WORK PROGRAMME

on

CO-OPERATION IN THE FIELD OF CLIMATE CHANGE VULNERABILITY, RISK ASSESSMENT, ADAPTATION AND MITIGATION

Between

THE MINISTRY OF SCIENCE, TECHNOLOGY AND ENVIRONMENT OF THE REPUBLIC OF CUBA

and

THE MINISTRY FOR THE ENVIRONMENT, LAND AND SEA OF THE REPUBLIC OF ITALY

WORK PROGRAMME

Following the Memorandum of Understanding (MOU) signed in Havana, on July 14, 2017, between the Ministry for the Environment and Land and Sea of the Republic of Italy and the Ministry of Science, Technology and Environment of the Republic of Cuba, the Parties agree to implement the following Work Programme.

Objectives

The objectives of the Work Programme are to identify, select and plan activities and projects, that correspond to the general objective of the MoU, to strengthen and coordinate efforts to combat the adverse effects of climate change and to support the implementation of mechanisms for regional climate change vulnerability and risk assessment, adaptation and mitigation, in the Republic of Cuba.

In accordance with Article 3 of the aforementioned MoU, in the course of the implementation of the projects and activities, consideration will be given to the participation of the public, private and non-profit sectors and, where appropriate, Universities, scientific and technical research bodies and Non-governmental Organizations, as well as Institutions coming from Italy and Cuba.

In accordance with Article 2.1 of the MoU, and taking into account the indications provided by the Nationally Determined Contributions (NDCs) submitted on November 2015, and by the National Adaptation Programme for Action, both by the Republic of Cuba, this Work Programme aims to focus on the following areas of interest:

Description of Activities

1. Improving of Climate Data Collection, Management and Forecasting: Early Warning Systems, monitoring, recording and acquisition of data for vulnerability and risk assessment of the Cuban coastal zone to climatic change

One of the most damaging consequences of climate change is sea level rise, which in recent years has been shown to occur at alarming rates. The Republic of Cuba, and particularly the "cayos", is subject to this problem, as well as to other specific vulnerabilities, due to intense and important climate variations that have consequences able to impact the whole planet, such as long term changes in the intensity, distribution and prevalent paths of tropical cyclones and other extreme weather phenomena. In tropical regions the effect of extreme wind events and storm surges may have a huge impact on economic development as well as safety and quality of life of coastal populations.

The activity will focus on the following actions:

- collection, analysis, and dissemination of meteorological and sea-level data relevant to the observation of climate change and the measurement of its impact on the potentially vulnerable sectors such as: health and biodiversity, aquaculture, agriculture, energy, tourism;
- implementing coastal vulnerability assessment procedures for natural/environmental, structural and operational components, concerning coastal zones;
- identification of coastal areas particularly vulnerable to sea-level rise;
- implementing a spatial data infrastructure to collect, store and manage environmental and socio-economic data and information on critical facilities as a tool for coastal and risk management and for maritime spatial planning;
- strengthening early warning capacity for collection, analysis, management and use of relevant data, on the evolution of weather events (such as tropical cyclon activities, hurricane, etc.);
- supporting the implementation, monitoring, reporting and communication of the Nationally Determined Contributions (NDCs);
- elaboration of national policies and special programs for coastal zone management, disaster management, impact assessment and community level mitigation and adaptation measures;
- support to engineering projects related to adaptation to climate change, particularly in the coastal zone where coastal defenses and natural ecosystem engineers (e.g. mangroves) can mitigate the impact of storms.

2. Use of computational tools and numerical models to assess scenarios in coastal areas vulnerable to sea-level rise due to climate change and/or flooding by extreme weather events.

Many processes can be investigated and simulated by using computational tools. In coastal areas, vulnerable to sea-level rise and/or flooding by extreme met-ocean events due to climate change, water circulation, coastal flooding, storm-surge and coastal evolution can be mapped or simulated by means of specific computational tools or software. This task will aid in improving conceptual treatment of coastal vulnerability in Cuba and disseminating GIS based vulnerability methodologies for risk assessment, allowing to build capacity and resilience of the local communities. More specifically it will provide:

- model simulations to test and select best available technologies and options for coastal defense against flooding;
- high resolution simulations using state-of-art numerical ocean models (at the local scale); depending on data availability and quality, several numerical simulations can be carried out. This

task is crucial for scientific and management purposes as results can help to understand and determine coastal water circulation, sediment transport and shoreline evolution. In situ calibration and validation of large scale/long term processes might be necessary if data are not available or quality is poor.

3. Resilience and adaptation/mitigation actions in coastal areas particularly linked to coastal protection-restoration and tourism development

Climate change can severely affect marine and coastal environments, with consequences on communities, coastal morphology and ecosystems, infrastructures and economic activities,.

Besides direct consequences on low-lying areas, expected sea level rise due to global change would increase vulnerability and risks due to more frequent and severe coastal flooding and coastal erosion. This is due to an increase in wave action and frequency/duration of storms.

Increasing temperatures, harmful algal blooms, ocean acidification, coupled with anthropogenic pressure are serious threats to marine resources and tourism attractions.

Hence, studies aimed at evaluating possible adaptation and mitigation actions in coastal zones are needed and can relate to different topics. Results could be used by administrative and technical Cuban Authorities as a knowledge base to support planning and implementation of future actions.

- Sea level rise.

  Expected sea-level rise due to climate change can expose the low-lying coastal areas to the risk of flooding. Identification and mapping of the most vulnerable low areas, using GIS-based techniques, is needed to support development plans and adaptation measures.

- Ecosystem-based adaptation

  Healthy coastal ecosystems such as coral reefs, mangroves, seagrass meadows, dunes and beach systems have an important role in coastal protection, wave attenuation, food supply, biodiversity conservation, carbon storage, etc.. Anthropogenic pressures and climate change threaten these ecosystems, that in many areas are now severely damaged. It is therefore necessary to define and apply innovative methodologies (habitat mapping) for monitoring and assessing coastal habitats, their health status and trends. This information will aid the maritime spatial planning aimed to identifying areas that need to be protected and areas that could be exploited and assess the effectiveness of the present network of marine protected areas.

- Coastal protection measures.

  Coastal areas and cities can be exposed to risks due to the effects of incident wave action and coastal erosion. Among the vulnerable areas, special attention must be drawn to touristic sites,

beaches and Cayos. Both, short term erosion induced by cross-shore processes and long-term erosion due to long-shore processes and sediment budget must be considered. In addition, the effect of wave set-up and run-up on the coastal areas is to be addressed. As beach-dune systems represent a natural defense system against sea-level rise and coastal flooding, current state-of-the art protection measures comprise both:

- "hard" measures (e.g. breakwater, seawall, etc.) and
- "soft" measures (e.g. beach nourishment, dune conservation and restoration, etc.).

- Sediment management.

  Appropriate strategies for sediment management are necessary to evaluate the volume of sedimentary resources available and their sustainable use for coastal intervention. Sediment for coastal protection and restoration can be found off-shore (continental shelf), along shore (close to coastal infrastructures) or on shore (mines, rivers, dams, etc.). Sediment treatment and re-use is a frontier application that is needed in developing countries, in particular when dredging activities are carried out for safety of navigation or hydraulic intervention. In other cases, sediment treatment can be necessary to avoid dispersion of contaminants during storms. In contaminated areas, like Moa for examples (Northeast of Cuba), systematic or accidental contamination could be reduced by specific actions. The analysis of cost and performance can be provided in order to understand if use and re-use of sedimentary resources, necessary to mitigate the impact of climate changes and storms, can be applied at a sustainable cost for the society.

- Soft engineering techniques for restoration and protection of coastal features and habitats.

  Site-specific measures can be evaluated in order to support decisions of the Cuban Authorities. These measures can include soft engineering techniques to consolidate rocky and sandy coastal areas, or provide the use of local natural fiber (juta and coconuts) and vegetal biomasses (seagrass wrack) for emerged beach system restoration. Submerged-beach nourishment in shallow water coastal environments, can also be considered in order to enhance wave breaking and energy dissipation before impact on the shore. Sand dunes stabilization and restoration can be provided as it represents a natural reserve of sediment that can be stocked to protect coastal communities exposed to flooding.

The overall aim of this task is to strengthen the national capacity to implement practical adaptation actions and measures and build infrastructures resilient to climate changes. Specifically, provide information to support decision-makers to reduce the impact of weather-climatic hazards and related risks in the potentially affected sectors. Definition of measures for coastal cities and cayos protection,

in relation to extreme weather events, can be part of this activity as well as evaluation of their assessment/footprint.

4. Assessment of Renewable Energy availability and needs in Cuba.

The production of energy from renewable sources is already widely distributed all over Cuba, but the country need is constantly increasing. Hence, particular emphasis should be given to assess ocean energy resource assessment. In case of coastal intervention, waves and tidal currents along the Cuban coasts can be considered for energy production. Ocean energy resource assessment studies include the development of a chain of high-resolution three-dimensional and two-dimensional circulation and wave models capable of reproducing at best the present climatological marine circulation and sea state. To calibrate and validate the numerical models in situ, measurement campaigns will be conducted. Based on the results of the numerical simulations, some interesting sites will be identified, in which to deploy instruments for measuring marine currents. The instruments best fitted for the sites will be selected and deployed, and measurements collected by local technical experts. This data will provide validation of the numerical results and will guide to the final selection of the most promising sites for energy extraction. Finally, a fine-tuning study will be conducted for identifying consolidated international technologies suitable to exploit the potential of currents and wave energy along the Cuban coasts. Technological characteristics, considerations and restrictions will also be highlighted. The activity will consist of the following actions:

- promotion and development of the use of renewable energies, in order to achieve the target established by both countries in their NDCs;
- modeling studies of the marine circulation and sea state along the Cuban coasts;
- experimental activities for promising energy extraction sites;
- analysis of the best technological solutions for ocean energy extraction.

5. Strengthening disaster risk governance and national capacities for disasters prevention, mitigation, preparedness

When a disaster of a certain magnitude hits a populated zone, a huge amount of data have to be collected in order to address the typical hazard and emergency actions for rescue, assistance, viability, etc. Generally, the bigger and longer the storm, the stronger the damage. Several studies demonstrated that the post-event performance of a fast damage detection, designed to meet the needs of first responders after disaster, is needed.

The aim of this Task is: i) to strengthen the national technical capacity and quality of local expertise in disaster and environmental management; ii) more importantly to strengthen the capacity to effectively address environmental concerns and risks, resulting from global climate change, with the purpose of helping the society to have a role in national and regional policy development and decision making; iii) to manage, mitigate and resolve climate change-related challenges; iv) to develop programs on resilience to gain in-depth understanding of climate processes and their interactions.

Depending on budget available, the following components can be pursued:

- increase soil permeability and drainage in order to facilitate and accelerate recovery from coastal flooding events;
- exchange of best practices and projects, developed under the framework of the bilateral cooperation between the Italian Ministry for the Environment Land and Sea and Cuba, on the development of resilience strategy;
- enhance awareness, capacity and engagement of stakeholders and coastal communities;
- environmental education, mainly on disaster management, coastal management, sediment dynamics, climate change, numerical modelling, storm surge and coastal flooding, assessment of coastal infrastructures and footprint related to their realization;
- promote participation of citizens and stakeholders in marine and coastal protection and conservation. Specific dissemination programs to stakeholders and citizens should be defined and citizen science actions could also be established.