TNA TECHNOLOGY NEEDS ASSESSMENT

Collaborative Brief on

Taxonomy of Climate Change Adaptation Technology

GREEN TECHNOLOGY CENTER Korea

UNEP DTU PARTNERSHIP

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More on Technology Needs Assessments(TNAs) can be
Found at http://tech-action.unepdtu.org

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(http://www.ctc-n.org)

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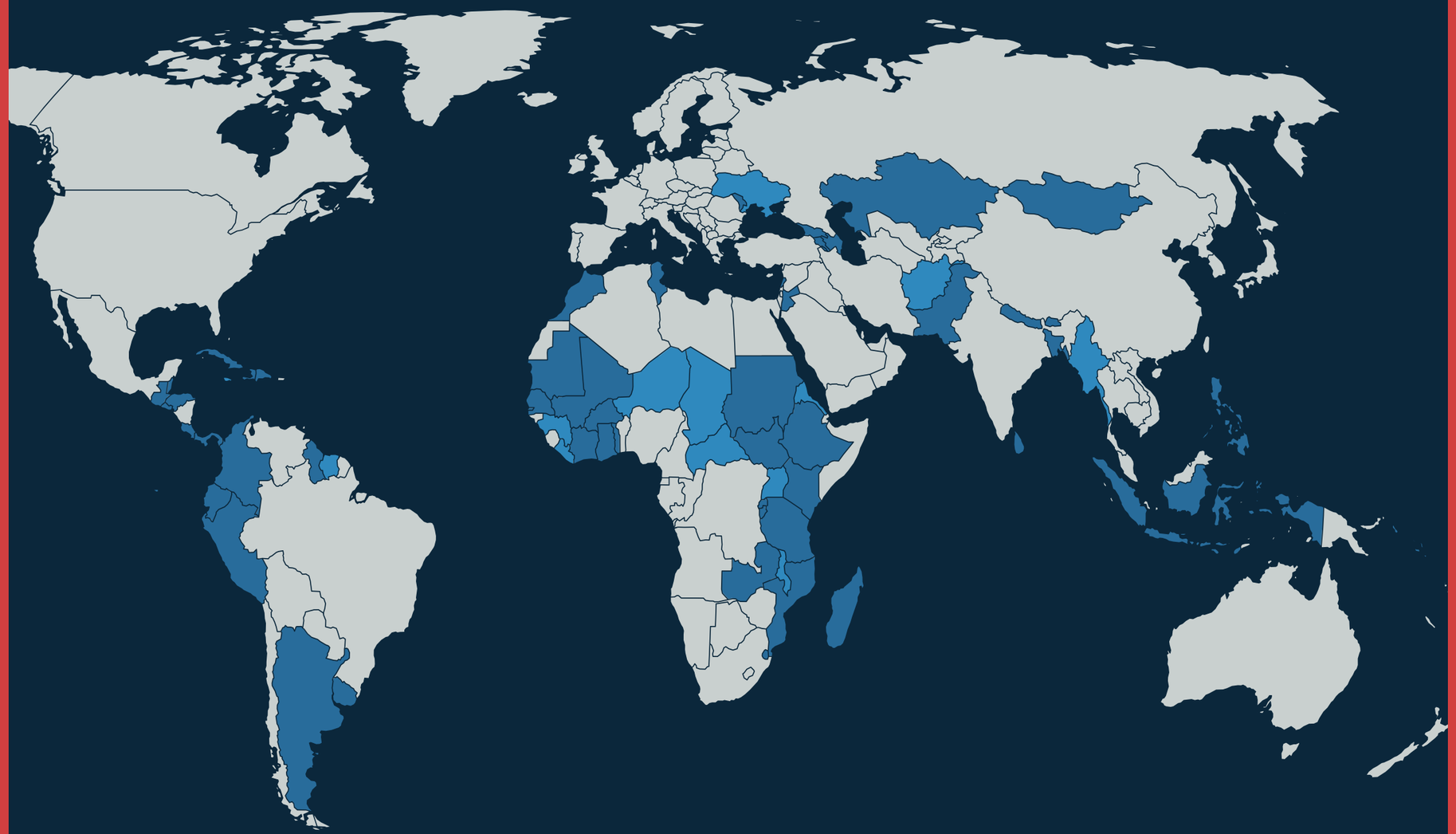
Figure 1: Map of countries participating in the TNA project



Enhancing the development, transfer and uptake of technology is a key pillar of the international response to climate change. With funding from the Global Environment Facility, UNEP through the UNEP DTU Partnership, supports developing countries in preparing their Technology Needs Assessments (TNAs) and Technology Action Plans (TAPs) within the global Technology Needs Assessment (TNA) project. Since 2009, close to a hundred developing countries have joined the project: twenty-four countries in the Latin America and Caribbean region, thirty-seven in the African region, and thirty-nine in the Asia-Pacific region.

The objective of the TNA project is to assess and articulate countries' technology needs in relation to climate change adaptation and mitigation. TNAs provide information about the potential, ability and scale of climate technologies, and they can play a unique role in the formulation and implementation of NDCs. They are a highly practical tool that provides an effective and solid foundation upon which developing countries can both scale up and implement action on climate technologies. Countries can therefore pursue both the targets they agreed under the Paris Agreement and their national Sustainable Development Goals.

TNAs were strongly emphasized in the Paris Agreement, and they play a central role in the newly agreed UNFCCC Technology Framework, which provides overarching guidance to the UNFCCC's Technology Mechanism. Greater support to developing countries in conducting effective TNAs and implementing Technology Action Plans (TAPs) will be instrumental in enhancing implementation of the Paris Agreement.

Issues and challenges

The international community still roughly sets technical areas based on the industrial- and project-level approaches, and most of the technologies are classified without considering the characteristics and purposes of their utilization. In addition, a hierarchical classification structure of the sub-classification system needs to be developed, and the technologies that remain must be divided into large areas of the section unit.

Although the importance of climate technology transfer and the need for technology demands are highlighted in global society, private sector and government stakeholders in donor countries still lack information on demand from developing countries, since differing classification systems in developing and advanced countries have created difficulties in identifying technologies that are suitable for each other.

To narrow the imbalances for climate technology transfer, UNEP DTU Partnership and the UNFCCC conduct the Technology Needs Assessment(TNA) project to support developing countries in the identification of climate technologies, to build resilience to climate change hazards. Hence, the development of a mutually acceptable technology classification system is essential for providing matching information, both on the demand and supply sides.

In addition, it is difficult to accurately match the technological demand of developing countries, which are centered on adaptation technology needs, due to insufficient classification. As a result, it is highly necessary to prepare a commonly acceptable climate technology classification system that considers the advantages and disadvantages of existing climate technology-related classification. It is also important to consider adaptation technology that is highly connected to projects.

Research process of TNA Adaptation Taxonomy

The Green Technology Center, a government-funded research institute under the Ministry of Science and ICT Korea, signed a memorandum of understanding (MOU) with UNEP DTU Partnership on June 13th, 2019 and is jointly conducting research on the development of classification systems based on TNA information for climate change responses in developing countries.

In order to develop such a classification system, the scope and types of technologies were divided by criteria: scale, universality, and other considered elements. In addition, a review of policies and expert advice, as well as a review and evaluation for adequacy of climate change response were conducted.

To achieve the goal of developing a taxonomy for climate change adaptation related technologies in the framework of the TNA project, GTC conducted a research, inclusive of all elements linked to adaptation, following the steps below. For the first step in this study, the perspective of the “Climate Adaptation-related Industry” category was considered. After the process, a comparison of adaptation activities with the suggested “Climate Technology Classifications (CTC)” was conducted to increase the compatibility to adaptation actions. The Green Technology Center started to conduct a research on establishing Climate Technology Classification from 2014 and finalized it in 2017 after many years dedicated to the review and classification of climate technologies, with the support of sectoral experts. It is also planning to update the classification regularly to adopt newly defined technologies.

As a result, the draft of the Climate Technology Classification based on TNA information was suggested and reviewed by 20 technology experts. The terms from UDP’s standardized TNA taxonomy and CTC’s taxonomy were merged together. The TNA Adaptation Taxonomy expects to be updated time to time after new technology needs is identified. This would give more clarity to both developing countries and technology implementers.

TNA Adaptation Taxonomy

As for the result of the joint research, the TNA Adaptation Taxonomy is established as per Figure 2. next page and expected to be updated regularly with newly prioritized technology needs from developing countries.

Based on standardized TNA technology classes, it is divided into six sectors: 1) Agriculture & Livestock, 2) Water, 3) Forestry & Land, 4) Marine, Fisheries and Coastal Zones, 5) Health, and 6) Climate Change Forecast and Monitoring. Each sector is divided further into categories, which is designed to include all developing countries’ prioritized technology needs and gives more flexibility within categories to cover a greater scope of technologies. There are some overlapping categories within sectors, but they are precisely designed to be more appropriated to each sector.

It is believed to cover TNA technology classes that have not yet been defined but which might not be included after upcoming TNAs, but certainly gives more clarity in terms of the technology needs of developing countries. After updating it with the newly prioritized technology class, it will have many use such as a technology classification system for developing countries. For further use of the TNA Adaptation Taxonomy, development of guidelines including the factsheets for each sectors is under progress and expected to be published in this year.

TNA Adaptation Taxonomy

Figure 2: TNA Adaptation Taxonomy

Agriculture & Livestock	Water	Forestry & Land
Climate-resilient farming measures	Maintaining of sustaianble water supply	Climate-resilient forest resources production
Crop management and climate-resilient crops	Monitoring & early warning for water resources	Forest disaster risk management
Climate-resilient livestock management	Water quality assurance	Forest carbon sink management
Agricultural water management	Integrated water resource management	Forestry & Land ecosystem service management
Agricultural soil management	Water-related disaster risk management	Forestry & Land ecosystem restoration
Agricultural environment monitoring	Service management of water ecosystem	Forestry & Land ecosystem change detection and prediction
Disaster risk reduction and management in agriculture	Water education and consulting	Forestry & Land education and consulting
Agriculture & Livestock residue and waste management		
Agriculture & Livestock disease management		
Post-harvest/ processing/ distribution		
Finance mechanisms		
Agriculture & Livestock education and consulting		

Marine, Fisheries and Coastal Zones	Health	Climate Change Forecast and Monitoring
Coastal zone risk retention-soft structures	Medical and public health infrastructure	Climate risk analysis, prediction and assessment
Coastal zone risk retention-hard structures	Prevention and control of infectious disease	Climate data and information services
Coastal environment monitoring and risk assessment/prediction	Food safety, food security and nutrition	Climate disaster prediction and warning
Disease management of marine resources	Health policy consulting, enabling environment, health education, health system strengthening	Climate change monitoring and modelling
Production of marine resources and aquaculture		Climate change education and consulting
Marine ecosystem service management		
Marine, Fisheries and Coastal Zones education and consulting		

Terminology of TNA Adaptation Taxonomy

Agriculture & Livestock

Technology Section	Definition
Climate-resilient farming measures	Agroforestry, soil conservation agriculture, improvement of agricultural and livestock production, eco-friendly agriculture, agricultural infrastructure and technology, adaptive infrastructure for climate change for automation and cultivation of production management systems and mechanization techniques
Climate management and climate-resilient crops	Securing genetic resources and improving disease-resistant, and weather-resistant properties for improving crop varieties in response to climate change and extreme weather events.
climate-resilient livestock management	Production of livestock in response to climate change, including livestock nutrition and feedstock management, livestock disease management, etc.
Agricultural water management	Irrigation is a method of supplying water to plants at regular intervals for farming. It is used to help grow crops, maintain landscapes and cultivate disturbed soil in dry areas and during dry seasons.
Agricultural soil management	Regenerative, or restorative, agriculture can help soil to capture more carbon by encouraging farmers to adopt a mixture of techniques to improve soil health and moisture balance.
Agricultural environment monitoring	Monitoring of ecosystem changes in agriculture and livestock products, assessing effect on agricultural production due to climate change by means of vulnerability assessment.
Disaster risk reduction and management in agriculture	Improving agricultural facilities, improving infrastructure, and reducing crop damage to minimize the harm caused by abnormal weather and disasters. It includes early warning systems and modelling of climate disaster prediction.
Agriculture & Livestock residue and waste management	Management of agricultural and livestock waste, such reuse of agricultural and livestock by-products, eco-friendly treatment, and energy production.
Agriculture & Livestock disease management	With gradual climate change, the inflow of new pests and viruses increases and spreads, and technology is needed to provide products and services to reduce damage. Includes pest diagnosis kits and prevention technologies and product production technologies.
Post-harvest/processing/ distribution	Technology that maximizes merchantability for the entire process of screening, pre-cooling, storage, packaging, transportation of harvested agricultural and livestock products.
Finance mechanisms	The generic term for various contracts in which beneficiaries of agricultural livestock environment services pay a certain amount of service costs to suppliers based on private contracts.
Agriculture & Livestock education and consulting	Educational framework, capacity building, expansion of public acceptance, information sharing, tourism, and consulting, etc.

Related Project

GGW: Agriculture Production Support Project (with Sustainable Land and Water Management / GEF-5/3701

- Country: Chad
- Implementing Agency: The World Bank
- Summary

  To support rural communities and producer organizations in increasing production of selected food crops and livestock in targeted zones while increasing the use of sustainable land and water management practices in climate vulnerable ecosystems.

  (i) Capacity building and institutional support to public services will provide institutional support for government.

  (ii) Provision of agricultural inputs aims at increasing access to improved seed, fertilizer, animal food, and veterinary inputs.

  (iii) Support for food production, with the overall objective to enhance crop and livestock production and productivity through two disbursement windows.

  (a) water resource development for cereal production and animal watering points; (b) irrigation for rice production; (c) community storage facilities; (d) animal health infrastructure; and (e) feeder roads.

  (iv) Sustainable land and ecosystem management to address issues of forest and biodiversity in the larger ecosystem landscape related to agricultural production and expansion

Climate Resilient Livestock Management Project / GEF-5/5394

- Country: Zambia
- Implementing Agency: African Development Bank
- Summary

  This project is aimed at increasing the resilience of the Zambian livestock breeders to climate change effects by among others; enabling beneficiaries to undertake climate-resilient projects, improvement of natural resource management, improving the water supply and harvesting techniques and provision of capacity building to livestock breeders on issues related to climate change as well as undertaking monitoring and evaluation of the project.

  (i) Promoting livestock investments to provide stock breeders with climate resilient breeds of livestock, development of effective models for community livestock management, and restoration of degraded pasture and increased vegetation cover with different drought tolerant perennials. With regard to water harvesting, various technologies will be studied and those that are best suited to guarantee good water supply (rainwater, boreholes etc.) in the livestock areas.

  (ii) Strengthening capacity of livestock breeders with marketing skills for their choice of livestock with capacity building related to community mobilization, farmer organizations, promotion of women's participation, field demonstrations, staff and farmers' training and environment and social management activities.

Water

Technology section	Definition
Maintaining of sustainable water supply	Technology to maintain and increase the capacity of water to enhance the safety of water facilities from various threats such as abnormal rainfall, earthquakes, and deterioration of facilities, and to manage the entire water supply process from the supply source to the faucet.
Monitoring & early warning for water resources	Technology that includes quantitative rain forecasting and decision-making techniques for efficient water management amid extreme floods, frequent abnormal droughts and severe regional seasonal changes in precipitation including water level and flow observation (monitoring). e.g. Monitoring and early warning system for flood damage reduction, dam condition observation, etc.
Water quality assurance	Establishing a preventive water quality safety management system, minimizing the ecological impact of changes in water quality, and applying various water quality ecological restoration technologies to enhance the sustainable development and utility value of water resources facilities. e.g. Sewage treatment and management, water purification system, water quality management, etc.
Integrated water resource management	Integrated management of water quality, quantity, water ecology, environment, etc., which has been managed individually in consideration of all matters affecting water management in the region. e.g. Water demand and supply management, watershed management
Water-related disaster risk management	Pre-emptive drought and flood response, urban flooding and damage reduction technologies through monitoring of flood-stricken areas and drought-prone areas and establishment of an operational plan for the flood-watershed season also including water level and rainfall data monitoring systems and water resource management infrastructure. e.g. Disaster prevention and disaster mitigation infrastructure, etc.
Service management of water ecosystem	Policy design that includes upstream water source management funding for the protection of water resources ecosystems and a system for levying environmental charges on water users, etc. e.g. Watershed management contract, water quality credit, land purchase/rental limit, watershed environment-friendly certificated product, tax for watershed conservation and protected areas.
Water education and consulting	Educational framework, building competencies, expanding public acceptance, sharing information, tourism, policy consulting, etc.

Related Project

Building Resilience to Climate Change in the Water and Sanitation Sector / GEF-5/5204

- Country: Uganda
- Implementing Agency: African Development Bank
- Summary

  Making water and sanitation infrastructure climate resilient will reduce the vulnerability of the population to climate-induced changes in water availability. Adaptive capacity will be increased through the availability of additional streams, groundwater and rain gauges that improve access to information, together with appropriate training at local and national levels for staff to use that information for effective early warning. Adaptive capacity will also be enabled through policy analysis and development of a program document for the water and sanitation sector that addresses climate change and explores issues of technology transfer for adaptation. Training and awareness-raising of climate-resilient Water, Sanitation and Hygiene (WASH) principles will also contribute to building adaptive capacity at the local level.

  (i) Building resilience to climate change in flood-prone areas of Mount Elgon

  (ii) Ensuring access to water for production as adaptation in drought-prone areas

  (iii) Ensuring climate-resilient sanitation in flood-prone peri-urban areas

Forestry & Land

Technology Section	Definition
Climate-resilient forest resources production	Technology to raise the value of forestry and land ecosystem management for utilization of resources and to efficiently create forest resources through climate-adaptable genetic variety and species management.
Forest disaster risk management	Technology to minimize soil erosion, disaster forecasting and management, and pest response technology. e.g. early detection of forest fire and landslide, forest pest prediction and management.
Forest carbon sink management	Management of soil nutrition and moisture in forest and land ecosystems, monitoring of carbon conservation in forest flatlands.
Forestry & Land ecosystem service management	Design of an environmental payment service for the protection of livestock, genetic conservation and ecosystems in forest areas. e.g. taxes on ecotourism, exploration rights on biological resources, biodiversity-friendly products, biodiversity credit, tax on conservation areas, biodiversity resource management, forest logging rights purchase.
Forestry & Land ecosystem restoration	Promoting biodiversity of damaged forests and land to help vegetation restoration, combined with landscape conservation, management of deterioration by related disasters and ecological stability.
Forest & Land ecosystem change detection and prediction	Prediction of environmental changes in forests and land due to climate change
Forestry & Land education and consulting	Education framework, building competencies, expanding public acceptance, sharing information, tourism, consulting, etc.

Related Project

Scaling up a Multiple Benefits Approach to Enhance Resilience in Agro- and Forest Landscapes of Mali's Sahel Regions (Kayes, Koulikoro and Ségou) / GEF-5/9293

- Country: Mali
- Implementing Agency: African Development Bank
- Summary
  To enhance food security and access multiple environmental benefits through sustainable, resilient and healthy agro- and forest ecosystems in the Sahelian regions of Mali based on a landscape approach, agricultural innovations and inputs that support sustainable production will be the focus of the field interventions. Sahelian agro-ecosystems will be enriched through improved agro-sylvo-pastoral management, site-appropriate SLWM, improved agricultural techniques and inputs (such as drought resistant seeds), and integrated crop-tree-animal systems that concurrently enhance soil fertility, help protect water sources and habitats, and reduce carbon emissions from increased vegetative cover. Sustainable land and pastoral management will be sought particulalry via climate-smart agricultural techniques, known to strengthen food security and deliver mitigation benefits. Specific activities will involve 5000 ha of cropland under measures for soil conservation, mixed/inter-cropping, improved grazing, conservation agriculture and small rural hydro-agricultural infrastructure (e.g. rainwater harvesting and improved irrigation). Increasing demographic pressures and agricultural intensification are also resulting specifically in conversion of woodlands into land for cultivation, resulting in widespread loss of forest habitats. As such, activities will also seek to rehabilitate wooded areas in the landscape, improve forest management, and defend remaining forest ecosystems, thereby maintaining the provision of forest services and carbon stock. Techniques for increasing woody biomass will be adopted more widely by placing 9500 ha under woodlots, agro-forestry, ANR, and community forestry. These techniques are additionally important for economic diversification, creating new income activities, and conserving biodiversity, and will include the promotion of NTFPs and harvesting of fuelwood to reduce deforestation.

Marine, Fisheries and Coastal Zones

Technology Section	Definition
Coastal zone risk retention-soft structures	Restoration of natural functions of coastal wetlands, construction of land/ embankment to prevent erosion, prevention of inflow/leakage of groundwater or surface or sea water, transplanting healthy alternative trees, responding to flood control, etc.
Coastal zone risk retention-hard structures	Establishing safe and flexible infrastructure to cope with coastal disasters caused by abnormal phenomena such as (coastal) flooding, typhoons, heavy rains, and high water temperatures due to rising sea levels.
Coastal environment monitoring and risk assessment/prediction	Prediction of changes in the marine coastal environment due to climate change (increase in sea level, change in ocean currents/side, increase in sea temperature, etc.) and environmental impact assessment, etc.
Disease management of marine resources	With growing interest in the safety of the marine environment and marine ecosystem, the response to diseases arising from fisheries resources, safety surveys, rapid diagnosis kits and related management technologies are necessary technologies.
Production of marine resources and aquaculture	To enhance the productivity of marine and coastal ecosystems by protecting coastal environments, marine life habitats, protected species, etc. e.g. Genetic breeding, strengthening of aquaculture facilities.
Marine ecosystem service management	Response management of climate change to ensure that various services, such as marine resources, tourism and leisure, are sustainable by the marine ecosystem.
Marine, Fisheries and Coastal Zones education and consulting	Education framework, building competencies, expanding public acceptance, sharing information, tourism, consulting, etc.

Related Project

Financing Advanced Environmental Technologies in the Mediterranean Sea Region for Water Systems and Clean Coasts (EnviTeCC) / GEF-6/9691

- Countries: Regional, Albania, Bosnia-Herzegovina, Egypt, Lebanon, Morocco, Montenegro, Tunisia, Turkey
- Implementing Agency: European Bank for Reconstruction and Development
- Summary
  To accelerate investments in wastewater treatment and POPs elimination and reduction with the aim of embedding pollution prevention and reduction techniques, technologies and practices into the management practices of private and publicly-owned businesses in Albania, Bosnia and Herzegovina, Egypt, Lebanon, Montenegro, Morocco, Tunisia and Turkey.

  (i) In the IW area, into point and non-point source pollution reduction measures, by targeting investments that lead to improved wastewater collection, wastewater treatment and wastewater recycling across public infrastructure systems and municipal services, agribusinesses and industrial processes

  (ii) In the C&W area measures to improve chemicals and waste management, including but not limited to the upgrade of PCB- based electrical equipment, promotion of chlorine free operations, fuel quality control in waste oil refineries and cement industry, solvent recovery systems, hazardous waste management infrastructure, the replacement of chemicals in industrial processes, and promoting land remediation and elimination and safe disposal of POPs containing waste. For investments targeting the C&W, in particular, a joint delivery mechanism developed with UNEP as outlined above, which will ensure coordination on the technical assistance measures () to identify and prepare potential investments in POPs reduction and prevention projects.
  The ultimate objectives are: (a) streamlining public and private investment; (b) strengthening institutional capacity of the public sector in WWTPs, and possibly related to hazardous waste treatment (c) stimulating additional private investment in the corporate sector, which will enable scaling up of investments upgrading wastewater systems that are discharging directly or indirectly into coastal pollution hotspots.

Health

Technology Section	Definition
Medical and public health infrastructure	Management of health infrastructure with extreme events arising from climate change. e.g. after extreme events, water pollution prevention, exposure to harmful environments, indoor air quality management, etc.
Prevention and control of infectious disease	Strengthening control and related multi-sector activities that enable disease control in the early stages. e.g. vector-borne and water-borne disease prevention technology, medical waste management
Food safety, food security, and nutrition	Monitoring and preventing food hazards and rapid detection of food poisoning bacteria to reduce unintended environmental pollutants contaminated by the production environment and transferred to food. e.g. Evaluation model for predicting occurrence of foodborne diseases, risk factors, detection of addiction, safety diagnosis, food sanitation system
Health policy consulting, enabling environment, health education, health system strengthening	Policy consulting, strengthening local health capabilities, enhancing sanitation and medical publicness, etc.

Related Project

Reducing Environmental Health Impacts of Harmful Pollutants in Africa Region / GEF-5/5583

- Country : Regional, Africa
- Implementing Agency : The World Bank
- Summary

  To improve the shared understanding of current trends in environmental health associated with chemicals waste management in artisanal and small scale gold mining and unregulated waste dump sites in sub-Saharan Africa, and develop a regional collaborative platform to address this.

  (i) Mapping key areas of exposure across the region. This exercise will evaluate and map key Africa region health and environmental data, knowledge, risks and impacts, including identification and delineation of key hotspots based on environment and health risks. In addition, stock-taking exercise will be undertaken covering the regulatory framework and institutional mechanisms that are currently used to identify, regulate and monitor the environmental health risks associated with harmful chemicals and substances, such as mercury and PCBs; including analysies of current system effectiveness and identification of entry points for immediate and long-term interventions to address these risks in a couple of pilot countries.

  (ii) Analyzing the environmental health and socio-economic consequences of land degradation from toxic chemicals, and opportunity costs associated with management of chemicals and hazardous wastes. Recognizing that the risks of exposure, scope of regulations and capacity of enforcement and environmental health consequences of poor management of chemicals may vary among countries and regions, it is important to develop shared regional economic approaches and solutions for eliminating hazardous chemicals and waste, including contaminated sites.

Climate Change Forecast and Monitoring

Technology Section	Definition
Climate risk analysis, prediction and assessment	Technology includes the variability of climate systems, abnormal climate analysis and detection techniques, seasonal weather forecasting and evaluation by the effects of climate change.
Climate data and information services	Establishment of an information production system for the purpose of producing customized information on climate change.
Climate disaster prediction and warning	Prediction and monitoring of extreme climatic changes, such as heat waves and cold waves, and drought trends.
Climate change monitoring and modeling	Monitoring climate change at national and regional levels and developing standardized climate change scenarios, observing and monitoring greenhouse gases.
Climate change education and consulting	Building capabilities, expanding public awareness of climate change, sharing information, etc.

Related Project

Enhancing Climate Risk Management and Adaptation in Burundi (ECRAMB) / GEF-5/3701

- Country: Burundi
- Implementing Agency: African Development Bank
- Summary

  To improve forecasting and early warning systems for climate variability and change for better awareness, preparedness and adaptation, through enhanced capacity of the population to adapt to climate change and reduce vulnerability

  (i) Enhancement of the capacity of the National Weather Service (IGEBU) to provide short- to medium term climate forecast information. Revision of key national policies (agriculture, water, forestry, etc), investments and practices to take climate change into account. Incorporation of climate change adaptation in public awareness and environmental education programmes for target groups including farmers. Ensuring national budgets provide for climate change risks. Uploading the support and practice of anticipatory adaptation planning by key stakeholders in pilot regions.

  (ii) Improvement of the climate and hydrological observation networks to generate improved climate information and appropriate data to enhance baseline investments in conservation and production. Including a data acquisition and management system to allow for the analysis and interpretation of data (historic, real-time and future forecasting). Development of national meteorological and hydrological GIS datasets supporting planning and implementation of adaptation, risk reduction and climate proofing interventions. The datasets shall also be appropriate for future hydropower scoping studies. Piloting of new/ enhanced methodologies for soil and water conservation in the watershed in the face of climate change and modification of baseline investments in order to demonstrate climate change proofing.

Appendix. Compatible Table of CTC and TNA Technology Class

Technology Division	Technology Section	TNA Standardized Technology Class
Agriculture & Livestock	Climate-resilient farming measures	Agroforestry
		Conservation agriculture
		Infrastructure and technology
		Management of production system
	Crop management and climate-resilient crops	Crop diversification and new varieties
		Optimisation of fertilizers
	Climate-resilient livestock management	Feedstock improvement
		Livestock management
	Agricultural water management	Drip irrigation
		Water supply system
	Agricultural soil management	Soil management
	Agricultural environment monitoring	Monitoring of agricultural environment
		Early warning system
		Monitoring and modelling
		Risk management and disaster prevention
	Agriculture & Livestock disease management*	-
	Agriculture & Livestock residue and waste management	Composting
		Waste recycling
	Post-harvest/processing/distribution	Food conservation
		Food conservation and grain storage
	Finance mechanisms	Finance mechanism
	Agriculture & Livestock education and consulting	Research & development
		Educational framework
		Information and awareness
Water	Maintaining of sustainable water supply	Desalination of saltwater
		Drip Irrigation
		Extraction of groundwater
		Water catchment and harvesting
		Water saving technologies
		Water supply system and storage
	Monitoring & early warning for water resources	Monitoring and modelling
		Early warning system
	Water quality assurance	Wastewater treatment and recycling
	Integrated water resource management	Land conservation
		Water management
	Water-related disaster risk management	Resilient infrastructure
		River protection
		Risk management and disaster prevention
	Service management of water ecosystem*	-
	Water education and consulting	Organisational structure and capacity
		Educational framework
		Information and awareness
Forestry & Land	Climate-resilient forest resources production	Agroforestry system
		Forest management
		Improved mining exploration
	Forest disaster risk management	Forest conservation
		Land conservation
		Reforestation
		Early warning system
		Risk management and disaster prevention
	Forest carbon sink management	Monitoring of carbon sink
	Forest & Land ecosystem service management*	-
	Forestry & Land ecosystem restoration	Conservation and restoration
		Improved management
		Landscape connectivity
	Forest & Land ecosystem change detection and prediction	Monitoring and modelling
	Forestry & Land education and consulting	Educational framework
		Information and awareness
Marines, Fisheries and Coastal Zones	Coastal zone risk retention-soft structures	Beach nourishment
		Coastal management
		Coral reef restoration
		Dune restoration
		Wetland restoration
	Coastal zone risk retention-hard structures	Hard coastal protection
		Early warning system
		Risk management and disaster prevention
	Coastal environment monitoring and risk assessment/prediction	Climate monitoring and forecasting
		Monitoring and modelling
	Disease management of marine resources*	-
	Marine ecosystem service management*	-
	Production of marine resources and aquaculture	Farming systems and crop management
	Marine, Fisheries and Coastal Zones education and consulting	Educational framework
		Information and awareness
Health	Medical and public health Infrastructure	Early warning system
		Health infrastructure in communities
		Disaster relieve provisions
	Prevention and control of infectious disease	Medical waste management
	Food safety, food security, and nutrition*	-
	Health policy consulting, enabling environment, health education, health system strengthening	Capacity building
Climate Change Forecast and Monitoring	Climate risk analysis, prediction and assessment	Scenario building
	Climate data and information services	Data centre
	Climate disaster prediction and warning	Early warning system
	Climate change monitoring and modeling	Monitoring and modeling
	Climate change education and consulting	Educational framework
		Information and awareness

***Newly added category: technology class is not yet defined but has potentials to be prioritized soon**

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