	15	29.4%	51
Total	**57**	**18**	**24.3%**	**74**

The Environmental and Social Impact Assessment (ESIA) consultations carried out in both Gambia and Tanzania yielded important information crucial for the planning and execution of the hydro-meteorological project. Engaging with a wide range of stakeholders from governmental entities to academic institutions highlighted six primary themes critical for the project's success and sustainability. The identified themes, namely Regulatory Compliance and Stakeholder Engagement, Infrastructure and Technical Capacity Building, Gender Inclusivity and Social Impact, Education, Training, and Capacity Building, Risk Mitigation and Market Competitiveness, and Strategic Location and Institutional Collaboration, offer a clear framework for analyzing the feedback and recommendations from the consultations. This organized breakdown helps highlight the different aspects of the project and provides a strong basis for developing a plan that addresses the varied priorities and concerns from the diverse range of stakeholders in both countries.

Tanzania

In Tanzania, the consultations involved a diverse array of stakeholders, each bearing significant relevance to the Environmental and Social Impact Assessment (ESIA) inputs essential for the project. Governmental bodies were pivotal as they provide the regulatory framework and policies that guide environmental and hydrometeorological practices. Their input helped ensure that the project aligns with national policies and regulatory standards. Academic institutions were crucial for providing research-based insights, technical expertise, and innovative solutions which were indispensable for the project's objective of advancing hydromet services. Water management entities and community-based organizations offered grassroots insights into the practical challenges and opportunities within the local hydrometeorological landscape. Their input was essential for ensuring that the project's activities are grounded in the realities of the communities they aim to serve.

Major results of the consultations in Tanzania include:

I. Regulatory Compliance and Stakeholder Engagement:

a. Early Project Registration and Compliance Assurance:

- Register the project with the National Environment Management Council (NEMC) at the commencement of implementation to address all associated regulatory issues.
- Consider housing the proposed "Innovation Hub" within an existing structure/institution to leverage existing compliance frameworks.

b. Continuous Stakeholder Engagement:

- Engage all key stakeholders throughout the project's life cycle, from design to full implementation.
- Ensure meaningful engagement and extensive consultation with stakeholders to garner valuable input, foster ownership, and facilitate crowd-sourcing of data.

II. Infrastructure and Technical Capacity Building:

a. Utilization of Existing Structures:

- Leverage existing structures and expertise at Tanzania Meteorological Authority (TMA) for housing the Innovation Hub.
- Utilize the established frameworks for manufacturing, calibrating, and repairing hydro-meteorological instruments.

b. Technical Development and Automation:

- Focus on automating data collection routines and enhancing real-time data capabilities.
- Address the communication challenges for transmitting data to remote data collection centers.
- Integrate forecasting systems with hydromet data collection routines.

III. Gender Inclusivity and Social Impact:

a. Gender-Sensitive Approach:

- Adopt gender-sensitive data collection methodologies.
- Ensure women's representation in community-based organizations (CBOs) and decision-making levels of the project.
- Develop proactive measures to engage women, especially young girls, in Science, Technology, Engineering, and Mathematics (STEM).

b. Social Benefits and Community Outreach:

- Highlight the project's potential benefits for women, the disabled, and other vulnerable groups in decision-making on agricultural production and early warning systems.
- Engage communities at all levels of the project cycle to foster partnerships in data collection and equipment installation.

IV. Education, Training, and Capacity Building:

a. Engagement with Educational Institutions:

- Collaborate with institutions like the Dar Es Salaam Institute of Technology (DIT) and the University of Dar es Salaam (UDSM) for technical knowledge building and maintenance training.
- Promote internships, scholarships, and engagement with early education institutions to encourage women's participation in hydro-meteorology related fields.

b. Innovative Collaboration and Funding Opportunities:

- Explore collaborative innovation calls through COSTECH's "National Fund for the Advancement of Science and Technology".
- Leverage opportunities like the Annual Water Conference organized by ATAWAS for stakeholder feedback and project information dissemination.

V. Risk Mitigation and Market Competitiveness:

a. Product Quality and Market Competition:

- Address potential risks related to the quality, cost, and market competitiveness of equipment produced through the project.
- Ensure that products are tailored to local contexts and meet international quality standards.

b. Cultural Sensitivity and Traditional Knowledge Preservation:

- Acknowledge and integrate traditional knowledge in information sharing while adopting modern hydromet information platforms.
- Address potential cultural norms and misguided perceptions that may limit engagement in STEM fields, especially among young girls.

VI. Strategic Location and Institutional Collaboration:

a. Optimal Location for Innovation Hub:

- Consider the Water Resources Centre of Excellence and the UDSM - WRED's existing design for an innovation hub as potential locations for the project's Innovation Hub.

b. Institutional Collaborations:

- Foster collaborations with institutions like the Water Institute and the Global Water Partnership for capacity building, training, and ensuring inclusivity in project implementation.

The Gambia

In The Gambia, similar categories of stakeholders were consulted. Governmental departments provided the regulatory and policy framework essential for ensuring the project's alignment with national environmental and water resources management standards. Their insights were crucial for ensuring compliance and promoting sustainable practices. Academic and research institutions were vital for providing the technical expertise, research, and innovation necessary for advancing the project's objectives. Private entities highlighted the potential for public-private partnerships in advancing hydromet services, and their input was essential for fostering a conducive commercial environment for hydrometric innovations.

Major results of the consultations in The Gambia include:

I. Regulatory Compliance and Stakeholder Engagement:
- *a. Early Project Registration and Compliance Assurance:*
  - Ensure prompt registration of the project with appropriate Gambian regulatory bodies to smoothen the compliance process throughout the project's life cycle.
  - Evaluate the possibility of integrating the proposed "Innovation Hub" within an existing institution to benefit from pre-established compliance frameworks, considering the less developed technological landscape in Gambia compared to Tanzania.
- *b. Continuous Stakeholder Engagement:*
  - Establish a robust engagement plan with all key stakeholders from the outset, with a focus on local community involvement to ensure their concerns and insights are adequately captured and addressed.

II. Infrastructure and Technical Capacity Building:
- *a. Utilization of Existing Structures:*
  - Leverage existing infrastructures within institutions like the University of The Gambia and Gambia Technical Training Institute for housing the Innovation Hub, given the limited number of tech startups and innovative solutions in Gambia compared to Tanzania.
  - Explore partnerships with established technical entities for the manufacturing, calibrating, and repairing of hydro-meteorological instruments.
- *b. Technical Development and Automation:*
  - Prioritize automation and real-time data collection capabilities to bridge the technological gap and enhance hydro-meteorological data accuracy and timeliness.

III. Gender Inclusivity and Social Impact:
- *a. Gender-Sensitive Approach:*
  - Adopt a gender-sensitive approach in all project phases to promote gender equality, aligning with the Ministry of Gender's directives and considering the cultural sensitivities within Gambian communities.
- *b. Social Benefits and Community Outreach:*
  - Highlight the social benefits of the project, especially in water resource management, to address the distinct needs of reverine communities like CRR, which are unique to Gambia.

IV. Education, Training, and Capacity Building:
- *a. Engagement with Educational Institutions:*
  - Collaborate with local educational institutions for technical knowledge building, while fostering partnerships with international entities to compensate for the limited local expertise in hydro-meteorology related fields.
- *b. Innovative Collaboration and Funding Opportunities:*
  - Seek innovative collaborations and funding opportunities both locally and internationally to enhance the project's technical and financial resources, considering the less varied technological startup landscape in Gambia.

V. Risk Mitigation and Market Competitiveness:
   a. Product Quality and Market Competition:
      - Address potential market competition by ensuring the equipment produced meets international quality standards, while being cost-effective to cater to the economic realities in Gambia.
   b. Cultural Sensitivity and Traditional Knowledge Preservation:
      - Recognize and integrate traditional knowledge in the project's information sharing platforms to preserve cultural heritage while adopting modern hydromet information dissemination channels.

VI. Strategic Location and Institutional Collaboration:
   a. Optimal Location for Innovation Hub:
      - Determine strategic locations for the Innovation Hub to foster collaboration, knowledge sharing, and technical development in alignment with the goals of relevant Gambian institutions and ministries.
   b. Institutional Collaborations:
      - Strengthen collaborations with institutions and ministries to ensure a holistic approach to capacity building, training, and inclusivity in project implementation, leveraging the expertise and networks of local entities.

Unique outcomes of the consultations between The Gambia and Tanzania

The unique socio-economic, political, and environmental contexts of Gambia might result in distinctive outcomes and considerations during the project designs. Here are some outcomes that emerged from the consultations in ***Gambia but not in Tanzania***:

- *Lower Technological Adoption:* Given the difference in technological advancement between the two countries, stakeholders in Gambia express concerns or face challenges related to lower levels of technological adoption and digital literacy which could impact the project's objectives.
- *Climate Change Vulnerability:* Gambia has unique vulnerabilities to climate change given its geographic location and economic conditions. Stakeholders emphasize more on climate resilience and adaptive strategies in hydro-meteorological services.
- *International Partnerships and Aid Dependency:* Gambia has a higher dependency on international partnerships and aid, and stakeholders emphasize the importance of aligning the project with international aid and development programs.
- *Riverine Community Concerns:* The concerns of riverine communities like CRR highlight the importance of water resource management and flood prevention in a more pronounced manner in Gambia compared to Tanzania.
- *Cross-Border Water Management:* Given Gambia's geographical positioning along the Gambia River, cross-border water management issues come up during consultations which may not be as prominent in the Tanzanian context.
- *Capacity Building and Education:* The emphasis on capacity building, education, and training is stronger in Gambia to address the technological gap and to foster local expertise in hydro-meteorological services.
- *Public-Private Partnerships (PPPs):* There is a different level or method of engagement with private sector stakeholders in Gambia, and the consultations reveal unique opportunities or challenges regarding PPPs in the country.
- *Socio-Cultural Sensitivities:* There are different socio-cultural sensitivities in Gambia that could impact gender inclusivity, community engagement, and the acceptance of modern hydro-meteorological technologies and practices.
- *Policy and Regulatory Framework:* The policy and regulatory framework in Gambia has different implications for the project, and stakeholders have specific insights or recommendations regarding compliance with local laws and regulations.
- *Economic Diversification:* The need for economic diversification is a recurring theme, with stakeholders emphasizing on how the project can contribute to economic diversification through innovation in hydro-meteorological services.

And outcomes that emerged from the consultations in ***Tanzania but not in Gambia***:

- *Technological Advancements:* Tanzania, being relatively more advanced technologically, has stakeholders emphasizing leveraging existing technological infrastructure and innovations in hydro-meteorological services.
- *Innovative Start-up Ecosystem:* With a more vibrant and varied start-up ecosystem, stakeholders in Tanzania highlight collaborations with local start-ups and innovators to foster a culture of innovation in hydromet services.
- *Higher Education and Research Institutions:* The presence of established higher education and research institutions in Tanzania brings forth recommendations on forging partnerships with these institutions for research, development, and training purposes.
- *Regional Influence and Cooperation:* Tanzania's position within the East African Community yields discussions on regional cooperation and the role of regional bodies in the project.
- *Urbanization and Industrialization:* As Tanzania has a higher degree of urbanization and industrialization, issues related to urban water management, industrial emissions, and their impact on water resources are more pronounced.
- *Gender Mainstreaming:* There are more established frameworks or initiatives in Tanzania for gender mainstreaming in STEM and water resource management which are being leveraged for the project.
- *Economic Diversification:* Stakeholders highlight the potential of the project to contribute to economic diversification in sectors like agriculture, mining, and manufacturing which are significant in Tanzania.
- *Private Sector Engagement:* With a potentially larger private sector, discussions around private sector engagement, investment, and public-private partnerships are more advanced.
- *National Policies and Strategic Frameworks:* Tanzania has different national policies and strategic frameworks guiding hydro-meteorological services and water resource management that impact the project's implementation.
- *Data Management and Analytical Capabilities:* With more advanced data management and analytical capabilities, stakeholders emphasize on leveraging data analytics, machine learning, and other advanced technologies in hydro-met services.
- *Infrastructure Development:* The pace and scale of infrastructure development in Tanzania lead to discussions on integrating the project with ongoing or planned infrastructure projects, especially in urban areas.

Summary of the feedback from Stakeholders on the Project

Perception and appreciation of the project by the Stakeholders

The perception and appreciation of the project by the stakeholders are critical aspects that reflect the level of support, engagement, and alignment of various actors involved. Through the public consultations, stakeholders had the opportunity to express their opinions, concerns, and expectations regarding the project. Here's an overview of how some of the key stakeholder groups might perceive and appreciate the "Enhancing Hydromet Services through Regional Monitoring Innovation Hubs in Africa" project:

- Local Communities: Local communities perceive the project as an opportunity for improved disaster preparedness and enhanced early warning systems. They appreciate that the project aims to empower them with accurate and timely information about weather and climate-related risks. They value the Innovation Hub's potential to create local jobs, offer training opportunities, and contribute to community development. The consultations allow them to voice their needs for accessible and understandable information, as well as their concerns about potential disruptions to traditional knowledge systems.
- National Environmental Management Council (NEMC): NEMC recognizes the project's alignment with their regulatory mandate for environmental impact assessments and compliance. They appreciate the project's emphasis on engaging stakeholders and gathering their inputs. The consultations offer NEMC a platform to ensure that environmental considerations are integrated into the project's activities. They value the opportunity to receive feedback on potential environmental implications and the assurance that regulatory requirements will be met.

- Tanzania Meteorological Authority (TMA): TMA views the project as a step forward in strengthening hydromet services in the country. They appreciate the Innovation Hub's potential to enhance instrument calibration, data collection, and forecasting capabilities. The consultations allow TMA to engage with the public and understand their expectations for improved weather information and early warnings. They value the feedback received, as it helps tailor project activities to meet the needs of various regions and communities.
- Ministry of Gender: The Ministry of Gender recognizes the project's commitment to gender equality and women's empowerment. They appreciate the emphasis on encouraging women's participation in STEM fields and the creation of opportunities for skill development. The consultations provide a space to ensure that gender-sensitive data collection and analysis are considered. They value the project's efforts to address gender-related challenges and involve women in decision-making processes.
- Academic Institutions (Water Resources Centre of Excellence, Water Institute, WRED, DIT): Academic institutions see the project as a collaborative opportunity to enhance research, training, and innovation in the water sector. They appreciate the Innovation Hub's potential to serve as a resource for technical expertise and capacity building. The consultations allow them to contribute their insights, align their curricula with project goals, and identify areas of collaboration. They value the project's commitment to fostering a conducive environment for women's participation in science, technology, and engineering.
- ATAWAS and Global Water Partnership: ATAWAS and Global Water Partnership view the project as an important initiative to strengthen water and sanitation services. They appreciate the project's efforts to engage water utility providers, experts, and stakeholders in discussions. The consultations provide them with an understanding of how the project aligns with their goals and priorities. They value the opportunity to offer their expertise and collaborate on initiatives that promote sustainable water management.
- COSTECH: COSTECH recognizes the project's potential for collaborative innovation and advancements in science and technology. They appreciate the project's intention to leverage existing funds and co-financing opportunities. The consultations allow COSTECH to align the project's objectives with their funding framework and ensure the project's innovation components are well-supported. They value the project's engagement with research and technology institutions to drive impactful outcomes.
- National Meteorological and Hydrological Services (NMHSs) of Tanzania and Gambia: The NMHSs of Tanzania and Gambia perceive the project as a chance to strengthen their technical capabilities and extend their reach to local communities. They appreciate the Innovation Hub's potential to enhance instrument calibration, data collection, and disaster risk reduction efforts. The consultations allow them to gather input from the communities they serve, ensuring that the project's outcomes are relevant and responsive. They value the opportunity to collaborate with international partners and contribute to the project's success.
- Private Sector (Equipment Manufacturers, Manufacturers of Water Equipment): The private sector stakeholders view the project as a potential market for their products and services. They appreciate the project's focus on instrument calibration, equipment manufacturing, and technology innovation. The consultations provide them with insights into the specific requirements and demands of the project, allowing them to tailor their offerings accordingly. They value the opportunity to showcase their expertise, contribute to technological advancements, and establish partnerships that drive economic growth.
- Non-Governmental Organizations (NGOs) and Civil Society Groups: NGOs and civil society groups perceive the project as a valuable initiative to enhance community resilience and disaster preparedness. They appreciate the project's efforts to engage local populations, gather feedback, and address their concerns. The consultations provide them with a platform to advocate for the inclusion of vulnerable groups, such as women, children, and disabled individuals, in the project's activities. They value the project's commitment to social equity and inclusivity.
- Community-Based Organizations (Water Committees, Water Users Association Committees): Community-based organizations view the project as an opportunity to strengthen their roles in water management and disaster risk reduction. They appreciate the project's emphasis on local engagement and ownership. The consultations allow them to voice their needs for accessible information, involvement in data collection, and capacity

building. They value the project's efforts to empower communities and ensure that their contributions are acknowledged and integrated into project outcomes.

Expectations, advice and recommendations

Throughout the process of public consultations, a wide array of stakeholders engaged in thoughtful discussions, sharing their expectations, advice, and recommendations regarding the project's strategy and activities. These inputs provided valuable insights that will contribute to shaping the project's approach and ensuring its alignment with the diverse needs and aspirations of the Tanzanian population. The following summarizes the expectations, advice, and recommendations offered by key stakeholders:

- Tanzania Meteorological Authority (TMA): TMA's expectations revolve around the seamless integration of the Innovation Hubs with existing meteorological operations. They advised that the project should prioritize the development of cutting-edge technology that enhances real-time data capabilities. Furthermore, TMA recommended an open dialogue with key stakeholders and the sharing of project documents to ensure that all parties are well-informed and actively contribute to the project's evolution.
- National Environment Management Council (NEMC) – Tanzania: NEMC's expectations primarily revolved around environmental sustainability. They recommended that the project closely collaborate with them to ensure adherence to environmental regulations. NEMC advised conducting thorough environmental impact assessments and incorporating robust mitigation measures. Additionally, they suggested engaging local communities to foster a sense of environmental responsibility.
- Dar es Salaam Institute of Technology (DIT): DIT emphasized the potential for collaborative innovation and knowledge transfer. They advised the project to leverage DIT's expertise in equipment production and innovation. DIT recommended active involvement in the design and establishment of the Innovation Hubs, ensuring that they are conducive to local innovation and research. They also highlighted the importance of focusing on maintenance expertise to ensure the sustainability of the project's outcomes.
- Ministry of Community Development, Gender, Women and Special Groups: The Ministry's expectations centered on gender inclusivity and empowerment. They advised the project to take proactive measures that encourage women's participation in technical fields related to hydrometeorology. They recommended creating opportunities for internships, scholarships, and awareness campaigns to inspire young girls to pursue STEM fields. The Ministry emphasized the importance of gender-sensitive data collection and equitable distribution of project benefits.
- Ministry of Water (MoW), Tanzania: MoW's expectations emphasized coordination and collaboration. They advised aligning the project with existing water management structures and strategies. MoW recommended close engagement with local water management bodies, such as Regional Basin Water Boards and Water Users Associations, to ensure that the project complements existing efforts and avoids duplication. They emphasized community involvement and ownership.
- Water Institute: The Water Institute's expectations revolved around sustainable innovation and capacity building. They recommended close collaboration with the Institute, particularly in establishing the Innovation Hubs. Their advice was on integrating local traditional knowledge with scientific advancements. The Water Institute also highlighted the importance of maintenance and support structures for long-term sustainability.
- Regional Basin Water Boards and Catchment/Sub-Catchment Water Committees: These stakeholders emphasized community engagement and integration. They advised the project to actively involve local communities and traditional leaders in decision-making processes. They recommended considering local water resource management practices and tailoring project activities to the specific needs of each region.
- Community-Based Water Supply Organizations (CBWSOs) and Water Users Associations (WUA): CBWSOs and WUAs highlighted community involvement and ownership. They advised the project to ensure that community-based organizations play a central role in the project's implementation. They recommended capacity-building programs and knowledge sharing that empower local communities to take charge of water management and data collection.

- Tanzania Water and Sanitation Network (TAWASANET): TAWASANET's expectations focused on holistic water management. They advised the project to integrate monitoring efforts with broader water access and sanitation goals. They recommended cross-sector collaboration and alignment with existing water and sanitation initiatives. TAWASANET emphasized the need for information sharing and networking.
- *Tanzania Commission for Science and Technology (COSTECH)*: COSTECH's expectations centered on sustainable research and innovation. They recommended incorporating mechanisms that ensure the continuity of research and development beyond the project's duration. They advised leveraging existing funding mechanisms for collaborative innovation and encouraging partnerships with local institutions.

Applicable domestic and international laws for environment and social management

Environmental policy documents are general instruments with which States equip themselves for the management of their environment. National environmental policies are major instruments of public policies for the State in that they establish, in the medium or long term, the vision of the State, the general framework of all the interventions of the State and other actors in this sector. National environmental policies define in particular: (i) the objectives pursued by the State in terms of the environment; (ii) the guiding principles that should guide the actors in the field of Environmental Protection; (iii) the role of each category of actors; (iv) the means to achieve these objectives (legal, financial, institutional, operational); and (v) the systems for monitoring and evaluating the implementation of the said policy.

National legal environmental protection

Several laws, policies, instruments and administrative frameworks are available to support sustainable environmental and social management. The ESIA aims to identify the range of obligatory environmental and social management measures including sectoral guidelines to be undertaken and followed, respectively during the planning, design, implementation and operation phases of the project and so as to ensure compliance with the AF principles as well as environmental and social compliance requirements of participating countries. For this purpose, a number of legal, regulatory and administrative frameworks are essential to guide policy considerations and decision making in implementation of the program. Thus, the framework laws on the Environment and water which constitute major instruments for implementing environmental national policies in that they set out a minimum legal framework for the protection of all the constituent elements of the environment exist in the 5 participating countries (**Table A.1.1.2**).

Table A.1.1.2. Framework environmental and water laws of participating countries.

Country	Framework law on the environment	Water Resources Law
The Gambia	▪ National Environmental Management Act (NEMA) of 1994: This Act provides the framework for environmental management in Gambia. It establishes the National Environment Agency (NEA) as the lead agency for environmental protection and sets out the responsibilities of government, businesses, and individuals in protecting the environment. ▪ Environmental Impact Assessment Regulations of 2014: These Regulations set out the procedures for carrying out an environmental impact assessment (EIA) for proposed development projects. An EIA is required for projects that are likely to have a significant impact on the environment. ▪ Wildlife Conservation Act of 1977: This Act provides for the conservation and	▪ National Water Resources Council Act of 19799: This Act provides the legal framework for the management of water resources in Gambia. It establishes the Department of Water Resources (DWR) as the lead agency for water resources management and sets out the responsibilities of government, businesses, and individuals in managing water resources. ▪ National Water Policy of 2006: This Policy provides the strategic direction for the development and management of water resources in Gambia. It sets out the goals and objectives of water resources management, as well as the strategies for achieving these goals and objectives. ▪ National Water Resources Management Strategy (NWRMS) of 2014: This Strategy provides a detailed plan for implementing the National Water Policy. It sets out the specific actions that need to

	rational management of wildlife, for the establishment of national parks and local sanctuaries, and for the creation of a Department of Wildlife Conservation. ▪ Forestry Act of 1998: This Act provides for the conservation and sustainable management of forests in Gambia.	be taken to achieve the goals and objectives of the Policy. ▪ Integrated Water Resources Management (IWRM) Roadmap of 2009: This Roadmap provides a framework for the implementation of IWRM in Gambia. IWRM is a holistic approach to water resources management that considers all aspects of water use, including water supply, water demand, water quality, and water environment. ● National Water Resources Strategic Plan 2015-2019. ● The Gambia Water Bill 2020. ● National Water Resources Management Authority Bill 2019. ● Gambia Meteorological Authority Bill 2018.
Tanzania	▪ Environmental Management Act (EMA) of 2004: This Act provides the framework for environmental management in Tanzania. It establishes the National Environment Management Council (NEMC) as the lead agency for environmental protection and sets out the responsibilities of government, businesses, and individuals in protecting the environment. ▪ Environmental Impact Assessment and Audit Regulations of 2005 (amended 2018): These Regulations set out the procedures for carrying out an environmental impact assessment (EIA) for proposed development projects. An EIA is required for projects that are likely to have a significant impact on the environment. ▪ Wildlife Conservation Act of 1974: This Act provides for the conservation and management of wildlife in Tanzania. It establishes the Tanzania Wildlife Management Authority (TAWA) as the lead agency for wildlife conservation. ▪ Forestry Act of 2002: This Act provides for the conservation and sustainable management of forests in Tanzania. It establishes the Tanzania Forest Service (TFS) as the lead agency for forest conservation. ▪ Water Resources Management Act of 2009: This Act provides the legal framework for the management of water resources in Tanzania. It establishes the Water Resources Management Authority (WARMA) as the lead agency for water resources management. ▪ Climate Change Adaptation and Mitigation Action Plan in the Water Sector (2014 under review process) ▪ Sector specific EIA and Audit Regulation (2014 under review)	▪ Environmental Management Act (NEMA) of 2004: This Act provides the framework for environmental management in Tanzania. It establishes the National Environment Management Council (NEMC) as the lead agency for environmental protection and sets out the responsibilities of government, businesses, and individuals in protecting the environment. ▪ Environmental Impact Assessment Regulations of 2005: These Regulations set out the procedures for carrying out an environmental impact assessment (EIA) for proposed development projects. An EIA is required for projects that are likely to have a significant impact on the environment. ▪ Water Resources Management Act of 2009: This Act provides the legal framework for the management of water resources in Tanzania. It establishes the Water Resources Management Authority (WARMA) as the lead agency for water resources management. ▪ National Water Policy of 2021: This Policy provides the strategic direction for the development and management of water resources in Tanzania. It sets out the goals and objectives of water resources management, as well as the strategies for achieving these goals and objectives. ▪ National Environmental Action Plan (NEAP) of 2021: This Plan sets out the priorities for environmental management in Tanzania for the period 2021-2025. It identifies the key environmental challenges facing Tanzania and sets out the strategies for addressing these challenges.

The procedures applicable in project for assessing the project's environmental and social impacts differs between the countries. However, in all the participating countries in accordance with the national laws on environmental assessment full-fledged ESIAs are only required for projects with high or substantial risks. The other projects are required to take environmental and social

requirements to manage any potential environmental impacts. The requirement will need to demonstrate: (i) the expected effect of the project on the environment; (ii) any negative effects of the project which can be avoided; (iii) sufficient explanation of the environmental sustainability of the project; and (iv) the precautions adopted for containing any negative effects of the project. The project is an environmentally positive project with no potentially adverse impacts and it is aligned with the Adaptation Fund's Environmental and Social Policy and Principles, the countries environmental and social laws and regulations and the international conventions and standards.

The potential impacts of project activities relate to land acquisitions and the production of waste from the use of batteries at hydromet stations. The legislative and regulatory texts relating to these impacts will be analyzed in this section. The main national texts relating to land acquisition and waste management are presented in the **Table A.1.1.3**.

Table A.1.1.3. Legislative and regulatory texts related to land acquisition and waste management.

Country	Land acquisition or protection	Waste management
The Gambia	• Land Registration Act of 1966: This Act provides for the registration of land in Gambia. It establishes the Land Registry as the official body responsible for registering land. • Land Acquisition Act of 1976: This Act provides for the compulsory acquisition of land by the government for public purpose. It sets out the procedures for acquiring land under this Act. • Customary Land Act of 1966: This Act provides for the administration of customary land in Gambia. It recognizes the customary rights of landowners and sets out the procedures for acquiring customary land. • Land Policy of 2017: This Policy provides the strategic direction for land management in Gambia. It sets out the goals and objectives of land management, as well as the strategies for achieving these goals and objectives. • Land Acquisition Regulations of 2018: These Regulations set out the procedures for acquiring land under the Land Acquisition Act of 1976.	• Ecological Solid Waste Management Act No. 9003 of 2000: This Act provides for the management of solid waste in Gambia. It establishes the Gambia Environmental Management Agency (GAMA) as the lead agency for waste management. • Environmental Management Regulations of 1999: These Regulations set out the procedures for managing solid waste in Gambia. They include provisions for waste collection, transportation, disposal, and recycling. • Municipal Solid Waste Management Policy of 2018: This Policy provides the strategic direction for waste management in Gambia. It sets out the goals and objectives of waste management, as well as the strategies for achieving these goals and objectives. • Municipal Solid Waste Management Plan of 2019: This Plan sets out the specific actions that need to be taken to achieve the goals and objectives of the Municipal Solid Waste Management Policy.
Tanzania	• Land Act, No. 4 of 1999: This Act provides for the registration of land in Tanzania and the granting of rights of occupancy over land. It also provides for the compulsory acquisition of land by the government for public purpose. • Land Acquisition Act, No. 43 of 1967: This Act provides for the compulsory acquisition of land by the government for public purpose. It sets out the procedures for acquiring land under this Act.	• Environmental Management Act, 2004: This Act provides for the management of the environment in Tanzania. It establishes the National Environment Management Council (NEMC) as the lead agency for environmental management. • Environmental Management (Waste Management) Regulations, 2009: These Regulations set out the procedures for managing waste in Tanzania. They include

	• Customary Land Act, 1999: This Act provides for the administration of customary land in Tanzania. Customary land is land that is held under customary law. This law recognizes the customary rights of landowners and sets out the procedures for acquiring customary land. • The Village Land Act, No. 5 of 1999 (VLA) provides for the management and administration of village land. Village land is land that is located within a village and is held by the villagers under customary law. The VLA recognizes the customary rights of villagers to their land and provides for a system of governance and administration that is designed to ensure that these rights are protected. The VLA establishes a Village Land Council (VLC) in each village, responsible for the management and administration of village land. • Land Policy of 2001: This Policy provides the strategic direction for land management in Tanzania. It sets out the goals and objectives of land management, as well as the strategies for achieving these goals and objectives. • Land Acquisition Regulations, 2019: These Regulations set out the procedures for acquiring land under the Land Acquisition Act, 1967. • Water Sector Development Programme - Resettlement Management Framework (RMF revised ed. 2019). is a set of guidelines and procedures for the management of involuntary resettlement in the water sector in Tanzania.	provisions for waste collection, transportation, disposal, and recycling. • National Solid Waste Management Strategy, 2016: This Strategy provides the strategic direction for waste management in Tanzania. It sets out the goals and objectives of waste management, as well as the strategies for achieving these goals and objectives. • Dar es Salaam City Solid Waste Management Master Plan, 2020: This Plan sets out the specific actions that need to be taken to achieve the goals and objectives of the National Solid Waste Management Strategy for Dar es Salaam City.

Table A.1.1.4. Legislative and regulatory texts related to social protection (including marginal groups) and labour code.

Country	Social protection, including marginal groups	Labor Code
The Gambia	▪ National Social Protection Policy of 2018: This Policy provides the strategic direction for social protection in Gambia. It sets out the goals and objectives of social protection, as well as the strategies for achieving these goals and objectives. The Policy aims to ensure that all Gambians have access to basic social services, such as healthcare, education, and social security. ▪ Gambia Social Security Act of 2018: This Act establishes the Gambia Social Security Scheme (GSSS) and sets out its objectives and functions. The GSSS provides a range of social security benefits, such as old-age pensions, disability benefits, and survivor benefits. ▪ Gambia National Health Insurance Act of 2018: This Act establishes the Gambia National	▪ Labour Act of 2003: This Act is the main law governing labour relations in Gambia. It sets out the rights and obligations of employers and employees, as well as the procedures for resolving labour disputes. ▪ Workplace Safety and Health Act of 2013: This Act sets out the standards for workplace safety and health. It requires employers to take steps to protect the health and safety of their employees. ▪ Minimum Wages Act of 2017: This Act sets the minimum wage for

	Health Insurance Scheme (GNHISS) and sets out its objectives and functions. The GNHISS provides health insurance coverage to all Gambians. ▪ Gambia Poverty Reduction Strategy Paper (PRSP) of 2021: This PRSP sets out the government's strategy for reducing poverty in Gambia. The PRSP includes a number of social protection interventions, such as cash transfers, school feeding programs, and public works programs. ▪ Gambia National Disability Policy of 2019: This Policy provides the strategic direction for disability inclusion in Gambia. It sets out the goals and objectives of disability inclusion, as well as the strategies for achieving these goals and objectives. The Policy aims to ensure that people with disabilities have equal access to opportunities and services.	workers in Gambia. The minimum wage is reviewed every two years. ▪ Equal Opportunities Act of 2014: This Act prohibits discrimination in employment on the basis of race, gender, religion, disability, or other grounds. ▪ Child Labour Act of 2016: This Act prohibits the employment of children under the age of 15. Children under the age of 18 are only allowed to work in certain limited circumstances.
Tanzania	▪ National Social Protection Policy of 2019: This Policy provides the strategic direction for social protection in Tanzania. It sets out the goals and objectives of social protection, as well as the strategies for achieving these goals and objectives. The Policy aims to ensure that all Tanzanians have access to basic social services, such as healthcare, education, and social security. ▪ Tanzania Social Security Act of 2007: This Act establishes the National Social Security Fund (NSSF) and sets out its objectives and functions. The NSSF provides a range of social security benefits, such as old-age pensions, disability benefits, and survivor benefits. ▪ Tanzania National Health Insurance Act of 2010: This Act establishes the National Health Insurance Fund (NHIF) and sets out its objectives and functions. The NHIF provides health insurance coverage to all Tanzanians. ▪ Tanzania Poverty Reduction Strategy Paper (PRSP) of 2020: This PRSP sets out the government's strategy for reducing poverty in Tanzania. The PRSP includes a number of social protection interventions, such as cash transfers, school feeding programs, and public works programs. ▪ Tanzania National Disability Policy of 2015: This Policy provides the strategic direction for disability inclusion in Tanzania. It sets out the goals and objectives of disability inclusion, as well as the strategies for achieving these goals and objectives. The Policy aims to ensure that people with disabilities have equal access to opportunities and services.	▪ Employment and Labour Relations Act, 2004: This Act is the main law governing labour relations in Tanzania. It sets out the rights and obligations of employers and employees, as well as the procedures for resolving labour disputes. ▪ Workplace Safety and Health Act, 2003: This Act sets out the standards for workplace safety and health. It requires employers to take steps to protect the health and safety of their employees. ▪ Minimum Wages Act, 2004: This Act sets the minimum wage for workers in Tanzania. The minimum wage is reviewed every five years. ▪ Equal Opportunities Act, 2015: This Act prohibits discrimination in employment on the basis of race, gender, religion, disability, or other grounds. ▪ Child Labour Act, 2006: This Act prohibits the employment of children under the age of 15. Children under the age of 18 are only allowed to work in certain limited circumstances.

International legal framework for environmental protection

Both The Gambia and Tanzania have ratified the three Rio de Janeiro conventions: (i) the United Nations Framework Convention on climate Change (UNFCCC); (ii) the Convention on Biological Diversity (CBD); and (iii) the United Nations Convention to Combat Desertification (UNCCD). The 2 countries have also ratified the Convention on the Elimination of All Forms of Discrimination against Women.

Identification of the main environmental and social risks in the two countries participating in the project

The two countries participating in the project are confronted with numerous environmental problems. Certain problems are common to these countries due to their character as developing countries. These are mainly the effects of climate change, degradation of biological diversity, water quality, and pollution. The main environmental and social problems of the countries are presented in the **Table A1.1.5** below.

Table A1.1.5. Main environmental and social issues per country.

Country	Main environmental and social issues
The Gambia	***Environmental issues*** • Land degradation: Gambia is a small, low-lying country with limited land resources. Land degradation is a major problem, caused by factors such as deforestation, overgrazing, and poor agricultural practices. Land degradation can lead to soil erosion, desertification, and flooding. • Coastal erosion: Gambia is a coastal country, and coastal erosion is a major threat. The coastline is eroding at an alarming rate, due to factors such as sea level rise, coastal development, and deforestation. Coastal erosion can displace people, damage property, and disrupt livelihoods. • Water pollution: Water pollution is a major problem in Gambia. The main sources of water pollution are agricultural runoff, industrial waste, and sewage. Water pollution can make water unsafe to drink, cook with, and use for bathing. It can also lead to the spread of waterborne diseases. • Air pollution: Air pollution is a growing problem in Gambia, due to factors such as traffic congestion, industrial emissions, and burning of biomass fuels. Air pollution can cause respiratory problems, heart disease, and cancer. ***Social issues*** • Poverty: Poverty is a major problem in Gambia. The majority of the population lives below the national poverty line. Poverty can lead to malnutrition, poor health, and lack of access to education and other essential services. • Gender inequality: Gender inequality is a major problem in Gambia. Women have fewer opportunities than men in education, employment, and decision-making. Gender inequality can lead to discrimination, violence, and exploitation. • Child labor: Child labor is a major problem in Gambia. Many children are forced to work in hazardous conditions, such as agriculture, mining, and fishing. Child labor can deprive children of their education and childhood, and can lead to health problems and exploitation. • Political Instability: The country has experienced coups, political tensions, and changes in governance, impacting social stability.
Tanzania	***Environmental issues*** • Deforestation: Tanzania has lost about half of its forest cover in the past few decades. Deforestation is caused by factors such as logging, agricultural expansion, and charcoal production. Deforestation can lead to soil erosion, desertification, and climate change. • Land degradation: Tanzania is a landlocked country with limited land resources. Land degradation is a major problem, caused by factors such as overgrazing, poor agricultural practices, and mining. Land degradation can lead to soil erosion, desertification, and flooding. • Water pollution: Water pollution is a major problem in Tanzania. The main sources of water pollution are industrial waste, agricultural runoff, and sewage. Water pollution can make water unsafe to drink, cook with, and use for bathing. It can also lead to the spread of waterborne diseases. • Air pollution: Air pollution is a growing problem in Tanzania, due to factors such as traffic congestion, industrial emissions, and burning of biomass fuels. Air pollution can cause respiratory problems, heart disease, and cancer. • Climate change: Tanzania is vulnerable to the effects of climate change. The country is already experiencing more extreme weather events, such as droughts and floods. Climate change can also lead to sea level rise, which could displace people and damage infrastructure. ***Social issues*** • Poverty: Poverty is a major problem in Tanzania. The majority of the population lives below the national poverty line. Poverty can lead to malnutrition, poor health, and lack of access to education and other essential services.

	• Gender inequality: Gender inequality is a major problem in Tanzania. Women have fewer opportunities than men in education, employment, and decision-making. Gender inequality can lead to discrimination, violence, and exploitation. • Child labor: Child labor is a major problem in Tanzania. Many children are forced to work in hazardous conditions, such as agriculture, mining, and fishing. Child labor can deprive children of their education and childhood, and can lead to health problems and exploitation. • HIV/AIDS: HIV/AIDS is a major problem in Tanzania. The prevalence of HIV/AIDS is among the highest in the world. HIV/AIDS can lead to premature death, social stigma, and economic hardship. • Refugees and displaced people: Tanzania is home to a large number of refugees and displaced people. These people are often vulnerable to poverty, exploitation, and violence.

Risk identification and categorization

Based on the Guidance document for Implementing Entities on compliance with the Adaptation Fund Environmental and Social Policy, social and environmental risks were identified using the social and environmental risks screening checklist (**Table A.1.1.6**). This table with the evidence-base risk identification has assessed the six project components listed above. This table includes the Checklist of E&S Principles, with related questions and answers that guided the determination of whether distinct types of actions or documentations shows the principle's non-compliance risk. Based on the information and analysis presented in **Table A.1.1.6**, in **Table A.1.1.7** Risks Identification per AF's Environment and Social (E&S) Principles, each AF E&S Principle describes if there is or not a risk associated. Then, all project activities have been screened against the AF E&S Principle in Table **A.1.1.8**.

Table A.1.1.6. Evidence-based Risk Identification.

Evidence-based Risk Identification			
Checklist of E&S Principles	**Questions**	**Yes/No**	**Evidence-based Identification**
1. Compliance with the law	1.1. Has the project identified all the specific, applicable domestic and international laws, regulations, standards, procedures and permits that apply to any of its activities?	Yes	The proposed project, Part 1, section 1.2.3, identifies the regulatory framework in Tanzania and The Gambia that promote Science, Technology and Innovation, including R&D. In Part 2, sections G and F identify, respectively, the key laws, policies and plans related to the water sector in Tanzania and The Gambia, and the relevant strategies and plans at national and regional levels. This Annex describes the environment and water laws, legislative and regulatory texts related to land acquisition and waste management, and social protection (including marginal groups) and labour code. It also provides information on the ratification of the International Conventions by Tanzania and The Gambia. Project activities will be compliant with these Conventions, laws and regulations. Unidentified sub-projects (USPs) in Activities 1.2.3 ('WMO HydroHub Innovation Calls'), and 2.2.1 and 2.2.2 (Innovation Camps) will be development in compliance with relevant laws, regulations and acts of the participating countries. This will be assured by the introduction of such requirement in the Terms of Reference and will be monitored throughout the project implementation. Nevertheless, additional assessments will be carried out during the project implementation.
	1.2. Does the Project demonstrate any incompliance with any applicable national law?	No	The proposed project does not show any incompliance with applicable national law. On the contrary, the proposed project will help materializing The Gambia Water Bill and the National Water Resources Management Authority Bill that in process of being enacted.
	1.3. Has the project identified activities that may require prior permission (such as planning permission, environmental permits, construction permits, permits for water extraction, emissions, and use or production or storage of harmful substances)	No	The project will not require any prior legal and regulatory approvals for environmental and construction issues as no physical or structural construction is foreseen during the implementation of the project.
	1.4. Has the project identified environmental and social safeguarding requirements, other than those of the AF (e.g. national or of co-financing entities).	No	There are no other or additional environment and social safeguarding requirements.
2. Access and Equity	2.1. Has the project identified benefits and its geographical area of effect?	Yes	The benefits of the project were discussed with stakeholders during the consultation process. In the different areas of intervention, beneficiaries have been identified and their concerns regarding the planning and implementation of activities have been considered.
	2.2. Has the project identified any marginalized or vulnerable groups among potential project beneficiaries?	Yes	The vulnerable groups were identified during the Stakeholder Workshops hosted in Tanzania and The Gambia as part of the consultation process. Different social organizations participated. Specific meetings and interviews were also carried out.
	2.3. Has the project identified the existing risk to access to the essential services and rights indicated in the principle?	No	The project will allow impartial and equitable access to its benefits.
	2.4. Has the project described the mechanism of allocating and distributing project benefits, and how this process ensures fair and impartial access to benefits?	No	The project is designed to enable representatives of vulnerable and indigenous groups to participate in the development of the innovative solutions (through the 'Innovation Camps') and in the implementation of crowdsourcing solutions (through the 'Innovative Calls Projects'). The selection of participants in these activities will be done in consultation with local practices and traditions. Pilot testing will ensure that all stakeholders, including vulnerable and indigenous groups, are involved. These are USPs, and therefore additional assessments will be carried out during the project implementation.

	2.5. Has the project developed stakeholder and local authorities' consultations?	Yes	A broad consultation process was organized. Stakeholder Workshops were hosted in Tanzania and The Gambia, individual meetings and interviews.
	2.6. Has the project presented a mechanism to ensure participation of communities, marginalized, vulnerable groups, stakeholder and local authorities?	Yes	Regular consultations will be organized throughout the implementation of activities with stakeholders and participatory approaches will be adopted. Also, project performance evaluation workshops will be organized with stakeholders, including vulnerable groups.
3. Marginalized and Vulnerable Groups	3.1. In the influence area of the project has there been identified the presence of marginalized or vulnerable groups, including but not limited to children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities and people living with HIV/AIDS?	Yes	Vulnerable and marginalized groups identified and took part in discussions during the consultations. Their concerns were considered.
	3.2. Has the project described the characteristics of any marginalized or vulnerable groups, identifying their particular vulnerabilities that would or could make them disproportionately vulnerable to negative environmental or social impacts caused by the implementation of the activities of the project?	No	Local community members will be provided with information and explanation of the systems that will be put in place in order to participate in their development and contribute to their security, operation and maintenance. The benefits of the use of these systems will also be explained to them. Engagement of civil society in the 'Innovation Camps' (USP) will support the participation of marginalized and vulnerable groups and their ownership of the benefits of the project. Additional assessments will be carried out during the project implementation.
4. Human Rights	4.1. Has the host countries been cited in any Human Rights Council Special Procedures, being on the list of thematic or country mandates?	Yes	Both countries have been cited in the Human Rights Council Special Procedures.
	4.2. Is there a risk that rights-holders do not have the capacity to claim their rights?	No	The proposed project will allow open discussion where everybody can give their opinion and express their needs. A grievance mechanism will be put in place in the various project intervention areas. This mechanism will make it possible to receive and process complaints related to the implementation of project activities in a transparent and fair framework. This will be particularly relevant in the implementation of Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs.
	4.3. Has the project covered human rights issues during stakeholder consultations during project formulation?	Yes	Human rights issues were discussed during public consultations with stakeholders. Also, the populations were informed of the establishment of mechanisms for managing complaints and violations of rights that would be observed during the implementation of project activities.
	4.4. Has the project included the findings of the consultations on human rights issues in the project document?	Yes	Issues related to human rights were raised during public consultations. The proposed activities do not or will not violate any of the established human rights. Nevertheless, the project will mainstream training on Human Rights into all training activities.
5. Gender Equity and Women's Empowerment	5.1. Has the project identified activities that are known to exclude or hamper a gender group based on legal, regulatory or customary grounds?	Yes	The proposed project targets science and technology development, where men tend to hold most of the leadership positions. Women's participation is often limited due to cultural and social norms.
	5.2. Has the project identified elements that maintain or exacerbate gender inequality or the consequences of gender inequality?	Yes	The proposed project targets science and technology development, where men tend to hold most of the leadership positions. Women's participation is often limited due to cultural and social norms.
	5.3. Has the project identified particular vulnerabilities of men and women that would or could make them disproportionately vulnerable to negative environmental or social impacts caused by the outputs / activities of the project?	Yes	The proposed project targets science and technology development, where men tend to hold most of the leadership positions. Women's participation is often limited due to cultural and social norms.

6. Core Labour Rights	6.1. Has the project determined if the host country has ratified the eight ILO core conventions	Yes	Both countries have ratified the eight ILO core conventions.
	6.2. Has the project reviewed the latest ILO assessments of application of the standards in the country?	Yes	Both countries have ratified International Labour Organization (ILO). Tanzania: https://www.ilo.org/gateway/faces/home/ctryHome?locale=EN&countryCode=TZA&_adf.ctrl-state=ym8wym3fz_88 The Gambia: https://www.ilo.org/gateway/faces/home/ctryHome?locale=EN&countryCode=GMB&_adf.ctrl-state=ym8wym3fz_51
	6.3. Has the project identified how the ILO core labour standards are incorporated in the design and the implementation of the outputs / activities' project?	Yes	The project mainstream core labour rights in all the actions and at different levels. All the procurement process will follow the UN - WMO Financial Regulations and Rules as well as a sustainable procurement process including core labour rights. The project will respect all labor agreements and ensure that its workers are treated fairly, while guaranteeing them safe and healthy working conditions. For Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, these aspects will be assured and monitored.
	6.4. Has the project describe the common labour arrangements in the sector(s) in which the project will operate, with particular attention to all forms of child labour and forced labour.	Yes	The project will be implemented and managed in accordance with the labour laws of the target countries. All project interventions will be carried out with respect for workers' rights. Forced labor and child labor will be given special attention by the project. For Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, these aspects will be assured and monitored.
7. Indigenous Peoples	7.1. Has the project identified if indigenous peoples are present in the area of influence?	Yes	The indigenous population of the area will be consulted and involved during the design and implementation of the project activities. The traditional knowledge of indigenous people on floods and droughts will be useful in decision-making. For Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, these aspects will be further assessed.
	7.2. Has the project quantify the groups identified of indigenous peoples?	No	The indigenous population of the area will be consulted and involved during the design and implementation of the project activities. This is particularly important for Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, wherein these aspects will be further assessed.
	7.3. Has the project determined if there are provisions for a realistic and effective Free, Prior, Informed Consent process, giving a community the right to give or withhold its consent to proposed projects that may affect the lands they customarily own, occupy or otherwise use?	No	The indigenous population of the area will be consulted and involved during the design and implementation of the project activities. This is particularly important for Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, wherein these aspects will be further assessed.
	7.4. Has the project provided a summary of any reports, specific cases, or complaints that have been made with respect to the rights of indigenous peoples by the Special Rapporteur on the rights of indigenous peoples and that are relevant to the project?	No	Government entities and NGOs representing these groups were consulted and participated in the Stakeholders Workshops, individual meetings and interviews. For Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, these aspects will be further assessed.
8. Involuntary Resettlement	8.1. Has the project determined if it is voluntary or involuntary resettlement?	No	The project will not create direct involuntary resettlement of communities.
	8.2. Has the project identified stakeholders whose livelihoods may be affected, directly or indirectly?	No	The project will not create direct involuntary resettlement of communities.
	8.3. Has the project identified stakeholders whose assets or access to assets may be affected, directly or indirectly, and if this may	No	The project will not create direct involuntary resettlement of communities.

	lead to resettlement and its consequences including indemnification, compensation, etc.		
9. Protection of Natural Habitats	9.1. Has the project identified all the critical natural habitats in the region that may be affected? The area considered should be large enough to be credible and be chosen in function of the impact generating agent (e.g. noise) and an appreciation of its propagating ability. The habitats to be considered include all those recognized as critical in any way, be it legally (through protection), scientifically or socially.	No	There are no potential direct risks to the protection of ecosystems, their natural habitats and biological diversity through project activities. On the contrary, the proposed project will generate data that can support protection of natural habitats.
	9.2. Has the project identified for each critical natural habitat, the mechanism by which it is particularly vulnerable?	No	There are no potential direct risks to the protection of ecosystems, their natural habitats and biological diversity through project activities. On the contrary, the proposed project will generate data that can support protection of natural habitats.
	9.3. Has the project considered all the activities to identify actual risks for each of the natural habitats identified taking into account the specific characteristics of the activity (location, dimension, duration etc.) and the vulnerability mechanism(s) of each habitat identified.	No	There are no potential direct risks to the protection of ecosystems, their natural habitats and biological diversity through project activities. On the contrary, the proposed project will generate data that can support protection of natural habitats.
10. Conservation of Biological Diversity.	10.1. Has the project identified all the elements of biodiversity interest in the region that may be affected? The area considered should be large enough to be credible and be chosen in function of the impact generating agent and an appreciation of its propagating ability. It is important in the identification of the elements of biodiversity interests not to limit this to the species level but to include all elements of biodiversity interest, including landscapes, ecosystem processes, habitats, and hydrological cycles, processes of erosion and sedimentation and interactions between taxa. Include all elements enjoying local or international protection	No	There will be no direct risks associated with the conservation of biological diversity as the project will not involve any physical action on natural resources and will not introduce any known invasive species. On the contrary, the proposed project will generate data that can support conservation of biological diversity. The project activities will ensure that the principles of the Convention on Biological Diversity which has been signed by the participating countries are followed and supported.
	10.2. For each identified biodiversity element, has the project identified the mechanism by which it is particularly vulnerable? (Changes in flow regime or water quality for a seasonal wetland or disruption of migration routes).	No	There will be no direct risks associated with the conservation of biological diversity as the project will not involve any physical action on natural resources and will not introduce any known invasive species. On the contrary, the proposed project will generate data that can support conservation of biological diversity. The project activities will ensure that the principles of the Convention on Biological Diversity which has been signed by the participating countries are followed and supported.
	10.3. Has the project identified the potential of introducing – intentionally or accidentally – known invasive species?	No	There will be no direct risks associated with the conservation of biological diversity as the project will not involve any physical action on natural resources and will not introduce any known invasive species.
	10.4. Has the project identified the use of living modified organisms resulting from modern biotechnology?	No	There will be no direct risks associated with the conservation of biological diversity as the project will not involve any physical action on natural resources and will not introduce any known invasive species. On the contrary, the proposed project will generate data that can support conservation of biological diversity. The project activities will ensure that the

			principles of the Convention on Biological Diversity which has been signed by the participating countries are followed and supported.
11. Climate Change	11.1. Has the project determined if it belongs to a sector mentioned in the Guidance document for which a greenhouse gasses emission calculation is required? Energy, transport, heavy industry, building materials, large-scale agriculture, large-scale forest products, and waste management.	No	The project will not result in the emission of greenhouse gases into the atmosphere or deforestation, so there will be no impact on climate change. On the contrary, the proposed project will generate data that can support actions aimed at increasing the resilience of populations at the local level.
	11.2. Has the project carried out a qualitative risk identification for each of the following drivers of climate change: • Emission of carbon dioxide gas from the use of fossil fuel and from changes in land use • Methane and nitrous oxide emissions from agriculture • Emission of hydrofluorocarbons • Perfluorocarbons • Sulphur hexafluoride • Other halocarbons, aerosols, and ozone.	No	The project will not result in the emission of greenhouse gases into the atmosphere or deforestation, so there will be no impact on climate change. On the contrary, the proposed project will generate data that can support actions aimed at increasing the resilience of populations at the local level.
	11.3. Has the project carried out a qualitative risk identification of any impact on carbon capture and sequestration capacity.	No	The project will not result in the emission of greenhouse gases into the atmosphere or deforestation, so there will be no impact on climate change. On the contrary, the proposed project will generate data that can support actions aimed at increasing the resilience of populations at the local level.
	11.3. Has the project identified any climate variability and change impacts?	No	The project activities are not expected to result in water, air, and soil pollution. The project will build technical and organizational capacity for water resource management with guidelines, policies, and action plans contributing to green and blue economies.
12. Pollution Prevention and Resource Efficiency	12.1. Has the project identified activities with preventable waste or pollution production?	No	The project activities are not expected to result in water, air, and soil pollution. The project will build technical and organizational capacity for water resource management with guidelines, policies, and action plans contributing to green and blue economies. Nevertheless, for Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, these aspects will be further assessed.
	12.2. Has the project determined the nature and quantity of the waste, as well as those of possible pollutants that may be produced?	No	The project activities are not expected to result in water, air, and soil pollution. The project will build technical and organizational capacity for water resource management with guidelines, policies, and action plans contributing to green and blue economies. Nevertheless, for Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, these aspects will be further assessed.
	12.3. Has the project determined if the concept of minimization of waste and pollution production has been applied in the design phase and if this will be effective during implementation?	No	The project is not expected to have a negative impact on public health. On the contrary, it will contribute to monitoring the water quality to assist decision-makers in water supply, and preventing the population from hydromet disasters. Nevertheless, for Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, these aspects will be further assessed.
13. Public Health	13.1. Has the project identified using an appropriate health impact screening tool (check list) potentially significant negative impacts on public health generated?	Yes	Both countries have ratified the 1972 UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage. Tanzania: https://treaties.un.org/Pages/showActionDetails.aspx?objid=08000002800ff067&clang=_en The Gambia: https://treaties.un.org/Pages/showActionDetails.aspx?objid=08000002800fef12&clang=_en

14. Physical and Cultural Heritage	14.1. Has the project determined if the host country has ratified the 1972 UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage?	Yes	The project does not affect the physical and cultural heritage. The aim of the project is to develop better management of natural resources and to have traditional and cultural integration from civil society. Tanzania: https://www.maliasili.go.tz/sectors/category/antiquities The Gambia: https://www.motc.gov.gm
	14.2. Has the project identified the national and local legal and regulatory framework for recognition and protection of physical and cultural heritage?	No	The project does not affect the physical and cultural heritage. The aim of the project is to develop better management of natural resources and to have traditional and cultural integration from civil society.
	14.3. Has the project described in the influence zone all the elements of the cultural heritage, their location and their vulnerabilities? The area considered should be large enough to be credible and be chosen in function of the impact generating agent (e.g. vibrations, landscape elements) and an appreciation of its propagating ability. Include all elements enjoying local or international protection.	No	The project does not affect the physical and cultural heritage. The aim of the project is to develop better management of natural resources and to have traditional and cultural integration from civil society.
	14.4. Has the project determined if any of the heritage elements included in the List of World Heritage in Danger is in the influence zone?	No	The project does not affect the physical and cultural heritage. The aim of the project is to develop better management of natural resources and to have traditional and cultural integration from civil society.
	14.5. Has the project considered all the activities to identify actual risks for each of the heritage elements identified taking into account the specific characteristics of the activity (location, dimension, duration etc.) and the vulnerability mechanism(s) of each heritage element identified?	No	The areas where the proposed project will be implemented are no productive lands nor high value conservation sites.
15. Lands and Soil Conservation	15.1. Has the project identified the presence of fragile soils within the influence area?	No	The project is designed and shall be implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services. Nevertheless, for Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, these aspects will be further assessed.
	15.2. Has the project identified activities that could result in the loss of otherwise non-fragile soil?	No	The project is designed and shall be implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services. Nevertheless, for Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, these aspects will be further assessed.
	15.3. Has the project identified productive lands and/or lands that provide valuable ecosystem services within the influence area?	No	The project is designed and shall be implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services. Nevertheless, for Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, these aspects will be further assessed.
	15.4. Has the project identified activities that may lead to land degradation?	No	The project is designed and shall be implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services. Nevertheless, for Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, these aspects will be further assessed.

Table A.1.1.7. Risk identification per E&S Principles.

Checklist of E&S Principles	Associated Risk (Low,	Description of Associated Risks

	Medium, High)	
1.Compliance with the law	Low	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance.
2. Access and Equity	Low	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance.
3. Marginalized and Vulnerable Groups	Medium	There is a risk that vulnerable and marginalized groups do not have sufficient knowledge and access to technological devices such as mobile phones or lack of good telephone connection especially required for participating in engaging civil society. To avoid the exclusion of marginalized and vulnerable communities, several communication means must be explored in the 'Innovation Calls Projects' (USPs) in order to reach these groups, particularly women, girls, the elderly and disabled people.
4. Human Rights	Low	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance.
5. Gender Equity and Women's Empowerment	Medium	The proposed project targets science and technology development, where men tend to hold most of the leadership positions. Women's participation is often limited due to cultural and social norms. The gender-responsive stakeholder engagement strategy included as one activity of this project will ensure that women and representatives of women's groups are fully involved.
6. Core Labour Rights	Low	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance.
7. Indigenous Peoples	Medium	The proposed project will engage with Indigenous people in Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs. Insufficient consideration of local communities' knowledge, practices, and needs when implementing follow-on projects could lead to a lack of community ownership, participation, and alignment with their priorities. In addition, inadequate consultation and engagement with relevant stakeholders, including vulnerable groups, during the implementation of follow-on projects may result in exclusion, negative perceptions, and resistance to project activities.
8. Involuntary Resettlement	Low	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance.
9. Protection of Natural Habitats	Low	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance.
10. Conservation of Biological Diversity	Low	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance.
11. Climate Change	Low	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance.
12. Pollution Prevention and Resource Efficiency	Low	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance.
13. Public Health	Low	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance.
14. Physical and Cultural Heritage	Low	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance.
15. Land and Soil Conservation	Low	Activities 1.2.3, 2.2.1 and 2.2.2., which are USPs, will be developed in compliance.

Table A.1.1.8. Activity identified risks in accordance with the AF's E&S Principles and Potential E&S Impacts.

Activity identified risks in accordance with AF's E&S Principles and Impacts		
Activity	**Identified risks in accordance with AF's E&S Principles**	**Potential E&S Impacts if risks materialize**
1.1.1 Undertake a detailed analysis of the training capacities related to hydrometric monitoring and related fields in the academia sector in Tanzania and The Gambia, and develop supportive courses (e.g. using digital and Innovation Hub) to address the specific scientific, technical, and operational expertise deficits related to hydrometric monitoring	**Risk 1:** Inadequate consideration of gender equity in the analysis could lead to a lack of women's representation and empowerment in the hydrometric monitoring and related fields. **Risk 2:** Insufficient involvement of local communities and indigenous knowledge holders might result in the neglect of valuable traditional knowledge and community needs in the analysis.	**Impact 1:** Gender inequity may persist, leading to a lack of diverse perspectives and participation, hindering innovation and comprehensive solutions in the field. **Impact 2:** Neglecting indigenous knowledge could result in missed opportunities to incorporate traditional methods for monitoring and disaster risk reduction, potentially undermining the effectiveness of the project.

1.1.2 Organize (1) twinning arrangements between the academic sector within the countries covered by each Regional Water Monitoring Innovation Hub and relevant international partners (e.g. WMO Regional Training Centres based at other universities), and (2) training-of trainers to ensure that all required human capacities in the academic sector are built and/or enhanced, considering gender equity	**Risk 1:** Insufficient consideration of local context and needs when partnering with international institutions might lead to training approaches that are not tailored to the specific challenges and conditions of the region. **Risk 2:** Inadequate gender equity considerations during the training-of-trainers program might result in gender imbalances among trainers, limiting the inclusivity and diversity of the training programs. **Risk 3:** Lack of engagement with local communities and indigenous knowledge holders may result in the neglect of traditional knowledge and practices in the training curriculum, reducing its comprehensiveness.	**Impact 1:** Training programs that do not address local challenges and needs may not effectively contribute to enhancing human capacities, hindering the development of skilled professionals in the field of hydrometric monitoring. **Impact 2:** Gender imbalances among trainers could result in training programs that do not adequately address the unique perspectives and needs of all genders, leading to reduced effectiveness and relevance. **Impact 3:** Failure to integrate indigenous knowledge and engage local communities may lead to a disconnect between the training content and the on-the-ground reality, potentially undermining the sustainability of hydrometric monitoring initiatives.
1.1.3 Organize twinning arrangements between the academic and the private sector within the countries covered by each Regional Water Monitoring Innovation Hub, with technical guidance and supervision by an international partner, for research and co-design of the innovative solutions, and development of training courses and materials to support their operationalization by NMHSs	**Risk 1:** Exclusion of key stakeholders, such as local communities and indigenous groups, from the research and co-design process might lead to solutions that do not align with local needs and priorities. **Risk 2:** Inadequate attention to gender equity in the development of training courses and materials might result in gender biases in the content, excluding women and limiting their participation.	**Impact 1:** Lack of community involvement and consultation in the design process could lead to resistance, misunderstandings, and limited uptake of the innovative solutions, hampering their effectiveness. **Impact 2:** Gender-biased training materials may deter women from participating in the training programs, perpetuating gender disparities in the field and limiting the potential impact of the project.
1.1.4 Develop a capacity development plan and collaborative agreements/ MoU between the NMHS and the academic sector to ensure regular training/ retraining of NMHS staff for sustainability of the investments	**Risk 1:** Inadequate consideration of gender equity in the capacity development plan may result in limited opportunities for women to access training and retraining, perpetuating gender disparities within the project. **Risk 2:** Lack of proper collaboration and clear agreements between the NMHS and the academic sector might lead to misunderstandings, conflicting priorities, and ultimately hinder the effective implementation of training programs. **Risk 3:** Insufficient attention to local cultural contexts and community needs in the training may result in training content that is not relevant, applicable, or inclusive.	**Impact 1:** Gender-insensitive capacity development could exclude women from valuable training opportunities, limiting their participation and contribution to the project's outcomes. **Impact 2:** Weak collaboration and unclear agreements might result in delays, inefficiencies, and reduced effectiveness of training initiatives, undermining the long-term sustainability of the project's investments. **Impact 3:** Training programs that do not consider local contexts and community needs could fail to resonate with participants, leading to low engagement, minimal knowledge retention, and ultimately reducing the impact of the project.
1.2.1 Undertake a detailed assessment of the hydrometric monitoring systems in Tanzania and The Gambia, as well as in transboundary Lake Basins and transboundary Aquifers, and prepare an inventory of the available station equipment and data acquisition, transmission and processing systems	**Risk 1:** Inadequate consideration of local communities and indigenous peoples in the assessment process might lead to the neglect of their traditional knowledge and needs in hydrometric monitoring systems. **Risk 2:** Insufficient attention to gender equity might result in overlooking the perspectives and contributions of women in designing and implementing monitoring systems. **Risk 3:** Lack of involvement and consultation with neighboring countries and their communities could lead to cross-border tensions, disagreements, and conflicts related to data sharing and management.	**Impact 1:** Exclusion of local communities and indigenous peoples could lead to the loss of valuable traditional knowledge and practices that could enhance the accuracy and effectiveness of hydrometric monitoring systems. **Impact 2:** Gender-insensitive assessment might exclude women's perspectives and expertise, leading to a lack of diversity in system design and potentially overlooking critical aspects. **Impact 3:** Failure to engage neighboring countries and their communities could result in strained diplomatic relations, hindered information sharing, and ultimately

		compromise the effectiveness of transboundary monitoring efforts.
1.2.2 Assess and identify vulnerable indigenous communities that could engage in (i) innovative approaches for data acquisition; and (ii) equipment security, operation and maintenance	**Risk 1:** Inadequate consultation and engagement with indigenous communities might result in the misrepresentation or neglect of their traditional knowledge and practices. **Risk 2:** Overlooking the social and cultural contexts of indigenous communities could result in the implementation of data acquisition approaches that are incompatible with their traditional ways of living and knowing. **Risk 3:** Inadequate consideration of equipment security, operation, and maintenance needs might lead to the abandonment or ineffective use of equipment over time, reducing the reliability of the early warning system.	**Impact 1:** Misrepresentation or neglect of indigenous knowledge could lead to mistrust, resistance, and reduced community ownership of the early warning system, undermining its effectiveness. **Impact 2:** Implementation of data acquisition approaches that disregard indigenous practices could lead to cultural insensitivity, disrupting the social fabric of the communities and potentially leading to conflicts. **Impact 3:** Ineffective equipment security, operation, and maintenance could render the early warning system unreliable, leaving communities vulnerable to climate-related risks and disasters.
1.2.3 Develop and implement WMO HydroHub Innovation Calls	**Risk 1:** Limited stakeholder engagement during the development of the ToR might result in overlooking important perspectives, needs, and concerns, leading to a lack of ownership and community support for the projects. **Risk 2:** Lack of effective engagement with local communities and stakeholders during project implementation may lead to misunderstandings, conflicts, and resistance, particularly if their concerns and needs are not adequately addressed.	**Impact 1:** Negative impacts resulting from poorly designed projects could lead to adverse effects on communities' livelihoods and environment. **Impact 2:** Poor community engagement and consultation during implementation could result in distrust, social unrest, and project delays, impacting the project's effectiveness and acceptance by the affected communities.
2.1.1 Undertake an assessment of the 'innovation environment' in both Hubs	**Risk 1:** Incomplete assessment of the innovation environment might lead to a lack of understanding of existing strengths, weaknesses, opportunities, and threats. This could result in the implementation of strategies that are misaligned with the actual needs and potentials of the innovation ecosystems. **Risk 2:** Insufficient engagement of relevant stakeholders, including local communities and marginalized groups, in the assessment process may result in overlooking important perspectives and failing to consider the potential impacts of innovation on diverse populations.	**Impact 1:** A superficial assessment of the innovation environment could lead to the allocation of resources and efforts to areas that do not effectively support the development and growth of hydrometric monitoring innovations. This might limit the project's ability to achieve meaningful outcomes and impact. **Impact 2:** Lack of representation and involvement of marginalized groups and local communities in the assessment could lead to exclusion from the benefits of innovation and capacity development efforts. This might perpetuate inequalities and hinder the creation of inclusive and equitable innovation ecosystems.
2.1.2 Provide international twinning/mentoring to assist suitable entrepreneurs in developing the required capacities in relation to hydrometric monitoring and building their business case/model for potential grow and job creation	**Risk 1:** Lack of social inclusion and community engagement in the mentoring process might result in a limited understanding of the local context, needs, and potential impacts of the developed innovations. This could lead to innovations that do not effectively address the needs of local communities and marginalized groups.	**Impact 1:** Exclusion of local communities and marginalized groups from the mentoring process could lead to a lack of local ownership and understanding of the developed innovations. This might hinder the successful adoption and integration of these innovations into the local context, limiting their effectiveness in addressing water-related challenges and creating job opportunities.
2.1.3 Develop and provide technical guidance materials to assist suitable institutions building their business case/model	**Risk 1:** Lack of social inclusivity in the development of technical guidance materials could result in business models that do not address the needs and concerns of marginalized groups, leading to unequal distribution of benefits.	**Impact 1:** Failure to engage with and incorporate the perspectives of marginalized groups in the development of guidance materials could result in business models that perpetuate existing inequalities. This may lead to limited

		job creation, exclusion of vulnerable communities, and exacerbation of social disparities.
2.2.1 Based on the results of activity 3.2.2, launch Calls for Expressions of Interest (EoI) for the establishment of the Innovation Camps and organize them with a focus on coming up with ideas for solutions to one/a small number of monitoring problem(s)	**Risk 1:** Insufficient attention to social inclusivity in the selection criteria for Innovation Camp participants might lead to the exclusion of marginalized groups or fail to address their unique needs and contributions.	**Impact 1:** Excluding marginalized groups or failing to consider their perspectives in the selection process for Innovation Camp participants could perpetuate existing social inequalities. This might hinder the development of innovative solutions that reflect diverse experiences and needs, limiting the project's potential benefits.
2.2.2 Implement follow-on projects (similar to 'Innovation Calls Projects') from the Innovation Camps for the realization of the ideas	**Risk 1:** Insufficient consideration of local communities' knowledge, practices, and needs when implementing follow-on projects could lead to a lack of community ownership, participation, and alignment with their priorities. **Risk 2:** Inadequate consultation and engagement with relevant stakeholders, including vulnerable groups, during the implementation of follow-on projects may result in exclusion, negative perceptions, and resistance to project activities.	**Impact 1:** Neglecting the integration of local communities' knowledge and practices into the follow-on projects might lead to projects that are mismatched with community contexts, resulting in minimal benefits for the communities and potential negative social impacts. **Impact 2:** Failing to engage with stakeholders, especially marginalized groups, could lead to conflicts, grievances, and reduced social acceptance of the projects. This could hinder project success and damage relationships between project implementers and affected communities.
3.1.1 Undertake an organizational assessment of NMHSs and regional organizational arrangements for hydrometric monitoring and data sharing within the Regional Water Monitoring Innovation Hub, and develop and organize training and learning staff exchanges to facilitate and guide learning exchanges among NMHSs within a Regional Water Monitoring Innovation Hub	**Risk 1:** Inadequate consideration of the diverse needs and capacities of different stakeholders, including marginalized groups and indigenous communities, during the organizational assessment might result in exclusion, lack of representation, and unequal benefits. **Risk 2:** Failure to engage with local communities and stakeholders in the assessment process could lead to a lack of understanding, mistrust, and potential resistance to the changes introduced by the organizational assessment.	**Impact 1:** Neglecting the needs and capacities of marginalized groups and indigenous communities could perpetuate existing inequalities and limit their ability to access and benefit from the improved hydrometric monitoring and data sharing systems. This could exacerbate social disparities and hinder inclusive development. **Impact 2:** Excluding local communities and stakeholders from the assessment process might result in a lack of local buy-in and understanding of the changes being introduced. This could lead to misunderstandings, conflicts, and reduced support for the new organizational arrangements, potentially hindering project success.
3.1.2 Set up to the 'Regional Water Monitoring Innovation Hubs', and develop 'Regional Technical Champions'/long-term Centres of Excellence in hydrometry	**Risk 1:** Inadequate representation of local communities and indigenous knowledge in the development of 'Regional Technical Champions' and Centres of Excellence could result in the exclusion of valuable traditional practices and marginalization of indigenous perspectives. **Risk 2:** Insufficient attention to gender equity considerations in the selection and capacity-building of 'Regional Technical Champions' might lead to the underrepresentation of women, hindering the diversity and inclusiveness of the Centres of Excellence.	**Impact 1:** Excluding local communities and indigenous knowledge from the development of Centres of Excellence may undermine the effectiveness and relevance of these centers in addressing water monitoring challenges specific to the region. This could also contribute to the loss of traditional knowledge and practices. **Impact 2:** Neglecting gender equity considerations in the selection and capacity-building of 'Regional Technical Champions' could perpetuate gender disparities in the field, limiting the participation and contributions of women. This might hinder the holistic and diverse perspective needed for effective water monitoring and management.
3.1.3 Undertake assessment of capacity needs and investment requirement for establishment of	**Risk 1:** Insufficient integration of local communities and indigenous knowledge in the planning and development of calibration facilities might lead to the disregard of	**Impact 1:** Disregarding local communities' and indigenous peoples' perspectives and knowledge in the development of calibration facilities may lead to social tensions, disputes,

calibration facility and services for hydromet equipment	traditional practices and values related to water resources, potentially leading to conflicts and mistrust.	and resistance, thereby undermining the effectiveness and acceptance of these facilities.
3.2.1 Organize workshops among public, privates and academic sectors, with the support of international partners, to identify the skills needs in relation to hydrometric innovation, ensuring gender equity	**Risk 1:** Inadequate consideration of gender equity in the identification of skills needs may lead to a lack of representation and participation of women in the hydrometric innovation sector, perpetuating gender disparities and limiting the diversity of perspectives and solutions. **Risk 2:** Insufficient engagement with local communities and indigenous knowledge holders during skills needs assessments could result in the overlooking of valuable traditional knowledge related to water resources and weather patterns, which might contribute to incomplete or ineffective solutions.	**Impact 1:** Neglecting gender equity in skills needs identification may result in the underrepresentation of women in hydrometric innovation, limiting their opportunities for participation, leadership, and empowerment in the sector. **Impact 2:** Failing to involve local communities and indigenous knowledge holders in skills needs assessments may lead to the exclusion of valuable insights, potentially resulting in the development of hydrometric innovations that do not fully align with local needs and contexts.
3.2.2 Organize stakeholders' workshops to discuss and agree on real challenges and needs to be addressed at Innovation Camps in the context of adaptation to climate change	**Risk 1:** Insufficient representation and engagement of vulnerable and marginalized communities in the stakeholders' workshops could result in the overlooking of their unique challenges and needs related to climate change adaptation. This may lead to the development of solutions that do not adequately address their specific vulnerabilities. **Risk 2:** Lack of effective communication and collaboration among diverse stakeholders during the workshops may result in misunderstandings, conflicts, or disagreements on priority challenges and needs. This could hinder the development of a coherent and consensus-driven approach to addressing climate change adaptation.	**Impact 1:** Excluding vulnerable and marginalized communities from discussions could lead to the development of climate adaptation solutions that do not effectively mitigate their risks or enhance their resilience, perpetuating their vulnerability to climate impacts. **Impact 2:** Failure to foster effective collaboration among stakeholders may result in the allocation of resources to less critical challenges or the duplication of efforts, ultimately undermining the efficiency and impact of the Innovation Camps' outcomes.
4.1.1 Undertake national cost-benefit analysis of the hydrological data-related investments within each Regional Water Monitoring Innovation Hub	**Risk 1:** Lack of participation and engagement of local communities and stakeholders in the cost-benefit analysis process might result in the exclusion of their perspectives, concerns, and potential benefits from the analysis. This could lead to projects that do not align with the needs and aspirations of the affected communities.	**Impact 1:** Excluding local communities and stakeholders from the analysis process may lead to projects that do not generate meaningful benefits for them or adequately address their concerns. This can result in reduced community support, project resistance, and challenges in achieving the intended project outcomes.
4.1.2 Undertake an assessment of the legal and regulatory frameworks related to integrated water resources management and innovation and propose any required changes based on the results of the Innovation Calls projects and the Innovation Camps	**Risk 1:** Lack of engagement and consultation with local communities and stakeholders during the assessment and change proposal process may lead to regulatory changes that do not address their needs, concerns, and traditional knowledge. This could result in regulatory frameworks that fail to align with the principles of participation and inclusive decision-making.	**Impact 1:** Failure to engage local communities and stakeholders in the assessment and change proposal process may lead to regulatory changes that are not sensitive to their cultural values, rights, and livelihoods. This can result in project resistance, social conflict, and challenges in achieving effective implementation of the regulatory changes.
4.1.3 Organize awareness-raising activities for decision-makers, legislators, and water users, including Ministerial Roundtables that will showcase the comprehensive results and recommendations of national cost-benefit analysis of hydrological data investments	**Risk 1:** Insufficient attention to inclusivity and representation in the awareness-raising activities could result in key stakeholders, particularly local communities and marginalized groups, not being adequately engaged. This may lead to a lack of understanding, ownership, and support for the analysis results and recommendations.	**Impact 1:** Limited engagement of local communities and marginalized groups in awareness-raising activities could result in their perspectives and needs not being considered. This may lead to projects and policies that do not address their specific vulnerabilities and aspirations, potentially exacerbating existing inequities.

4.1.4 Develop a gender-responsive stakeholder engagement strategy for continuous including government departments, private sector, academia, and local community representatives, implement and institutionalize it to ensure continued engagement beyond project implementation	**Risk 1:** Inadequate consideration of the unique needs and perspectives of marginalized and underrepresented groups within stakeholder engagement could result in their voices not being heard. This may lead to decisions and strategies that do not effectively address the specific challenges faced by these groups. **Risk 2:** Lack of commitment and buy-in from key stakeholders, including government departments, private sector, and local communities, could hinder the implementation of the gender-responsive stakeholder engagement strategy. This may result in limited participation, reduced collaboration, and a lack of meaningful engagement in decision-making processes.	**Impact 1:** Excluding marginalized and underrepresented groups from the stakeholder engagement process may perpetuate existing social inequalities and hinder efforts to achieve gender equality. This could lead to projects and initiatives that fail to deliver equitable benefits to all stakeholders. **Impact 2:** If key stakeholders do not fully engage in the gender-responsive stakeholder engagement strategy, the implementation of gender-sensitive actions and policies may be compromised. This could result in missed opportunities to integrate diverse perspectives, leading to suboptimal outcomes in terms of gender equity and social inclusion.
4.2.1 Carry out a consultative survey for NMHSs to analyse various aspects of their data services provision, and for existing and potential new users of NMHSs' data services. Based on the results, map and identify existing and potential users of NMHSs' data services that should take part of the User-Provider Workshops and Webinars	**Risk 1:** Inadequate representation of marginalized or vulnerable communities in the survey process could result in a lack of consideration for their specific data needs. This may lead to a data gap that hinders the effectiveness of early warning systems for these communities. **Risk 2:** If the survey process lacks transparency and inclusivity, there's a risk that NMHSs' data services may not align with the actual needs and expectations of stakeholders. This misalignment could reduce the utility and relevance of the data services provided.	**Impact 1:** Excluding marginalized communities from the survey could perpetuate environmental and social injustices by neglecting the vulnerabilities they face. This might lead to inadequate early warning systems for these communities during disasters or climate-related events. **Impact 2:** Misalignment between data services and stakeholder needs could result in wasted resources and efforts on providing data that doesn't effectively address the real-world challenges faced by communities. This misalignment may reduce the overall impact and usefulness of the data services.
4.2.2 Organize User-Provider Webinars; and hold Workshops to bring together NMHSs, public and private sectors and facilitate targeted interactions among them for awareness, integration and uptake of new data-driven services stemmed from Innovation Calls projects and Camps in other projects and initiatives	**Risk 1:** Insufficient consideration of gender and social equity in the selection of participants for the webinars and workshops may lead to a lack of representation from certain groups, limiting the diversity of perspectives and insights shared during the sessions. This could hinder the effective integration and uptake of data-driven services. **Risk 2:** If the process for identifying and developing new markets for NMHSs' data services is not transparent and inclusive, there's a risk that potential market opportunities may be overlooked, and the benefits of these services may not reach a wider range of users.	**Impact 1:** Excluding certain stakeholder groups, particularly those from underrepresented or marginalized communities, from the webinars and workshops could result in a missed opportunity to gather diverse feedback and insights. This may lead to an incomplete understanding of user needs and preferences, potentially limiting the adoption of new data-driven services. **Impact 2:** Lack of inclusivity in the process of identifying and developing new markets may result in the exclusion of potential users and stakeholders. This could prevent the expansion of the user base for NMHSs' data services, limiting the potential impact and value of these services.

Categorization

Based on the above analysis, the project outputs/activities were characterized according to the scale, nature and severity of their potential environmental and social impacts (**Table A.1.1.9**) and classified in terms of significance of the risk.

Table A.1.1.9. Categorization definition.

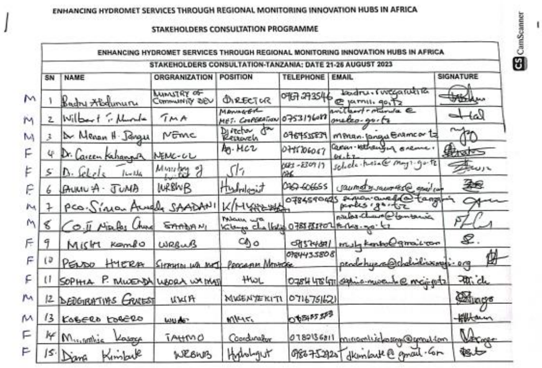
Questions	Component 1 (Yes/No)	Component 2 (Yes/No)	Component 3 (Yes/No)	Component 4 (Yes/No)

Does the Project Outputs / Activities have significant adverse environmental or social impacts that are diverse?	No	No	No	No
Does the Project Outputs / Activities have significant adverse environmental or social impacts that are widespread?	No	No	No	No
Does the Project Outputs / Activities have significant adverse environmental or social impacts that are irreversible?	No	No	No	No
Does the Project Outputs / Activities have few adverse environmental or social impacts?	Yes (for USPs)	Yes (for USPs)	No	No
Does the Project Outputs / Activities have in small scale / low widespread adverse environmental or social impacts?	No	No	No	No
Does the Project Outputs / Activities have reversible or easily mitigated adverse environmental or social impacts?	Yes (for USPs)	Yes (for USPs)	No	No
Does the Project Outputs / Activities have no adverse environmental or social impacts?	No (for USPs)	No (for USPs)	Yes	Yes
Categorization (A, B or C)	**B**	**B**	**C**	**C**

Project activities have been designed and will be implemented to minimize any risks for negative social and environmental impacts. Activities were discussed with beneficiaries (including the most vulnerable groups – and taking into account the different needs and constraints of these groups). An extensive consultation process on environmental and social issues was carried out. However, there will be Unidentified Sub-projects (USPs) in Activities 1.2.3, 2.2.1 and 2.2.2, wherein neither the activity nor the location are known, so there will be Environment and Social Impact Assessments carried out in association with the 'WMO HydroHub Innovation Calls' and with the Innovation Camps. With the risks identification per E&S Principles, and the uncertainties associated with the USPs, the proposed project is categorized as B according to the categories established in the ESP. Category B projects/programmes are those with a few adverse environmental or social impacts associated USPs.

A.1.2 List of stakeholders consulted and field mission pictures

Tanzania



ENHANCING HYDROMET SERVICES THROUGH REGIONAL MONITORING INNOVATION HUBS IN AFRICA

STAKEHOLDERS CONSULTATION PROGRAMME

ENHANCING HYDROMET SERVICES THROUGH REGIONAL MONITORING INNOVATION HUBS IN AFRICA

STAKEHOLDERS CONSULTATION-TANZANIA: DATE 21-26 AUGUST 2023

SN	NAME	ORGRANIZATION	POSITION	TELEPHONE	EMAIL	SIGNATURE

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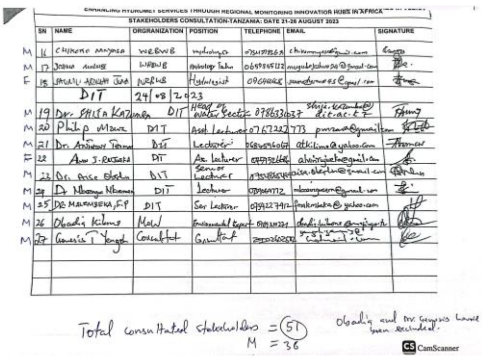

ENHANCING HYDROMET SERVICES THROUGH REGIONAL MONITORING INNOVATION HUBS IN AFRICA

STAKEHOLDERS CONSULTATION-TANZANIA: DATE 21-26 AUGUST 2023

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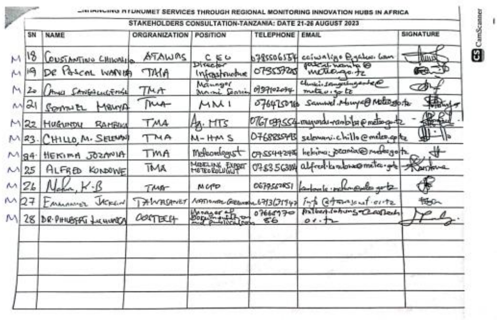

ENHANCING HYDROMET SERVICES THROUGH REGIONAL MONITORING INNOVATION HUBS IN AFRICA

STAKEHOLDERS CONSULTATION-TANZANIA: DATE 21-26 AUGUST 2023

SN	NAME	ORGRANIZATION	POSITION	TELEPHONE	EMAIL	SIGNATURE

CamScanner

The Gambia

Participants list for the Consultation meeting with the Consultant for the development of the WMO HydroHub Fully Developed Project document funded by the Adaptation Fund 7 – 30th August, 2023.

10.	Landing Bojang	Chief Hydrologist	2373151	landingbojang@gmail.com
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18.	Ebrima Jallow	Dept. P. S.	7415945	ebrimajallow@yahoo.com
19.				
20.				

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21.	Saidou Sow	Bomba SPO	3160794	[illegible]
22.	Fredieton Gomez	SPO	9970081	[illegible]
23.	Dr Bentie K Jallow	Dir. - NMHS	9981451	dembentie@yahoo.com
24.	Matty Cessay	Ag. Director	7770078	[illegible]
25.	Cesaire T. Yenke	Consultant	2612587	yenkecesaire@yahoo.com
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27.				
28.				
29.				

ANNEX 2 – GENDER ASSESSMENT AND ACTION PLAN

The Environment and Social Policy (ESP) and Gender Policy of the Adaptation Fund (AF) requires that all projects be screened against the 15 principles, including the Gender. This includes the identification of the conditions affecting gender responsiveness in the two countries (The Gambia and Tanzania) and how the proposed project activities address Gender inequalities.

This Annex therefore presents a detailed Gender Assessment (A2.1), which includes the literature review and the results of the consultative process with stakeholders in the field, as well as the assessment of Gender responsiveness of project activities. Based on these results, a Gender Action Plan (GAP) specific to relevant project activities has been developed (A2.2).

A2.1 GENDER ASSESSMENT

Purpose of this assessment

The purpose of this assessment is to identify some central gendered issues prompted by climate variability and change, in particular by hydromet hazardous events such as floods and droughts, as the main target impact of the project. This assessment includes an analysis of the gender disaggregated socio-economic and cultural data for the two countries (The Gambia and Tanzania), in particular in relation to the climate-dependent sectors. It establishes a gender baseline, describing gender differences, analysing gender-differentiated impacts and risks, and detailing opportunities to proactively address gender gaps influenced by intersectional socio-political factors, geared to promoting empowerment of women and girls, as a key outcome of the project.

Methodology

This Gender Assessment provided the basis for the development of the Gender Action Plan (GAP) presented in A2.2 below. For the preparation of the Gender Assessment, the following methodology was applied:

- Literature review – a review of the literature about the project and its sector of activity was conducted before the field visits to two countries concerned. The literature review focused on: (i) review of relevant documents of the project to get the understanding of the project activities and its scope; (ii) review the relevant national legislation relating to Gender issues and the Gender Policy of the Adaptation Fund that the project must conform with; (iii) review of other gender-related regional and global reports, in order to prepare a situational analysis of the relevant indices; and (iv) review of other relevant documents related to the project preparation. Information gathered at this stage were used to conduct the consultation process. The project concept note presented the geographical and hydroclimatic context of the project intervention area and gave a good idea of the natural resources exploited by populations. It also provided an initial overview of the gender issues in the two countries (The Gambia and Tanzania).

- Field missions and stakeholder consultation – the purpose of the field consultation was: (i) to understand and characterize potential gender-related impacts of the project; (ii) to generate a good understanding of the project by all stakeholders and identify gender-related actions; (iii) to understand people's expectations about the project; and (iv) to enable stakeholders involved in the project to provide their views and recommendations related to gender aspects. In addition, site-specific investigations were also conducted to gain insight to the likely impacts of the project to the environment. Survey questionnaires were used to gather the information.

The Gender Assessment was made in conjunction with the Environment and Social Impact Assessment (ESIA), and involved meetings and exchanges with several stakeholders including: government bodies, academic and research institutions, water management entities, and private

entities in both Tanzania and The Gambia. Field visits to communities dependent on water resources and prone to climate variability and change events were also conducted.

Consultative process

Consultation is the process of gathering information or advice from stakeholders and taking their views into account when making project decisions and/or setting targets and defining strategies. From July to August 2023, a consultant hired by WMO conducted stakeholder consultations to understand their existing challenges and needs, collect their opinions and comments on the project, as well as suggestions and recommendations that could improve the environmental and social performance, as well as the gender aspects of the project.

Project activities have been designed and will be implemented with a special focus on Gender mainstreaming. Project activities were discussed with beneficiaries (including the most vulnerable groups – and taking into account the different needs and constraints of these groups). These visits allowed broad consultations with the local populations, the technical services, the administrative and traditional authorities. In summary, during the field consultation process, 74 people were met (23 people in The Gambia and 51 in Tanzania, of which 24.3% were women (see **ESIA summary**, Table A1.1.1 for detailed information). List of stakeholders consulted, and field mission pictures are provided at the end of ESIA summary.

Differentiated Climate Change Impacts on Gender

The impacts of climate change affect men and women differently as their roles differ in the society. It has been observed that climate change could increase existing gender inequalities by aggravating the vulnerability and adaptability of women to face climate change impacts (WEDO, 2007). It is often the burden of women to take charge of acquiring water and fuel for cooking and subsistence in rural areas. In times of drought, stress on water supplies increase the time women spent on this task, therefore limiting their availability to participate in educational opportunities or income-generating activities (WEDO, 2007). The dependency of women on natural resources such as water or firewood makes them more vulnerable to climate change. Drought and desertification, which lead to resource scarcity, are also amplified by climate change and disproportionately affect women. When faced to climate extremes such as floods and droughts, factors such as social exclusion, lack of equal access to resources and lack of mobility disproportionately affect women (Neumayer and Pluemper, 2007).

Rising temperatures lengthen drought seasons leading to the depletion of water resources that become insufficient for family and agricultural production. This decrease in accessible resources increases the number of tasks performed by women and girls or makes these tasks more time-consuming, such as the search for water and firewood. In such a context, the time available for income-generating activities, education and participation in community decision-making is becoming increasingly scarce.

Tanzania

The Government of Tanzania is also committed to support gender integration into various government efforts to address climate change. The Tanzania National Strategy for Mainstreaming Gender in Climate Change addresses six priority sectors (agriculture, water, health, energy, forests, and coastal management) each comprising actions where women are agents for change.

Agriculture (which a climate-sensitive sector) accounts for one-third of the GDP and two-thirds of total employment in Tanzania (WB, 2022), ownership of agricultural land is essential. Yet, significantly fewer women than men own agricultural land, particularly in rural areas and regions dominated by the agricultural sector. In cases where women do own land, they are more likely than men to be joint owners, which entails a lower degree of control. Women's low ownership of land primarily results from two distinct discriminatory social norms and customary practices (SIDI, 2022): (i) customs dictating that land belongs to men shape inheritance practices by favouring sons over daughters and other male family members over widows; and (ii) social norms influence

intra-household dynamics and establish the man as the family's primary decision maker. Furthermore, evidence suggests that as women marry, formal ownership of agricultural land is partly transferred to their husband, limiting their control over critical productive assets.

The Gambia

In The Gambia's Long-term Climate-neutral Development Strategy 2050, the Government of The Gambia has committed to support mainstreaming climate change related aspects in the National Strategy for Gender Equality.

Agriculture is one of the most important sectors in The Gambia for economic development. Women comprise 78 percent of economically active population who work in agriculture compared to just 57 percent of men. Despite, the fact that more women than men work in agriculture they, however, are not afforded the same rights as men, such as land, credit, technology, and access to markets (FAO, 2019).

Gender disaggregated socio-economic and cultural data for the two countries: The Gambia and Tanzania

Tanzania

According to the Africa 2030 Report (JICA, 2017), East Africa has made modest progress by increasing the percentage of seats held by women in national parliaments. This is particularly the case of Tanzania, wherein the percentage of women in the national parliament increased from 21.36% in 2003 (Statista, 2022) to 36.86% in 2021 (IPU, 2022). Tanzania is one of the countries in the region with a high number of women in the parliament in 2021 (143 women). By legislation, it has 102 seats reserved for women. However, women in Tanzania can be considered significantly behind men in the 'political empowerment' sub-index (0.245; rank #60 of 146) in 2022 in the Global Gender Gap Index (GGGI) of the World Economic Forum (WEF, 2022), being underrepresented in the (formal) labour force and in political decision-making positions.

Tanzania's Gender Development Index (GDI) stands at 0.943 (UNDP, 2022a) and Gender Inequality Index (GII) (UNDP, 2022b) at 0.560. In brief, gender inequalities are still common, especially in rural areas, despite the commitment by the Government of Tanzania to addressing gender inequality in all aspects of women's lives. Gender is integrated into Constitution (1977 with revisions), the Bill of Rights (1985), the National Five-Year Development Plan (2021/22- 2025/26), and the Tanzania Development Vision 2025 emphasizes the county's commitment to promoting gender equality in all social, economic, and political contexts. To achieve this goal, the Government of Tanzania has enacted several policy reforms to support greater gender equality and women's empowerment in terms of education, health, employment, access to assets, and protection from gender-based violence. Some of these efforts have already brought positive impacts. Tanzania scores 0.719 (rank #64 of 146) in 2022 in the GGGI of the World Economic Forum (WEF, 2022), with an increase in relation to 2021 (0.707; rank #82 of 146). In particular, Tanzania scores much higher in sub-indices for 'educational attainment' (0.957; rank #110 of 146) and 'health and survival' (0.970; rank #80 of 146), specifically showing very strong improvements in 'educational attainment' in the last years (e.g. 0.921; rank #127 of 146 in 2021), by increasing gender equality in access to schooling at the lower- secondary level. Yet, there is a need to speed up progress in many areas and go beyond what has already been achieved, such as by improving schooling rates for girls at the upper secondary level, more rapidly lowering maternal mortality rates, and increasing the pace of women's transition into higher paid, more productive jobs and economic sectors. This requires improved implementation of existing policies and identification of additional priority policies and interventions that can help close remaining gaps.

Tanzania scores 0.705 (rank #65 of 146) in the sub-index for 'economic participation and opportunities' in 2022 in the GGGI of the World Economic Forum (WEF, 2022). According to the Tanzania Social Institution and Gender Index study (SIDI, 2022), women's participation in paid work is socially accepted and translates into a high level of labour force participation, albeit slightly lower than that of men. Yet, several underlying factors continue to constrain women's employment in Tanzania either by imposing limitations or regulating women's opportunities and access to

certain types of jobs. In particular, social norms dictate that men should control whether a woman is allowed to work outside the household. Social norms and views on traditional gender roles in the household also dictate that men should be breadwinners and that women should undertake the majority of unpaid care and domestic work. As women are still expected to work for pay, these norms impose a double burden of paid and unpaid work, often forcing them to make labour-related choices that offer a degree of flexibility in order to balance paid work with household duties. As a consequence, unpaid family workers or own-account workers account for a significant proportion of women's employment, exposing them to a high degree of vulnerability. Meanwhile, women's lower levels of education compared to men limit their access to quality jobs and formal employment, especially in science and technology related jobs. Evidence suggests that these educational differences stem partly from norms favouring the education of boys over that of girls. Finally, social norms and biases ascribe certain types of professions to women – for instance, being a maid, a housekeeper or a midwife. In the non-agricultural sector, these biases result in a segregated labour force with a high concentration of women in sectors of low productivity, such as food and accommodation services or wholesale and retail activities. The COVID-19 pandemic has severely affected all these sectors.

Women entrepreneurs' sales are 46 percent less than those of male entrepreneurs. This gender gap results from (WB, 2017): (1) women's lower spending on wages for workers in their business widens the gender gap in sales, which may hint that women are operating in less productive sectors; 2) Women are less likely to register their enterprise; and 3) lower returns to the wealth index suggests women's businesses are less able to cope with the impacts of poverty. In addition to this, when it comes to capital, men are more likely to use their own savings from their non-agricultural businesses as startup capital, but the impact of this on the gender gap in sales is more than compensated for by women's greater use of gifts from family and friends; however, the latter may restrict women's room for faster and sustainable business growth in the long-term.

The Gambia

According to the Africa 2030 Report (JICA, 2017), despite primary and secondary girl enrolment have improved substantially, there are still major impediments for women in the West Africa region, basically access to equal education and economic opportunities. This is particularly the case of The Gambia, wherein the percentage of women in the national assembly is still at 8.62% (5 seats), even though it has increased from 2% in 2001 (WB, 2022). By legislation, there are no reserved seats for women in the national assembly. Women in The Gambia can be considered significantly behind men in the 'political empowerment' sub-index (0.118; rank #115 of 146) in 2022 in the Global Gender Gap Index (GGGI) of the World Economic Forum (WEF, 2022), being considerably underrepresented in the (formal) labour force and in political decision-making positions.

The Gambia's Gender Development Index (GDI) stands at 0.924 (UNDP, 2022a) and Gender Inequality Index (GII) (UNDP, 2022b) at 0.6110. In brief, gender inequalities are still common, especially in rural areas. Women face limited access to land resources, extension programs, financial credit, and job training; women generally have longer work hours, and a large share of all unpaid work; and women are underrepresented in decision-making positions and in government, especially local government. Since independence in 1965, numerous laws and policies have been passed to advance gender equality and women's rights in The Gambia. However, the representation of women in positions of power and decision-making within public and private bodies and representative institutions at national and local levels and within political parties remains low.

The Government of the Gambia is committed to addressing gender inequality in all aspects of women's lives. Gender is integrated into the Women's Act (2010) and into the National Gender Policy 2010-2020. This policy provides a legitimate point of reference for addressing gender inequalities at all levels of government and by all stakeholders. Some of these efforts have already brought positive impacts. Major achievements of this policy include among others, increase awareness on gender as a development concern, increase enrolment and retention of girls in schools, improved health care delivery, increase women participating in decision making, and reduction in gender stereotyping and discrimination.

The Gambia scores 0.641 (rank #121 of 146) in 2022 in the GGGI of the World Economic Forum (WEF, 2022). The Gambia scores much higher in sub-indices for 'educational attainment' (0.873; rank #132 of 146) and 'health and survival' (0.968; rank #86 of 146). While some progress on women's rights has been achieved, much work still needs to be done in The Gambia to achieve gender equality.

The Gambia scores 0.604 (rank #109 of 146) in the sub-index for 'economic participation and opportunities' in 2022 in the GGGI of the World Economic Forum (WEF, 2022). Men has on average 1.83 times more years in school than female in 2014. When incorporated in the labour market, men earned 1.6 times more than their female counterparts. The Gambia has the greatest level of income inequality (JICA, 2017).

In both countries

The Governments of the two countries are committed to addressing gender inequality in all aspects of women's lives. Gender is integrated into their National Gender Policies and Strategies. These policies and strategies provide a legitimate point of reference for addressing gender inequalities at all levels of government and by all stakeholders. While still limited, it is expected that these efforts will bring positive impacts in the near future, such as increasing awareness on gender as a development concern, increasing enrolment and retention of girls in schools, improving health care delivery, increasing women participation in decision-making, and reduction in gender stereotyping and discrimination.

Communities' expectations in relation to the project

During the consultations, information was gathered from communities on their actual problems and expectations in relation to the project. These have been compiled in the **Table A.2.1.1** below.

Table A.2.1.1. Communities' problems and expectations in relation to the project

COUNTRY	**The Gambia**		
Stakeholders	**Local Communities**	**National Stakeholders**	**Entrepreneurs and related Associations**
Women	Enhanced gender equity and women's empowerment; Increased involvement in hydromet-related activities and decision-making processes; Improved understanding of climate adaptation strategies.	Improved decision-making through access to accurate and timely hydromet data; Strengthened collaboration with regional partners for technical assistance; Better understanding of the importance of hydromet data in various sectors.	Economic opportunities in the development and maintenance of hydrometeorological monitoring systems; Access to reliable data for informed business decisions, particularly in sectors like agriculture and water management.
Youths	Strengthened engagement in innovation and technology development; Opportunities for skill-building and leadership roles in hydromet services; Improved knowledge of water resource management and climate change impacts.		
Disabled People and others vulnerable groups	Increased access to water-related information and data; Enhanced participation in disaster risk reduction and climate adaptation efforts; Improved overall resilience to climate-related challenges.		
COUNTRY	**Tanzania**		
Stakeholders	**Local Communities**	**National Stakeholders**	**Entrepreneurs and related Associations**
Women	*Expected benefits:* Strengthened gender and social inclusion within the hydromet networks; Increased resilience to extreme climate impacts; Improved food and water security	*Expected benefits:* Improved decision-making in water resource management;	*Expected benefits:* Economic opportunities through the development and maintenance of

	through data-driven decision-making; Enhanced participation in innovation and technology development.	Strengthened collaboration with regional partners for mutual technical assistance; Enhanced understanding of hydromet data's role in disaster risk reduction and climate adaptation.	hydrometeorological monitoring systems; Access to improved and reliable hydromet data for business planning, especially for sectors like hydropower and urban planning.
Youths	*Expected benefits:* Strengthened engagement in hydromet-related R&D; Increased opportunities for skill development through training and learning exchanges; Enhanced understanding of water resource management and climate change adaptation.		
Disabled People and others vulnerable groups	*Expected benefits:* Increased access to water and environmental information; Improved participation in hydromet monitoring and disaster risk reduction; Enhanced resilience to climate-related challenges.		

A2.2 GENDER ACTION PLAN

How the proposed project addresses gender inequalities

The 2007/2008 UNDP Human Development Report cautions that gender inequalities intersect with climate risks and vulnerabilities. Thus, women's historic disadvantages, their limited access and control over decision-making, environmental and economic resources, and their restricted rights, make them more vulnerable to climate change. However, this disproportionate burden of climate change on women can be countered by their empowerment and recognition. Women are, however, powerful agents of change and not just helpless victims. Their leadership is critical. Women can enhance strategies related to, *inter alia*, agriculture, water resource management, disaster risk reduction, and energy. These are target user sectors of the proposed project.

Gender consultations with ministries in charge of gender issues and non-governmental organizations (NGO) with gender focus were carried out in both Tanzania and The Gambia as part of the stakeholder workshops. Results suggest that the proposed project targets science and technology development, where men tend to hold most of the leadership positions. Women's participation is often limited due to cultural and social norms. Nevertheless, to address the inequalities, the proposed project integrates women into different components, as follows:

- In Component 1, a capacity development plan will be implemented taking into account gender equity, meaning that there will be a defined quota of women required to participate in trainings and research activities. Also under Component 1, a defined quota of women will be identified within the vulnerable indigenous communities that could be engaged in (i) innovative approaches for data acquisition (e.g. crowdsourcing indigenous knowledge that could be blended with scientific knowledge for data-driven decision-making); and (ii) equipment security, operation and maintenance – these would contribute to a people-centred early warning system (EWS) that supports climate change adaptation and disaster risk reduction.
- Component 2 will support the provision of international twinning/mentoring to assist suitable entrepreneurs in developing the required capacities in relation to hydrometric monitoring and building their business case/model for potential grow and job creation. In this activity, a gender equity and youth will be promoted to build early career innovators and increase the number of women entrepreneurs.
- Component 3 will identify and address the skills needs in relation to hydrometric innovation, ensuring gender equity, meaning that particular women needs will be considered and attend.
- In Component 4, the gender-responsive stakeholder engagement strategy and action plan will ensure that women and representatives of women's groups are fully involved in all activities of the project. This strategy and action plan will define gender quotas with quantitative indicators including but not limited to representation and memberships in

groups to be established, increased knowledge, and ownership of prototypes and productive assets. This strategy and action plan will define a monitoring protocol to be duly documented over the project's lifecycle.

In addition, the activities related to the coordination and management of this proposed project will maintain gender balance, such as the representation in established Project Steering Committee and other technical groups. To ensure women's participation in the proposed project, women focal points will be appointed in both implementing and executing entities, who will oversee the implementation and take actions, if women participation is at risk in any of the project activities.

Gender-responsive measure associated with project outputs/activities – Gender Action Plan (GAP)

Gender-responsive measures are foregrounded to demonstrate how the project addresses differential gender needs, equitable participation and equitable distribution of benefits, resources and rights. In view of the differentiated vulnerability of women, youth and men to climate change and extreme events such as droughts and floods, the project will aim to improve the access of accurate and usable hydroclimatic information for a better resilience of local communities. By facilitating the participation of women in the programme and their access to climate information, and decision-making processes related to hydrometeo decision, this project will play a strategic role in promoting the resilience of women active in the agricultural sector against climatic hazards. The assessment described in A4.1 above helped designing a gender transformative approach for suitable training and other implementation components of the project.

Table A2.2.1 outlines the Gender Action Plan (GAP) with specific actions per Output of the project. To determine impact and the relevance of interventions, sex-disaggregated data must be collected as far as possible, especially for the purpose of formative a summative assessment and evaluation. As described in Part III, section E. on the results framework, the project proposal integrates several key performance indicators (KPIs) linked to gender and social inclusion. These include quotas to ensure equal participation in meetings and training sessions on information disseminated through early warning systems. The budget allocated to the GAP has been integrated in the overall budget associated with the project activities, as presented in Part III, section G.

Monitoring and evaluation

Project Coordinators (PCs) at each of the NMHSs, who will be part of the PMU, will be responsible for Gender Action Plan (GAP) in coordination with the Project Manager. PCs will be responsible for reporting semi-annually to the Executing Entities (CEH and NMHSs) and Implementing Entity (WMO). In addition, during periodic meetings organized to monitor the progress of the project, the PCs will report on any potential gender risks that have arisen that have not been previously identified. He/she will be responsible for updating the Gender Action Plan during the first year of the project as the gender-responsive stakeholder engagement strategy is developed, as well as whenever unforeseen impacts and risks are identified. This gender-strategy is developed as part of the project to ensure gender-responsive and inclusive approaches, taking into account any possible barriers to women's involvement. This gender-strategy will be informed by the assessment done during project preparation. The reason why there is a need for a gender-strategy is because there will be Innovation Calls that are all different and therefore different approaches to address gender aspects may need to be considered.

The Implementing Entity (WMO) will designate a responsible officer to oversee compliance with the Gender Action Plan (GAP). This officer shall work in conjunction with the PCs and the PMU to ensure compliance with all conditions. General Operating Principles are:

1. Both the Executing Entities and the Implementing Entity will ensure compliance with the Adaptation Fund's Gender Policy.
2. The updates to the Gender Action Plan will be presented by the PMU with the support of PCs to the Project Steering Committee.
3. The Project Steering Committee will review the gender-related aspects of the evaluation report.

4. PCs will report on progress with the Gender Action Plan for the quarterly reports as well as for the annual reports.
5. The Implementing Entity will incorporate the annual reports and the feedback by the Steering Committee in the Annual Reports to the Adaptation Fund.

Table A2.2.1. Gender Responsiveness of Project Outputs/Activities and Action Plan (GAP).

Outcomes/ Outputs	Key Performance Indicators (KPIs) with Gender disaggregation	Baseline (2024)	Gender Action	Target Gender Achievements	Means of Verification of the Gender aspects	Budget (it's part of the overall budget of the outputs; not additional funding)
Component 1. Increased operational capacity of the NMHSs to provide fit for purpose hydrological data through the use of innovative monitoring approaches						
Outcome 1. Improved and sustained technical expertise of NMHSs staff and uptake of innovative technologies						
Output 1.1 Enhanced local trainings capacity, research and tailored technical guidance material to addressing specific technical expertise deficits related to hydrometric monitoring within the Regional Water Monitoring Innovation Hub (e.g. linked to the use of new instrumentation)	Needs of women and other marginalized groups incorporated in the Training course curricula developed that address innovative hydrometric monitoring solutions [Yes/No] Percentage (%) of women and youth participating in innovation-related trainings and workshops	Inexistence of Training course curricula hydrometric monitoring that considers the needs of women and other marginalized groups Limited participation of women and youth in hydrometric monitoring activities	Ensure that the needs of women and other marginalized groups are incorporated in the Training course curricula developed that address innovative hydrometric monitoring solutions Promote the participation of women and youth in innovation-related trainings and workshops	Needs of women and other marginalized groups incorporated in the Training course curricula developed that address innovative hydrometric monitoring solutions At least 30% women and 50% youth participate in innovation-related trainings and workshops	Training course curricula Progress reports Monitoring and Evaluation Reports Training reports, materials and list of participants	$ 200 000
Output 1.2 Enhanced management and operationalization of instrumentation/hydrological equipment and other hydrometric monitoring aspects through Innovation Calls projects (involving collaborations between in-region and international operational and research partners) implemented to find and operationalize innovative water monitoring solutions to NMHSs hydrometric challenges within the Regional Water Monitoring Innovation Hub	Number (#) of hydrometric monitoring stations assessed that are placed in the most vulnerable areas for women and other marginalized groups Number (#) of applications (individuals or organizations) to WMO HydroHub Innovation Calls under the project/programme that include women and youth	Baseline to be determined with the inventory of the existing stations, wherein it will be assessed whether the existing stations are located in the most vulnerable areas for women and other marginalized groups No applications to WMO HydroHub Innovation Calls in Tanzania and	Detailed inventory of hydrometric monitoring stations taking into account the most vulnerable areas for women and other marginalized groups Promote the participation (in the Terms of Reference) of women and youth in the applications to WMO HydroHub Innovation Calls	All stations assessed are placed in the most vulnerable areas for women and other marginalized groups At least 2 application to WMO HydroHu	Reports of the comprehensive and detailed assessments and inventories of the hydrometric monitoring systems Progress reports Monitoring and Evaluation Reports	$ 250 000

		The Gambia that include women and youth		b Innovation Calls that include women and youth	Terms of Reference of the WMO HydroHub Innovation Calls Reports of the WMNO HydroHub Innovation Calls	
Component 2. Enhanced public-private engagement in hydrometry leading to a strengthened commercial environment for local companies						
Outcome 2. Locally designed, manufactured and maintained capabilities exist in both countries to service water monitoring needs across their regions						
Output 2.1. International twinning/mentoring bring together hydro monitoring institutions and startups that innovate from across the world to assess their suitability to address identified hydrometric challenges in The Gambia and Tanzania. Selected startups will benefit from pump priming grants to grow both public and private sector capability and linkages with the research sector, with the potential to lead to job creation	Number (#) of women in the International twinning /mentoring teams Number (#) of women and youth in the startups that will benefit from pump priming grants	Baseline to be determined in the inception phase once the international advisors and startups are identified	Promote the inclusion of women in the International twinning /mentoring teams Promote the participation of women and youth in the startups that will benefit from pump priming grants	At least 1 woman as part of the International twinning /mentoring teams At least 1 woman and 1 youth in the startups that will benefit from pump priming grants	Reports of the assessments of the 'innovation environment' in both Hubs Progress reports Monitoring and Evaluation Reports	$ 50 000
Output 2.2 Innovation Camps and other activities established to bring together public and private entities to support the development, manufacturing and maintenance of digital and physical monitoring technologies	Percentage (%) of women and youth participating in the Innovation Camps related to hydrometric monitoring Number (#) of Vulnerable Communities engaged in the Innovation Camps	No Innovation Camps related to hydrometric monitoring established and organized in the Hubs	Promote the participation (in the Terms of Reference) of women and youth in the Innovation Camps Ensure the participation of Vulnerable Communities in the Innovation Camps	At least 20% of women and youth participate in the Innovation Camps At least 2 Vulnerable Communities engaged in the Innovation Camps	Reports of the Innovation Camps in both Hubs Progress reports Monitoring and Evaluation Reports	$ 100 000
Component 3. Enhanced regional cooperation for mutual technical assistance among NMHSs and other monitoring organizations within the region where the Innovation Hubs are established						
Outcome 3. Improved dialogues and exchanges within Regional Water Monitoring Innovation Hubs and beyond						

Output 3.1 Organization of Learning Staff Exchanges to facilitate and guide learning exchanges among NMHSs within a Regional Water Monitoring Innovation Hub in view of addressing specific common hydrometric challenges	Percentage (%) of women and youth participating in learning and sharing initiatives (Training and Learning Staff Exchanges on hydrometric monitoring) Percentage (%) of women and youth participating in hydrometric monitoring trainings	Limited participation of women and youth in hydrometric monitoring activities	Promote the participation of women and youth in learning and sharing initiatives (Training and Learning Staff Exchanges on hydrometric monitoring) Promote the participation of women and youth in hydrometric monitoring trainings	At least 30% women and 50% youth participate in Learning Staff Exchanges on hydrometric monitoring At least 30% women and 50% youth participate in hydrometric monitoring trainings	Reports of the Training and Learning Staff Exchanges on hydrometric monitoring, materials and lists of participants Progress reports Monitoring and Evaluation Reports	$ 100 000
Output 3.2. Organization of Innovation Workshops to bring together NMHSs, academia, private sector (solution providers) and others, and facilitate targeted interactions among them in a way that allows NMHSs to express their operational challenges and needs, and the private sector to tailor their solutions to operational realities of NMHSs	Percentage (%) of women and youth participating in learning and sharing initiatives (Innovation Workshops among public, private and academic sectors to identify challenges to be addressed by Innovation Calls)	Limited participation of women and youth in hydrometric monitoring activities	Promote the participation of women and youth in learning and sharing initiatives (Innovation Workshops among public, private and academic sectors to identify challenges to be addressed by Innovation Calls)	At least 30% women and 50% youth participate in learning and sharing initiatives (Innovation Workshops among public, private and academic sectors to identify challenges to be addressed by Innovation Calls)	Reports of the Innovation Workshops, and lists of participants Progress reports Monitoring and Evaluation Reports	$ 40 000
Component 4. Increased political and institutional commitment for operational hydrology through improved stakeholder collaboration and engagement, including co-production of hydromet services						
Outcome 4. Increased support to NMHSs through budget and Water Legislations, and fit-for-purpose innovative hydrometric technologies and user-oriented hydromet services						

Output 4.1 Organization of Ministerial Roundtables in each country of the Regional Water Monitoring Innovation Hubs that will showcase the comprehensive results and recommendations of national cost-benefit analysis of hydrological data investments	Percentage (%) of women participating in WMO HydroHub Ministerial Roundtables Gender-responsive stakeholders engagement strategy and action plan at regional and national levels [Yes/No] Percentage (%) of implementation of the stakeholder engagement strategy and action plan	No WMO HydroHub Ministerial Roundtables undertaken in the Hubs No gender-responsive stakeholder engagement strategy	Ensure participation of women HydroHub Ministerial Roundtables Develop and support implementation of a gender-responsive stakeholder engagement strategy	At least 30% of women participating in HydroHub Ministerial Roundtables Gender-responsive stakeholder engagement strategy developed At least 75% implementation of the stakeholder engagement strategy and action plan; and support provided to institutionalize the process	Consultation meeting reports; and lists of participants Reports of the WMO HydroHub Ministerial Roundtables; and lists of participants Gender-responsive stakeholder engagement strategy and action plan	$ 100 000
Output 4.2 Organization of User-provider Workshops and Webinars, to bring together NMHSs, public and private sectors (users of hydromet services) and facilitate targeted interactions among them, including for identifying and developing new markets for NMHSs services	Percentage (%) of women and other marginalized people, and youth, participating in WMO Regional HydroHub User-provider Workshops Needs of women and other marginalized groups, and youth, incorporated the analysis and recommendations [Y/N]	Limited understanding of the needs of women and other marginalized groups, and youth	Ensure participation of women and other marginalized groups, and youth, in the WMO Regional HydroHub User-provider Workshops (face-to-face and webinars) Ensure that the needs of women and other marginalized groups, and youth, are incorporated into the entry points for participation of different user groups	At least 30% women and other marginalized people, and 50% of youth, participate in WMO Regional HydroHub User-provider Workshops Needs of women and other marginalized groups, and youth, incorporated the	Reports of the WMO Regional HydroHub User-provider Workshops and webinars; list of participants	$ 50 000

				analysis and recommendations		

ANNEX 3 - SOCIO-ECONOMIC BENEFITS OF IMPROVED HYDROMETEOROLOGICAL SERVICES AND EARLY WARNING SYSTEMS IN THE TANZANIA AND THE GAMBIA

1. Introduction

For a potential public investment to be justified, the socioeconomic benefits it will produce should be compared to the costs involved. The application of cost-benefit analysis to modernizing hydrometeorological services was explored in WMO et al. (2015), which also outlined different methodologies (and challenges) for quantifying benefits and costs related to weather, climate, and water-related information and services. This study found that in general, investing 1 USD in any element of the hydrometeorological services and EWS value chain results in 2 to 36 USD in socioeconomic benefits (defined as a range from 2:1 to 36:1 benefit/cost ratio).

2. Conservative Approach

Cost-benefit analysis for disaster and hydromet-related risk management is often challenged by a lack of data and information. In addition, there are several complexities and uncertainties inherent in quantifying disaster risk management that are compounded by climate change. Cost-benefit analysis is also challenged in handling intangibles and—of particular importance for extreme events—in discounting future impacts. Therefore, to build confidence in and robustness of a cost-benefit analysis of hydrometeorological services, a transparent and conservative approach is necessary (Kull, Mechler, and Hochrainer, 2013). All assumptions and their supporting analyses are described below. Where a range of potential analysis inputs is generated, the most "conservative" values are taken, meaning that for a range of potential benefits the lowest value is used. This approach results in the analyzed net present value and benefit/cost ratio representing the lowest threshold of expected economic effectiveness; most likely the truly realized economic efficiency will be greater than what is reported here.

The three key conservative assumptions taken in this study are:

1. The analysis does not consider future population growth and development that will be protected by a potential investment; the economy at risk is considered the same as the most recent World Bank data on GDPs (**Table 1**).

2. Only reductions in the short-term direct impacts of weather and climate-related processes are considered; long-term indirect impacts (such as in health) are not included.

3. Disaster risk is based on past experience and therefore does not consider the potential impacts of climate change.

As indicated above, these assumptions contribute to a conservative estimate of the investment's economic effectiveness.

Table 1. GDPs of Tanzania and The Gambia (WB, 2022)

Country	GDP (current USD ; billion)	Reference year
Tanzania	67.78	2021
The Gambia	2.08	2021
Total	**69.86**	

3. Benefits from Avoided Disaster Losses

Considering the stochastic nature of disasters, common practice for cost-benefit analysis of disaster risk management is to determine the average annual losses due to disasters (Kull, Mechler, and Hochrainer, 2013). This represents the averaging of all potential losses over time to quantify the expected economic

burden per year. When sufficient data are available, the average annual loss is calculated as the area under a loss frequency curve, which is a common metric indicating the exceedance probability of the full potential range of losses per year (for example from the yearly flood to the 100- or 200-year flood).

Tables 2 and 3 provide, respectively, the total loss and the average annual loss (AAL) in thousand USD, for the main hydrometeorological hazards in Tanzania and The Gambia (i.e. floods and droughts) during the period 1960-2021.

Table 2. Total Loss in thousand USD for the main hydromet-related hazards in Tanzania and The Gambia, 1960-2021. *Source: EM-DAT (2022) and DESINVENTAR (2022)*

Country	TOTAL
Tanzania	33,730
The Gambia	5,372
TOTAL	**39,102**

Table 3. Average Annual Loss (AAL) in thousand USD for the main hydromet-related hazards in Tanzania (1978-2018) and The Gambia (1970-2015). Source: UNDRR (2019, 2018, respectively)

Country	TOTAL
Tanzania	140,000
The Gambia	3,700
TOTAL	**147,300**
Percent of Total GDP	**0.21**

4. Benefit Analysis

4.1 Benefits from Reduced Disaster Losses

Subbiah, Bildan, and Narasimhan (2009) provides guidance on the level of damage reduction that can be achieved through early warning, which ranges from 5 percent to 90 percent, depending on the items at risk and provided lead times. While a 20 percent reduction is often assumed as an average reduction in economic losses attributable to early warning, contextually relevant experience indicates a more conservative range of 5–10 percent is more appropriate. In line with the conservative approach set out for this analysis, the lower end of the range of global experience (5 percent) is applied. Out of total annual damages due to hydrometeorological hazards of 39,102 thousand USD, improved forecasting and early warning can potentially eliminate some 1,955 thousand USD.

Considering the limited data availability, a benchmarking methodology is here employed to verify the results, following Hallegatte (2012) and based on a region's GDP. Hallegatte (2012) found that on average, well-functioning, modern EWS reduce disaster-related asset damages by between 0.003 percent and 0.017 percent of GDP. The study therefore concludes that the potential benefit of an investment in any element of the EWS value chain is the difference between the current protection provided by the existing systems and the potential reduction in asset damages if the systems are modernized.

Under this benchmarking methodology, Tanzania and The Gambia would be considered a lower-middle-income countries with relatively modest systems and would therefore be assumed to currently capture only 20 percent of the potential damage reduction benefits of hydromet early warning. Potential benefits would thus be calculated as the difference between the potential reduced losses — between 0.003 percent and 0.017 percent of GDP, assuming Tanzania and The Gambia correspond to the global benchmark — and the actual reduced losses, which in this case would be 20 percent of that value. The results for Tanzania and The Gambia range from 2.10 to 2.38 million USD in average annual reduced losses.

The benchmarking methodology indicates that estimates of annual benefits from reduced flood and drought losses are of a similar order of magnitude of the lower value. Recognizing some discrepancies, likely due to the Tanzania and The Gambia being less or more exposed to hydrometeorological hazards than the global average, a sensitivity analysis is also pursued to identify the impact of reduced benefits on the overall economic assessment.

4.2 Benefits from Increased Production

In addition to diminishing disaster losses, modernized hydromet systems can significantly enhance economic productivity. Because information is lacking, a benchmarking approach is used to estimate potential benefits to economic productivity from modernized hydromet services in Tanzania and The Gambia.

Hallegatte (2012) finds that about 25 percent of the world GDP is generated in weather- and climate-sensitive sectors, i.e., agriculture, water resource management, energy, construction, and transport. Modernized hydromet and warning systems can benefit these sectors in many ways, ranging from immediate warnings and seasonal advisories to infrastructure design and spatial planning. A conservative global benchmark is that modern hydromet services add value of 0.1 percent to 1 percent in weather- and climate-sensitive sectors, which would translate into gains of approximately 0.025 percent and 0.25 percent of global GDP.

In Tanzania and The Gambia, weather- and climate-sensitive sectors represent at least 25 percent of the countries' economies for agriculture; but this may be even higher as there are other sectors of the society that are also weather- and climate-sensitive (see Part 1, section 1.4). Applying the Hallegatte (2012) benchmarking approach, results in annual benefits in production of 17.47–174.65 million USD per year. To avoid double-counting and again pursuing a conservative approach, the lower end of the range (i.e., 17.47 million USD) is used in this analysis. However, considering the frequency of droughts and floods in Tanzania and The Gambia, this must be considered extremely conservative.

4.3 Total Annual Benefits

As indicated above, the benefits attributed to improved hydrometeorological services for this analysis are based on the lower end of the ranges, i.e., 2.10 million USD for the reduced disaster losses due to hydromet hazards, and 17.47 million USD for the increased productivity, in a total of 19.57 million USD per year, in case the project addresses improvements throughout the hydromet value chain. However, this proposed project focuses on improving hydromet services associated with monitoring and related systems, representing one-third of the overall system i.e. thirty-three percent of the potential benefits of a perfect system.

5. Cost-Benefit Analysis

For this project, there is a proposed investment of 5.269 million USD. Benefits in terms of reduced disaster damages and increased production are assumed to increase linearly after the first project year, reaching full benefits the year after program completion.

Comparing the costs and benefits of the project over time can show the relative value of the planned investments. While cost-benefit analysis provides a useful process and resultant metrics to help steer investment decision making, however, it should not be the only factor considered.

While the implementation spans over 5 years, this analysis assumes that the project impact is 15 years, as this is based on the average life cycle of the infrastructure (hydrological equipment). Additional O&M costs have been added after the project completion. Benefits in terms of reduced disaster damages and increased production are assumed to increase linearly, starting to be realized from the second year and reaching a constant maximum the year after the fifth year of the project investments are completed.

Cost-benefit analysis uses a discount rate to represent societal preference for consuming in the present as opposed to saving and consuming in the future. A discount rate of 0 percent indicates no preference between now and in the future, while a discount rate of 15 percent represents a high preference for spending now. In this analysis a discount rate of 5 percent is applied, representing an understanding that future costs and benefits are relatively important in comparison to the current situation (in keeping with concerns regarding climate change). However, 0 percent to 15 percent discount rates are also applied for sensitivity analysis. **Table 4** shows the results of the analysis for the following cost-benefit metrics:

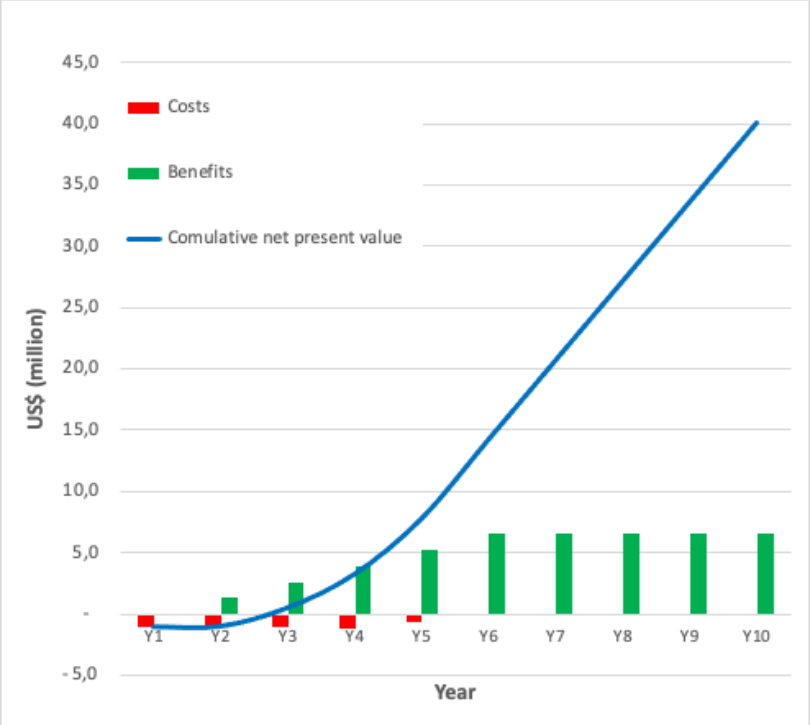
- **Net present value:** Present benefits minus present costs. If the net present value is greater than 0.0, then the investment is considered economically effective.

- **Benefit/cost ratio:** Present benefits divided by present costs. If the benefit/cost ratio is greater than 1.0, then the investment is considered economically effective.

Table 4. Cost-benefit analysis results

	Net present value (million USD)				Benefit/cost ratio			
Discount rate	*0%*	*5%*	*10%*	*15%*	*0%*	*5%*	*10%*	*15%*
Benefits	72	45	30	20	13	10	8	6

Figure 1. Annual financial and economic flows of investment with benefits and 5 percent assumed discount rate



The importance of reliable long-term budget availability is reflected in **Figure 1**, which shows the first 10 years of financial and economic flows, assuming "realistic" benefits and a discount rate of 5 percent. The first two years of investments result in a negative net present value, but as more and more investments come online, the net present value becomes positive, despite increased operations and maintenance costs. Once the project is completed (in Year 5), the annual costs and benefits remain constant, with the cumulative net present value significantly increasing year on year. The relatively small operations and maintenance costs leverage the investment to deliver significant benefits far into the future.

6. Summary of the SEB analysis

The cost-benefit analysis indicates that the investment is economically efficient, meaning they will produce socioeconomic benefits greater than their costs. The generated benefits are significantly greater than the costs (10:1) for a discount rate of 5 percent.

Considering the very conservative approach and assumptions applied throughout the analysis, the results are considered robust. Hallegatte et al. (2017) found that globally, universal access to EWS would almost double the benefits of reducing asset losses by also reducing "well-being" losses. These less tangible well-being benefits — for example, contributions to poverty reduction — are not considered in this analysis, again suggesting that the analysis very likely underestimates the benefits from the proposed investments. In addition, the saving of lives, which is a primary benefit of EWS, is not considered in the analysis. This is omitted due to the moral implications and sensitivities of assigning economic values to human lives, even

with “neutral” approaches such as value of a statistical life (VSOL). This omission further contributes to the conservative nature of the analysis.

As weather and climate impacts increase, the net present value and benefit/cost ratio of the proposed investments will also increase. This is because early warning provides benefits that are not limited by thresholds; whether a flood is a 25-year or a 50-year event, early warning still reduces impacts similarly (as opposed for example to levees or other structural measures, whose design thresholds are at some point exceeded).

As the Tanzania and The Gambia population and economic productivity grows, EWS will continue to provide benefits. New developments and investments will also benefit from improved hydromet and early warning services, as opposed (again) to structural flood control, where new levees may need to be built to protect new developments. The fact that these two factors (climate change and population/economic growth) were not incorporated in the analysis again points to an underestimation of the actual program benefits.

The investment is economically efficient, i.e., net present value greater than 0.0 and benefit/cost ratio greater than 1.0). Considering that such investments are relatively low in cost, are economically efficient, protect lives and property, and contribute to economic development and resilience, they should be considered for priority financing.

Calculations

	Changed value
Sensitivity Analysis to Benefits variation	0%

Costs of the project (USD)	TOTAL	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15
Investment costs and implementation	5 269 000	1 051 500	1 262 000	1 104 000	1 167 500	684 000										
Sub-total	*5 269 000*	*1 051 500*	*1 262 000*	*1 104 000*	*1 167 500*	*684 000*										
Operation and maintenance costs																
Operation and maintenance (6% of the total investment; ref. International literature in infrastructure and tools)	223 200						55 800	55 800	55 800	55 800	55 800	55 800	55 800	55 800	55 800	55 800
Sub-total	*223 200*	-	-	-	-	-	*55 800*	*55 800*	*55 800*	*55 800*	*55 800*	*55 800*	*55 800*	*55 800*	*55 800*	*55 800*
Total costs	5 492 200	1 051 500	1 262 000	1 104 000	1 167 500	684 000	55 800	55 800	55 800	55 800	55 800	55 800	55 800	55 800	55 800	55 800
Total discounted costs (5%)	4 933 814															

Benefits derived from the Hydromet project (MUSD)	TOTAL	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15
Total of benefits		-	*1 304 667*	*2 609 333*	*3 914 000*	*5 218 667*	*6 523 333*	*6 523 333*	*6 523 333*	*6 523 333*	*6 523 333*	*6 523 333*	*6 523 333*	*6 523 333*	*6 523 333*	*6 523 333*
Total discounted benefits (5%)	50 213 781															
Annual Net benefits = (Benefits - Costs)		1 051 500	42 667	1 505 333	2 746 500	4 534 667	6 467 533	6 467 533	6 467 533	6 467 533	6 467 533	6 467 533	6 467 533	6 467 533	6 467 533	6 467 533

Discounting rate	Discounted Costs	Discounted benefits	CB Ratio	Net Benefits (MUSD)
0%	5 827 000	78 280 000	13	72
5%	4 933 814	50 213 781	10	45
8%	4 510 455	39 409 112	9	35
10%	4 263 358	33 840 790	8	30
15%	3 741 323	23 811 756	6	20
20%	3 323 458	17 391 760	5	14

Discounting rate	NPV reference (MUSD)	Changes in benefits			
		-30%	-15%	15%	30%
5%	45	32	38	52	59
8%	35	24	30	40	45
10%	30	21	25	34	38
15%	20	14	17	23	26
20%	14	10	12	16	18

ANNEX 4 – SUMMARY OF THE DISCUSSIONS IN THE VALIDATION WORKSHOP IN TANZANIA AND THE GAMBIA

1. Introduction

Validation workshops were held virtually on 11 and 12 September 2024 with the AF Delegated Authority, Project Partners, various stakeholders, riparian countries and related Basin Commissions both in Tanzania and The Gambia. Full list of participants is provided in section 4. below.

2. Summary of the discussions

All participants were very supportive of the project that aims to strengthen regional capacity for hydromet services, leveraging innovative technology to address climate adaptation challenges in the shared water bodies. They considered that the proposal is well aligned with the guidelines of the Adaptation Fund.

Major observations and comments:

- **Updated information:** since the development of the Project Concept Note, there is more recent information (e.g. results of census) requiring update of the Fully Developed Proposal.
- **Capacity Building**: The project will enhance both institutional and human capacities within the regions. The establishment of 'Regional Innovation Hubs' will provide modern, state-of-the-art instrumentation and hydromet services. However, the project should ensure integrating the existing initiatives, such as the Flood Early Warning System (FEWS) e.g. of the Songwe River Basin, improving coordination and leveraging ongoing efforts. This will ensure the sustainability of the project interventions.
- **Funding Mobilization**: The current funding request may be insufficient for the scope of activities planned. Prioritization is needed, as well as emphasis should be placed on resource mobilization to ensure operational sustainability.
- **Sustainability**: It's important to link with the private sector through partnerships / business models for sustainability of the investments.
- **Roles and responsibilities of the riparian/neighbouring countries**: while its clear the involvement of the riparian countries in the project, particularly in Component 3, there is still a need to expand on their role and responsibilities within the project.
- **Mentoring with manufacturers**: Both the Tanzania and the Gambia, as well as the riparian/neighbouring countries have been facing issues related to Operation and Maintenance (O&M) of stations acquired abroad. Therefore, the project should include mentoring with usual manufacturers of existing stations.
- **Calibration**: issues of calibration have been identified in the two Hubs, and therefore assessment of the needs to establish or revamp existing metrological calibration lab should be considered in the project.

Areas for Improvement:

- **Maintenance of Hydrological Monitoring Systems**: The importance of robust operation and maintenance strategies for the hydrological and meteorological systems are emphasized. Without proper maintenance, the effectiveness of the systems will be compromised, particularly in the long term.
- **Capacity Building**: More emphasis is needed on building local expertise for handling hydrometeorological instrumentation. The project should prioritize both the training of human resources and strengthening institutional capacity for real-time data management and early warning system deployment.

Additional comments for enhancing Hydrometeorological Services through 'Regional Monitoring Innovation Hubs':

The establishment of 'Regional Monitoring Innovation Hubs' will play a crucial role in strengthening hydromet services in the region, addressing climate adaptation needs as outlined by the Adaptation Fund. These hubs will serve as advanced centres of excellence, focusing on improving the collection, analysis, and dissemination of weather, water, and climate data.

Key Areas for Innovation Hubs would include:

1. **Improved Data Collection and Sharing**:
    - Hubs can be equipped with cutting-edge monitoring tools, such as automatic weather stations, sensor networks, and remote sensing technologies, improving the quality and coverage of data. By centralizing data sharing, collaboration can be enhanced between sectors like agriculture, disaster management, and water resource management.
2. **Real-Time Monitoring and Early Warning Systems**:
    - The hubs will enable real-time monitoring, supporting early warning systems like the Songwe River Basin's Flood Early Warning System (FEWS). This system will gather real-time data on rainfall, river flows, and other key indicators, enabling more precise and timely predictions of extreme weather events, reducing the impact of floods and droughts.
3. **Capacity Building and Innovation**:
    - Regional hubs will provide essential training in hydrological monitoring technologies and data analysis, strengthening local capacities. This will support the development of region-specific solutions for climate resilience, ensuring that the project outcomes are sustainable and effective.
4. **Community-Based Monitoring**:
    - Community involvement can be integrated into the hubs' operations, allowing local citizens to contribute on-the-ground data through citizen science initiatives. This approach will increase local engagement and trust in the FEWS and other hydromet services, ensuring they are more tailored to community needs.
5. **Cross-Border Collaboration**:
    - Given the transboundary nature of the project interventions, regional hubs would foster greater cross-border cooperation in water resource management. This would improve shared decision-making and reduce potential water conflicts by ensuring that all stakeholders have access to reliable, shared data.
6. **Utilization of Big Data**:
    - Advanced technologies like big data analytics and machine learning**,** would be used to enhance climate modelling and weather forecasting. By analysing regional data, can deliver highly accurate, localized predictions, helping governments and communities to better prepare for climate risks.

Suggested Areas for Technological Innovation:

i) **IoT and Sensor Networks**: Deploying **Internet of Things (IoT)** devices across vulnerable regions can facilitate continuous, real-time data collection, improving the granularity and frequency of monitoring.
ii) **Decentralized Data Sharing Using Blockchain**: Blockchain technology could be employed to securely manage data sharing across borders, improving transparency and collaboration in water management.
iii) **Satellite-Ground Data Fusion**: Combining satellite imagery with ground data will create more comprehensive environmental monitoring systems, providing better insights into weather patterns and water management challenges.
iv) **Empowering Local Innovation**: By encouraging local innovation, the hubs could help communities develop low-cost solutions, such as DIY weather stations or mobile apps for water conservation.

3. Conclusions

All comments, observations and suggestions have been considered and addressed in the fully developed proposal.

4. List of participants

Tanzania
ONLINE PARTICIPANTS

SN	Name	Tittle/Position	Organization	City/Country
1	Remy Norbert DUHUZE	Division Manager	Rwanda Water Resources Board	Kigali/Rwanda
2	Baranyikwa Desire	Hydrological Advisor Burundi	Ministry of Water	Bujumbura/Burundi
3	Solomoni Kalima	Hydrological Advisor Malawi	Ministry of Water and Sanitation	Lilongwe/Malawi
4	Felix Ngamlagosi	Executive Secretary	Zambezi Watercourse Commission	Harare/Zimbabwe
5	Frank Nyoni	For Hydrological Advisor Zambia	Ministry fo Water	Lusaka/Zambia
6	Philipo Patrick	Hydrologist	Pangani Basin Water Board	Moshi/Tanzania
7	Florance Mahay	Basin Director	Rufiji Basin Water Board	Iringa/Tanzania
8	Selemani Chillo	Meteorologist	Tanzania Meteorological Authority (TMA)	Dar Es Salaam/Tanzania
9	Alvin Rujekwa	Lecturer	Dar Es Salaam Institute of Technology (DIT)	Dar Es Salaam/Tanzania
10	David Manyama	Hydrogeologist	Ministry of Water	Dodoma/Tanzania
11	Meigaru Mollel	Hydrologist	Lake Victoria Basin Water Board Tanzania	Mwanza/Tanzania
12	Josephine	Lecturer	Water Institute	Dar Es Salaam/Tanzania
13	Anjela Joseph	Hydrologist	Lake Nyasa Basin Water Board	Mbeya/Tanzania
14	Dr. Hans Komakecth	Lecturer	Nelson Mandela African Institute of Science and Technology (NMAIST)	Arusha/Tanzania
15	Joseph Marimoto	Hydrogeologist	Ministry of Water/Laboratory of Isotope Hydrology	Dodoma/Tanzania
16	Musiba Masamba	Lecturer	Water Institute	Dar Es Salaam/Tanzania
17	Hossea Sanga	Hydrogeologist,	Water Resources Centre of Excellence Ministry of Water	Dodoma/Tanzania
18	Paul Damian	Hydrogeologist	Ministry of Water	Dodoma/Tanzania
19	Dr. Subira Munishi	Lecturer	University of Dar Es Salaam	Dar Es Salaam/Tanzania
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The Gambia

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