ADB

Technical Assistance Report

Project Number: 48333-001
Regional—Capacity Development Technical Assistance (R–CDTA)
March 2015

Applying Space-Based Technology and Information and Communication Technology to Strengthen Disaster Resilience
(Financed by the Japan Fund for Poverty Reduction)

Asian Development Bank

ABBREVIATIONS

ADB	–	Asian Development Bank
DMC	–	developing member country
DRM	–	disaster risk management
GIS	–	geographic information system
GPS	–	global positioning system
ICT	–	information and communication technology
JAXA	–	Japan Aerospace Exploration Agency
OSM	–	OpenStreetMap
SBT	–	space-based technology
TA	–	technical assistance

NOTE

In this report, "$" refers to US dollars.

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CAPACITY DEVELOPMENT TECHNICAL ASSISTANCE AT A GLANCE

1. Basic Data			Project Number: 48333-001
Project Name	Applying Space-Based Technology and Information and Communication Technology to Strengthen Disaster Resilience	Department /Division	RSDD/RSAS
Country	REG, ARM, BAN, FIJ, PHI	Executing Agency	Asian Development Bank
Borrower	None		

2. Sector	Subsector(s)	Financing ($ million)
✓ Information and communication technology	ICT strategy and policy, and capacity development	2.00
	Total	**2.00**

3. Strategic Agenda	Subcomponents	Climate Change Information	
Inclusive economic growth (IEG)	Pillar 1: Economic opportunities, including jobs, created and expanded	Climate Change impact on the Project	Low
Environmentally sustainable growth (ESG)	Disaster risk management		
Regional integration (RCI)	Pillar 4: Other regional public goods		

4. Drivers of Change	Components	Gender Equity and Mainstreaming	
Governance and capacity development (GCD)	Client relations, network, and partnership development to partnership driver of change Institutional development Organizational development	No gender elements (NGE)	✓
Knowledge solutions (KNS)	Application and use of new knowledge solutions in key operational areas Knowledge sharing activities Pilot-testing innovation and learning		
Partnerships (PAR)	Bilateral institutions (not client government) Implementation Regional organizations		

5. Poverty Targeting		Location Impact	
Project directly targets poverty	No	Not Applicable	

6. TA Category:	B

7. Safeguard Categorization	Not Applicable

8. Financing

Modality and Sources	Amount ($ million)
ADB	**0.00**
None	0.00
Cofinancing	**2.00**
Japan Fund for Poverty Reduction	2.00
Counterpart	**0.00**
None	0.00
Total	**2.00**

9. Effective Development Cooperation

Use of country procurement systems	No
Use of country public financial management systems	No

I. INTRODUCTION

1.   The Asia and Pacific region is subject to all major types of natural hazards. Direct physical losses are increasing more rapidly than regional gross domestic product as both exposure and vulnerability to natural hazards continue to grow. There is a strong need for assistance to strengthen disaster resilience and support timely post-disaster response, recovery, and reconstruction efforts in Asia and the Pacific. The Asian Development Bank (ADB) Midterm Review of Strategy 2020 indicates that ADB will continue to mainstream disaster risk management (DRM) and provide early and medium-term disaster response in partnership with specialized aid agencies.[1]

2.   Recently, space-based technology (SBT)[2] and information and communication technology (ICT)[3] applications for DRM have spread dramatically. These technologies provide effective tools to strengthen disaster resilience. However, ADB's developing member countries (DMCs) still find accessing these technologies difficult without external technical advice.

3.   Through this technical assistance (TA), ADB, with the technical support of the Japan Aerospace Exploration Agency (JAXA)[4] and Sentinel Asia,[5] will support Armenia, Bangladesh, Fiji, and the Philippines in enhancing the use of SBT and ICT applications in their DRM-related interventions. Extensive discussions were held with prospective pilot countries and other organizations and initiatives such as JAXA, Sentinel Asia, the United Nations Development Programme, and the United Nations Office for the Coordination of Humanitarian Affairs. The design and monitoring framework is in Appendix 1. The TA received concept clearance from ADB Management in October 2014.[6]

II. ISSUES

4.   The collection, visualization, and sharing of information on disasters and disaster risk provide a basis for strengthening disaster resilience and supporting timely post-disaster response, recovery, and reconstruction efforts. For example, base maps (identifying the location of key infrastructure, and critical assets), hazard risk maps, and evacuation maps are necessary for planning interventions related to disaster risk reduction, including activities related to disaster preparedness. Similarly, information from post-disaster damage assessment is important for guiding activities in response, recovery, and rehabilitation phases, such as rescuing affected communities, providing relief, and developing required recovery and reconstruction plans.

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[1]   ADB. 2014. *Midterm Review of Strategy 2020: Meeting the Challenges of a Transforming Asia and Pacific.* Manila.
[2]   SBT refers to technologies relying on space infrastructure, including satellite remote sensing, satellite navigation such as the global positioning system (GPS), and satellite communication and broadcasting systems.
[3]   ICT refers to technologies that provide access to information through telecommunications such as the internet, wireless network, and cell phones.
[4]   In July 2010, ADB and JAXA signed a letter of intent to promote activities, including disaster management in Asia and the Pacific by using SBT. ADB. 2012. *Technical Assistance for Applying Remote Sensing Technology in River Basin Management.* Manila (TA 8074-REG) has been conducted to support Bangladesh, the Philippines, and Viet Nam to apply SBT and ICT in flood management.
[5]   Sentinel Asia is an international cooperation network of space agencies and disaster management agencies in Asia and the Pacific that shares free satellite imagery and data analysis when disasters occur. It is an initiative of the Asia–Pacific Regional Space Agency Forum, and JAXA takes the lead and acts as a secretariat. ADB became a member of Sentinel Asia as the data analysis node in January 2012. It used satellite data from Sentinel Asia and the International Charter on Major Disasters for the damage assessment for Typhoon Yolanda in the Philippines in November 2013.
[6]   The TA first appeared in the business opportunities section of ADB's website on 10 October 2014.

5.   Many DMCs, through development projects, have tried to introduce disaster monitoring and early warning systems using conventional sensor networks for data collection, such as water-level gauges to understand flood extent, and geographic information systems (GISs) for data management and sharing as a pilot demonstration. However, DMCs face financial difficulties in scaling up because the conventional data collection network requires a lot of hardware to be installed at considerable cost. The GIS capacity developed as part of these pilot interventions has not been fully utilized because systems installed during such projects have not been maintained properly after the projects because of difficulties in collecting updated information. The lack of reliable and updated information can lead to inappropriate plans and policies and, consequently, unfavorable outcomes. Additional funding is required to overcome the challenges in collecting and sharing information in a cost-effective manner.

6.   Recently, the use of SBT and ICT for more efficient and cost-effective data collection and management have spread dramatically based on rapid technology advancements, which have made them affordable and accessible, thereby increasing potential applications for DRM.

7.   Crisis mapping using ICT tools equipped with global positioning system (GPS), such as smartphones, has been increasingly used to provide information during disaster responses.[7] Where sensor networks for disaster warning and response are not available, crowdsourcing information collection, such as through geo-tagged reports and photos, can be effective for situation assessment regarding impending disasters and during events.[8] People armed with ICT tools can be used as mobile human sensors providing immediate eyewitness reports. The approach has also been utilized to collect information necessary for disaster risk reduction, such as potential inundation area based on experiences of local people, and post-disaster response such as location of shelters and evacuation routes.

8.   OpenStreetMap (OSM), a method of community-based mapping using satellite imagery and ICT tools, has been used to develop base maps necessary for planning and prioritizing DRM-related interventions.[9] ICT tools such as mobile phone applications have been developed to support this mapping approach. OSM provides simple access to its entire database under open license, which is useful for community-based mapping and data sharing in the event of a disaster, as well as in humanitarian and international development work. Since OSM relies on the local community to develop and update detailed base maps, it has become an effective mechanism to strengthen community-based DRM.

9.   Satellite-based damage assessment has been used in post-disaster situations to collect rapid and objective damage information cost-effectively. By combining satellite-based damage maps with baseline OSM data, quick and remote identification of disaster locations and the extent of damage, such as the number of damaged buildings categorized by type can be obtained for early emergency response planning of humanitarian rescue, delivery of goods, and effective budget mobilization. International cooperation mechanisms to share satellite imagery and analyze maps for free in the event of disasters have already been established, with many DMCs as members of the community. The International Charter for Space and Major Disasters and Sentinel Asia have provided opportunities for DMCs to access free satellite-based

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[7]   Crisis mapping is the method of information collection that utilizes data received from volunteers after disasters. One of the first major events to utilize crisis mapping was the 2010 Haiti earthquake.

[8]   Crowdsourcing is the process of obtaining needed information by soliciting contributions from a large group of people, and especially from an online community or local volunteers, rather than from traditional employees.

[9]   OSM is a project to create and distribute free geographic data and maps developed by volunteer contributors. Their data is accessible at the website (http://www.openstreetmap.org).

information for post-disaster activities.[10] However, these data have been underutilized at the local level because of issues such as lack of awareness on the availability of such data, difficulties in data access with no internet connection after a disaster, and lack of coordination among government agencies to share baseline GIS data necessary for effective analysis.

10.   Assistance is needed to improve DMC capacity to collect and share reliable and timely disaster-related data using SBT and ICT at the local government and community levels to strengthen their disaster resilience and support timely post-disaster response, recovery, and reconstruction efforts in a more cost-effective manner.[11] These new approaches will provide cost-effective ways for DMCs that suffer from low institutional capacity to collect and share information on disasters and disaster risk.

III.   THE PROPOSED CAPACITY DEVELOPMENT TECHNICAL ASSISTANCE

A.   Impact and Outcome

11.   The impact will be more information-based DRM. The outcome will be improved quality and timeliness of information for disaster preparedness and response using SBT and ICT in the pilot countries.

B.   Methodology and Key Activities

12.   Activities will be organized under three outputs to achieve the outcome.

13.   **Output 1: Enhanced disaster-related information collection, sharing, and utilization applying space-based technology and information and communication technology in the selected communities.** The TA will support Armenia, Bangladesh, Fiji, and the Philippines by strengthening the use of SBT and ICT applications for DRM, especially for information collection, sharing, and utilization for disaster risk reduction, post-disaster response, recovery, and reconstruction. Relevant agencies will be assisted with advisory services and financial support in introducing and implementing (i) community-based OSM base map development in the pilot city; (ii) ICT applications in developing community-based hazard risk mapping, evacuation mapping, and crisis mapping in the pilot communities; (iii) satellite-based damage information at the local government and community levels using ICT tools; and (iv) disaster-related information management using ICT tools in the pilot local government. Discussions will be held with DMC agencies and development partners involved in supporting actions on disaster information systems to ensure links with related ongoing activities. Methodologies, tools, and mechanisms will be documented and enhanced in preparation for the potential scaling up after the TA implementation.

14.   The TA will strengthen capacities of target agencies, relevant agencies, stakeholders, and local communities in Armenia, Bangladesh, Fiji, and the Philippines for applying SBT and ICT to DRM in a sustainable manner by optimizing existing human and technical resources and country experience. One or two pilot cities will be selected in each pilot country. One community in each pilot city will be selected as the pilot community. Expected training programs are hands-on training and training workshops for (i) the use of SBT and ICT in community-based DRM,

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[10] The International Charter on Space and Major Disasters provides charitable satellite data to relief organizations in the event of major disasters.
[11] ADB. 2014. *Operational Plan for Integrated Disaster Risk Management, 2014–2020.* Manila. This plan highlights that ADB will promote the application of state-of-the-art space-based and ICT such as remote sensing and GIS both for disaster risk assessment and early warning systems.

especially for community-based mapping and information collection; and (ii) the application of SBT and ICT in DRM, especially for data collection and management at the local government level. The TA will also conduct training of trainers for sustainable capacity development and evacuation drills to demonstrate introduced applications and operational procedures. The evacuation drills will be conducted in each pilot community to demonstrate the new methodologies of data collection and coordination among relevant agencies. The specific activities will be identified through further information collection and consultation sessions with target and relevant agencies.

15.   **Output 2: Expanded knowledge on space-based technology and information and communication technology applications for disaster risk management in each pilot country and the region.** The TA will support dissemination of knowledge and practices on SBT and ICT applications for DRM in each pilot country as well as other DMCs and development partners in the region. The TA will strengthen their capacities through videoconferences and regional workshops, in collaboration with JAXA and other space agencies as well as existing international frameworks for SBT and ICT applications for DRM such as Sentinel Asia.

16.   **Output 3: Policy guidelines developed regarding sustainable space-based technology and information and communication technology applications for disaster risk management in each pilot country.** The TA will support a needs survey, cost–benefit analyses, and a study of best-practice SBT and ICT applications for DRM in DMCs to organize related information and develop policy guidelines in each pilot country. The policy guidelines will be introduced to decision makers through workshops to promote understanding about the importance and cost-effectiveness of the newly introduced methodologies. The aim is to secure enough support to operate them in a sustainable manner after project completion and expand them to wider areas.

C.   Cost and Financing

17.   The TA is estimated to cost $2,033,400, of which $2,000,000 will be financed on a grant basis by the Japan Fund for Poverty Reduction and administered by ADB. JAXA will make a $33,400 equivalent in-kind contribution for counterpart personnel costs, technical fees, and administration services. The cost estimates and financing plan are in Appendix 2.

D.   Implementation Arrangements

18.   ADB, through the Sector Advisory Service Division of its Regional and Sustainable Development Department, will be the executing agency. The division will collaborate with ADB's urban sector group, regional departments, and resident missions concerned. Team members from regional departments will coordinate implementation of in-country TA activities. JAXA will be ADB's project technical adviser. In accordance with the partnership agreement between ADB and JAXA for their collaboration under the TA, JAXA will provide in-kind services for (i) implementing capacity development for applying SBT, and (ii) technical inputs in applying SBT to DRM. The TA will be implemented over 24 months, from April 2015 to March 2017.

19.   Armenia, Bangladesh, Fiji, and the Philippines are selected as pilot countries of the TA because (i) among the DMCs, they are highly prone to disasters; (ii) they have identified strengthening disaster resilience in ADB's country partnership strategies and/or country operations business plans; (iii) they have strong commitment to developing nonstructural measures to manage disaster risk and to strengthen local capacities for effective implementation of DRM-related interventions; and (iv) they have potential complementarity with

the ongoing nationwide implementation of community-driven development or urban disaster management programs.[12]

20.   Implementing agencies will include the Ministry of Emergency Situation in Armenia, the Department of Disaster Management with the support of the Local Government Engineering Department in Bangladesh, the National Disaster Management Office in Fiji, and the Department of Social Welfare and Development in the Philippines. The implementing agencies in the pilot countries will assign TA project directors from among senior staff to supervise and coordinate TA in-country activities and to participate in the regional workshops. Coordination with related agencies, including space agencies, DRM agencies, stakeholders, ADB, JAXA, and consultants, will be essential to ensure synergy of activities and value addition to outcomes through regular joint meetings organized by the implementing agencies.

21.   The TA will require 144 person-months of consulting services (32 person-months international and 112 person-months national) to implement the TA components in the pilot countries. All consultants will be engaged by ADB in accordance with its Guidelines on the Use of Consultants (2013, as amended from time to time). For the selection of the main consulting firm, the quality- and cost-based selection (90:10) method will be used because of the requirement for a highly qualified level of technique, knowledge, and experience to achieve expected outputs. For the selection of two international consulting firms for ICT and remote sensing, consultants' qualifications selection will be used.[13] The consultants will work under the overall supervision of ADB. The outline terms of reference for consultants are in Appendix 3.

22.   Any procurement under this TA will be in accordance with ADB's Procurement Guidelines (2013, as amended from time to time). The shopping method will be used to procure equipment.[14] Disbursements under the TA will be made in accordance with ADB's *Technical Assistance Disbursement Handbook* (2010, as amended from time to time). At the end of the TA, equipment purchased through the shopping method under the TA will be assigned to the agencies concerned in the DMCs.

IV.   THE PRESIDENT'S RECOMMENDATION

23.   The President recommends that the Board approve ADB administering technical assistance not exceeding the equivalent of $2,000,000 to be financed on a grant basis by the Japan Fund for Poverty Reduction for Applying Space-Based Technology and Information and Communication Technology to Strengthen Disaster Resilience.

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[12] For example, ADB. 2013. *Technical Assistance to Armenia for Urban Development in Secondary Cities*. Manila; ADB. 2014. *Report and Recommendation of the President to the Board of Directors: Proposed Loan and Grant to the People's Republic of Bangladesh for Coastal Towns Environmental Infrastructure Projects*. Manila; ADB. 2012. *Technical Assistance for Strengthening Disaster and Climate Risk Resilience in Urban Development in the Pacific*. Manila; ADB. 2013. *Technical Assistance to the Republic of Fiji for Urban Development Planning and Institutional Capacity Building*. Manila; and ADB. 2013. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Republic of the Philippines for the KALAHI-CIDSS National Community-Driven Development Program*. Manila.

[13] Highly specialized expertise in ICT system development and satellite remote sensing are required for the assignments. The estimated contract value is around $190,000 for the international consulting firm for ICT and $200,000 for the international consulting firm for remote sensing.

[14] The single contract ceiling for shopping is set at $100,000.

DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets and Indicators with Baselines	Data Sources and Reporting Mechanisms	Assumptions and Risks
Impact More information-based DRM	By 2020: Increased number of plans and activities for DRM based on information collected using methodologies and tools introduced under the TA (2015 baseline: 0, 2020 target: 4)	National and local government DRM plans and post-disaster reports of disaster impact	**Assumption** Pilot countries and agencies continue to be committed to improve disaster resilience **Risk** Inadequate priority of investments for DRM
Outcome Improved quality and timeliness of information for disaster preparedness and response using SBT and ICT in the pilot countries	By 2017: Established mechanism and operation of SBT and ICT applications for disaster preparedness and response in the pilot countries Knowledge and practice in pilot countries and other developing member countries shared in the region (2015 baseline: 0, 2020 target: Reports = 4, ADB website and report = 2)	Reports of implementing agencies Reports of implementing agencies, ADB website, and ADB knowledge products	**Assumption** Adequate capacity and resources in the pilot local governments and communities **Risk** Difficulty in coordination between relevant national and local agencies
Outputs 1. Enhanced disaster-related information collection, sharing, and utilization applying SBT and ICT in selected communities	Developed methodologies introduced to the pilot cities and the pilot communities (2015 baseline: 0, 2017 target: 4) Improved base map for the pilot cities available on OpenStreetMap platform (2015 baseline: 0, 2017 target: 4) Community-based hazard risk maps and evacuation maps developed using SBT and ICT in the pilot communities (2015 baseline: 0, 2017 target: 4) Satellite-based damage assessment viewable offline at the pilot cities (2015 baseline: 0, 2017 target: 4)	Project reports Used ICT tools shared in website Base maps on OpenStreetMap website Hazard risk maps and evacuation maps shared on platforms on the internet Reports about disaster response and damage assessment	**Assumptions** Sufficient participation of national and local government staff and local community during implementation **Risks** Shortage of qualified staff and interested local volunteers available to participate in the TA activities National and local governments may be reluctant to share information with the public
2. Expanded knowledge on SBT and ICT applications for DRM in each pilot country and the region	Selected staff (Male and/or Female) in pilot countries are able to apply introduced methodologies (2015 baseline: 0, 2017 target: 30 staffs in	TA review missions, back-to-office reports, and correspondence with the pilot countries	

Design Summary	Performance Targets and Indicators with Baselines	Data Sources and Reporting Mechanisms	Assumptions and Risks
	each country)		
	SBT and ICT incorporated in selected urban or DRM projects based on cost–benefit analyses (2015 baseline: 0, 2017 target: 4 projects)	Project reports, ADB website, and sector report	
	Knowledge and practices in pilot cities shared in each pilot country through training and workshops, and knowledge and practices in pilot countries shared in the region through online workshops and knowledge products (2015 baseline: 0, 2020 target: Reports = 4, ADB website and report = 2)	Project reports, ADB website, and sector report	
3. Policy guidelines developed regarding sustainable SBT and ICT applications for DRM in each pilot country	Policy guidelines of pilot countries in SBT and ICT for DRM developed (2015 baseline: 0, 2017 target: 4)	Project reports, ADB website, and sector report	

Activities with Milestones	Inputs
1. Enhanced disaster-related information collection, sharing, and utilization in applying SBT and ICT in selected communities 1.1 Development of methodologies in the pilot countries (by Q3 2015) 1.2 System and tool development (by Q1 2016) 1.3 Coordination to establish necessary mechanism (by Q3 2016) 1.4 Conduct of training programs and demonstration activities (by Q4 2016) **2. Expanded knowledge on SBT and ICT applications for DRM in each pilot country and the region** 2.1 Video conferences and regional workshops (by Q1 2017) **3. Policy guidelines developed regarding sustainable SBT and ICT applications for DRM in each pilot country** 3.1 Development of policy guideline based on needs survey and cost–benefit analysis (by Q4 2016)	**Japan Fund for Poverty Reduction: $2,000,000**

Item	Amount ($'000)
International consultants	480.00
National consultants	395.00
International and local travel	305.00
Reports and communications	20.00
Equipment	140.00
Workshops, training and seminars, and conferences	200.00
Surveys and studies	160.00
Miscellaneous administration and support costs	100.00
Contingencies	200.00

Japan Aerospace Exploration Agency (in-kind contribution on technical personnel cost, technical advice, and administration services) $33,400

ADB = Asian Development Bank, DRM = disaster risk management, ICT = information and communication technology, Q = quarter, SBT = space-based technology, TA = technical assistance.
Source: Asian Development Bank.

COST ESTIMATES AND FINANCING PLAN
($'000)

Item	Amount
A. Japan Fund for Poverty Reduction[a]	
1. Consultants	
a. Remuneration and per diem	
i. International consultants	480.0
ii. National consultants	395.0
b. International and local travel	305.0
c. Reports and communications	20.0
2. Equipment[b]	140.0
3. Training, seminars, and conferences[c]	200.0
4. Surveys and studies[d]	160.0
5. Miscellaneous administration and support costs[e]	100.0
6. Contingencies	200.0
Subtotal (A)	**2,000.0**
B. Japan Aerospace Exploration Agency	
In-kind contribution of technical personnel cost, technical advice, and administration services	
Subtotal (B)	**33.4**
Total	**2,033.4**

[a] Administered by the Asian Development Bank (ADB).
[b] Equipment that may be procured are computers, mobile phones, servers, personal computers, printers, and satellite imagery. Procurement will be in accordance with ADB's Procurement Guidelines (2013, as amended from time to time).
[c] Includes travel costs for ADB staff and Japan Aerospace Exploration Agency staff as resource persons and costs of dissemination activities.
[d] Includes the cost of satellite data processing and mapping activities in the field.
[e] Includes data support, communication, subscription, software acquisition, and printing costs.
Sources: Asian Development Bank and Japan Aerospace Exploration Agency estimates.

OUTLINE TERMS OF REFERENCE FOR CONSULTANTS

1.   This appendix provides a summary of the consulting services required during technical assistance implementation and the type of technical services and/or specialist inputs to be provided:

  (i)   main consultant (firm) to be recruited through quality- and cost-based selection (90:10), 18 person-months international and 112 person-months national;[1]
  (ii)   information and communication technology consultant (firm) to be recruited through consultants' qualification selection, 12 person-months international; and
  (iii)   remote sensing consultant (firm) to be recruited through consultants' qualification selection, 2 person-months international.

2.   All consultants will be engaged by the Asian Development Bank following its Guidelines on the Use of Consultants (2013, as amended from time to time).

Table A3.1: Main Consultant (Firm)
(international, 18 person-months; national, 112 person-months)

Name (Input)	Qualifications	Tasks
International		
Team leader and project management specialist (4 person-months)	Bachelor's degree or higher in development planning, community development, or Disaster Risk Management (DRM) More than 7 years of experience in DRM projects, preferably in partnership with local governments in developing member countries (DMCs) Experience in project management in development projects in DMCs	(i) Support the Asian Development Bank in project management as a team leader for the entire consultant team, including other consulting firms under the technical assistance (TA), supervising them to implement the project smoothly, taking necessary actions to solve problems, and ensuring the quality of their outputs in consultation with the Asian Development Bank, the implementing agencies, and relevant organizations in the pilot countries; (ii) develop and maintain a detailed work plan of the TA and follow up its progress by holding project team meetings; (iii) prepare implementation materials, monthly activity summaries, and reports (inception, midterm, draft final, and final) combining inputs from other consulting firms under the TA; (iv) conduct inception workshops, final workshops in each pilot country, and regional workshops; and (v) act as secretariat of project team meetings.
DRM specialist (4 person-months)	Bachelor's degree or higher in development planning or DRM More than 5 years of working experience in DRM, preferably in partnership with local governments in DMCs Preferably have working experience in application of space-based technology (SBT) or information and communication technology (ICT) in DRM	(i) Develop methodologies to apply SBT and ICT to disaster-related information collection, sharing, and utilization at the local government and community levels in each pilot country as described in output 1 of the TA, in collaboration with other consultants; (ii) develop a report about existing ICT tools for DRM and potential needs of SBT and ICT applications for DRM based on information collection through surveys and regional workshops; (iii) develop policy guidelines for SBT and ICT applications in DRM in the pilot countries based on cost–benefit analysis of the methodologies introduced under the TA; (iv) organize evacuation drill demonstration exercises in the pilot communities in each country to check the coordination mechanism among relevant agencies, and the effectiveness of the introduced methodologies and ICT tools for emergency disaster response;

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[1]   Given the need to ensure that a firm with the technical skills and program management experience is recruited by the Asian Development Bank, a heavier weight will be given to the technical merits of the proposals. Hence, the program management consultant will be selected using quality- and cost-based selection evaluation (90:10).

Name (Input)	Qualifications	Tasks
		(v) develop a knowledge product and website for dissemination of the project result; (vi) support the organization of a capacity development program in each pilot country in collaboration with other consultants; (vii) support the introduction of the developed methodology in each pilot country; and (viii) support the development of ICT tools.
Digital mapping specialist (5 person-months)	Master's degree or higher in geospatial technology, ICT, or a comparable discipline More than 5 years of working experience with OpenStreetMap (OSM), geotagging, and digital crisis mapping	(i) Develop a report about best practices and available ICT tools regarding OSM and ICT applications for DRM, including hazard risk mapping and crisis mapping, as input to the report developed by the international DRM specialist; (ii) develop strategies and guidelines for application of OSM, ICT applications for hazard risk mapping, and crisis mapping for DRM in each pilot country; (iii) support development of methodology and the ICT tools by providing knowledge about OSM, ICT applications for hazard risk mapping, and crisis mapping for DRM, and coordinating with OSM community and other international volunteer network about digital mapping; (iv) support the training for the capacity development about digital mapping, OSM, ICT applications for hazard risk mapping, and crisis mapping for DRM; (v) support the evacuation drill demonstration exercises in each pilot community; (vi) support the development of the OSM maps, hazard risk maps, and evacuation maps by mobilizing volunteers in the selected local community; and (vii) support the collection of the necessary geospatial information for developing maps.
Remote sensing coordinator (5 person-months)	Master's degree or higher in remote sensing technology, earth science, or a comparable discipline More than 5 years of experience in satellite-based damage assessment for disasters Work experience with Sentinel Asia and the International Charter on Space and Major Disasters Working experience on inter-organizational coordination for data sharing	(i) Develop a report about best practices and available ICT tools for application of satellite-based information for DRM as input to the report developed by IDRMS; (ii) develop strategies and guidelines for SBT application for DRM in each pilot country; (iii) support the development of methodology and the ICT tools by providing knowledge about SBT applications for DRM, Sentinel Asia, and the International Charter on Major Disasters; (iv) support the evacuation drill demonstration exercises in each pilot community; (v) support the training for the capacity development about SBT applications for DRM; and (vi) (vi) establish an inter-organizational mechanism to make use of satellite-based information for DRM provided from international initiatives such as Sentinel Asia in collaboration with Sentinel Asia, and share government geospatial data necessary for satellite-based data analysis by coordinating with relevant ministries, government agencies, local governments and local communities, and other consultants.

National		
Name (Input)	Qualifications	Tasks
DRM specialist (48 person-months; 8 person-months each for Armenia, Bangladesh, and Fiji; and 24 person-months for the Philippines)	Bachelor's degree or higher in development planning, community development, or DRM More than 5 years of experience in DRM, especially in partnership with local governments	(i) Support development of methodology and the ICT tools by providing knowledge about DRM in each pilot country; (ii) support development of the strategy and the policy guidelines for SBT and ICT applications for DRM in each country; (iii) organize capacity development program, including the training and workshops in each country, and support logistics and organization; (iv) conduct training program for SBT and ICT applications in DRM at national and local government levels in each pilot country; (v) support capacity development program at community level in each pilot community; (vi) support the evacuation drill demonstration exercises in each pilot community; (vii) serve as the general secretariat and administrative support for the project team (Philippines only); and (viii) serve as the team leader of national consultant members in each country and lead the coordination necessary for work of project team with relevant agencies in each country.
Community-based disaster risk management (CBDRM) specialist (32 person-months; 8 person-months for each pilot country)	Bachelor's degree or higher in DRM, community development, or a comparable discipline More than 5 years of experience in CBDRM	(i) Support development of methodology and the ICT tools by providing knowledge about CBDRM in each pilot country; (ii) support development of the strategy and the policy guidelines for SBT and ICT applications for DRM in each pilot country; (iii) conduct training program for SBT and ICT applications in CBDRM in each pilot community; (iv) support capacity development program at national and local government levels; (v) support conduct of evacuation drill demonstration exercises in the pilot communities; and (vi) establish sustainable mechanism SBT and ICT applications for CBDRM by mobilizing local volunteers in each pilot community.
Digital mapping specialist (32 person-months; 8 person-months for each pilot country)	Bachelor's degree or higher in geospatial technology, ICT, or a comparable discipline More than 3 years of working experience with geographic information systems, preferably for OSM, geotagging, or digital crisis mapping	(i) Support development of methodology and the ICT tools in each pilot country; (ii) support development of the strategy and the policy guidelines for SBT and ICT applications for DRM in each pilot country; (iii) support training program for SBT and ICT applications in pilot country; (iv) conduct training program for basic mapping, geographic information systems, and community-based mapping using SBT and ICT to introduce the developed methodology and ICT tools in each pilot country; (v) develop OSM maps, hazard risk maps, and evacuation maps by mobilizing volunteers in each pilot community; (vi) establish a sustainable mechanism for community-based mapping for CBDRM applying SBT and ICT through coordination and capacity development in each pilot community; and (vii) collect necessary geospatial information necessary for developing maps and satellite-based damage assessment.

Source: Asian Development Bank.

Table A3.2: Information and Communication Technology Consultant (Firm)
(international, 12 person-months)

Name (Input)	Qualifications	Tasks
Team leader and system architecture specialist (4 person-months)	Master's degree or higher in information and communication technology (ICT) or a comparable discipline, preferably with specialization in geospatial technology More than 5 years of experience in ICT system development, preferably for mobile applications, geographic information systems, mapping, or DRM	(i) Develop a report about existing methodologies and ICT tools for space-based technology and ICT applications for DRM such as online and offline mobile applications and personal computer software for OSM mapping, hazard risk mapping, evacuation mapping, crisis mapping, geospatial data browser, and geospatial data management systems; (ii) develop system requirements of the ICT tools for disaster-related information collection, sharing, and utilization at the local government and community levels in each pilot country as described in output 1 of the technical assistance, such as online and offline mobile applications and personal computer software for OSM mapping, hazard risk mapping, evacuation mapping, crisis mapping, geospatial data browser, and geospatial data management systems in consultation with relevant organizations in the pilot countries and relevant international organizations with the support of other consulting team members; and (iii) design and develop system architectures, including data and workflow based on system requirements defined in (ii).
ICT specialist 1 and 2 (8 person-months)	Bachelor's degree or higher in the field of ICT or a comparable discipline More than years of experience in ICT system development, preferably for mobile applications, geographic information system, mapping, or disaster risk management	(i) Develop software architecture, program, and test documents and quality control documents for the ICT tools to achieve system requirements; (ii) validate and demonstrate the developed ICT tools; (iii) develop technical documents and user manuals of the developed ICT tools; and (iv) translate all systems and materials in local languages.

Source: Asian Development Bank.

Table A3.3: Remote Sensing Consultant (Firm)
(international, 2 person-months)

Name (Input)	Qualification	Task
Remote sensing specialist (2 person-months)	Master's degree or higher in the field of remote sensing technology, earth science, or a comparable discipline More than 5 years of experience in earth observation satellite data analysis of Advanced Land Observing Satellite (ALOS), ALOS2, and other optical and radar satellites Working experience in earth observation satellite data analysis for disaster risk management in developing member countries	(i) Process optical or radar satellite imagery provided by the Asian Development Bank and develop damage assessment information, including damage distribution by building type, for big disasters in pilot countries by combining baseline geospatial datasets available from governments and OSM, quickly after the disaster; and (ii) develop satellite-based hazard risk maps of the pilot city with input from other consultant team members using freely available satellite data and other available geospatial data, if big disasters do not happen during the project and item (i) is not implemented.

Source: Asian Development Bank.