Instructions to lead Implementers for drafting the
Technical Assistance Closure and Data Collection Report

Objective of the technical assistance (TA) Closure Report and Data Collection Report:

- To communicate publicly in one synthesis document a summary of progress made and lessons learned under the technical assistance (TA) towards the anticipated impact (main template).
- Compile TA-specific information required for internal use in donor and UN reporting (annex 1).

Steps for completing the TA Closure report:

1. The lead TA implementer drafts the report at the end of the assignment as a final deliverable /product. The TA Closure report will capture all activities conducted under the TA hence it is expected that duplication of information will occur from earlier documents. Please copy and summarise relevant material from previous TA outputs/deliverables and the Response Plan, as relevant.
2. A CTCN Manager will review and revise the report before final approval by the CTCN Director.

Important note on public and internal use of the closure report:

Once approved by the CTCN Director, the TA Closure and Data Collection Report will be a public document available on the CTCN website. Annex 1 is for internal use only and will not be publicly available.

Closure and Data Collection Report for CTCN Technical Assistance

1. Basic information

Title of response plan	Strengthening Bangkok's Early Warning System to respond to climate induced flooding
Country / countries	Thailand
NDE focal point and organisation	ดร.สุรชัย สถิตคุณารัตน์ Surachai SATHITKUNARAT, PhD Thailand NDE Focal Point National Science Technology and Innovation Policy Office Surachai@sti.or.th
Proponent focal point and organisation	Dr. Suthimol Kessomboon Department of Drainage and Sewerage Bangkok Metropolitan Administration BMA, City Hall 2 Mitmaitri Road, Dindaeng, Bangkok 10400 Thailand k.suthimol@yahoo.com
Sector(s) addressed	Adaptation: Early warning and environmental assessment; Human health; Infrastructure and urban planning; Water
Technologies supported	Flood forecasting systems; Community-run early warning systems; Canals and drainage systems
Implementation period and total duration	01-09-2016 to 30-11-2017

Total budget for implementation	264,843 USD Pro bono support during the TA implementation period: Value of software made available: 26,500 USD
Designer of the response plan	DHI
Implementer of response plan	DHI

2. Summary of all activities, outputs and products that contribute to the expected impact of the technical assistance.

Description of delivered outputs and products as well as the activities undertaken to achieve them. In doing so, review the log frame of the original response plan and refer to it as appropriate	Technology: Existing system documented, through in-depth site visits and interviews Hydraulic model refined and updated, through review of data and operational knowledge Core data management system established, through various level of linking with BMAs existing data logging and data publishing systems Web system enabled and made available, through configuration of relevant software, running as a cloud solution Capacity building On-the-job training, through close interaction and supervision skills have been enhanced on BMA key staff Advanced modelling course, through hands-on training of 8 BMA staff in using hydraulic models Two workshops, one in Bangkok and one in Denmark, focusing on technical details, data collection, data quality and forecast modelling Dissemination workshop in Bangkok, sharing results within BMA, NDE, Universities, Royal Rain Department, HAII. A total of 52 people attended the dissemination workshop
Partners organisations	The TA was implemented by DHI with significant support from Hydro and Agro Informatics Institute (HAII) providing rainfall forecast data from Royal Rain Dept. radars. Further, the draft hydraulic model was supplied by courtesy of Asian Institute of Technology (AIT).
Beneficiaries	The main beneficiary is BMA and the citizen of Bangkok.
Methodologies applied to produce outputs and products	Workshops; Data inspection; Interviews; Site inspection; Hydrology and hydraulic models; Weather radar; Forecast technologies; Web-tools
Deviations	A one-month delay was experienced at the initial ramp-up period and planning of the kick-off workshop. Due to internal management changes at BMA, the project completion date was also pushed two months, with the Dissemination workshop held in November 2017. Rather than a complete hard- and software installation at the premises of BMA, the technology applied was deployed as a cloud service. Also, some of the planned data transfer functions were changed due to practical reasons. Finally, the envisaged use of BMA radar data proved not to be feasible, and alternative radar and forecast data were provided by HAII using Royal Rain radars.
Achieved or anticipated gender benefits from the TA	The benefits have no gender bias
Achieved or anticipated co-benefits from the TA	The TA have identified some development areas for BMA to further qualify the organisation to provide efficient drainage services. These include improved asset management, increased understanding of complex city hydrology and hydraulics, improvement of weather radars,

	value of combined forecasts. The increased knowledge and attention to the flood issues is also likely to advance future investment in both flood adaptation and mitigation. Future positive consequences will include reduced damage costs and transport disruptions, and even in extreme cases prevent loss of lives.
Anticipated follow up activities and next steps	BMA is reviewing the options to continue the demonstration early warning system for the 2018 flood season. BMA may seek collaboration with the national centre for flood control (HAII). DHI have offered to waive the costs of using the applied software technology for 2018. BMA is also looking into upgrade of the radars, to enhance the accuracy and responsiveness of local rainfall forecasts. The existing radars are not continuous calibrated, which is required to have reliable absolute rainfall intensity data. BMA have also decided to upgrade their skills in hydraulics. They are planning to organise a dedicated staff team to be trained in hydraulics by a local university. This team will resume responsibility for evaluating the hydraulic drainage conditions of the city.

3. Lessons learnt

	Lessons learnt	Recommendations
Lessons learnt for this TA. Describe essential factors contributing to successful implementation, as well as specific challenges. Recommendations include considerations on what would need to be in place for increasing success of similar efforts (i.e. regulatory, legal, stakeholders, communication, etc.)	Data quality and data access Although appearing easy accessible in the preparation phase, both availability and quality of data was a challenge.

IT challenges An IT department has its own life, and special procedures, response times, etc. making it difficult to get engagement in a relatively short implementation period.

Specific technical competences The TA spans over several disciplines, one being hydraulic knowledge, only available to limited extent within BMA at the project start. | Spend more time as part of the Response plan to understand availability and quality of the data to be applied during the project

Engage the IT department at an early stage during the TA application.

Map existing and needed competences within all partners and plan for compensations of any gaps |
| Lessons learnt related to climate technology transfer Describe opportunities, challenges and barriers for the use and deployment of the technology or technologies supported by the TA. The objective is to identify specific success factors for technology transfer | Strong motivation and commitment from Beneficiary

The overall objective – to use advanced technology and live data to issue early warning – has been achieved. Some barriers exist to scale the demonstration system into a Bangkok city-wide system, like: | BMA demonstrated strong commitment throughout the TA, including top management attention and support

This TA depended heavily on data, but more static information as well as dynamic living data. If some, anticipated data is not available in a timely manner and sufficient quality, the |

	Improved knowledge and data for the physical drainage system; existing radar to be calibrated and deployed for short term forecasts; improved skills and knowledge in the use of hydraulic models; Some of the same barriers are likely to exist in other cities Due to the very fast response to extreme downpour in a dense city, a key for early warning is a reliable and high-resolution rainfall forecast.	Response plans should prepare some alternatives. An important part of the project was a thorough update of an existing model. The response plan assumed a significant part of the work to be done by the beneficiary, but lack of relevant competences required re-allocation of this activity.
Lessons learnt related the CTCN process for TA	A one-year implementation plan is a challenge, but as it was a fixed boundary from start, it secured a focused effort throughout the TA. The liaison officer from CTCN in Denmark has been very supportive and helpful, and contributed to timely execution The Response plan included too many deliverables trough out the TA period.	Follow the plan and don't accumulate delays CTCN continue to offer professional and supportive assistance Keep the number of deliverable to, say one per 2-3 months (or less)

4. Illustration of the TA and photos

For communication purposes, please provide 2-4 Power Point slides with illustrations or charts showing the TA process, applied methodology, activities, outputs and achieved results. The illustrations must be copied into the TA Closure report but must also be delivered as power point files. Also, please provide at least five high-resolution pictures in jpg format, capturing technical assistance. The pictures should illustrate how the TA has impacted the lives of the beneficiaries in particular and the communities in general.
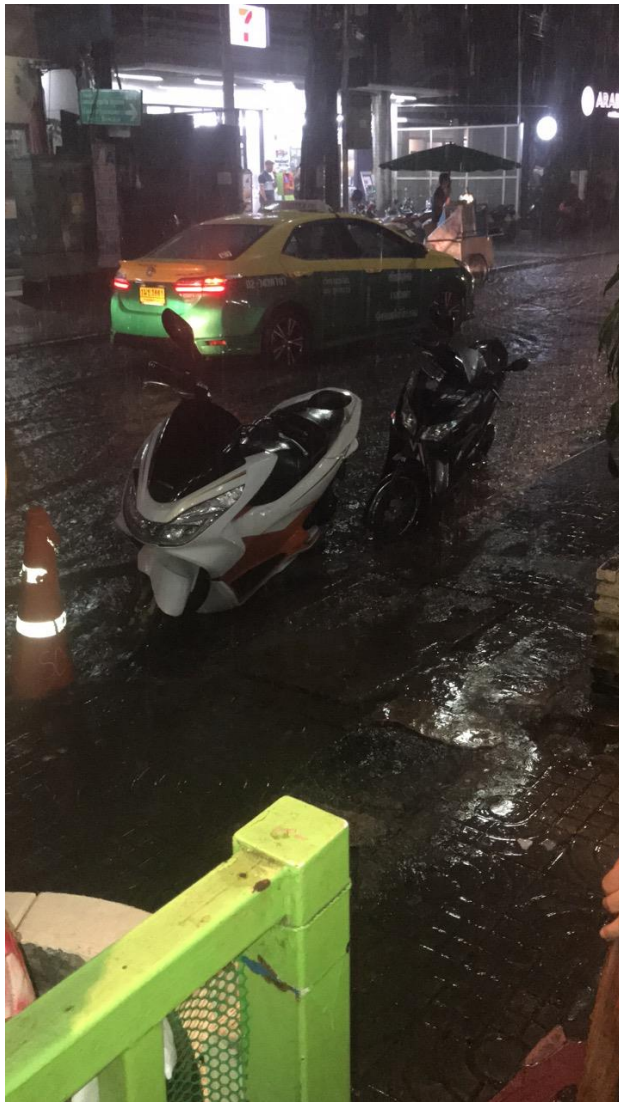
Control room, BMA Drainage department

BMA staff attending the Inception meeting

Flood in Sukhumvit, Soi 4/6, 17 Oct 2017. In less than 30 minutes, 20 cm water on street and sidewalk

Pump station outlet point

Manual intervention to remove floods – opening manholes

Flood Sukumvit 13-14 October 2017

Inlet basin to pump station

5. Information for TA impact description
The information in the table below will be used to produce the CTCN TA Impact Description.
The TA Impact description is a 2-page summary document for communication purposes.
Please copy information from sections above and technical delivery reports as required.

Challenge: Approx. 500 characters with spaces	As a coastal megacity, Bangkok faces increased climate-related risks such as rising sea levels and an increased frequency of extreme weather events. Costs on infrastructure and the economy from major flooding events could run into the billions of dollars, with urban poor populations likely to be the hardest hit. For Bangkok to address future climate related risks, sound urban environmental management is crucial. Groundwater pumping, dumping of solid waste into city canals and waterways, clogged drainage systems, and deforestation in the upper watershed all contribute to urban flooding. Better management of these urban environmental issues will help manage future climate-related impacts.
CTCN Assistance: 2 to 4 bullet points. Approximately 450 characters with spaces	• Mapping existing drainage • Building hydraulic drainage models for

	flood scenario analysis • Validation of monitoring system design including configuration of web-based information system • Sharing approaches with other flood-prone cities in Thailand
Anticipated impact: 2 to 4 bullet points to summarise anticipated impact. Approximately 250 characters with spaces. As a minimum, please include one of the following: i) Quantity of greenhouse gas emissions reduced, avoided or sequestered; or ii) Number of people with increased capacity to adapt to the impacts of climate variability and change.	• Increased safety and transportation efficiency for the 500,000 people who live in and transit through the targeted flood-prone sector of the city on a daily basis • Improved municipal planning to reduce loss of economic productivity and property due to flooding, not possible to quantify at present • Potential for deployment throughout other Bangkok city sectors and Thai cities will further enhance this impact
Linkages and contribution to NDC: 2 to 4 bullet points. Approximately 350 characters with spaces	The TA advances Thailand's Nationally Determined Contribution to: • Promote and strengthen Integrated Water Resources Management (IWRM) practices • Strengthen disaster risk reduction and reduce the population's vulnerability to climate risk and extreme weather events • Strengthen climate modelling capacity while promoting collaboration among relevant agencies • Establish effective early warning system and enhance the adaptive capacity of national agencies
The narrative story: Approximately 1200 characters with spaces	When a World Bank report on Climate Risks and Adaptation in Asian Coastal Megacities indicated that Bangkok must undertake proactive measures to address increased flooding risks as an integral part of urban planning, the Bangkok Metropolitan Administration sought technical assistance through the CTCN. The CTCN drew on technical expertise of the UNEP-DHI Centre on Water and the Environment and the guidance of Thailand's National Designated Entity to design an urban flood early warning system for a high-risk catchment within the Bangkok Metro area. This assistance includes technology transfer, a demonstration programme and capacity building. The flood warning system will provide: • Information on flood risk zones to residents and commuters through an

	automated web and mobile platform • Empowerment of Bangkok city staff with warning management skills • Proposed methods to expand the system through a citywide warning platform • Dissemination of findings to other cities and organizations in the region.
Contribution to SDGs: Always include contribution to SDG 13, and to the extent possible, please include contribution to 2 other SDGs, describing the contribution with a few sentence for each SDGs concerned. A complete list of SDGs and their targets is available here: https://sustainabledevelopment.un.org/partnership/register/	3: Good health and well-being During urban flood, the flood water is a mix of sewerage and rainfall runoff. The TA helps by providing warning about contaminated flood water 11: Sustainable cities and communities The TA helps identifying areas being disrupted by floods 13: Climate actions The TA provides overview for flood risk areas supporting authorities and citizens in the use of the city. This identification will also serve as priority tool when upgrading the drainage capacity towards a more sustainable city-environment

Note: Please see example of a TA Impact Description at the following link:
https://www.ctc-n.org/sites/www.ctc-n.org/files/benin_a_ag_forestry.final_.pdf

Annex 1 (for internal use in donor and UN reporting)

A. Standardised CTCN performance indicators for donor and UN internal reporting
Please add quantitative values for indicators relevant to the particular TA in the list below. Non-relevant indicators should be left blank. Please only fill in the table for activities and outputs conducted or produced directly by the CTCN assistance.

CTCN standardised performance indicators	Quantitative value	Qualitative description *List the various elements corresponding to the quantitative value*
1. Overview		
Number of active person-days (not full duration) of technical assistance provided to counterparts or stakeholders by international experts and consultants	**148**	**DHI** **BMA**
Number of active person-days (not full duration) of technical assistance provided to counterparts or stakeholders by national experts and consultants	**36**	**DHI Thailand**
Number of for external communication and outreach activities conducted to showcase the assistance (news release, newsletters, articles on website, etc.)	**1**	**THA2017, International conference in Bangkok in January 2017**
2. Events (other than trainings) held as part of the assistance		
Number of international and multi-country (at regional or sub-regional level) technology and knowledge sharing events	**1**	**Dissemination workshop**
Number of participants in the events above	**52**	
Number of national technology and knowledge sharing events	**0**	
Number of participants in the events above	**0**	
Number of public-private events related to technologies	**0**	
Number of participants in the events above	**0**	
3. Training and capacity building activities conducted during the assistance		
Number of training sessions and capacity strengthening activities	**4**	1 Modelling course, 1 DIMS CORE, 1 web and 1 flood forecast workshops
Number of people who received the training	**38**	
Number of men	**30**	
Number of women	**8**	
Total number of organisations trained	**1**	
Number of research organisations, laboratories and universities	**0**	
Number of private companies	**0**	
Number of cities and local government	**1**	BMA
Number of communities	**0**	
Number of ministries	**0**	
Number of specialised governmental institutions	**0**	
Number of non-profit organisations	**0**	
Level of satisfaction of participants after the training (from training feedback form). Categories include: From very satisfied, satisfied, partly not satisfied, not satisfied	**Very satisfied**	Feedback collected from Modelling training course

at all		
Percentage of participants that increased their capacities thanks to the training (from training feedback form). Categories include: Significantly, very, moderately, to none.	**Significant**	
Percentage of men	**100**	
Percentage of women	**N/A**	
4. Tools, technical reports and information material supported by the assistance		
Total number of tools, technical reports and information material supported by the assistance (excluding mission, progress and internal reports)	**6**	**Software incl.documentation: MIKE URBAN, MIKE FLOOD, MIKE OPERATIONS, DIMS.CORE, Webtools, Training course material**
Number of tools strengthened, revised or developed	**5**	
Number of technical reports strengthened, revised or created	**0**	
Number of other information materials strengthened, revised or created	**1**	**Training course material**
5. Policies, laws and regulations supported by the assistance		
Number of policies, strategies, and plans drafted addressing climate change adaptation	**1**	**Upgrade of BMA capacity in hydraulics**
Number of policies, strategies, and plans drafted addressing climate change mitigation		
Number of documents developed to inform other policies, strategies, and plans on climate change adaptation (sectoral strategies, national development plans, etc.)		
Number of documents developed to inform other policies, strategies, and plans on climate change mitigation (sectoral strategies, national development plans, etc.)		
Number of laws, agreements, or regulations drafted addressing climate change adaptation		
Number of laws, agreements, or regulations drafted addressing climate change mitigation		
Number of documents developed to inform laws, agreements, or regulations on climate change adaptation		
Number of documents developed to inform laws, agreements, or regulations on climate change mitigation		
6. Institutional strengthening supported by the assistance		
Number of institutional arrangements in place to coordinate near and long-term national adaptation plans (NAPs)		
Number of organisations with increased technical capacity to advance near and long term national adaptation plans (NAPs) which integrate EbA		
Number of organisations with increase awareness and knowledge among countries to better own and drive national adaptation planning processes		

7. Partnerships and cooperation		
Number of private companies directly engaged in the assistance (that partnered with the proponent, the beneficiaries or the CTCN to implement the assistance)		
Number of South-South collaboration enabled during or through the assistance, when stakeholders from other countries were involved in the assistance	**1**	**Indonesia**
Number of North-South collaboration enabled during or through the assistance, when stakeholders from other countries were involved in the assistance	**1**	**Contact to Finnish radar competence center**
Number of Triangular collaboration enabled during or through the assistance, when stakeholders from other countries were involved in the assistance		

B. Indicators of anticipated impacts that may occur after the TA is completed

CTCN standardised performance indicators	Quantitative value Insert the request value and unit	Content List the elements included in the number provided	Expected timeline Indicate when the indicator and value are expected to be achieved	Responsible institution Indicate the institution(s) that will play leading role in enabling the indicators and anticipated values to be achieved
16. Anticipated finance mobilised				
a) Anticipated amount of public/donor investment mobilised (in USD) from the beneficiary country for climate change activities as a result of the TA	800,000 USD for	Upgrade of the BMA radars; transfer of operational system to HAII or BMA; upscaling internal competence in hydraulics	2018-2020	BMA
b) Anticipated amount of public/donor investment mobilized (in USD) from international and regional sources for climate change activities as a result of the TA				
c) Anticipated amount of private investment mobilised (in USD) from the beneficiary country for climate change activities as a result of the TA				
d) Anticipated amount of private investment mobilised (in USD)				

from international and regional sources for climate change activities as a result of the TA				
17. Policies				
a) Anticipated number of policies, strategies, plans, addressing climate change mitigation officially proposed, adopted, or implemented as a result of the TA				
Anticipated number of policies, strategies, plans, addressing climate change adaptation officially proposed, adopted, or implemented as a result of the TA.				
b) Anticipated number of laws, agreements, or regulations addressing climate change mitigation officially proposed, adopted, or implemented as a result of the TA.				
Anticipated number of laws, agreements, or regulations addressing climate change adaptation officially proposed, adopted, or implemented as a result of the TA.				
c) Anticipated laws, policies, regulations, strategies and plans where climate change mitigation will be mainstreamed as a result of the TA				
Anticipated laws, policies, regulations, strategies and plans where climate change adaptation will be mainstreamed as a result of the TA				
18. Anticipated number of public-private partnerships created	1	Memo of understanding between DHI and BMA	2018	
19. Anticipated twinning arrangements created as a result of the TA				
20. Anticipated number of technology projects prepared and implemented to support action on low emission and climate-resilient development				
21. Anticipated number of				

strengthened National Systems of Innovation and technology innovation centres in recipient country				
22. Anticipated Clean Energy Generation Capacity Clean supported by the TA that has achieved financial closure				
23. Anticipated and projected GHG reductions. Quantity of greenhouse gas (GHG) emissions, measured in metric tons of CO_{2-e}, anticipated to be reduced or sequestered as a result of projects supported by the TA				
24. Anticipated clean energy generation capacity supported by the TA that has achieved financial closure				
25. Anticipated and projected greenhouse gas emissions reduced or avoided through 2030, in metric tons of CO_{2-e}, from adopted laws, policies, regulations, or technologies related to clean energy/sustainable landscapes as a result of the TA				
26. Anticipated number of people improving their livelihood as co-benefits as a result of the TA	2-300,000	Inhabitants in Sukhumvit demonstration area. On longer term, the number of people benefitting may increase to 3-5 million if BMA decide for a city-wide warning system	2018-2020	BMA
27. Anticipated technology types effectively deployed in the country	4	Hydraulic models Rainfall forecast Flood forecast Web-dissemination	2018-onwards	BMA
28. Anticipated UNFCCC processes implemented as a result of the TA (NAMA, NAPA, NDC, etc.)				
29. Anticipated Technology Needs				

Assessments (TNA) and technology Action Plans (TAP) as a result of the TA			
30. Anticipated cooperative research, development and demonstration programmes within and between developed and developing country Parties facilitated as a result of the TA			
31. Anticipated improved climate change observation systems and related information management in developing country Parties.			

Annex 2 (for internal use – to be filled in by the CTCN)

CTCN evaluation
This section will be completed by the relevant CTCN Technology Manager.

- Evaluation of the timeliness of the TA implementation as measured against the timeline included in the response plan;
- Evaluation of TA quality as defined in the response plan;
- Overall performance of the Implementers;
- Overall engagement of the NDE and Proponent;
- Lessons learned on the CTCN process and steps taken by the CTCN to improve.