ADAPTATION FUND

PROPOSAL COVER PAGE

1. Type of project: Single-Country ☐ Regional ☒
2. Countries: Tanzania and The Gambia
3. Project/Programme Category Regular:
4. Project/Programme Stage: Concept
5. Requested financing amount (in U.S. Dollars Equivalent): 5,000,000
6. Project Formulation Grant (PFG) Request: Yes ☒ No ☐
7. Requested financing amount for PFG (in U.S. Dollars Equivalent): USD 30,000
8. Letter/s of Endorsement (LOE) signed:
   LOEs should be signed by the Designated Authority (DA). The signatory DA must be on file with the Adaptation Fund. To find the DA currently on file check this page: https://www.adaptation-fund.org/apply-funding/designated-authorities

   Yes ☒ No ☐
9. Write the date of endorsement for each LOE for the project.

   a) Country: Tanzania Date signed: 8/9/2022)
   b) Country: The Gambia Date signed: 7/26/2022

10. Title of Project/Programme: Enhancing Hydromet Services through Regional Monitoring Innovation Hubs in Africa
11. Implementing Entity: World Meteorological Organization (WMO)
12. Executing Entities: National Meteorological and Hydrological Services of Tanzania and the Gambia; UK Centre for Ecology and Hydrology
13. Is this a new submission or a resubmission: New: ☒ Resubmission: ☐
14. If a resubmission, please select the last submission date: Click or tap to enter a date

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:	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 Tanzania and The Gambia**; UK Centre for Ecology & Hydrology (UKCEH)
Amount of Financing Requested:	5,000,000 (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 depends 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 – to advance innovation in the hydrometry agenda, which is one of its Pillars. 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 Excellency 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 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.

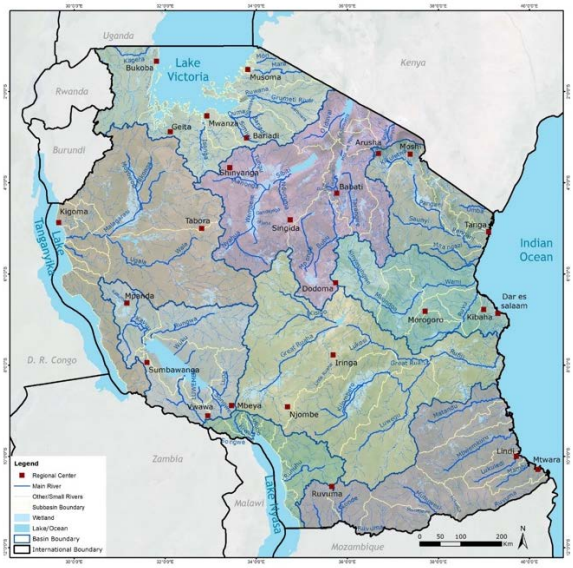
1.2.1 GEOGRAPHICAL AND REGIONAL CONTEXT

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 river, Wami/Ruvu river, Rufiji river, Ruvuma river, Lake Nyasa

(Tanzanian name for Lake Malawi; part of the Zambezi river basin), Lake Tanganyika (part of the Congo river basin), Lake Rukwa, and the Internal Drainage (including Lake Natron, Eyasi and Manyara) (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.

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/Malawi 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/Malawi, 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 Mtera Dam the largest in Tanzania (3,800 million cubic metres) (MOW, 2020).

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.**), five international rivers included in three of the largest African river basins – Nile, Congo and Zambezi (**Table 2.b.**) – and seven international aquifers (**Table 2.c.**) (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

[1] mcm (million cubic metres).

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: MOW (2020) and FAO (2016)*

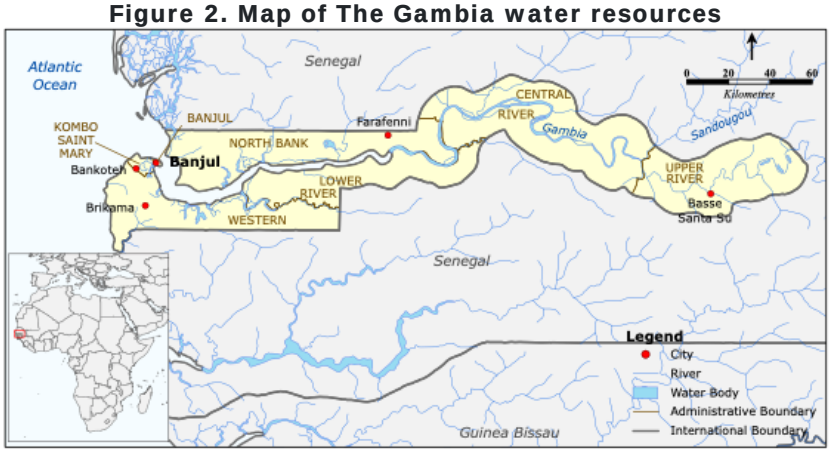
a. Transboundary lakes				
Lake	**Lake's area (square km)**	**Basin**	**Riparian countries and respective share**	**International management**
Victoria	68,800	Nile	Kenya (6 percent), Tanzania (51 percent), Uganda (42 percent)	Lake Victoria Basin Commission
Tanganyika	32,900	Congo	Burundi, Democratic 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
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)
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 entire 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

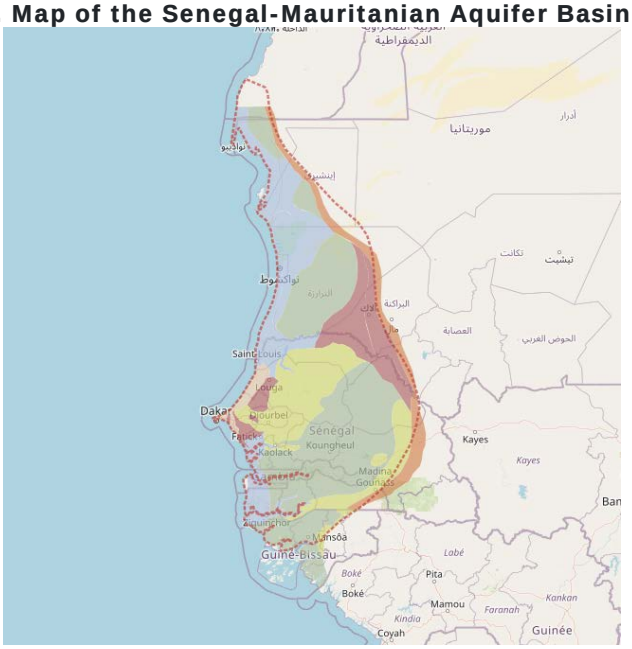
The Gambia river basin is shared among four countries: 13.7 percent in The Gambia, 15.4 percent in Guinea, less than 1 percent in Guinea Bissau, and 70.9 percent in Senegal (CAMES, 2014). The Gambia river flows through Guinea, Senegal and The Gambia over a distance of 1,150 km, with a drainage area of 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

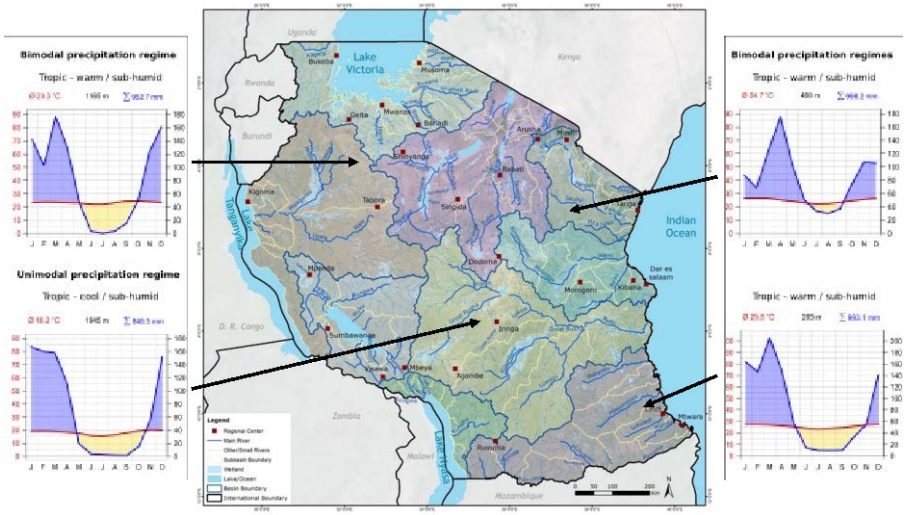
These water resources require a comprehensive hydrological monitoring system, particularly in the context of climate change (see section 1.2.2 below). Data is also important for transboundary water management among the countries in the Regional Water Monitoring Innovation Hubs'. The acquisition, operation 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

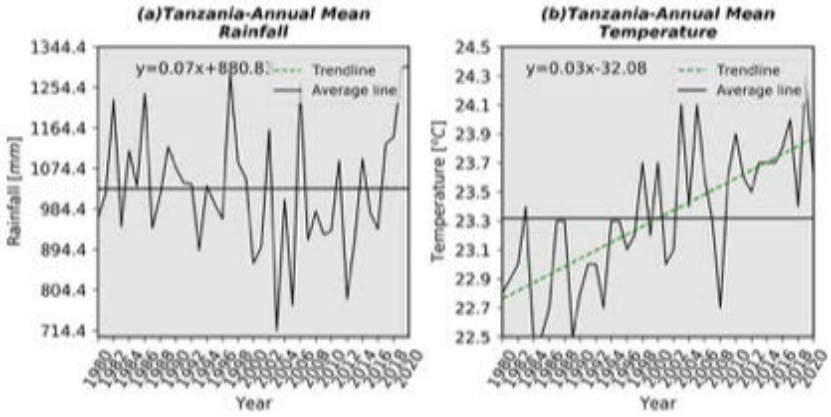


Source: Adapted from GoT (2020) and GIZ (2021)

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 Soudan-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 is 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).

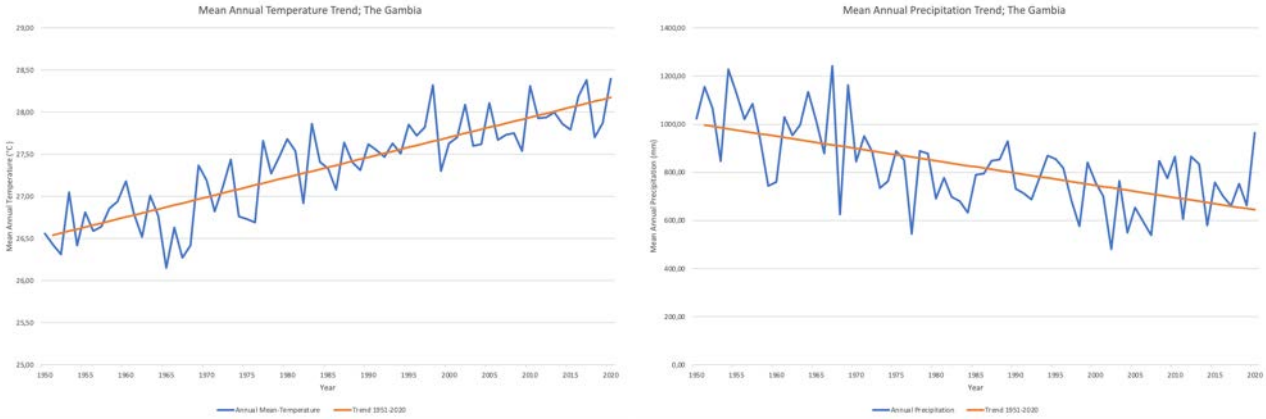
Observed climate trends

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 2, 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 2, 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 2, 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 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 57.6 million in 2020 (GoT,2020), 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):

- *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.

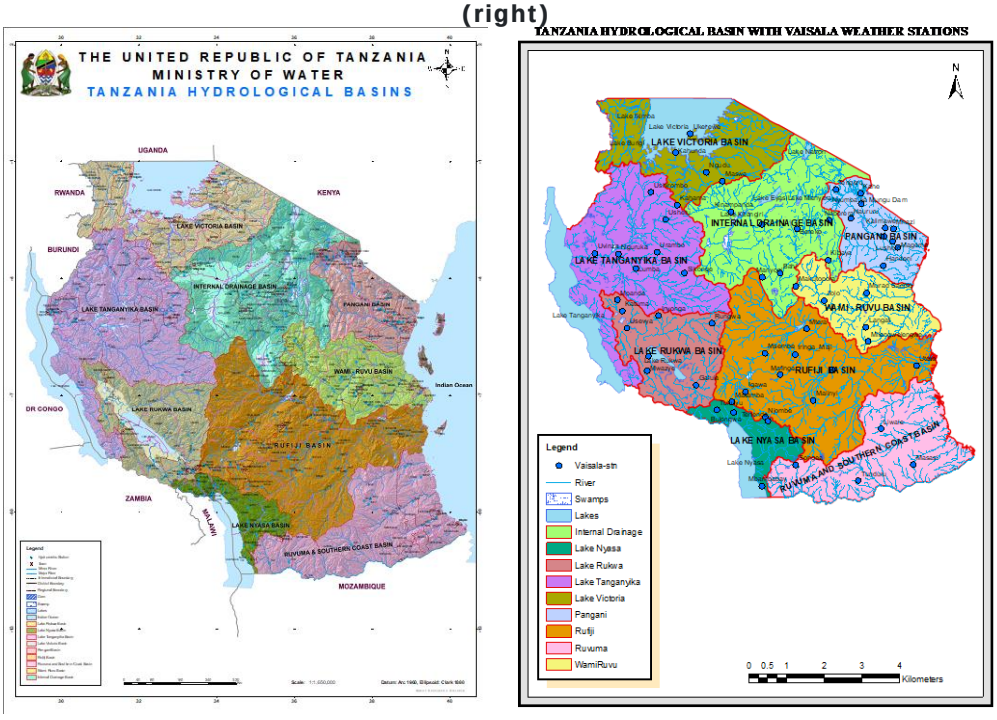
TANZANIA

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)

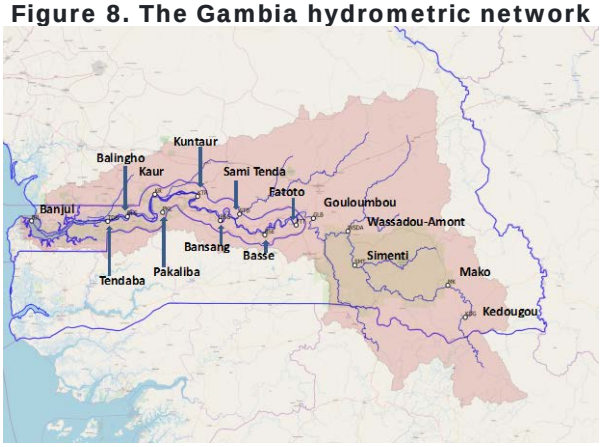


Source: Courtesy of the Department of Water Resources, Tanzania

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, seven 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; and,

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

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 2, 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 3 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	2,000,000
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	**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	Tanzania, The Gambia	600,000

	countries to service water monitoring needs across their regions	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. **2.2** 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	900,000
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	678,082
5. Project/Programme Execution cost				388,128
6. Total Project/Programme Cost				4,566,210
7. Project/Programme Cycle Management Fee charged by the Implementing Entity (if applicable)				433,790
Amount of Financing Requested				5,000,000

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 2023
Mid-term Review (if planned)	December 2025
Project/Programme Closing	July 2028
Terminal Evaluation	July 2028

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 structures of these 'Regional Water Monitoring Innovation Hubs', involving public, private and academia sectors, will be presented in Part 3 at the fully developed proposal based on further consultations with Tanzania, The Gambia and neighbouring countries.

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. 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. Based on preliminary 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. **Table 10** below provides an overview of the proposed activities.

Table 10. Components, expected project outcomes, outputs and associated activities

Expected Outcomes	Expected Outputs	Activities (within each Regional Water Monitoring Innovation Hub)
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	1.1 Enhanced local trainings capacity, research and tailored technical guidance material to addressing	**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

NMHSs staff and uptake of innovative technologies	specific technical expertise deficits related to hydrometric monitoring within the Regional Water Monitoring Innovation Hub (e.g. linked to the use of new instrumentation)	**1.1.2** Based on the results of the activities 1.1.1 and 3.2.1, develop supportive courses (e.g. using digital and Innovation Hub) to address the specific scientific, technical, and operational expertise deficits related to hydrometric monitoring **1.1.3** 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]* **1.1.4** 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 *[Note: This activity links with activity 1.2.9 below]* **1.1.5** Develop a capacity development plan (considering gender equity) and collaborative agreements/MoU between the NMHS and the academic sector to ensure regular training/ retraining of NMHS staff for sustainability of the investments
	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 (including surface water, groundwater and water quality) in Tanzania and The Gambia, as well as in transboundary Lake Basins and transboundary Aquifers (involving neighbouring countries), with identification of the operational and maintenance status and gaps *[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]* **1.2.2** Prepare an inventory of the available station equipment and data acquisition, transmission and processing systems; and determination of what type of required equipment and system components have the potential to be manufactured or developed locally *[Note: this applies for both rehabilitation and upgrading of existing stations, as well as installation of new stations]* **1.2.3** 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 **1.2.4** Develop Terms of Reference (ToR) of the Innovation Calls Projects aligned with the assessments and requirements identified in above activities 1.2.1 to 1.2.3, and taking into account the results of activities under outputs 2.1, 2.2, and 4.2 *[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)]* **1.2.5** Carry 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

		1.2.6 Implement the Innovation Calls Projects as per the ToR by the awarded companies or consortia **1.2.7** Provide of regular technical assistance to Innovation Calls Projects by international partners on behalf of WMO (e.g. UKCEH and others; see further information in Part 3 below) **1.2.8** Undertake regular monitoring and evaluation of the awarded Innovation Calls Projects **1.2.9** Document 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 *[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]*
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 needs across their regions	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 *[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]* **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]* **2.1.3** Develop and provide technical guidance materials to assist suitable institutions building their business case/model
	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	**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 *[Note: 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]* **2.2.2** Organize Innovation Camps with a focus on coming up with ideas for solutions to one/a small number of monitoring problem(s) *[Note: 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]* **2.2.3** Implement follow-on projects (similar to 'Innovation Calls Projects') from the Innovation Camps for the realization of the ideas *[Note: 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]*
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 Water Monitoring 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	**3.1.1** Undertake an organizational assessment, including capacity needs assessments (also involving innovation skills required), of NMHSs and regional organizational arrangements for hydrometric monitoring and data sharing within the Regional Water Monitoring Innovation Hub **3.1.2** Based on the results of the activities 3.1.1, develop and organize training and 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, including the associated Quality Management Systems (QMS) **3.1.3** Based on the results of previous activities, and through the set up to the 'Regional Water Monitoring Innovation Hubs', develop 'Regional Technical Champions'/long-term Centres of Excellence in hydrometry with critical masses of organizations and individuals able to support sustainable operational water monitoring in their wider regions **3.1.4** Undertake assessment of capacity needs and investment requirement for establishment of calibration facility and services for hydromet equipment
	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 *[Note: This activity contributed to Output 1.1]* **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: (1) 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; (2) This activity contributed to Output 2.2]*
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	**4.1.1** Undertake national cost-benefit analysis of the hydrological data-related investments within each Regional Water Monitoring Innovation Hub **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 **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 **4.1.4** Develop a gender-responsive stakeholder engagement strategy for continuous including government departments, private sector, academia, and local community representatives **4.1.5** Implement stakeholder engagement strategy and institutionalize it to ensure continued engagement beyond project implementation
	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 **4.2.2** Based on the survey results, carry out consultative surveys for existing and potential new users of NMHSs' data services *[Note: this requires coordination and collaboration with development partners to ensure that synergies are established between projects]* **4.2.3** Based on the results of activities 4.2.1 and 4.2.2, map and identify existing and potential users of NMHSs' data services that should take part of the User-Provider Workshops and Webinars **4.2.4** Organize User-Provider Webinars; and based on their results, hold Workshops to bring together NMHSs, public and

		private sectors (users of hydromet services) 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 we as for identifying and developing new markets for NMHSs' data services

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.

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:

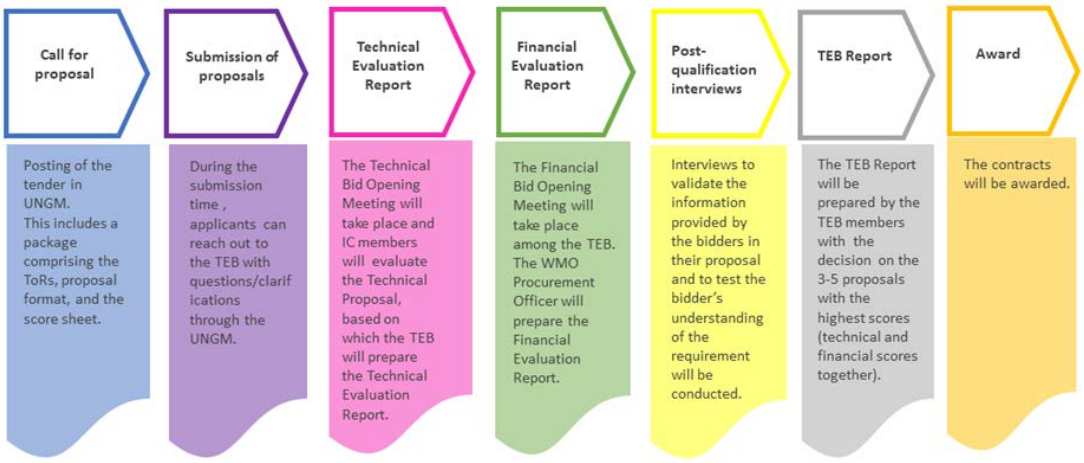
Tender process: The tender process to select a company or a consortium that submits a project application to fit the requirements outlined in the ToR of the Innovation Call shall go through the WMO procurement process and rules. A schematic of the process is provided in **Figure 9** below.

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 (as specified in activity 1.2.4) 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;
- 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 (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 9. 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 1, 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 section J. below). An active innovation ecosystem also exists in Tanzania, with several other incubators and accelerators (also consulted throughout the process – see section J. below) established across different sectors that could provide useful linkages with the hydrometry Innovation Hubs. In developing this Concept Note, other initiatives such as UNDP Innovation Labs have also been considered and will be further explored during the preparation of the full project proposal.

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 section B. above), the starting point is the assessment for their alignment to the local/regional conditions. 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 1, 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.

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. 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. 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 1, 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).

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 (2013-2022) 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.

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.

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 be Category C, and will not have negative environmental or social impacts. 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.

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 preliminary cost-benefit analysis (CBA) was carried out. **Annex 2a** describes the approaches and results of the quantitative assessment of the benefits and cost-benefit presents the cost-benefit analysis calculations; and **Annex 2b** the description of the cost-benefit analysis and results. 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 (9:1). 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.

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.

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 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.
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	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

Plan and the Climate Strategy	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 of Action (NAPA) on Climate Change	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 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.
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. 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 section N. below for further details). 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). This consultation will be further expanded during the development of the fully developed proposal to ensure that all activities comply with relevant national standards, as well as environmental and other statutory laws and regulations of

Tanzania, The Gambia and neighbouring countries that will contribute and benefit from the 'Regional Water Monitoring Innovation Hubs'. Where necessary, environmental impact assessments of project activities 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.

In addition to those listed in Part 1, 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.

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. Further information on the projects and initiatives is provided in the reports of the **consultative workshops in Tanzania (Annex 3a) and The Gambia (Annex 3b)**.

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 Organization: Ministry of Water Donor: World Bank	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; (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	The proposed project will enhance operationalization of ODSS through the integration of hydrological data being generated from the innovative and cost-effective hydrometric monitoring network, which is key to sustainability of ODSS.

	Water, Basin Water Boards and other stakeholders in making decisions related to flood emergency response, water use permits and dam operation.	
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 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.	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.

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	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	This project will procure hydrometric monitoring stations. Companies that will be award the Innovation Calls Projects (Output 1.2) under this

Resources Management in the Songwe River Basin Project Organization: Joint Songwe River Basin Commission (SONGWECOM) for Tanzania and Malawi	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.	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 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)	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 early warning systems related to climate change hazards and disaster risk management are replicated and up-scaled.	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.

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 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.
The Africa Centres of Excellence (ACE) Project	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	The project is transforming the Gambia Technical Training Institute (GTTI) into the University of Applied Science, Engineering and Technology

Donor: World Bank Organisation: Ministry of Higher Education Research Science and Technology	Project's main focus is on building capacities in Science, Technology, Engineering, Mathematics, Health and Agriculture.	(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 water for populations facing climate change (SMAB) Organization: countries, OSS, OMVS, OMVG Donors: UNEP led GEF IW Limited budget	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, 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.	This project requires groundwater data that can be generated under the context of the proposed project.
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.

I. 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.

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 pre-concept and this project concept note were developed by the NMHSs in Tanzania and The Gambia together with WMO. 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 a "men's world", the participation was still unbalanced (see number of male/female participants under item (3) below). However, there were a number of organizations representing women and children at the Workshops. During the preparation of the full project proposal, further participation of women will be promoted, as well as of the youth to support early career innovators.

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 concept proposal.

(3) A hybrid (physical/virtual) Consultation Workshop held on 20 June 2022 in Tanzania and on 14 June 2022 in The Gambia, whose reports are available in **Annex 3a for Tanzania** and **Annex 3b for The Gambia**. 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) 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 1, section 1.2, Table 2 for the list) - Ministry of Water/Department of Water Resources - Ministry of Water/Water Resources Centre of Excellence
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
Other Non-government organizations	- Tanzania Water Partnership (TWP) - Nile Basin Discourse
UN agencies working in the country in related subjects	- UNESCO – Natural Science Programme - UNESCO – Intergovernmental Hydrological Programme (IHP) Committee
Other development partners / donors that are implementing related projects in the country	- 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	- University of Dar es Salaam - 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
14.b. The Gambia	
Hydro-related institutions	- Ministry of Fisheries and Water Resources/Department of Water Resources-Hydrology Division – Hydrology Division
Meteorological Service	- Ministry of Fisheries and Water Resources/Department of Water Resources-Meteorology Division – 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 - 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
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

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 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.

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.

The sustainability aspects in Component 1 are twofold. 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. 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.

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.

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-raining 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.

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

As indicated in 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 (**Annex 1**). According to the Adaptation Fund's classification, this project is expected to be Category C, and will not have negative environmental or social impacts. The necessary detailed studies to further identify the risks will be carried out as part of the development of the project proposal to ensure compliance with the environmental and social policies and principles of the Adaptation Fund, as indicated in **Table 15** below.

Table 15. Initial 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	No additional assessment is required. The project will ensure that existing national and transboundary laws, policies, and guidelines are respected when implementing innovative solutions, adaptation measures and capacity development activities. The project will not require any prior legal and regulatory approvals	Risk: Low Potential impact: Low

	for environmental and construction issues as no physical or structural construction is foreseen during the implementation of the project. If necessary, international laws on data sharing protocol between different countries will be consulted.	
Access and Equity	No additional assessment is required. 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') 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.	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. Additional assessment will be carried out during the development of the full project proposal.	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' in order to reach these groups, particularly women, girls, the elderly and disabled people.
Human Rights	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	An Initial Gender Assessment was realised in line with the Fund's Gender Policy (see **Annex 1**). The proposed project will promote gender equity and women's empowerment in all Components. Additional gender assessments will be carried out during the development of the full project proposal.	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.
Core Labour Rights	No additional assessment is required. The project will be implemented and managed in accordance with the labor laws of the target countries.	Risk: Low Potential impact: Low
Indigenous Peoples	No further assessment is required. The indigenous population of the area will be consulted and involved during the design and	Risk: Low Potential impact: Low

	implementation of the project activities. The traditional knowledge of indigenous people on floods and droughts will be useful in decision-making.	
Involuntary Resettlement	No additional assessment is required. The project will not create direct involuntary resettlement of communities.	Risk: Low Potential impact: Low
Protection of Natural Habitats	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	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	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	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	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	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	No additional assessment is required. The project will help to improve agricultural practices through water data-driven decision-making.	Risk: Low Potential impact: Low

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.

WMO will be the implementing entity for this project. The NMHSs of Tanzania and The Gambia, and the UK Centre for Ecology & Hydrology (UKCEH) will act as executing entities. While 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, the UKCEH will support the project coordination and 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. 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.

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.

Other partners will be identified during the Full Project Proposal development. The Associated Programme on Flood Management (APFM) Support Based Partners represents a pool of possible partners that could be leveraged.

Sections B. to H. will be developed and presented in the fully developed proposal.

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: August 9, 2022
GAMBIA (The Republic of) Mr. Bubacar Zaidi Jallow Director Central Project Coordinating Unit Ministry of Environment, Climate Change and Natural Resources (MECCNAR)	Date: July, 26, 2022

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

B. Implementing Entity certification *Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project/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.	
 Jean-Paul Gaudechoux Implementing Entity Coordinator Office for Resource Mobilization and Development Partnerships Member Services and Development Department	
Date: November, 8, 2022	Tel. and email: jpgaudechoux@wmo.int +41227308311
Project Contact Person: Sophia Sandström	
Tel. And Email: +41227308501, ssandstrom@wmo.int	

REPUBLIC OF THE GAMBIA
Ministry of Environment, Climate Change & Natural Resources (MECCNAR)
GIEPA House - 1st Floor
Kairaba Avenue
Kanifing Municipality

PB 33/200/01/ Part I (BZJ)

26th July 2022

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

Subject: Endorsement for 'Enhancing Hydromet Services through Regional Monitoring Innovation Hubs in Africa'

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

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by the World Meteorological Organization (WMO) and executed by the Department of Water Resources.

Sincerely,

.....

Bubacar Zaidi Jallow
Deputy Permanent Secretary/ Adaptation Fund Focal Point

Cc:
R/file
Director, Department of Water Resources

MINISTRY OF ENVIRONMENT, CLIMATE CHANGE AND NATURAL RESOURCES
DESPATCHED
25 JUL 2022
Date

TEL: 4399446/ 4399504/ 4399503
Website: www.mofen.gov.gm

THE UNITED REPUBLIC OF TANZANIA

VICE PRESIDENT'S OFFICE

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Mtumba Area,
Vice President's Office Building,
P.O.Box 2502,
DODOMA.

Our Ref: BA.90/201/01/154

09th August, 2022

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

Ref: **ENDORSEMENT OF THE PROJECT ON ENHANCING HYDROMET SERVICES THROUGH REGIONAL MONITORING INNOVATION HUBS IN AFRICA**

The above subject matter is concerned.

2. In my capacity as Designated Authority for the Adaptation Fund in Tanzania, I confirm that the above national grant proposal is in accordance with the government's national priorities including National Environmental Policy 2021, National Environmental Master Plan for Strategic Interventions 2022, third National Five Years Development Plan 2021-2026, National Climate Change Response Strategy 2021-2026 and Nationally Determined Contribution (NDC) 2021-2026 in implementing adaptation activities to reduce adverse impacts and risks posed by climate change in Tanzania.

3. In this regard, I am pleased to endorse the above grant proposal with support amounting to **USD Five Million** from the Adaptation Fund. Once approved, the project will be implemented by the World Meteorological Organization (WMO) and executed by Ministry of Water in Tanzania.

Dr. Switbert Zakaria Mkama
DEPUTY PERMANENT SECRETARY

Project Formulation Grant (PFG)

Submission Date: 8 November 2022

Adaptation Fund Project ID:
Country/ies: Tanzania and The Gambia
Title of Project/Programme: Enhancing Hydromet Services through Regional Monitoring Innovation Hubs in Africa
Type of IE (NIE/MIE): Multilateral Implementing Entities
Implementing Entity: World Meteorological Organization (WMO)
Executing Entity/ies: National Meteorological and Hydrological Services (NMHSs) of Tanzania and The Gambia; UK Centre for Ecology & Hydrology (UKCEH)

A. Project Preparation Timeframe

Start date of PFG	**May 2023**
Completion date of PFG	**July 2023**

B. Proposed Project Preparation Activities ($)

Describe the PFG activities and justifications:

List of Proposed Project Preparation Activities	Output of the PFG Activities	USD Amount
Organize consultation workshop(s) in Tanzania and The Gambia with project executing entities, potential new partners, and national beneficiaries, including vulnerable communities to clarify and agree on roles/responsibilities of the partners (this will help foster sustainability and ownership of the project).	- Roles and responsibilities of each stakeholder well assigned/defined and timetable of activities agreed. - Budget estimates of activities agreed. Partners' activities are allocated. - Project sustainability and ownership plan is adopted with countries and partners.	12,000 USD
Hire consultants to support the development of an Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) study, aligning with the Environmental and Social Policy (ESP) of the Adaptation Fund. A gender assessment study will also be developed in the proposal in line with the Adaptation Fund Gender	- EIA and SIA studies are carried out jointly in consultation with the National and Regional stakeholders. - Environmental and social risks management plan is available and included in the fully developed proposal. - Identified gender aspects are included in the fully	18,000 USD

Policy (GP) and Gender Action Plan (GAP).	developed proposal.	
Total Project Formulation Grant		30,000 USD

C. Implementing Entity

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

Implementing Entity Coordinator, IE Name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
Jean-Paul Gaudechoux, Office for Resource Mobilization and Development Partnerships, Member Services Department		11/08/2022	Sophia Sandström, WMO HydroHub Coordinator	+412273 08311 +4122730 8501	jpgaudechoux@wmo.int ssandstrom@wmo.int