CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

# Technical Assistance Response Plan – Terms of Reference

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| **Country** | **Malaysia** |
| **Request ID#** | **2021000028** |
| **Title** | **Development of a Multi-Hazard Platform for forecasting Local level climate extremes and physical hazards for Iskandar Malaysia** |
| **NDE** | Ministry of Environment and Water<br>Dr. Sugumari Shanmugam<br>Under Secretary, Climate Change Division<br>sugumari@kasa.gov.my<br>Level 5, Block C7, Complex C, Federal Government Administrative Centre, 62662, Putrajaya, Malaysia |
| **Proponent** | Ms. Kamisah Mohd Ghazali<br>Senior Vice President<br>Iskandar Regional Development Authority (IRDA)<br>#G-01, Block 8, Danga Bay, Jalan Skudai, 80200 Johor Bahru Malaysia |

**Summary of the CTCN technical assistance**

Southeast Asia is one of the most hazard-prone regions in Asia and the Pacific. As per Asian Development Bank, the region suffered $91 billion in financial losses in 2004–2014 from the impacts of typhoons, storm surges, floods, drought, and earthquakes. Some of the Southeast Asian countries which are poor and vulnerable are also the ones most likely to be adversely affected when disasters strike. Malaysia's geographic location and low poverty rates mean both its risk and vulnerability to natural hazards are lower than some of its Southeast Asian neighbors. Nonetheless, Malaysia suffers high average annual losses. In 2014 UNISDR estimated these at around $1.3 billion. While Malaysia can experience drought, landslides, earthquakes and storm surges, the large majority of its losses are attributable to flooding. Flood risk in urban areas is rising. Growing urban populations are particularly exposed to flash floods driven by high intensity rainfall. In addition, coastal vulnerability has been increasing as a result of sea-level rise. Storm surge, coastal erosion and saline intrusion present increasing threats to the development of Malaysia's coastal zones, including fast growing coastal areas which are critical to the country's economic development.

Iskandar Malaysia (IM) is one such fastest growing economic zone in the southern tip of peninsular Malaysia which is vulnerable to the disasters due to rapid urbanization and increasing population and exposure to the coastal hazards. Iskandar Regional Development Authority (IRDA) through the National Designated Entity of Malaysia has requested CTCN Technical Assistance (TA) for the **Development of a Multi-Hazard Platform (MHP) for forecasting Local level climate extremes and physical hazards for Iskandar Malaysia.** While the project will be building upon the experiences from an operational MHP that is established for Kuala Lumpur, the scope of this TA will bring in a new component, focusing on coastal hazards. The TA will aim to localize the weather forecasting through MHP and build local capacity of IM to develop technical and financial specifications to deploy a MHP. The TA will deliver a prototype decision support tool which will demonstrate how MHP for five zones of IM can help address growing climate change risks of this important coastal economic zone. The TA demonstrates strong linkages with NDC and national priorities. The TA will be implemented in 18 months with maximum budget of USD 237,850.

**Agreement:**

*(If possible, please use electronic signatures in Microsoft Word file format)*

**National Designated Entity to the UNFCCC Technology Mechanism**
Name: Dr. Sugumari Shanmugam
Title: Under Secretary, Climate Change Division, Ministry of Environment and Water

Date: 23 September 2021
Signature:

**Proponent** (signature of the Proponent is optional)
Name: Ms. Kamisah Mohd Ghazali
Title: Senior Vice President, Iskandar Regional Development Authority (IRDA)

Date: 23 September 2021
Signature:

**UNFCCC Climate Technology Centre and Network (CTCN)**

Name: Ms. Rose Mwebaza
Title: CTCN Director
Date: 29/09/2021
Signature:

## 1. Background and context

*Please provide a brief description of the background and context for the CTCN Response Plan. Please include national and sectoral information using recognized and publicly available sources. (maximum 2500 characters including spaces).*

Iskandar Malaysia (IM), an area of 2,217 square per km, has been growing rapidly since its inception by optimizing its position within Malaysia's southernmost state of Johor that is primed with abundant land, natural and human resources, and enriched by a strong and sustainable living environment.

Strategically located at the southernmost tip of Mainland Asia to tap on a vast market of about 1 billion people, Iskandar Malaysia is set to become an integrated global node that synergizes with growth of the global City-state of Singapore and Indonesia. To that end, it has been projected that population in the urban region will more than double from 1.35 million in 2005 to over 3 million by 2025, supported by a stable 7-8% annual GDP growth that is primarily driven by five existing and four new strategic sectors in services and manufacturing. Towards strengthening the existing economic cluster and diversifying growth, five flagship zones have been proposed as key focal points for developments in Iskandar Malaysia. With the increasing population of IM, there are also rising concerns of coastal hazards and their adverse impacts on the people and infrastructure in IM. For example, one of the major hazards is flooding that accounts for the most frequent and significant damage and is responsible for a significant number of human lives lost, disease epidemics, property and crop damage, and other losses in Malaysia. The coastal communities of Iskandar Malaysia (IM) economic region in the State of Johor are also at risk of flooding due to sea-level rise.

As part of efforts to address the adverse impacts of climate change, IM has adopted the "Iskandar Malaysia Low Carbon Society Blueprint", which has driven many stakeholders in the region to adopt various programmes and initiatives that contribute to reducing greenhouse gas emissions. IM is also developed to be a Smart City which encompasses the six (6) dimensions of Smart Economy, Smart Governance, Smart Environment, Smart Mobility, Smart People and Smart Living. The lskandar Malaysia Urban Observatory (IMUO) is also currently being developed to establish baseline data to support development planning and ensure balanced development. IMUO is a robust, comprehensive, and up-to-date regional data and knowledge management system to improve decision making and galvanize targeted actions or responses, as well as to contribute to longer-term planning and setting up of appropriate systems and processes. A Community Crisis Preparedness System is currently being developed to benefit communities in flood-prone areas. It is felt that the IM region needed a Multi Hazard Platform (MHP) based on carefully selected meteorological and hazard models for tropical conditions in Iskandar Malaysia. The objective of the MHP will be managing and communicating risks and enhancing disaster resilience. The MHP will be used by the five local authorities in IM to strengthen their climate change adaptation response. Hence, IRDA through NDE of Malaysia has requested CTCN to provide technical assistance to develop a Multi-Hazard Platform for forecasting Local Level Climate Extremes and Physical Hazards for Iskandar Malaysia. The MHP will be developed based on the learnings of the operational MHP established for Kuala Lumpur. However, the MHP for IM will be focussing on coastal hazards as agreed in discussions with IRDA during the response plan design.

## 2. Problem statement

*Founded on the national and sectoral context as detailed in the section above, please include a brief problem statement clarifying the main problems and barriers for climate change mitigation and/or adaptation in terms of climate technologies that the CTCN Response Plan will address and overcome. (maximum 1250 characters including spaces).*

Iskandar Malaysia (IM) has a number of regional sustainable developmental plans such as initiatives under ***Iskandar Malaysia Low Carbon Society Blueprint and Urban Observatory and the shoreline management plan*** which can be further strengthened through a Multi-Hazard Platform.

Although actions taken during and post-disaster are important, pre-disaster measures such as flood forecasting through high-resolution modelling are useful to predict the scale and intensity of a probable hazard and its potential impact. The lack of contextualized data from detailed local risk assessments is one of the main barriers in implementing programs and initiatives related to disaster risk reduction in lskandar Malaysia. Data collection is important to ensure the reliability of forecasting environmental hazards. However, data acquisition for various parameters is very challenging. For some data types, problems of incompleteness and data scarcity arise. The institutional framework to address climate change is also fragmented and requires the development of new competencies and skills, especially at the local level.

Hence, the TA from CTCN is requested with the objective to enable Iskandar Malaysia to take early actions through a decision support system designed based on the understanding of the local level climate extremes and their impacts by integrating them into a prototype Multi-Hazard Platform (MHP) focusing on coastal hazards (including sea level rise and coastal erosion, storm surges, flooding and saline intrusion). The Multi-Hazard Platform will cover the five local authorities[1] that oversee all flagship zones of the Iskandar Malaysia economic cluster[2], four of which with coastline and one located further inland where some of the coastal hazards under analysis may pose a significant risk (including to strategic infrastructure), thus allowing for a comprehensive climate risk analysis and enhanced coordinated response to strengthen resilience of this important economic cluster. The TA will also assess financing needed to develop a fully operational MHP integrated with impact based forecasting and develop local capacity and awareness.

The objective will be achieved through following set of outputs:

- Develop technical specifications to design and integrate information on local climate extremes and hazard risks in a Multi-Hazard platform (MHP) for Iskandar Malaysia (IM)
- Develop a prototype and establish the financing requirements to operationalize the MHP for IM
- Improve local capacities in implementing a people-centred forecasting system using social innovation.

[1] Iskandar Puteri City Council (MBIP), Johor Bahru City Council (MBJB), Pasir Gudang Municipal Council (MPPG), and part of Pontian District Council (MDP), all with coastline, and the Kulaijaya district governed by Kulai Municipal Council) located further inland.

[2] Flagship A – Johor Bahru City Centre (heritage & cultural) (under Johor Bahru City Council); Flagship B – Nusajaya (financial, health, educational, administrative) (under Iskandar Puteri City Council); Flagship C – Tg. Pelepas & Tg. Bin (petroleum, logistics, cargo hub) (under Iskandar Puteri City Council); Flagship D – Pasir Gudang & Tg. Langsat (oleo, petrochemical, industries, educational) (under Pasir Gudang Municipal Council); and Flagship E (airport) located further inland (under the jurisdiction of Kulai Municipal Council).

### 3. Logical Framework for the CTCN Technical Assistance:

*(Guidance: Please note that multiple activities lead to one Output, and multiple Outputs lead to one Outcome. There can be several Outputs, but only one Outcome description capturing the CTCN technical assistance. Deliverables are the products or services to be delivered to the NDE/Proponent/CTCN based on the Activities and the Outputs.)*

| | Month | | | | | | | | | | | | | | | | | |
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| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| ***Objective**: The objective if the TA is to enable Iskandar Malaysia to take early actions to mitigate climate risk through a decision support system designed in an inclusive manner[3] and based on the understanding of the local level climate extremes and their impacts by integrating them into a prototype Multi-Hazard Platform (MHP) focusing on coastal hazards. Other key aspects, such as an assessment of appropriate sources of finance and financing mechanisms, as well as gender sensitive capacity building and awareness activities, are also targeted in this TA so as to enable a fully operational, gender sensitive and effective MHP, integrated with impact-based forecasting, to be developed.* | | | | | | | | | | | | | | | | | |
| **Outcome:** *The outcome of the TA is that Iskandar Malaysia will be able to move forward to develop and operationalize a full MHP based on the technical and financial specifications and a prototype of MHP, with improved capacity and awareness of local climate extremes and their impacts.* | | | | | | | | | | | | | | | | | | |
| **Output 1: Development of implementation planning and communication documents** | | | | | | | | | | | | | | | | | | |
| Activity 1**:** *All implementers must undertake the following activities at the beginning and at the end of the CTCN technical assistance.*<br>i) An inception meeting will be held virtually.<br>ii) A detailed work plan of all activities, deliveries, outputs, deadlines and responsible persons/organisations and detailed budget to implement the Response Plan. The detailed work plan and budget must be based directly on this Response Plan;<br>iii) Based on the work plan, a monitoring and evaluation plan with specific, measurable, achievable, relevant, and time-bound indicators used to monitor and evaluate the timeliness and appropriateness of the implementation. The monitoring and evaluation plan should apply selected | | | | | | | | | | | | | | | | | | |

[3] All main activities of the TA (part of outputs 2-4) must be carried out in an inclusive, participatory manner. Though the summary description of the activities presented in the logical framework table does not detail specific consultation activities, the lead implementer must ensure that key stakeholders are regularly consulted throughout the implementation of the TA and, as appropriate, organize stakeholder group discussions at key points of the development of the deliverables. A final stakeholder workshop is indicated in output 4, but this should not be seen as the sole stakeholder workshop or meeting that would be organized.

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| indicators from the Closure and Data Collection report template and enable the lead implementer to complete the CTCN Closure and Data collection report at the end of the assignment (please refer to item iv below and section 14 in the Response Plan);<br>iv) A two-page CTCN Impact Description formulated in the beginning of the technical assistance and update/revised once the technical assistance is fully delivered (a template will be provided); There is one template document for iii and iv.[4]<br>v) A Closure and Data Collection report completed at the end of the technical assistance (a template will be provided). | | | | | | | | | | | | | | | | | | | |
| **Deliverable 1:**<br>i) Inception meeting report<br>ii) Detailed work plan<br>iii) Monitoring and evaluation plan<br>iv) CTCN Impact Description<br>v) Closure and Data Collection report | | | | | | | | | | | | | | | | | | | |
| **Output 2: Develop technical specifications to design and integrate information on local climate extremes and hazard risks in a Multi-Hazard platform (MHP) for Iskandar Malaysia (IM)** | | | | | | | | | | | | | | | | | | | |
| Activity 2.1: *Select the hydrometeorological and hazard models based on the climatic conditions of the selected five local authorities in IM*<br><br>This activity will include the data selection, collection and validation of weather parameters covering multiple climate-induced hazards in this coastal region, based on existing data/information for the targeted area[5]. During the response plan design, consultations with the NDE and Project Proponent helped define the focus for the Multi-Hazard platform - coastal hazards in Iskandar Malaysia. The exercise will be conducted to provide probabilistic hazard forecasting and associated risk assessments with an appropriate level of spatial resolution. If an upgrade of the observation and monitoring system of the meteorological and hydrometeorological network is found to be required, technical specifications will be drawn to support the procurement of the required equipment. | | | | | | | | | | | | | | | | | | | |

[4] Link to the template: https://www.ctc-n.org/sites/www.ctc-n.org/files/documents/A.%20TA_M%26E_plan_impact_statement_form.doc
The template will be filled using the M&E guidance document which can be accessed at: https://www.ctc-n.org/sites/www.ctc-n.org/files/documents/TA%20ME%20guide%20for%20implementers..pdf

[5] Geographical boundary of target area for the MPH (which will then guide data collection and analysis) will be confirmed with PP and NDE at the start of the project.

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| Activity 2.2: *Establish threshold values for climate induced coastal hazards in IM*<br><br>Technical analysis and review of historical meteorological and hydrological data on extreme weather events in the target region (five zones in Iskandar Malaysia) which have resulted in flooding, storm surges, heavy rain and coastal erosion or sea level rise, and related adverse impacts, will be undertaken to determine the threshold values for each hazard for each of the 5 zones. A risk matrix with visual tools will be developed. | |
| Activity 2.3: *Generate probabilistic hazard maps for IM or the selected five local authorities in IM*<br><br>The hazard maps will be developed based on the probability of the occurrence of hazards (considering the frequency or intensity of severe weather events including heavy rainfall, strong winds, storm surges). The maps will be used in the development of current and future hazard scenarios and in the design of hazard risk management responses that fully consider climate variability and change and their potential impacts in the target areas. The probabilistic hazard maps are inputs to the development of sectoral planning, investment programming and resilience plans undertaken by the local authorities in the the target region. The lead implementer will | |
| Activity 2.4: *Design localized hazard forecasting integrated into the MHP for IM*<br><br>Localized hazard forecasting (e.g., flood, storm surge, and rainfall) will be generated on a daily basis depending on the weather patterns, using numerical weather predictions and hydrometeorological models. The platform will be designed for IM, in a consultative manner, building upon the implementation experiences of MHP for Kuala Lumpur.<br><br>The best possible role that innovation and digital technologies may play shall be explored, applied and documented. For example, exploring the use of big data analytics to improve the accuracy of the forecasting. | |
| Activity 2.5: *Update/develop vulnerability curves for different types of infrastructure and demography in IM (e.g. buildings in the economic zones of IM)*<br><br>The profile of 5 zones of IM will be carefully reviewed in terms of the infrastructure and demography to assess potential impacts of the coastal hazards and to develop the vulnerability curves. | |

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| **Deliverable 2:**<br>i) A detailed report well covering the approach and methodology used, data and information collected including the raw data and information, lessons learnt and outcomes of the activity in terms of<br>a. Data analytics under Activity 2.1 based on the data collected and models reviewed<br>b. Threshold values in an interactive manner (risk matrix with visuals) under Activity 2.2<br>c. Probabilistic maps – Activity 2.3<br>ii) A detailed report and working tools covering the approach and methodology used, data and information collected including the raw data and information, lessons learnt and outcomes of the activity in terms of<br>a. Localized weather forecasting using numerical weather data - Activity 2.4 and<br>b. Vulnerability curves - Activity 2.5 | | | | | | X | | | X | | | | | | | | | | |
| **Output 3: Develop a prototype and establish the financing requirements to develop the MHP for IM** | | | | | | | | | | | | | | | | | | | |
| Activity 3.1: *Develop a knowledge and decision support system for the establishment of prototype of MHP for IM*<br><br>Based on the specifications drawn from the Output 2, complex flowcharts with inputs and outputs will be modelled into a decision support tool (queries and functionalities of the decision support system will be defined in close consultation with the Proponent, and other key stakeholders, as well as the NDE). The tool will be developed using an open-source software as a prototype for demonstration purposes. A concise step wise manual will be developed for the users of the tool with clear classification of users with intended output, required input fields, source of data to provide options for inputting data in an interactive manner and interpretation guide of the tool's reports. The communication part will be designed considering the integration of the Impact based forecasting into MHP. Please note that the tool will be used for demonstration purposes and will not be subject to any copyrighting. | | | | | | | | | | | | | | | | | | | |
| Activity 3.2: *Assess the financing needs to develop the fully operational MHP*<br><br>Based on the specifications drawn from the Output 2 to develop an MHP, financing needs will be assessed to develop, test, launch, upgrade and maintain a fully operational MHP for IM. Potential sources of funding (including domestic and international climate finance) and possible financing mechanisms will be reviewed in closed consultation with NDE, PP and other relevant | | | | | | | | | | | | | | | | | | | |

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| stakeholders. Key technical inputs[6] to the financing proposals will be provided. | | | | | | | | | | | | | | | | | | |
| Activity 3.3: *Conduct a stakeholder consultation*<br><br>One common stakeholder workshop will be conducted for all 5 zones to run through the prototype of the MHP, seek support to make the MHP fully operational with impact-based forecasting and receive their feedbacks. If the pandemic situation permits the travelling and gathering of people, the consultation will be conducted face to face. | | | | | | | | | | | | | | | | | | |
| **Deliverables 3:**<br>i. Working tool as a prototype of the MHP with user manual<br>ii. Report on financing needs and input to the funding proposal<br>iii. Final 1-day Stakeholder Workshop<br>iv. Stakeholder consultation report- detailed minutes, synthesized summary, agenda, list of participants, recorded video if conducted virtually and the presentations conducted | | | | | | | | | | **X** | | **X** | **X** | | | | | |
| **Output 4: Improve local capacities in implementing a people-centred forecasting system using social innovation** | | | | | | | | | | | | | | | | | | |
| Activity 4.1: *Conduct a gap assessment on the MHP with impact-based forecasting*<br><br>A capacity needs assessment will be conducted to determine the existing capabilities and available resources needed to implement a people-centred MHP with impact-based forecasting (including forecast-based financing and early actions). The needs assessment will include a definition of the targeted groups to be considered (e.g., people-vulnerable groups and infrastructure- selected businesses/industries). | | | | | | | | | | | | | | | | | | |
| Activity 4.2: *Build gender-sensitive institutional and technical capacities to implement the MHP with impact-based forecasting*<br><br>Based on the results of the capacity needs assessment, a gender-sensitive capacity building plan will be developed for targeted groups. Training modules will be developed and trainings, workshops and knowledge sharing activities will be conducted for specific groups, such as | | | | | | | | | | | | | | | | | | |

[6] The scope is limited to the key input to the financing proposal. For example, if it is identified that the required funds to develop the fully operation MHP can be leveraged from GCF, the TA will provide the key technical inputs that can later be used to develop a concept note or funding proposal in GCF template in another follow up TA.

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| forecasters, key national agencies, planners from regional and local agencies/LGUs, communities at risk and indigenous communities, and key business sectors in the project areas to increase their understanding of impact-based forecasting and early warning (including early actions and forecast-based financing). If the pandemic situation permits, the training workshop will be conducted face to face with a one-day visit of the selected officials to see the operation of MHP at Kuala Lumpur[7]. | | | | | | | | | | | | | | | | | | | |
| Activity 4.3: *Develop early action protocols applicable to 5 authorities including shock-responsive social protection*<br><br>Localized impact tables and response tables for each hazard will be developed. Translation of hazard jargon into timely, meaningful and actionable information about the likely impacts of a hazard will be conducted. The design of early action protocols will include clear flowcharts from trigger situation to actionable items, illustrating for example how industrial communities (especially the small and medium scale ones) in the project target areas make use of early warning, climate and forecast information, which institutions and agencies they trust, and how messaging should be tailored to build adaptive capacity. | | | | | | | | | | | | | | | | | | | |
| Activity 4.4: *Develop knowledge products and information, education and communication (IEC) materials on the MHP with impact-based forecasting*<br><br>Besides the user manual for the prototype, which will be developed under output 3, this activity will include factsheets and visual materials which can be used to enhance awareness on local level climate extremes and information system of MHP, as well as appropriate responses (early actions). The manual and all the communication documents to be publicly disseminated will be translated in Malay language. | | | | | | | | | | | | | | | | | | | |
| **Deliverables 4:**<br>i. A report on capacity gap assessment on the MHP with impact-based forecasting<br>ii. A report on capacity building plan mainstreaming gender<br>iii. A report on social early action protocols and shock responsive social protection<br>iv. Knowledge products; and information, education and communication materials | | | | | | | | | | | | | | | | **X** | **X** | | **X** |

[7] The TA will support the travelling and boarding of 2 selected officials from IM to Kuala Lumpur for 2-3 days. NDE and IM Government will support in seeking meetings with relevant authorities of MHP in Kuala Lumpur to coordinate the site visit. An expert from the implementation team will join the selected officials.

**4. Resources required and itemized budget:**

*Guidance: Please provide an indicative overview of the resources required and itemized budget required to implement the CTCN technical assistance, including for M&E-related activities, using the table below. Important to note that minimum 1% of the budget should explicitly target gender specific activities related to the technical assistance (please see section 10 for further information on gender). Once the Response Plan is completed, a Response Implementation partner(s) will be selected by the Climate Technology Centre (CTC). A detailed activity-based budget for the CTCN assistance will be finalized by the CTCN and selected Implementer.*

| **Activities and Outputs** | **Input: Human Resources** *(Title, role, estimated number of days)* | **Input: Travel** *(Purpose, national vs. international, number of days)* | **Inputs: Meetings/events** *(Meeting title, number of participants, number of days)* | **Input: Equipment/Material** *(Item, purpose, buy/rent, quantity)* | **Estimated cost** *Please accumulate the costing at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan* | |
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| | | | | | **Minimum** | **Maximum** |
| **Output 1**: Development of implementation planning and communication documents | **Project manager-7, Senior Climate Expert-3, GIS Expert-1, IT Expert-1, Local Expert-4, Gender Expert-2** | | | | ***6,600*** | ***7,250*** |
| Activity 1.1: Formulation of i) Detailed work plan, ii) Monitoring and evaluation plan, iii) CTCN Impact Description, iv) Closure and Data Collection report. | Project manager-7, Senior Climate Expert-3, GIS Expert-1, IT Expert-1, Local Expert-4, Gender Expert-2 | | | | 6,600 | *7,250* |
| **Output 2: Develop technical specifications to design and integrate information on local climate extremes and hazard risks in a Multi-Hazard platform (MHP) for Iskandar Malaysia (IM)** | **Project manager-70, Senior Climate Expert-40, GIS Expert-60, IT Expert-19, Local Expert-80, Gender Expert-10** | | | | ***93,700*** | ***106,150*** |

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| Activity 2.1: *Select the hydrometeorological and hazard models based on the climatic conditions of the selected five local authorities in IM* | Project manager-15,Senior Climate Expert-5,GIS Expert-5,IT Expert-5,Local Expert-15,Gender Expert-1 | | | | 15,100 | *16,850* |
| Activity 2.2: *Establish threshold values for climate induced coastal hazards in IM* | Project manager-15, Senior Climate Expert-10, GIS Expert-10, IT Expert-2, Local Expert-10, Gender Expert-2 | | | | 18,050 | *20,400* |
| Activity 2.3: G*enerate probabilistic hazard maps for IM or the selected five local authorities in IM* | Project manager-10, Senior Climate Expert-10, GIS Expert-15, IT Expert-2, Local Expert-20, Gender Expert-2 | | | | 19,050 | *21,650* |
| Activity 2.4: *Design localized hazard forecasting integrated into the MHP for IM* | Project manager-15, Senior Climate Expert-5, GIS Expert-15, IT Expert-5, Local Expert-15, Gender Expert-3) | | | | 19,300 | *22,050* |
| Activity 2.5: *Update/develop vulnerability curves for different types of infrastructure and demography in IM (e.g. buildings in the economic zones of IM)* | Project manager-15, Senior Climate Expert-10, GIS Expert-15, IT Expert-5, Local Expert-20, Gender Expert-2 | | | | 22,200 | *25,200* |
| **Output 3: Develop a prototype and establish the financing requirements to develop the MHP for IM** | **Project manager-32, Senior Climate Expert-32, GIS Expert-20, IT Expert-30, Local Expert-14, Gender Expert-4** | ***10,000*** | ***5,000*** | | ***64,900*** | ***71,600*** |

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| Activity 3.1: *Develop a knowledge and decision support system for the establishment of prototype of MHP for IM* | Project manager-15, Senior Climate Expert-12, GIS Expert-10, IT Expert-26, Local Expert-2, Gender Expert-1 | | | | 24,700 | *28,350* |
| Activity 3.2: *Assess the financing needs to develop the fully operational MHP* | Project manager-12, Senior Climate Expert-15, GIS Expert-5, IT Expert-1, Local Expert-5, Gender Expert-1 | | | | *16,050* | *17,950* |
| Activity 3.3: *Conduct a stakeholder consultation* | Project manager-5, Senior Climate Expert-5, GIS Expert-5,IT Expert-3, Local Expert-7, Gender Expert-2 | *10,000 (International travel and DSA for 2 international experts to IM)* | *5000 (1 day stakeholder consultation workshop for 30-40 participants)* | | *24,150* | *25,300* |
| **Output 4: Improve local capacities in implementing a people-centred forecasting system using social innovation** | **Project manager-23, Senior Climate Expert-17, GIS Expert-10, IT Expert-5, Local Expert-25, Gender Expert-20** | ***12,000*** | ***3,000*** | | ***49,600*** | ***52,850*** |
| Activity 4.1: *Conduct a gap assessment on the MHP with impact-based forecasting* | Project manager-5, Senior Climate Expert-4, GIS Expert-3, IT Expert-2, Local Expert-6, Gender Expert-4 | | | | *8,200* | *9,050* |
| Activity 4.2: *Build gender-sensitive institutional and technical capacities to implement the MHP with impact-based forecasting* | Project manager-10, Senior Climate Expert-8, GIS Expert-2, IT Expert-1, Local Expert-12, Gender Expert-8 | *12,000 (International travel and DSA for 1 international* | *3000 (Meetings at KL)* | | *29,100* | *30,250* |

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| | | *expert to IM to conduct the training and local travel to KL for 2 selected Malaysian officials and 1 international expert)* | | | | |
| Activity 4.3: *Develop early action protocols applicable to 5 authorities including shock-responsive social protection* | Project manager-4, Senior Climate Expert-3, GIS Expert-3, IT Expert-1, Local Expert-2, Gender Expert-3 | | | | *6,000* | *6,700* |
| Activity 4.4: *Develop knowledge products and information, education and communication (IEC) materials on the MHP with impact-based forecasting* | Project manager-4, Senior Climate Expert-2, GIS Expert-2, IT Expert-1, Local Expert-5, Gender Expert-5 | | | | *6,300* | *6,850* |
| **Estimated range of costing for the entire Response Plan** | | | | | ***214,800*** | ***237,850*** |

## 5. Profile and experience of experts

*Based on the required Human Resources identified in section 4 (Resources required and itemized budget) please provide a description of the required profile of all involved experts for the implementation of the CTCN Response Plan.*

| Experts required | Brief description of required profile |
|---|---|
| Project Manager<br>(International Expert) | The project manager shall have the following expertise and experience:<br>• Master's degree or above (or equivalent experience) in environmental engineering, planning, technology and/or management, meteorology, climate technology, disaster risk management, or an affiliated major<br>• International experience in leading and managing a project and a team of experts from different cultural backgrounds and fields of expertise<br>• At least 10 years of international experience of working with various countries' national and local governments, local stakeholders and authorities on climate adaptation issues<br>• At least 5 years of experience in designing and/or deploying early warning services, weather forecasting and climate adaptation technologies in coastal zone sector<br>• Experience in developing capacity building programs and in organizing workshops and/or capacity building training<br>• Previous relevant experience in Malaysia or if based in Malaysia will be given preference.<br>• Excellent written and communication skills in English are required. |
| Senior Climate / DRR Expert<br>(International Expert) | The senior climate and DRR expert shall have the following expertise and experience:<br>• Master's degree or above (or equivalent experience) in meteorology, meteorological modelling, DRR, environmental engineering, planning and/or technology or an affiliated major<br>• At least 5 years of experience in planning, designing and/or implementing climate forecasting and designing climate information toolkits related to Disaster Risk Reduction at the sub-national and/or national level<br>• At least 3 references projects demonstrating experience in design and deployment of Multi-Hazard platform for climate forecasting at the sub-national and/or national level in developing countries.<br>• Demonstrated knowledge and experience on global climate finance and developing funding proposals for climate adaptation technologies.<br>• Relevant experience of designing and conducting the training modules and trainings respectively<br>• Previous relevant experience in Malaysia or if based in Malaysia will be given preference.<br>• Excellent written and communication skills in English are required. |
| Geographical Information System Expert- GIS data modeller<br>(International Expert) | The GIS expert shall have following expertise and experiences:<br>• Advanced degree in geographic information systems (GIS) and data modelling is required, with a climate focus preferred.<br>• At least ten years relevant work experience in designing data infrastructure for use in online decision support systems, preferably on coastal climate data, and in designing and developing of web GIS platforms, using free and |

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| | open-source software (FOSS), with direct applications in climate related warning services.<br>• Must have considerable knowledge and work experience on climate maps for Asian tropical coastal regions<br>• Previous experience of working on urban and coastal zone planning will be preferred.<br>• Previous experience of working with local governments in Iskandar Malaysia will be preferred.<br>• Excellent written and communication skills in Malaysian and English are required. |
| Information Technology Expert- IT (International Expert) | The IT expert shall have following experience and expertise:<br>• Advanced degree in Information Technology with specialization or experience in climate related data modelling<br>• At least 3 years of experience of designing and developing models for hazard and impact analysis;<br>• Relevant experience of working on and reviewing machine learning models and big data analytics will be valued.<br>• Demonstrable ability to design complex algorithms to support the decision support systems based on free and open-source software (FOSS).<br>• Previous experience of working with local governments in Iskandar Malaysia will be preferred.<br>• Excellent written and communication skills in Malaysian and English are required. |
| Coastal climate data coordination and stakeholder engagement expert (Local Expert) | The Coastal climate data coordination and stakeholder engagement expert will be a local expert from Malaysia preferably based in Iskandar Malaysia region and shall have the following expertise and experiences:<br>• Bachelor's degree or above (or equivalent experience) in environmental engineering, planning, technology and/or management, climate technology or an affiliated major<br>• At least 3 years of experience in the field of coastal zone climate data collection, analysis and management in Malaysia<br>• Previous experience of working with local governments in Iskandar Malaysia will be preferred.<br>• Experience in stakeholder engagement processes<br>• Excellent written and communication skills in Malaysian and English are required.<br>• Support and facilitate the translation of selected deliverables from English to Malaya. |
| Gender Expert (International/Local Expert) | The gender expert shall have the following expertise and experience:<br>• Bachelor's degree or above (or equivalent experience) in social science or an affiliated major<br>• At least 8 years of experience in gender studies and/or management of equality policies<br>• At least 2 references demonstrating experience in gender studies in coastal zone sector in developing countries, with preference given for experience in gender studies in Malaysia<br>• Experience in stakeholder engagement processes<br>• Excellent written and communication skills in English are required. |

**6. Intended contribution to impact over time**

The average annual direct loss from seasonal monsoon floods amounts to RM915 million (at 2000 price level) (Department of Irrigation & Drainage Malaysia, 2003). Malaysia also had the highest percentage of the population exposed to floods among ASEAN member states between July 2012 and January 2019 (CFE-DM, 2019). It is estimated that, in Malaysia, the costs of damage for an annual flood, a 10-year flood and a 40-year flood are USD 0.98 million, USD 5.87 million and USD 14.34 million, respectively (Aldrich, Gum, & Sawada, 2014). Floods that occurred in December 2006/January 2007 in the State of Johor alone caused the death of 18 people and damages estimated at USD 489 million. Again, in 2008, floods in Johor caused 28 deaths and USD 21.19 million in damage (Chan, 2012). The coastal communities of Iskandar Malaysia (IM) economic region in the State of Johor are also at risk of flooding due to sea-level rise. More recently, in the beginning of 2021, Malaysia faced severe flood events and Johor, the neighboring area of Iskandar Malaysia, witnessed several people being evacuated and displaced. The MHP will benefit the region through advanced climate information services triggering early warnings, actions and forecast based financing, thus helping reducing risks and mitigate adverse impacts of climate-related coastal hazards.

**7. Relevance to NDCs and other national priorities**

Malaysia in its Initial NDC emphasized the protection of the coastal line. Malaysia has about 5267km of coastline and 29% of these faces' erosion problems. As part of the solution towards coastal erosion, both hard and soft engineering approaches had been implemented. For the longer term, Integrate Shoreline Management Plans (ISMPs) have been developed and implemented for specific areas. In addition, a National Coastal Vulnerability Index to sea-level rise is being developed. Detailed sea level rise studies had also been conducted at some of the vulnerable coastal areas to project future vulnerabilities in a 20-year sequence from 2020 to 2100. Malaysia has also mentioned to address the flood risks and climate related disasters in the INDC.

At subnational level, Malaysia has a number of regional sustainable developmental plans like initiatives under ***Iskandar Malaysia Low Carbon Society Blueprint and Urban Observatory; and shoreline management plan*** which can be further strengthened through a Multi-Hazard Platform.

**8. Linkages to relevant parallel on-going activities:**

The Iskandar Malaysia Urban Observatory (IMUO) is also currently being developed to establish baseline data to support development planning and ensure balanced development. IMUO is a robust, comprehensive, and up-to-date data and knowledge management system at the regional level to improve decision making and galvanize targeted actions or response, contributing to strengthening longer-term planning and setting up of appropriate systems and processes. A Community Crisis Preparedness System is currently being developed to benefit communities in flood-prone areas.

PESISIR Programme is an Iskandar Malaysia Coastal Partnership and Documentation initiative involving all levels of government, researchers, coastal communities and NGOs. PESISIR's current focus is on sharing and enabling coastal data for better understanding of IM coastal areas, including developing biodiversity inventory programs for the region. PESISIR's long-term goal is to develop a coastal observatory system for the State of Johor to enable long-term tracking of the coastline (currently in early stages of implementation). This TA directly complements PESISIR's activities.

Iskandar Malaysia is also currently reviewing its Low Carbon Society Blueprint and Comprehensive Development Plan (II). This TA could potentially provide relevant inputs on climate change adaptation to both reviews.

It is felt that development of Multi Hazard Platform (MHP) for IM is a timely initiative having strong complementarity with the mentioned on-going activities. Furthermore, the MHP will also provide relevant input to the sub-national and national plans and priorities listed in #7 as above.

**9. Anticipated follow up activities after this technical assistance is completed:**

As the outcome of the TA, IM will have the technical and financial specifications with the learnings from the working prototype to develop and operate the MHP with enhanced capacity. The technical input from the TA will be used to develop a financing proposal for leveraging funds from climate financing mechanism like GCF to develop a fully operational MHP for IM.
As a reference, information is shared on a similar USD 10 million GCF funded project from Philippines - Multi-Hazard Impact-Based Forecasting and Early Warning System for the Philippines[8]

**10. Gender and co-benefits:**

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| Imbedded in design of the activities: | Output 4 is focusing on building gender-sensitive institutional and technical capacities to implement the MHP with impact-based forecasting. A gender-sensitive capacity building plan will be developed for targeted groups as the part of this output. |
| Gender and co-benefits intended as result of the activities: | Disasters affect women and men differently, and due to deep-seated gender inequalities, women are at greater risk of being severely impacted by climate-related disasters (Enarson & Dhar Chakrabarti, 2009). It is noted from the TA request that flood response in Malaysia has not always been gender sensitive. Aligned with the objective of Iskandar Malaysia Disaster Risk Reduction Strategy and Action Plan, the aim of this TA is to develop the MHP in a gender inclusive manner. Through a gender sensitive institutional and technical capacity building plan to support the implementation of a MHP for IM, women's involvement in developing risk and hazard maps, community-based risk management procedures and activities for preparedness and response, development of action plans for post-disaster recovery, and early monitoring and/or warning activities will be emphasized. This is expected to contribute to reducing gender inequalities and to empowering women to take an active role in building local climate resilience and DRR. |

**11. Main in-country stakeholders in implementation of the technical assistance activities:**

*Using the table below, please list and describe the role of in-country stakeholders, participants and beneficiaries who will be involved in or directly consulted during implementation of the assistance.*

| In country stakeholder | Role in implementation of the technical assistance |
|---|---|
| National Designated Entity | Focal point of the country to CTCN. |
| National Designated Authority | Focal point of the country to GCF. Can be consulted on GCF related matters and clarifications. |
| Iskandar Regional Development Authority http://www.irda.com.my/ | Project Proponent- beneficiary of the Technical Assistance. Review and approve the deliverables submitted from Technical Assistance. |

[8] funding-proposal-sap010-landbank-phillipphines.pdf (greenclimate.fund)

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|---|---|
| National Disaster Management Agency (NADMA)<br><br>http://www.nadma.gov.my/en/ | NADMA is the leading disaster management agency in Malaysia. Overall scope of NADMA involves the coordination of all activities and cooperation before, during and after disasters, including disaster risk prevention and mitigation activities, disaster preparedness and response activities, as well as recovery and redevelopment activities. Hence, it is an important stakeholder and beneficiary of MHP. |
| University Kebangsaan Malaysia — Southeast Asia Disaster Prevention Research initiative (SEADPRI)<br>http://www.ukm.my/seadpri/ | SEADPRI has developed the MHP for Kuala Lumpur. They will bring the learnings and experiences from the development and operational of the MHP for KL. |
| Malaysia Meteorology Department (METMALAYSIA)<br><br>https://www.met.gov.my/ | Malaysia Meteorology Department efficient and effective meteorological, climatological and geophysics services for the well-being, safety and sustainable development in order to meet the national and international needs. |
| Department of Mineral and Geoscience Malaysia (JMG) | An important stakeholder as a government agency that has the authority and expertise to lead the investigation, services and research in the field of mineral and geoscience in the country. |
| Other important stakeholders | • Department of Environment Malaysia (DoE)- https://www.doe.gov.my/portalvVen/<br>• UKM Pakarunding Sdn Bhd (UKMP) https://www.ukmpakarunding.my/<br>• Geological Society of Malaysia (GSM) https://gsm.org.my<br>• Geomapping Technology Sdn Bhd (GMT)- https://geomapping.com.my/web2018/<br>• CoRE Expert Systems Sdn. Bhd. (CoRE)<br>• Param Agricultural Soil Surveys (M) Sdn. Bhd (PASS)<br>• Department of Irrigation and Drainage (DID) https://www.water.gov.my/<br>• National Water Research Institute of Malaysia (NAHRIM) http://www.nahrim.gov.my/<br>• University Malaya — Department of Geology (UM) https://geology.um.edu.my/ |

## 12. SDG Contributions:

*Instructions: Please complete the grey section below for **a maximum of three SDGs** that will be advanced through this TA. A complete list of SDGs and their targets is available here: https://sustainabledevelopment.un.org/partnership/register/.*

| Goal | Sustainable Development Goal | Direct contribution from CTCN TA (1 sentence for top 1-3 SDGs) |
|---|---|---|
| 1 | End poverty in all its forms everywhere | |
| 2 | End hunger, achieve food security and improved nutrition, and promote sustainable agriculture | |
| 3 | Ensure healthy lives and promote well-being for all at all ages | |
| 4 | Ensure inclusive and equitable quality education and promote life-long learning opportunities for all | |
| 5 | Achieve gender equality and empower all women and girls | A gender-sensitive institutional and technical capacity building assessment and plan to implement the MHP with impact-based forecasting (Output 4) will contribute to this goal. |
| 6 | Ensure availability and sustainable management of water and sanitation for all | |
| 7 | Ensure access to affordable, reliable, sustainable, and modern energy for all (consider adding targets for 7) | |
| | 7.1 - By 2030, ensure universal access to affordable, reliable and modern energy services | |
| | 7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix | |
| | 7.3 - By 2030, double the global rate of improvement in energy efficiency | |
| | 7.a - By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology | |
| | 7.b - By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support | |
| 8 | Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all | |
| 9 | Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation | |
| 10 | Reduce inequality within and among countries | |
| 11 | Make cities and human settlements inclusive, safe, resilient and sustainable | Reduce the risk of impact from disaster in an inclusive manner |
| 12 | Ensure sustainable consumption and production patterns | |
| 13 | Take urgent action to combat climate change and its impacts | *All TAs should indicate relevance to Goal 13 and at least one target below (13.1 to 13.b).* |
| | 13.1 - Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries | Yes |
| | 13.2 - Integrate climate change measures into national policies, strategies and planning | Yes |
| | 13.3 - Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning | Yes |
| | 13.a - Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible | |
| | 13.b - Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities | |
| 14 | Conserve and sustainably use the oceans, seas and marine resources for sustainable development | |
| 15 | Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss | |
| 16 | Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, | |

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| | accountable and inclusive institutions at all levels | |
| 17 | Strengthen the means of implementation and revitalize the global partnership for sustainable development | |

**13. Classification of technical assistance:**

*Please indicate primary type of technical assistance. Optional: If desired, indicate secondary type of technical assistance.*

| *Please tick off the relevant boxes below* | *Primary* | *Secondary* |
|---|---|---|
| ☐ 1. Decision-making tools and/or information provision | ☐ | ☐ |
| ☐ 2. Sectoral roadmaps and strategies | ☐ | ☐ |
| ☐ 3. Recommendations for law, policy and regulations | ☐ | ☐ |
| ☐ 4. Financing facilitation | ☐ | ☐ |
| ☐ 5. Private sector engagement and market creation | ☐ | ☐ |
| ☐ 6. Research and development of technologies | ☐ | ☐ |
| ☐ 7. Feasibility of technology options | ☐ | ☐ |
| ☐ 8. Piloting and deployment of technologies in local conditions | ☐ | ☐ |
| ☐ 9. Technology identification and prioritisation | ☐ | ☐ |

*Please note that all CTCN technical assistance contributes to strengthening the capacity of in country actors.*

**14. Monitoring and Evaluation process**

*Upon contracting of the implementing partners to implement this Response Plan, the lead implementer will produce a monitoring and evaluation plan for the technical assistance. The monitoring and evaluation plan must include specific, measurable, achievable, relevant, and time-bound indicators that will be used to monitor and evaluate the timeliness and appropriateness of the implementation. The CTCN Technology Manager responsible for the technical assistance will monitor the timeliness and appropriateness of the Response Plan implementation. Upon completion of all activities and outputs, evaluation forms will be completed by the (i) NDE about overall satisfaction level with the technical assistance service provided; (ii) the Lead Implementer about the knowledge and learning gained through delivery of technical assistance; and (iii) the CTCN Director about timeliness and appropriateness of the delivery of the activities and outputs.*