

Country Name	Digital Topographic Mapping Project for the Bamako Metropolitan Area
Republic of Mali	

I. Project Outline

Background	Due to economic growth in West Africa, the population of Bamako, the capital of Mali, markedly increased from about 1 million in 1998 to 1.8 million in 2009. Particularly in the peripheric area of the city where suburban sprawl occurred, essential infrastructural facilities, such as transportation, water supply, hospitals, and schools were not sufficiently provided. It resulted in deteriorating living conditions and public security in the area. Furthermore, the lack of such facilities would impede its socio-economic development of the country. It was also palpable that needed infrastructure construction required deliberate planning based on updated data and accurate information including the wider areas to account for the suburban sprawl above.		
Objectives of the Project	Through the production of 1:5,000 scale digital topographic maps and GIS data and training to Institut Géographique du Mali (IGM), the project aimed to assist the sustainable socio-economic development planning, thereby contributing to the improvement of urban infrastructure and thus living conditions in the Bamako metropolitan area. 1. Expected Goals through the proposed plan ¹ : the utilization of the digital topographical map expedites the improvement of living conditions and urban infrastructure in Bamako and the surrounding area.		
Activities of the Project	1. Project site: Bamako metropolitan area (520 km ²) and Bamako and its surrounding area (1,400 km ²) 2. Main activities: (1) produce 1:5000-scale digital topographic maps and orthophotos; (2) produce Geographic Information system (GIS) data; (3) conduct technical training for IGM 1. Inputs (to carry out the above activities) Japanese Side (1) Mission Members: 10 persons (2) Trainees Received: 2 persons (3) Equipment: Digital mapping equipment (UPS, GPS digital Cameras, software, etc.), Printers, PCs, servers, etc. Malian Side (1) Staff allocated: 13 persons (2) Office space: Project office for Japanese experts and its utility costs (3) Operation expenses		
Project Period	February 2015-October 2016 (Extension Period: September 2016-October 2016)	Project Cost	(ex-ante) 428 million yen (actual) 633 million yen
Implementing Agency	Ministry of Equipment, Transport, and Rural Development Institut Géographique du Mali (IGM)		
Cooperation Agency in Japan	Asia Air Survey Co., Ltd.		

II. Result of the Evaluation

I Relevance
<Consistency with the Development Policy of Mali at the Time of the Ex-Ante Evaluation> The project was consistent with the development policies of Mali at the time of ex-ante evaluation. As the Government of Mali addressed the infrastructure development in the Second Poverty Reduction Strategy, the topographic map was regarded as a basis for formulating various development plans. The Government of Mali also proclaimed an ordinance for the establishment of the cabinet council and national committee on GIS data and setting-up the Inter-ministerial Committee for Geographic Information (Conseil Interministériel d'Information Géographique: CIIG) ² in 2002, with the objectives of developing and facilitating the application of GIS data in public organizations. Based on the results of CIIG's coordination activities, the National Policy of Geographic Information (Politique Nationale d'Information Géographique: PNIG) was approved by the Cabinet in 2012. To substantiate the policy, the Action Plan (2012-2016) was thus addressed to further enhance the utilization of GIS data.
<Consistency with the Development Needs of Mali at the Time of the Ex-Ante Evaluation> The project was consistent with the needs of Mali at the time of ex-ante evaluation. There was a growing need for creating large-scale topographic maps for updating the urban development master plan. But they had only the technology for creating medium-scale (1/50,000) topographic maps. Because of this discrepancy between the information on the maps and the actual situation, the available maps fail to satisfy the demand for geographic information of the actors in the development of the Bamako metropolitan area including government and donor organizations involved in the urban planning sector and private developers. Large-scale geospatial information was important for urban planning of the metropolitan area as well as to share data with other relevant ministries and agencies, which would enable them to engage in effective planning and implementation of various development projects.
<Consistency with Japan's ODA Policy at the Time of the Ex-Ante Evaluation>

¹ The degree of achievement of expected goals is not to be assessed in principle at the time of ex-post evaluation, since it is defined as the medium-to-long-term goals which will be attained as a result of crystallizing the proposed plan ("output" of the project).

² CIIG is to serve public organizations on a wider scale, along with the establishment of the National Committee for Geographic Information (Comité National d'Information Géographique: CNIG) for the central government and the Regional Committee for Geographic Information (Comité Régionale d'Information Géographique: CRIG) for the local governments. As the secretariat of CNIG, IGM has coordinated with 42 organizations, consisting of ministries, agencies, universities, and research institutes in terms of the development of map data, code standardization, metadata, and geographic information policy.

The project was consistent with Japan's ODA policy for Mali³. Japan supported the sustainable development of Mali at the time of ex-ante evaluation. The Government of Mali announced the "Mali Sustainable Reconstruction Plan" in May 2013. Considering the essential common denominator among multiple policy areas, Japan's assistance was to support the improvement of basic human needs and economic recovery to ensure compatibility with the peace and stability of the country.

<Evaluation Result>

In light of the above, the relevance of the project is high.

2 Effectiveness/Impact

<Status of Achievement for the Objectives at the time of the Project Completion>

The objectives of the project were achieved by the time of the project completion. As planned in the project, 1:5,000-scale digital topographic map data set (520 km²), GIS Data (520km²), and orthophoto maps of the Bamako metropolitan area (approximately 1,400 km²) were produced along with technology transfer for creating and/or updating the maps at the disposal of IGM.

<Utilization Status of the Proposed Plan at the time of the Ex-post Evaluation>

The proposed plan has been utilized at the time of the ex-post evaluation. The products by the project were utilized in the formulation of the socio-economic development plan and/or national land planning (Indicator 1). The Geographic Information Management Center (Centre de Gestion de l'Information Géographique: CGIG) IGM promoted the updated digital topographic maps and the other products of the project. As a result, those maps and products were used to serve the objectives of each public and private institution from the perspective of improving public goods and services.

<Status of Achievement for Expected Goals through the Proposed Plan at the time of the Ex-post Evaluation>

The expected goals through the proposed plans have been achieved. The utilization of the digital topographical map was deemed to expedite the improvement of living conditions and urban infrastructure in the target area (Indicator 1). In terms of public safety and security, improvement of traffic safety, fire protection, and security enforcement resulted from the applications of the maps and the products of the project. Likewise, regarding health and sanitation, they were used for the enhancement of water supply, drainage system, healthcare facilities, and waste treatment and waste disposal. Furthermore, regarding people's livelihood, they were used for updating a tourist map, school distribution, and urban planning.

<Other Impacts at the time of the Ex-post Evaluation>

As the digital topographic map was instrumental for urban planning, environmental ramifications were observed such as deforestation entailed for the expansion of the suburban area of Bamako. On the other hand, several positive impacts were observed due to better planning. Notable cases are the creation of income generation activities for women (e.g. vegetable gardening and commercial activities in the vicinity to local marketplaces) in new habitation areas and new precautionary measures taken by identification of flood-prone areas.

<Evaluation Result>

In light of the above, the effectiveness/impact of the project is high.

Status of Achievement of Utilization Status of the Proposed Plan and Expected Goals through the Proposed Plan

Aim	Indicators	Results																	
Utilization Status of the Proposed Plan The updated digital topographic map is utilized in the formulation of the socio-economic development plan and/or national land planning.	(Indicator 1) The utilization status of the digital topographic maps at relevant organizations (directorates related to city planning and housing, Bamako municipality government, etc)	(Ex-post Evaluation) Achieved The updated digital topographic maps and the other products became available to public and private institutions listed below. <ul style="list-style-type: none"> ➤ the National Institute of Statistics ➤ Peacekeeping Missions in Mali ➤ Higher education & research institutions ➤ the National Directorate of Land Registry ➤ EDM-SA (electric power company in Bamako and metropolitan area) ➤ Société Malienne de Gestion de l'Eau Potable (SOMAGEP) (water supply Company) ➤ Private consulting firms such as GeoConsult and NGOs <p>The digital topographic maps and products of the project were used extensively in the public and private/NGO sectors on their initiatives and needs. Notable examples of applications are as follows.</p> <ul style="list-style-type: none"> • the National Directorate of Land Registry used digital topographic maps for proposing candidate sites for the installation of certain national infrastructures. • The electric power company used orthophotos for the installation of power lines. • The water supply company used orthophotos to locate certain clients. • Expert Surveyors, Town Planners, and some Architects used the topographic map to make location plans for their projects. <p style="text-align: center;">Table 1: Utilization Status of the Maps and Products in Projects/Plans</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Utilized Area</th> <th>Organization</th> <th>Project/Plan</th> </tr> </thead> <tbody> <tr> <td>Cartography</td> <td>IGM</td> <td>Map of Bamako (updated version)</td> </tr> <tr> <td>Cooperation</td> <td>Embassy of France</td> <td rowspan="5">Master Plan of Bamako (* an inventory plan highlighting landscape elements, existing infrastructure, facilities, public squares, and tourist information)</td> </tr> <tr> <td>Public Security</td> <td>Ministry of Defense</td> </tr> <tr> <td>Cadastral Survey</td> <td>TOPO Mandé (survey firm)</td> </tr> <tr> <td>Sanitation</td> <td>OZONE Mali (waste management company)</td> </tr> <tr> <td>Private sector</td> <td>IGIP (international consulting firm)</td> </tr> </tbody> </table>	Utilized Area	Organization	Project/Plan	Cartography	IGM	Map of Bamako (updated version)	Cooperation	Embassy of France	Master Plan of Bamako (* an inventory plan highlighting landscape elements, existing infrastructure, facilities, public squares, and tourist information)	Public Security	Ministry of Defense	Cadastral Survey	TOPO Mandé (survey firm)	Sanitation	OZONE Mali (waste management company)	Private sector	IGIP (international consulting firm)
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³ Ministry of Foreign Affairs, "ODA Country Databook" (2014)

		Design office	JV of LCI/GIC/SA	
		NGO	Sasakawa Peace Foundation	
		Agronomic research	CIRA(Consulting e Engineering and Applied Research)	Applied research
		Humanitarian	International NGOs (e.g. AID International)	Projet d'Appui au Mali Humanitarian Projects in the area of health and nutrition and integration of new sectors such as protection (psychological support for survivors of gender-based violence) and water, hygiene, and sanitation.
		Microcredit	MICROCRED Mali	Microcredit plan
		Road network	The Directorate in charge of National Road	Road plan
		Water supply	SOMAGEP	Water supply network
		Land Cadastre Management	The Directorate in charge of the Cadastral plan	Cadastral map
		Electrification	EDM-SA	Power network plan

Source: IGM

<p>Expected Goals through the Proposed Plan</p> <p>The updated digital topographical map is utilized in the formulation of the socio-economic development plan and/or national land planning.</p>	<p>(Indicator 1)</p> <p>Development projects realized by utilizing digital topographic maps (e.g. road and water and sewage infrastructure development, etc.)</p>	<p>(Ex-post Evaluation) Achieved</p>			
		<p>Table 2: Applied Target Areas for the Improvement of Living Conditions and Urban Infrastructure in Bamako and the surrounding area</p>			
		Applied Target Areas/Urban infrastructure	Leading/Responsible Organization	Utilization Status.	
		Safety and Security			
		Traffic safety	National Road Safety Agency (Agence Nationale de la Sécurité Routière: ANASER)	the road map of the District of Bamako derived from project data	
		Fire prevention	National Directorate of Civil Protection (Direction Nationale de la Protection Civile: DNPC)	Elaboration of the National Contingency Plan	
		Public security	United Nations Security Mission in Mali (Mission des Nations Unies pour la Sécurité au Mali : MINUSMA)	Planning for peacekeeping operations	
		Health and Sanitation			
		Water supply, drainage system	SOMAGEP	orthophoto set	
		Healthcare facilities	National Directorate of Health (Direction Nationale de la Santé: DNS)	health infrastructure data	
		Waste treatment and waste disposal	National Directorate of Sanitation and Pollution and Nuisance Control (Direction Nationale de l'Assainissement et du Contrôle des Pollutions et Nuisances : DNACPN)	Identification of favorable sites for dumping sites and final disposal sites	
		People's Livelihood			
		Tourist map (monuments, hotels)	Mali Tourist Promotion Agency (Agence de la Promotion Touristique du Mali)	the Bamako Master Plan derived from project data	
School distribution	Ministry of Higher Education and National Education (Ministère de l'Enseignement Supérieur et de l'Education Nationale)	School Infrastructure Data			
Urban planning	National Directorate of Town Planning and Housing (Direction Nationale de l'Urbanisme et de l'Habitat)	habitational data, status of areas of interest			

Source: Information provided by IGM

3 Efficiency

Project cost and period both exceeded the plan (ratio against the plan: 148% and 105%, respectively). Although the project was temporarily suspended during the course of implementation due to the political situation in the country, the outputs were produced as planned. Therefore, the efficiency of the project is fair.

4 Sustainability

<Policy Aspect>

“The National Geographic Information Policy” (2020-2024) has explicitly addressed the importance of quality geographic information. To promote this, the policy has specified the following strategic objectives to be achieved: (1) to develop a national spatial data infrastructure; (2) to reinforce the capacity of actors involved in production and management of geographic information; (3) to strengthen multiple aspects of cooperation in the field of geographical information; (4) to implement a communication and information flow strategy between various partners and actors/users concerning geographic information.

< Institutional/Organizational Aspect>

A steering role collectively attached to IGM (including CGIG), CIIG, and the National Committee for Geographic Information (CNIG) has remained unchanged structurally and legally to promote geographic information at the central level. Concerning the manpower for the matter, it was considered generally sufficient in IGM and relevant institutions as the staffing need has been mostly accommodated since the decree stipulating the structure was effective in 2002.

<Technical Aspect>

According to the survey result, it was deemed IGM incapable yet of gaining mastery in advanced digital photogrammetry, digital mapping, and GIS techniques as it would like, due to lack of access to the latest equipment and a suitable training program for technical staff members. In order to accomplish the organizational goals, IGM needed to further strengthen in several technical aspects such as (1) to operationalize geoportals to coordinate all the tasks and activities for production and management of geographic information, and wide dissemination of products and services; (2) to establish a nation-wide network of well-equipped permanent stations for a geodetic survey; (3) to master maintenance techniques for topographic and cartographic equipment to better assist professionals in the related fields. Considering the challenges, it had even more room for technical improvement in a self-sustaining way.

<Financial Aspect>

According to the survey result, IGM secured a budget for “the Five-Year Action Plan” (2012-2016). The provisional budget was 6,284 million CFA Franc, whereas the actual disbursement was 5,300 million CFA Franc. In the meantime, 4 million CFA Franc was funded by the European Union within the framework of the “Project for the rehabilitation of the topographic map at 1/200,000 scale.” The project was to assist technology transfer and to provide training IGM staff members in France to produce the map of the scale. 1,500 million CFA Franc was disbursed from the National Budget to complete the 1/200,000 mapping project and start the implementation of the Mali Geodetic Reference Network Project (RGRM). However, to achieve the organizational goals, the accrual-basis deficit was palpable, and insufficient level of the budget in light of the required funding level to cover comprehensive implementation of the Action Plan: creation and operation of the CGIG; capacity building of stakeholders; strengthening of cooperation and implementation of the communication strategy. Thus, it has still been limited by the given budget.

<Evaluation Result>

In light of the above, some problems have been observed in terms of the technical and financial aspects of the implementing agency. Therefore, the sustainability of the effectiveness through the project is fair.

5 Summary of the Evaluation

The 1:5,000-scale digital topographic map data set, GIS Data, and orthophoto maps of the Bamako metropolitan area were produced by the project as planned. With regards to the utilization of the updated map data, they extensively served the objectives of each public and private institution from the perspective of improving public goods and services. As a result, the map data expedited the improvement of living conditions and urban infrastructure in the target area after project completion. As for sustainability, the organizational setting is underpinned by the basic policy of the Malian government. On the other hand, in terms of the technical aspect, IGM and related institutions were not amply reinforced to the extent of being capable of following up on constantly evolving technology in the field. Also, the national budget was not fully allocated to suffice the implementation of the planned activities. As for efficiency, the project cost and the project period exceeded the plan.

Considering all of the above points, this project is evaluated to be satisfactory.

III. Recommendations & Lessons Learned

Recommendations for Implementing Agency:

Recommended areas to be addressed are as follows.

- The management board of the CGIG of IGM should make the authority aware of the need to expedite the regulatory procedure in order to mandate and organize its operations in due course.
- The promotion of the use of the products must be further reinforced through the strengthening of the capacities of the CGIG.
- IGM should exercise prudence over budget secured not only for the implementation of the Action Plan 2021-2025 but also to cover the unexecuted activities of the previous Action Plan.

Lessons Learned for JICA:

In the case of the master plan project (e.g. digital mapping project), it would be essential for JICA to raise authorities' awareness of the significance of the application of the results and to confirm the entailed law enforcement of the relevant reforms in parallel such as decrees and other regulatory documents throughout the implementation since there would be a time lag between the technical validation and the political validation that require for the subsequent application of the results of the project. It is a common practice to take several years after the end of the project for the authorities to make an official decision to grant the enforcement in the form of an issued decree for the application of the master plans. And the project is no exception that to date, no revision of the relevant law to enhance the further application of the

results has been confirmed. Thus, it is necessary to take a preparatory step to make the authorities amply aware of the merits and benefits of the study project so that they would be motivated enough to expedite the process of the use and application of the technical results of the master plan projects even after project completion.



An Excerpt of a Map of Bamako (scale of 1/5,000)



A Road Map of Bamako