



Technical Assistance Concept Paper

Project Number: 54321-001
Knowledge and Support Technical Assistance (KSTA)
September 2020

Empowering Developing Member Countries to Use Multi-Spectral Satellite Images and Artificial Intelligence for Land Use and Coastal Planning

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KNOWLEDGE AND SUPPORT TECHNICAL ASSISTANCE AT A GLANCE

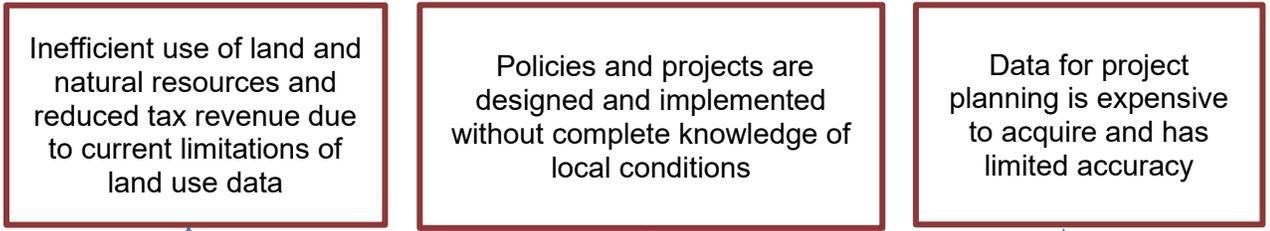
Project Classification Information Status: Complete

KNOWLEDGE AND SUPPORT TECHNICAL ASSISTANCE AT A GLANCE

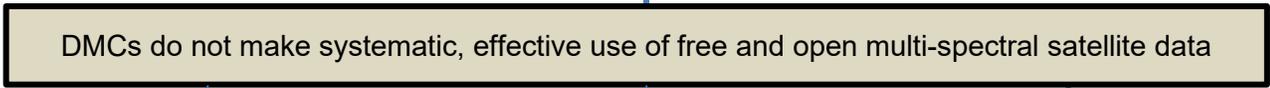
1. Basic Data		Project Number: 54321-001	
Project Name	Empowering Developing Member Countries to Use Multi-spectral Satellite Images and Artificial Intelligence for Land Use and Coastal Planning	Department/Division	SDCC/SDCC-DT
Nature of Activity	Capacity Development	Executing Agency	Asian Development Bank
Modality	Regular		
Country	Regional		
2. Sector	Subsector(s)	ADB Financing (\$ million)	
		Total	0.00
3. Operational Priorities		Climate Change Information	
✓ Addressing remaining poverty and reducing inequalities		GHG Reductions (tons per annum)	0
✓ Accelerating progress in gender equality		Climate Change impact on the Project	Low
✓ Tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability		ADB Financing	
✓ Making cities more livable		Adaptation (\$ million)	0.00
✓ Promoting rural development and food security		Mitigation (\$ million)	0.00
✓ Strengthening governance and institutional capacity		Cofinancing	
		Adaptation (\$ million)	0.00
		Mitigation (\$ million)	0.00
Sustainable Development Goals		Gender Equity and Mainstreaming	
SDG 1.a		Some gender elements (SGE)	✓
SDG 2.4		Poverty Targeting	
SDG 5.b		General Intervention on Poverty	✓
SDG 8.2			
SDG 9.4, 9.b			
SDG 10.2			
SDG 11.3			
SDG 12.8			
4. Risk Categorization	Low		
5. Safeguard Categorization	Safeguard Policy Statement does not apply		
6. Financing			
Modality and Sources		Amount (\$ million)	
ADB		0.00	
None		0.00	
Cofinancing		1.00	
High Level Technology Fund (Full ADB Administration)		0.50	
Republic of Korea e-Asia and Knowledge Partnership Fund (Full ADB Administration)		0.50	
Counterpart		0.00	
None		0.00	
Total		1.00	
Currency of Financing: US Dollar			

PROBLEM TREE

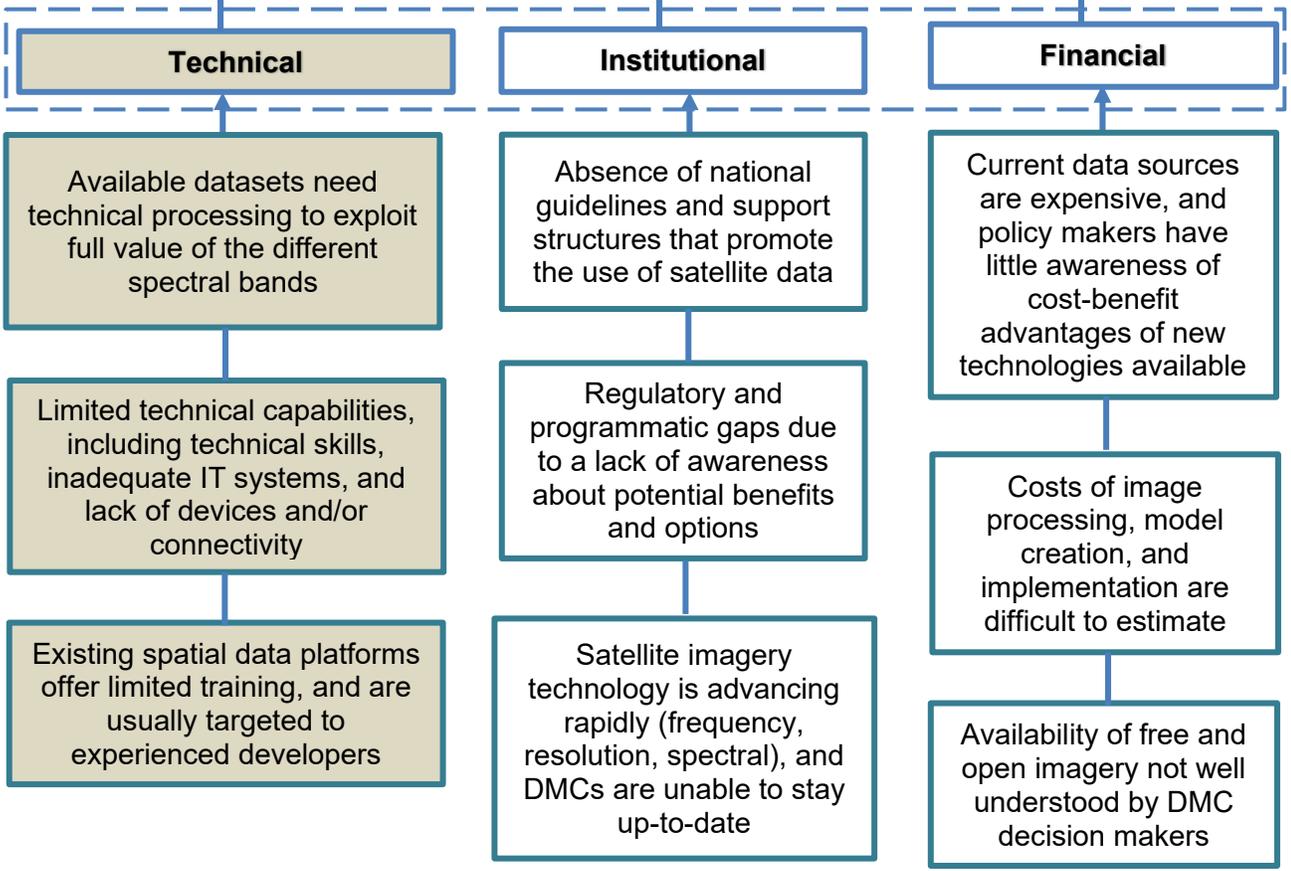
EFFECTS



CORE PROBLEM



CAUSES



I. KNOWLEDGE AND SUPPORT TECHNICAL ASSISTANCE

1. The knowledge and support technical assistance (TA) will support the Asian Development Bank (ADB) and its developing member countries (DMCs) in the use of artificial intelligence (AI), satellite imagery and Earth observation (EO) solutions for project planning and implementation, including land use management and coastal planning.

2. Strategy 2030 recognizes the promotion of innovative technology as one of its guiding principles and aims to “proactively seek ways to promote the use of advanced technologies across its operations and provide capacity building support to DMCs.”¹ EO is one of these advanced tools. The use of satellite-based EO products has advanced significantly in the last decade leading to innovative solutions that cut across the operational priorities (OP), specifically OP3, OP4, OP5, and OP6.²

3. The particular advantage of satellites is the non-intrusive, objective, and consistent nature of the information, available both historically and into the future.³ DMCs can now improve the accuracy of their land use and ecosystem models and reduce the cost of land surveys by transitioning to EO-based solutions. EO can provide reliable data in cases where actual field surveys are difficult to conduct because of the coronavirus disease pandemic travel restrictions or in cases of conflict.

4. The TA is included in the 2020 Management-approved results-based workplan of the Sustainable Development and Climate Change Department.⁴

A. Rationale

5. Satellite imagery combined with AI is driving a global revolution in land management. Much of the new imagery, with improved resolution, frequency, and spectral range, is also available as free and open resource, provided by space agencies like the European Space Agency (ESA). Satellite technology with AI-based image processing can enable DMCs to “leapfrog” traditional data gathering and analysis solutions, which are often too expensive and complex. DMCs are well positioned to take advantage of these solutions, given their lack of historical investments in land management infrastructure. In addition, some DMCs have limited technical capabilities or inadequate IT systems to perform the technical processing required for these solutions.

6. In response to the demand from DMCs for EO-based interventions, the proposed TA aims to create AI solutions using open data from space agencies such as ESA, Japan Aerospace Exploration Agency, and the Korean Aerospace Research Institute (KARI), and other organizations, such as the University of Tokyo.

7. The TA will focus on processing EO image data to create sustainable and replicable solutions for decision makers. The Digital Technology for Development Unit (SDCC-DT) will build on experience from various technical assistance projects that integrate relevant data into planning

¹ ADB. 2018. *Strategy 2030: Achieving a Prosperous, Inclusive, Resilient, and Sustainable Asia and the Pacific*. Manila.

² Operational Priority (OP) 3: Tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability, OP4: Making cities more livable, OP 5: Promoting rural development and food security, OP6: Strengthening Governance and Institutional Capacity

³ ADB. 2017. *Earth Observation for a Transforming Asia and the Pacific*. Manila.

⁴ Former title of proposed TA is “Earth Observation Technical Assistance.”

and implementation (e.g., two cloud-based interferometric processing platforms, Geohazard Exploitation Platform⁵ and Rheticus,⁶ are currently used in Central Sulawesi and Java.⁷)

8. The proposed TA will prioritize solutions to address institutional constraints linked to lack of awareness on available effective technologies, insufficient regulatory processes, or limited dissemination of best practices on how to use the information from multi-spectral satellite images. Demonstrating that the technical capacity in the countries can be developed, and that the cost-benefit ratio is more favorable than other solutions, ADB will act as a broker between ESA, as provider of free and open data, and the DMCs that are in need of innovation.

9. The proposed TA will build on previous ADB projects where satellite imagery has been used to develop and pilot land use solutions. These include activities organized for Emergency Assistance for Reconstruction and Rehabilitation in Indonesia (footnote 7).⁸ It will also build on the work for a project in Cambodia⁹ on coastal and marine fisheries through monitoring of the health of coastal mangrove ecosystems. The TA will also build on a grant in Timor-Leste.¹⁰ Results obtained using AI will be made available to other operations departments. SDCC-DT will advise on potential scaling up or customization suitable in other regions.

10. **ADB's value addition.** ADB's value addition would be leveraging partnerships with ESA, the University of Tokyo, and upcoming collaboration with the Japan Aerospace Exploration Agency and KARI to provide the most appropriate EO-based solutions to the DMCs, including obtaining historical data and satellite images. It may also make use of existing resources within ADB for purposes of storage and dissemination.¹¹ ADB is in a unique position to provide state-of-the-art solutions to DMCs, for small and remote Pacific islands, landlocked countries in Central Asia, or archipelagic countries in Southeast Asia.

B. Proposed Solutions

11. The proposed TA will produce three outputs: (i) cloud-based platforms operationalized; (ii) integration of EO technology solutions into projects supported; and (iii) knowledge in adopting EO-based solutions improved.

12. **Output 1: Cloud-based platforms operationalized.** This refers to the use of state-of-the-art machine learning techniques to process terabytes of free and open satellite data from a variety of sensors at different spatial resolutions.¹² It will allow for available datasets to be processed and used in a beneficial manner to support areas like agro-forestry and sustainable coastal fisheries.

⁵ Geohazard Exploitation Platform allows exploitation of EO data resources, by combining fast data access, Cloud processing facilities and intuitive data analysis tools and can be operated by external users (<https://geohazards-tep.eu/#!>).

⁶ Rheticus is a cloud-based geoinformation service platform for land monitoring to deliver products upon user request (https://www.planetek.it/eng/products/all_products/rheticus).

⁷ Loan 3792/3793: Emergency Assistance for Rehabilitation and Reconstruction; and Project No. 51157: Enhanced Water Security Investment Project.

⁸ ESA. Earth Observation for Sustainable Development—Disaster Risk Reduction (EO4SD). <https://eo4sd.esa.int/>. The EO4SD program is an ESA initiative to support the uptake of EO-derived information in sustainable development. It is composed of: a) knowledge development, and b) capacity building and skills transfer being done in coordination with ADB and the World Bank.

⁹ Project No. 53261-001: Sustainable Coastal and Marine Fisheries Project.

¹⁰ Grant 9209-TIM: Coffee and Agroforestry Livelihood Improvement Project.

¹¹ One of these is the Spatial Data Analysis Explorer or SPADE is an interactive geospatial web-based cloud platform on project preparation, due diligence and monitoring. SPADE contains satellite maps and datasets for a number of ADB projects.

¹² Ensuing AI models will be considered ADB property.

This includes cooperation with KARI, for a marine information service, based on the recently launched GEO-KOMPSAT 2B (or Cheollian 2B).¹³ ESA will make available AI expertise for the integration of Sentinel 3¹⁴ and Cheollian 2B.

13. **Output 2: Integration of Earth observation technology solutions into projects supported.** The TA will support mainstreaming of EO technology, where appropriate. An example is having the precise location of coffee plantations in Timor-Leste to have effective interventions to boost coffee production. Similar solutions can be replicated in other sectors and DMCs. This output can use KARI's data mentioned above and available tools from ESA and others.

14. **Output 3: Knowledge in adopting Earth observation-based solutions improved.** The resulting service will be implemented via a cloud platform with a user-friendly web interface to foster DMC uptake without major investments in local information technology infrastructure. This will include hosting the AI model, processing imagery, connecting to free and open data archives, and storage of the results. User training and knowledge products will also be disseminated.

15. These outputs will result in the following outcome: capacity of DMCs to use free and open multi-spectral satellite data improved.¹⁵ The TA will be aligned with the following impact: Use of advanced technologies in land use planning and natural resources management increased.¹⁶

C. Indicative Technical Assistance Budget and Financing Sources

16. The proposed TA budget is \$1 million, of which (i) \$500,000 will be financed on a grant basis by the Republic of Korea e-Asia and Knowledge Partnership Fund, and (ii) \$500,000 will be financed on a grant basis by the High-Level Technology Fund,¹⁷ both to be administered by ADB.¹⁸

D. Implementation Arrangements

17. The TA will be implemented from October 2020 to September 2023. ADB, through SDCC-DT, will be the executing agency and be responsible for overall supervision. It will report to the Thematic Advisory Service Cluster on TA progress, consult with relevant sector and thematic groups and operations departments during implementation. ADB will engage the consultants and carry out procurement following the ADB Procurement Policy (2017, as amended from time to time) and its associated project administration instructions and/or staff instructions. The indicative implementation arrangements are summarized in Table 1.

Table 1: Indicative Implementation Arrangements

Aspects	Arrangements
Indicative implementation period	October 2020 – September 2023
Executing agency	ADB, SDCC-DT

¹³ GEO-KOMPSAT 2B or Cheollian 2 is the Korea Aerospace Research Institute's geostationary orbit multifunctional satellite launched that can observe the generation, migration, and extinction of environmental pollutants and monitor marine. https://www.kari.re.kr/eng/sub03_02_02.do

¹⁴ Sentinel 3 is the European Space Agency's low Earth-orbit moderate sized satellite. Its main objective is to measure sea surface topography, sea and land use surface temperature, and ocean and land surface color with high accuracy and reliability to support ocean forecasting systems, environmental monitoring, and climate monitoring. <https://sentinel.esa.int/web/sentinel/missions/sentinel-3>

¹⁵ The design and monitoring framework is in Appendix 1.

¹⁶ Footnote 1.

¹⁷ Financing partner: the Government of Japan

¹⁸ To be submitted for funding approval.

Aspects	Arrangements		
Implementing agency	ADB, SDCC-DT		
Consultants	Package title	Selection method	Engaged by
	Firm	Quality cost-based selection (90:10)	ADB
	Individual	ICS	ADB
Disbursement	The TA resources will be disbursed following ADB's <i>Technical Assistance Disbursement Handbook</i> (2020, as amended from time to time).		

ADB = Asian Development Bank; ICS = individual consultant selection; TA = technical assistance; SDCC-DT = Digital Technology for Development Unit under the Sustainable Development and Climate Change Department.

Source: Asian Development Bank.

E. Application of Optional Provisions

18. The proposed optional provisions are summarized in Table 2:

Table 2: Proposed Optional Provisions

Optional Provisions	Indicative Scope of Application
Social media and websites	The cloud-based platforms will use existing systems in developing member countries. Existing resources in the Asian Development Bank (ADB) will also be used, such as the website and the Spatial Data Analysis Explorer, as applicable.

Source: Asian Development Bank

II. DELIBERATIVE AND DECISION-MAKING ITEMS

A. Risk Categorization

19. The TA is categorized as low risk because it does not involve an exception to a policy, cost recovery, knowledge partnership, integrity concern, or transfer of funds from ADB to other entities.

B. Scope of Due Diligence

20. The scope of due diligence is summarized in Table 3.

Table 3: Scope of Due Diligence

Items	Scope of Due Diligence
Items to be agreed in aide-mémoire or memorandum of understanding	
Social media and websites	Discussions with operations departments and sector and thematic groups on use of existing resources and website to disseminate results

Source: Asian Development Bank

C. Processing Schedule

21. The processing schedule by milestone is in Table 4.

Table 4: Processing Schedule by Milestone

Milestones	Expected Completion Date
1. Approval of Technical Assistance Concept Paper	September 2020
2. Technical Assistance Report approved	October 2020

Source: Asian Development Bank

PRELIMINARY DESIGN AND MONITORING FRAMEWORK

Impact(s) the TA is Aligned with Use of advanced technologies in land use planning and natural resources management increased ^a			
Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting Mechanisms	Risks
Outcome Capacity of DMCs to use free and open multi-spectral satellite data improved	By 2023, at least six ADB projects which use EO cloud-based technology are implemented (2020 Baseline: 2)	a. Finalized Aide Memoires and project progress reports	Change in investment priorities of DMCs with respect to the use of multi-spectral data in their projects
Outputs			
1. Cloud-based platforms operationalized	1a. By end 2021, two optimized cloud-based platforms made available and access to different datasets organized (2020 Baseline: 0)	1a. Quarterly progress reports, invitation letters to participate to Ministries	Uncertainty due to coronavirus disease pandemic restricts DMCs' ability to support TA activities
2. Integration of Earth observation technology solutions into projects supported	2a. By 2022, two projects using sets of multi-temporal satellite data processed and made available either via simple download or located in user workspace in the cloud (2020 Baseline: 0)	2a. Project progress reports and processed data	The raw multi-spectral data satellite not available in sufficient amount due to cloud cover
3. Knowledge in adopting Earth observation-based solutions improved	3a. By 2023, 40 government officials, 40% of which are women, confirm increased knowledge on EO-based solutions (2020 Baseline: 5) 3b. By 2023, 2 knowledge products, including how-to guides on the use of EO technology, completed (2020 Baseline: 0)	3a. Workshop proceedings, post-workshop surveys 3b. Knowledge products published online and disseminated	
Key Activities with Milestones			
<p>1. Cloud-based platforms operationalized</p> <p>1.1. Conduct consultations with prospective users to scope the different use-case scenarios (Q4 2020)</p> <p>1.2. Develop user technical requirements document (Q1 2021)</p> <p>1.3. Prepare detailed technical note on foreseen institutional impact (Q2 2021)</p> <p>1.4. Select and adopt cloud-based solutions among those available in SDCC-DT (Q2 2023)</p> <p>2. Integration of Earth observation technology solutions into projects supported</p> <p>2.1. Codesign with KARI the use of GEO-KOMPSAT integrated with Sentinel 3 multi-spectral data (Q4 2021)</p> <p>2.2. Integrate satellite data catalogs in the cloud and operational test of the AI engines (Q1 2022)</p> <p>2.3. Test AI results for selected projects (Q2 2022)</p> <p>2.4. Validate the results with direct engagement of ADB and DMCs stakeholders (Q2 2022)</p>			

<p>3. Knowledge in adopting Earth observation-based solutions improved</p> <p>3.1. Prepare training materials (Q3 2022)</p> <p>3.2. Deliver training modules 1 and 2 for selected DMCs (Q4 2022)</p> <p>3.3. Evaluate and assess direct engagement of ADB and DMCs stakeholders (Q1 2023)</p> <p>3.4. Adopt corrective actions and improvements (Q1 2023)</p> <p>3.5. Deliver training modules 3 and 4 for selected DMCs (Q1 2023)</p> <p>3.6. Deliver training modules 5 and 6 for selected DMCs (Q2 2023)</p> <p>3.7. Final reporting, user manuals and long-term sustainability documents submitted (Q3 2023)</p> <p>TA Management Activities</p> <p>Prepare and submit concise monthly reports delivered (Q3 2023)</p> <p>Organize two-day long annual progress review in DMCs, final review and final workshop in ADB Headquarters (Q2 2023)</p>
<p>Inputs</p> <p>Republic of Korea e-Asia and Knowledge Partnership Fund: \$500,000</p> <p>High-Level Technology Fund: \$500,000</p>
<p>Assumptions for Partner Financing</p> <p>Not Applicable</p>

ADB = Asian Development Bank, AI = artificial intelligence, DMC = developing member country, EO = Earth observation, GEO-KOMPSAT = Geostationary Korea Multi-Purpose Satellite, KARI = Korean Aerospace Research Institute, OP = operational priority, Q = quarter, SDCC-DT = Digital Technology for Development Unit of the Sustainable Development and Climate Change Department, TA = technical assistance.

^a ADB. 2018. *Strategy 2030: Achieving a Prosperous, Inclusive, Resilient, and Sustainable Asia and the Pacific*. Manila Source: Asian Development Bank.