

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
SURVEY OF BANGLADESH (SOB)**

**BANGLADESH DIGITAL MAPPING
ASSISTANCE PROJECT
(BDMAP)**

Final Report

March 2012

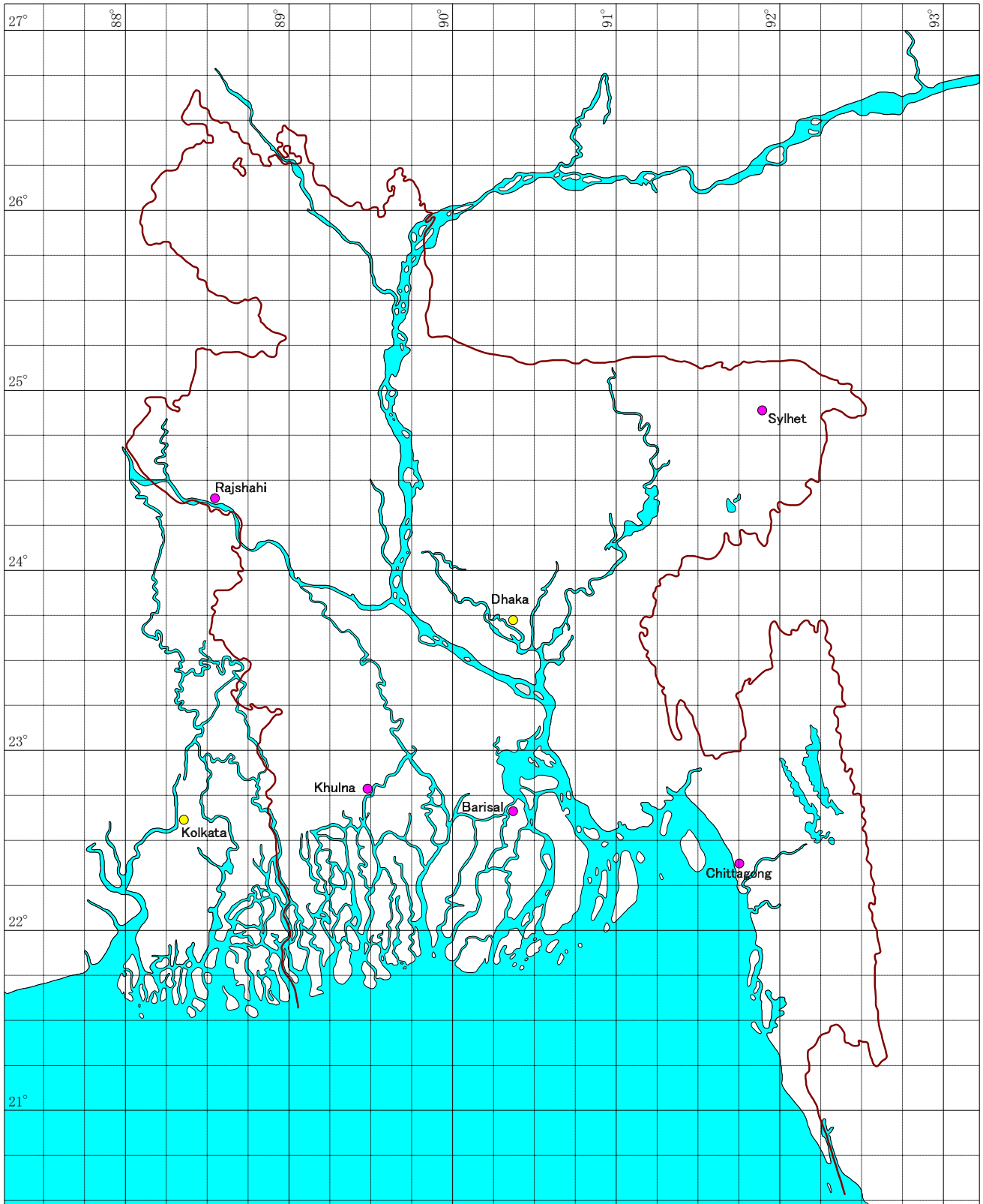
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Exchange Rate

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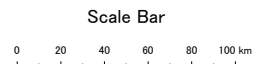
Location Map



1:50,000 scale existing topographic map sheet

International boundary

Target 5 cities for 1:5,000 scale digital topographic mapping:
Chittagong, Barisal, Khulna, Sylhet, Rajshahi



List of Abbreviations

AVR	Automatic Voltage Regulator
BDMAP	Bangladesh Digital Mapping Assistance Project
BMs	Bench Marks
Brig. General	Brigadier General
CAD	Computer Aided Design
Col.	Colonel
DEM	Digital Elevation Model
DRGA	Debt Relief Grant Assistance
DTM	Digital Terrain Model
EVM	Earned Value Management
M/M	Man Month
GIS	Geographic Information System
GPS	Global Positioning System
GSI	Geospatial Information Authority of Japan (former Geological Survey Institute of Japan)
IDMS	Improvement of Digital Mapping System in Bangladesh
JCC	Joint Coordination Committee
JICA	Japan International Cooperation Agency
JAXA	Japan Aerospace Exploration Agency
L/C	Letter of Credit
Lt. Col.	Lieutenant Colonel
OS	Operation System
PDM	Project Design Matrix
RESTEC	Remote Sensing Technology Center of Japan
SOB	Survey of Bangladesh
SPI	Schedule Performance Index
UPS	Uninterruptible Power Supply System
3D	3 dimension

Photos



Meeting between SOB and BDMAP



Lecture of project management



Basic training of Computer and software



Training of eccentric survey



Technical training of digital plotting



Establishment of air photo signal and
GPS observation by the staff of SOB

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Chapter 1 Outline of the Project

Chapter 1 Outline of the Project

The outline of BDMAP and IDMS are as follows:

1.1 Background of the Project

Survey and mapping in Bengal Region was started by the Survey of India under the British rule. After the independence of Bangladesh from Pakistan, a regional office of the Survey of Pakistan for East Pakistan was reorganized as Survey of Bangladesh (SOB). Due to the reason of a history in survey and mapping in Bangladesh, following problems were the bottlenecks of survey and mapping in Bengal Region.

- 1) No geodetic datum point in Bangladesh.
- 2) Geodetic control points were not distributed homogeneously.
- 3) Leveling network was divided into two parts by the Padma River.

The first Japanese technical cooperation program in the field of survey and mapping in Bangladesh was the topographic mapping and bathymetric survey for the construction of Megna Bridge at the several years after the independence of Bangladesh.

After that, the Government of Japan has executed following technical cooperation programs continuously to Survey of Bangladesh.

- 1) Feasibility study on establishing national geodetic network
- 2) Installation of advanced map printing equipment
- 3) The study on urban information management for greater Dhaka City
- 4) Dispatching long term and short term experts
- 5) Geographic and mapping training in Japan

The present 1:50,000 scale national base maps covering whole territory of Bangladesh has been prepared at approximately 60~70 years ago, and were not updated excepting partial updating. Considering the increase of demands of new maps, the Government of Bangladesh decided to prepare new 1:25,000 scale digital topographic maps covering whole territory and 1:5,000 scale digital topographic maps covering 5 major cities (Improvement of Digital Mapping System in Bangladesh : IDMS) suing DRGA fund.

The Government of Japan decided to support this Project on a technical aspect and also planning and management aspects, and technical cooperation program “Bangladesh Digital Mapping Assistance Project (BDMAP)” was started from August 2009.

1.2 Project purpose and outputs

The overall goal and project purpose of “Bangladesh Digital Mapping Assistance Project” (BDMAP) is set down as follows. The details of BDMAP are shown in Appendix 10.1 “PDM of BDMAP (Version 0.1, 24 November 2008) and Appendix 10.2 “PDM of BDMAP (Version 2.0, August 2009)”.

1.2.1 Overall goal

SOB implements the Project of “Improvement of Digital Mapping System of Survey of Bangladesh” (IDMS: 1:25,000 scale digital topographic mapping covering whole Bangladesh territory and 1:5,000 scale digital topographic mapping at major 5 cities).

1.2.2 Project purpose

Technical staff of SOB will develop their skills enough to implement the digital mapping in the scale of 1:5,000 and 1:25,000 of IDMS.

1.3 Project site

The project sites of IDMS are as follows:

- 1) 1:25,000 scale digital topographic mapping area
Whole Bangladesh territory: Approximately 144,000 km²

 - 2) 1:5,000 scale digital topographic mapping area
Major 5 cities
- | | |
|------------|-----------------------|
| Sylhet | 178 km ² |
| Rajshahi | 185 km ² |
| Chittagong | 575 km ² |
| Khulna | 329 km ² |
| Barisal | 148 km ² |
| <hr/> | |
| Total | 1,417 km ² |

1.4 Project implementation system

The project implementation system of BDMAP and IDMS is shown in Figure 1.4.1 “Implementation Structure of BDMAP and IDMS”.

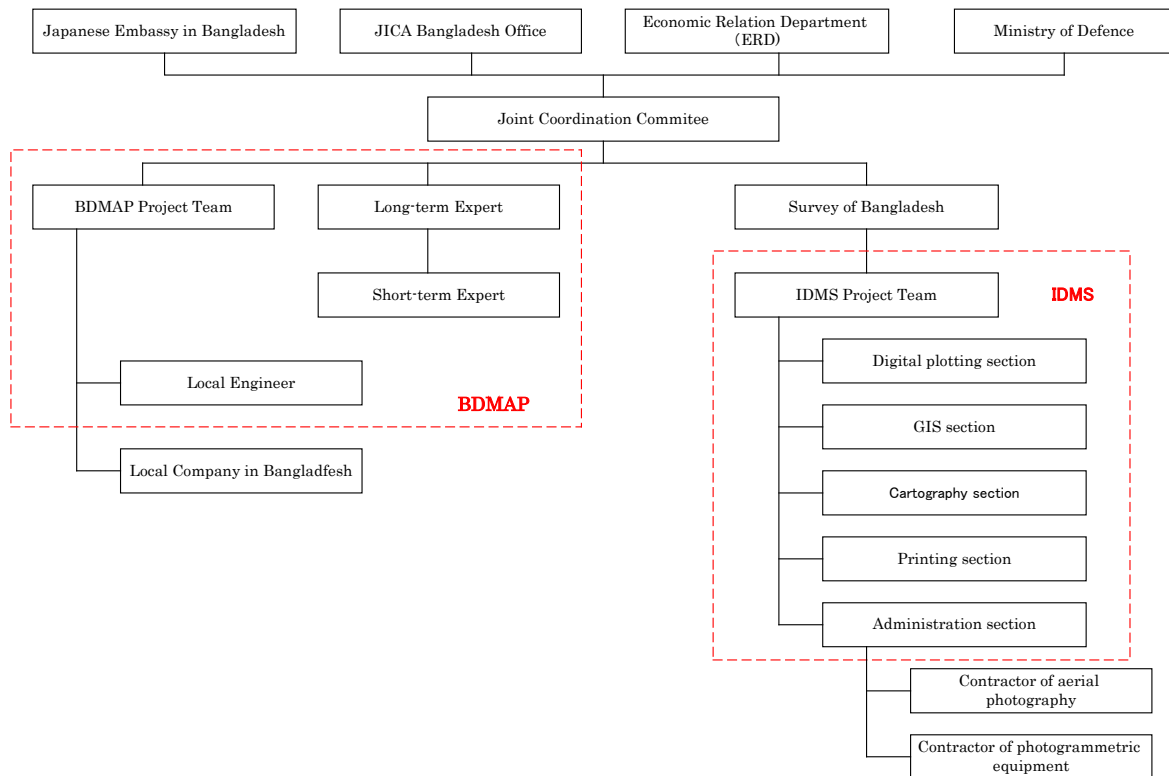


Figure 1.4.1 Implementation structure of BDMAP and IDMS

1.5 Points to be considered in the implementation of the Project

The target of IDMS is to produce 1:25,000 and 1:5,000 scale digital topographic mapping by SOB, and the target of BDMAP is to support the activities of SOB for the smooth implementation of IDMS by SOB. Therefore, IDMS and BDMAP have a close relationship with each other, and the schedule and activities of BDMAP has to be modified according to the progress of IDMS flexibly.

Especially, the schedule of procurement of photogrammetric equipment and software, aerial photography and renovation of working space has a great impact to the work schedule and activities of BDMAP. Therefore, during implementation of BDMAP, it is necessary to check and monitor the progress of IDMS always, and modify the schedule and activities of BDMAP to meet the change in the progress and schedule of IDMS.

In case of a big project such as IDMS, many issues will arise during the implementation of the project and it is necessary to solve the issues immediately to minimize the delay in the schedule of the project.

Generally, it is difficult to execute the project on schedule. Therefore, checking and monitoring

of the progress of the project and early trouble shooting are the important factors for the implementation of the project.

Chapter 2 Important Assumptions of BDMAP

Chapter 2 *Important Assumptions of BDMAP*

The important assumptions and the issues on the implementation of BDMAP are as follows:

2.1 Important assumptions of BDMAP

The important assumptions of BDMAP that were defined on PDM (Version 0.1, 24 November 2008) by the JICA Preliminary Study Team are as follows:

- 1) Necessary budget to produce digital map and database will be continuously allocated to SOB.
- 2) The other technical areas which are not subjects of JICA technical transfer project also have enough ability to conduct IDMS.
- 3) Trained staff of SOB is retained in their department during the project implementation.
- 4) Procurement of necessary equipment is done according to the schedule by SOB.
- 5) Aerial photo is taken according to the schedule by SOB.
- 6) Adequate number of technical staff of SOB will be assigned.

Furthermore, the BDMAP set down an additional important assumption as follow:

- 7) Renovation of enough working space for IDMS will be executed according to the schedule by SOB.

2.2 Issues on the important assumptions and its situation

The issues and situation concerning the above-mentioned seven (7) important assumptions were as follows:

2.2.1 Necessary budget to produce digital map and database will be continuously allocated to SOB

It was judged that the budget for the implementation of IDMS was secured by the Government of Bangladesh.

2.2.2 SOB has enough ability to conduct IDMS in other technical areas which are not covered by JICA transfer technical project

Not only the technical skill of digital photogrammetric mapping, but also the project planning and management capabilities are essential for the smooth implementation of IDMS. However, the staff of SOB does not sufficient capability of project planning and management for the implementation of big project such as IDMS.

The purpose of BDMAP is to execute the technical transfer of digital photogrammetric mapping to the staff of SOB so that they can execute the digital photogrammetric mapping of IDMS.

The purpose of IDMS is to prepare the 1:25,000 scale digital topographic maps covering whole country and 1:5,000 scale digital topographic maps covering 5 major cities except Dhaka city and to supply the outputs of IDMS to users.

Therefore, it was judged that the build up and level up of project planning and management capabilities of the staff of SOB was absolutely necessary for the smooth implementation of IDMS by SOB.

2.2.3 Trained staff of SOB is retained in their department during the project implementation

Several persons have been removed from IDMS or newly joined to IDMS during the implementation of IDMS from September 2009 up to the end of February 2012. However, no serious problems occurred by these personnel changes.

2.2.4 Procurement of necessary equipment is done according to the schedule by SOB

According to the original plan of IDMS, the procurement of photogrammetric equipment and software will be completed by the end of November 2009, and the technical training by BDMAP will be executed from around the beginning of December 2009 using the equipment and software that will be procured by SOB.

However, the tender for the procurement of photogrammetric equipment and software has been decided as a cancel on October 2009 by the Government of Bangladesh and fresh tender (2nd tender) was executed by SOB. Unfortunately, this fresh tender (2nd tender) also has been decided as a cancel by the Government of Bangladesh on May 2010, and new fresh tender (3rd tender) has been executed by SOB immediately after the decision by the Government of Bangladesh.

This new fresh tender (3rd tender) was approved by the Government of Bangladesh and the contract between SOB and the contractor was concluded in October 2010. The schedule of delivery and setting up of the photogrammetric equipment and software agreed between SOB and the contractor was as follow:

- 1) Delivery and setting up of photogrammetric equipment and software:
From the end of December 2010
- 2) Delivery and setting up of digital compilation and GIS equipment and software:
From the middle of January 2011
- 3) Delivery and setting up of server:
From the end of February 2011

Note: According to the contract between SOB and the contractor, the site training by the contractor will be executed immediately after completion of the delivery and setting up of equipment and software.

However, due to the reason of the delay of L/C procedure and so on, the schedule of delivery and setting up of photogrammetric equipment and software and so on was estimated as mentioned below at the end of February 2011.

- 1) Setting up of air conditioner, UPS and AVR
From the end of February 2011 to the middle of March 2011
- 2) Setting up of photogrammetric equipment and software
From the middle of March 2011 to the middle of April 2011
- 3) Setting up of LAN
From the end of March 2011 to the middle of April 2011
- 4) Site training in SOB
From the middle of April 2011 to the middle of May 2011

However, the actual schedule of delivery and setting up of equipment and software and site training delayed approximately one (1) month from the above-mentioned schedule. Accordingly, the procurement of photogrammetric equipment and software was delayed approximately 18 months from the original schedule (End of November 2009).

2.2.5 Aerial photo is taken according to the schedule by SOB

At the time of the starting of BDMAP on September 2009, the tender for aerial photography was already had been executed by SOB, and SOB was waiting for the approval by the Government of Bangladesh.

According to the original schedule of IDMS, the aerial photography will be started from around December 2009. However, this tender for aerial photography was finally decided as a cancel by the Government of Bangladesh on October 2009.

SOB executed the fresh tender (2nd tender) for aerial photography immediately after the decision by the Government of Bangladesh, and this fresh tender (2nd tender) was approved by the Government of Bangladesh and the contract between SOB and the contractor was concluded on October 2010.

The preparation work for aerial photography such as aerial photography planning and preparation of the necessary permission for aerial photography was started from the beginning of November 2010. Two aircrafts arrived at Dhaka air port and the actual aerial photography works were started from the beginning of December 2010.

Accordingly, the schedule of aerial photography delayed approximately twelve (12) months from the original schedule (December 2009).

2.2.6 Adequate number of technical staff of SOB will be assigned

Necessary numbers of staff were assigned for the implementation of IDMS by SOB. However, the issues are the technical level and experience of digital photogrammetric mapping of the staff of SOB.

The young generation of the staff of SOB, such as a newly recruited staff of SOB, do not have enough experience in actual works of survey and mapping, or completely no experience in actual works of survey and mapping including photogrammetric mapping. However, young generation has knowledge and an experience in computer operation on some level and it was considered that they may have a adaptability of computer operation of digital photogrammetric mapping.

Meanwhile, the old generation of the staff of SOB does not have enough basic knowledge of computer, or completely no experience in computer operation.

Considering the work volume of IDMS, SOB had to assign many staff of SOB to IDMS. The

total number of staff necessary for the implementation of IDMS was considered as approximately 200 persons for aerial triangulation, digital plotting, DEM and orthophoto making, GIS basic data production and digital compilation.

However, the human resources of SOB for digital photogrammetric mapping were limited. Therefore, SOB had to assign newly recruited staff and old generation staff to IDMS to secure the total number of personnel necessary for the implementation of IDMS even though some of the staff has no experience in actual work and basic knowledge on survey and mapping, and computer operation.

Therefore, BDMAP had to execute basic training of survey and mapping, especially photogrammetric mapping, and also computer operation to the staff of SOB before starting the actual technical training of digital photogrammetric mapping to the staff of SOB.

2.2.7 Renovation for enough work space in SOB will be executed according to the schedule by SOB

The renovation of work space for IDMS was completed by the end of December 2009 and these working spaces were used for the technical training and lecture by BDMAP and SOB.

2.3 Influence caused by the change of the important assumptions and countermeasures by BDMAP and SOB

The changes of the important assumptions of BDMAP and its influences are summarized as follows:

2.3.1 Countermeasures for “SOB has enough ability to conduct IDMS in other technical areas which are not covered by JICA transfer technical project ”

Due to the reasons of lacking of project planning and management capabilities of the staff of SOB, following issues were found during the technical training to the staff of SOB and the implementation of IDMS.

- 1) Staff of SOB could not make an implementation plan of IDMS including project implementation schedule by themselves.
- 2) Staff of SOB could not execute the project management of IDMS by themselves.
- 3) Staff of SOB could not make a technical training program and manage the training program

by themselves.

Therefore, BDMAP decided to execute the lecture and practical training of the project planning and management to the staff of SOB through the implementation of the 2nd year of BDMAP as follows:

- 1) The implementation plan of each section of IDMS was made by the section in charge and team leaders, and BDMAP assisted the preparation of implementation plan.
- 2) The lecture of project planning and management was executed to the main staff of IDMS.
- 3) The technical training program was made by the section in charge and team leaders, and BDMAP assisted the preparation of technical training program and management of technical training.

2.3.2 Countermeasures for “Procurement of necessary equipment is done according to the schedule by SOB”

Due to the delay in the procurement of photogrammetric equipment and software by approximately eighteen (18) months, following were occurred on the technical training to the staff of SOB.

- 1) The photogrammetric equipment and software which will be procured by SOB was not able to be used for the technical training to the staff of SOB. Therefore, it was difficult to execute the technical training to the staff of SOB according the original plan of BDMAP.
- 2) BDMAP decided to bring the digital plotting systems from Japan for the technical training to the staff of SOB. However, due to the reason of the limited number of digital plotting systems to be able to be used for the technical training to the staff of SOB, the technical training time (Actual training hours) per one person was less comparing to the original plan of BDMAP.
- 3) The digital plotting systems that were brought from Japan by BDMAP were not the same as the final digital plotting systems which were procured by SOB. Therefore, an additional training to master the operation of the final digital plotting systems was necessary immediately after the completion of setting up the photogrammetric equipment and software to SOB and before starting actual work of IDMS.
- 4) Due to the delay of the procurement of photogrammetric equipment and software, the equipment and software to be procured by SOB were not yet decided during the implementation of technical training to the staff of SOB. Therefore, it was difficult to

prepare the operation manuals for the software and equipment to be used at the implementation of IDMS by SOB. Therefore, the tentative operation manuals were prepared and the technical training to the staff of SOB was executed based on these tentative operation manuals.

Concerning the above-mentioned issues, BDMAP took the following countermeasures to solve these issues as much as possible.

- 1) Five (5) sets of desktop computers procured by BDMAP were decided to be used for the technical training to the staff of SOB, and the digital plotting software, aerial triangulation, DEM and orthophoto software were brought from Japan by BDMAP. Other software and computers were prepared by SOB.
- 2) BDMAP prepared eight (8) sets of digital plotting system to be used for the technical training of digital plotting, aerial triangulation, DEM and orthophoto making on the 1st year of BDMAP. However, due to further delay of procurement of photogrammetric equipment by SOB, four (4) sets of digital plotting systems were added for the efficient technical training to the staff of SOB on the beginning of the 2nd year of BDMAP. Finally, total twelve (12) sets of digital plotting systems were used for the technical training to the staff of SOB.
- 3) The software for the digital plotting, DEM and orthophoto making and aerial triangulation, which were procured by SOB, was different from the software used for technical training to the staff of SOB by BDMAP. Therefore, it was necessary to execute an additional training to the staff of SOB to become familiar with the new software of digital plotting, aerial triangulation and so on after completion of the installation of equipment and software to SOB. However, due to the delay of the delivery of equipment and software and site training by the contractor, BDMAP had not enough time for the additional training to the staff of SOB in the 2nd year of BDMAP.
- 4) The operation manuals prepared in the 2nd year of BDMAP were the preliminary version due to the reason of the delay of the procurement of photogrammetric equipment and software by SOB. Final version of operation manuals was prepared in the 3rd year of BDMAP after the delivery and installation of photogrammetric equipment and software to SOB by the contractor.

2.3.3 Countermeasures for “Aerial photo is taken according to the schedule by SOB”

Due to the delay of the start of aerial photography by SOB, following issues occurred for the implementation of IMDS Project.

- 1) Actual works of IDMS delayed by approximately 12 months.
- 2) There were no digital aerial photos which can be used for the technical training to the staff of SOB such as digital plotting, aerial triangulation and so on.

Concerning the above-mentioned issues, BDMAP took the following countermeasures to solve these issues.

- 1) To minimize the delay in the schedule of IMDS Project, pricking of the existing BMs started from the 1st year of BDMAP so that aerial triangulation can be started immediately after the completion of aerial photography.
- 2) The sample aerial photos and ground control point survey results were brought from Japan to Bangladesh for the technical training of digital plotting and aerial triangulation and so on by BDMAP. Also, the aerial photos and ground control point survey results of “1:5,000 scale digital photogrammetric mapping at Dhaka Metropolitan Area” were used for technical training to the staff of SOB.

2.3.4 Countermeasures for “Adequate number of technical staff of SOB will be assigned”

IMDS Project is a huge digital photogrammetric mapping project for SOB and the total number of staff to be engaged in IDMS was estimated as approximately 200 persons.

Due to the limited human resources of SOB, SOB had to assign newly recruited staff and also the staff who had no experience of digital photogrammetric mapping to IDMS. Therefore, following issues were occurred at the time of technical training to the staff of SOB by BDMAP.

- 1) Due to the lack of the basic knowledge of photogrammetric mapping, some staff of SOB could not understand the explanation of technical matters.
- 2) Due to the lack of the basic knowledge of computer, it was necessary to execute the basic training of computers and software before starting the technical training of digital mapping.

Concerning above-mentioned issues, BDMAP took the following countermeasures to solve these issues.

- 1) BDMAP decided to execute the lecture of basics of survey and mapping including photogrammetric mapping by Japanese Experts and also local engineers hired by BDMAP in the 1st year of BDMAP.

- 2) Before starting the technical training of digital photogrammetric mapping, BDMAP decided to execute the lecture and practical training of basis of computer and software to the staff of SOB in the 1st year of BDMAP.

Chapter 3 Outline of the Activities and Outputs of BDMAP

Chapter 3 Outline of the Activities and Outputs of BDMAP

The outline of the activities and outputs of BDMAP (1st year~3rd year) are as follows:

3.1 Outline of the activities of BDMAP (1st year)

The outline of the activities of BDMAP (1st year) are as follows:

3.1.1 Explanation and discussion of Inception Report

Based on the Inception Report prepared in Japan, schedule and contents of the activities and so on were explained and discussed between SOB and BDMAP at the beginning of the 1st year of BDMAP.

However, this Inception Report was necessary to be modified due to the changes of the important assumptions of BDMAP which were occurred at the beginning of the 1st year of BDMAP. Therefore, the revised Inception Report was prepared by BDMAP and explained to SOB and the activities of the 1st year of BDMAP were executed based on this revised Inception Report.

3.1.2 Changes of the important assumptions and preparation of the revised Inception Report

At the beginning of the 1st year of BDMAP, the tenders for aerial photography, and procurement of photogrammetric equipment and software were decided as a cancel by the Government of Bangladesh.

Therefore, it was judged that the activities of the 1st year of BDMAP could not be executed according to the plan mentioned in the Inception Report of BDMAP due to the change of the important assumptions of BDMAP.

Facing this issue, BDMAP prepared the revised activity plan of the 1st year of BDMAP through the discussion with JICA Bangladesh Office and SOB. Based on the results of discussion, the revised Inception Report was prepared by BDMAP and explained to SOB. The activities of the 1st year of BDMAP were executed based on this revised Inception Report.

The details of the discussion of the Inception Report are shown in Appendix 12.1 “Minutes of Meeting on Inception Report of Bangladesh Digital Assistance Project”.

3.1.3 Setting up of the project office

SOB arranged the office space for BDMAP on the ground floor of the main building of SOB. Size of this room is approximately 10 m×10 m length. Cleaning and renovation of the room was executed by SOB and air conditioning, exhaust fan, electric light, internet, desks and chairs were provided by SOB.

BDMAP procured necessary office equipment and materials, and also procured computers, copy machine, plotter and so on which were necessary for the activities of BDMAP.

3.1.4 Procurement of equipment

BDMAP procured the necessary equipment and software such as computers, printer, plotter and so on which are necessary for the activities of BDMAP. Procurement of the equipment was executed by the tender to the Bangladesh companies according to the regulation of JICA. The equipment and software procured by BDMAP are described in Chapter 8 “Equipment Used for BDMAP and IDMS”.

3.1.5 Check of the aerial photography plan and preparation of the revised flight plan

The tender of aerial photography was already executed by SOB, and SOB was waiting an approval from the Government of Bangladesh at the time of BDMAP arrived in Bangladesh. However, SOB requested BDMAP to check the specifications of aerial photography and also the flight plan which were proposed by the candidate contractor.

Based on the request from SOB, BDMAP prepared the comments and submitted them to SOB on 6 October 2009. The items pointed out by BDMAP were as follows:

- 1) Percentage of side lap

- 2) Relation between NFZ (Non Flight Zone) and flight lines proposed by the candidate contractor

Based on the comments by BDMAP, new aerial photography plan was prepared by the staff of SOB under the instruction of BDMAP. Through this work, the knowledge of aerial photography planning was transferred to the staff of SOB.

3.1.6 Preparation of ground control points plan

The ground control points plan necessary for the implementation of aerial triangulation was

prepared by the staff of SOB under the instruction of BDMAP.

Generally, aerial photography plan and ground control points plan will be prepared using 1:50,000 scale printed topographic maps as a base map. However, target area of aerial photography and ground control point survey of IDMS is very huge as approximately 144,000 km². The size of maps to be used for planning of aerial photography and ground control points will be approximately 3 m×3 m, even though the existing 1:250,000 scale topographic maps are used.

Therefore, BDMAP decided that all necessary information such as the location of the existing GPS points, BMs, flight lines and so on will be shown on Google Earth. Based on the information on Google Earth, new flight plan and ground control point plan was made using AutoCAD and ArcMap.

The technique of utilization of Google Earth and AutoCAD for the preparation of flight plan, and ground control point plan was transferred to the staff of SOB through this work.

3.1.7 Preparation of sheet index plan

Sheet index plan for 1:25,000 scale and 1:5,000 scale digital topographic maps was prepared by the staff of SOB under the instruction of BDMAP. The sheet index plan for 1:25,000 scale and 1:5,000 scale digital topographic maps was officially approved by SOB in the 3rd year of BDMAP.

The sheet index of 1:25,000 scale and 1:5,000 scale digital topographic maps are shown in Appendix 3.6 “Index to Sheets of Bangladesh (Scale 1:25,000)”, Appendix 3.7 “Index to Sheets of Sylhet (Scale 1:5,000)”, Appendix 3.8 “Index to Sheets of Rajshahi (Scale 1:5,000)”, Appendix 3.9 “Index to Sheets of Khulna (Scale 1:5,000)”, Appendix 3.10 “Index to Sheets of Barisal (Scale 1:5,000)” and Appendix 3.11 “Index to Sheets of Chittagong (Scale 1:5,000)”.

3.1.8 Preparation of sheet numbering plan

In parallel with the preparation of sheet index plan for 1:25,000 scale and 1:5,000 scale digital topographic maps, sheet numbering plan for 1:25,000 scale and 1:5,000 scale digital topographic maps was prepared by the staff of SOB under the instruction of BDMAP. The sheet numbering plan for 1:25,000 scale and 1:5,000 scale digital topographic maps was officially approved by SOB in the 3rd year of BDMAP.

The sheet numbering plan for 1:25,000 scale and 1:5,000 digital topographic maps are shown in Appendix 3.6 “index to Sheets of Bangladesh (Scale 1:25,000)”~Appendix 3.11 “Index to

Sheets of Chittagong (Scale 1:5,000)".

3.1.9 Preparation of specifications for 1:25,000 scale digital topographic maps

For the implementation of technical training of digital Photogrammetric mapping, it was necessary to decide the specifications of digital topographic maps such as map style, map symbol, items to be shown on the digital topographic maps, minimum size of data acquisition and so on.

Therefore, the specifications for 1:25,000 scale digital topographic maps (Draft version) were prepared by the staff of SOB under the instruction of BDMAP before starting the technical training. The technical training of digital plotting in the 1st year of BMDAP was executed based on this specifications (Draft version).

However, due to the reason of lacking in the actual work experience of 1:25,000 scale digital photogrammetric mapping using aerial photos, most of the staff of SOB could not grasp the image of 1:25,000 scale digital topographic maps to be prepared by IDMS.

Therefore, the specifications of 1:25,000 scale digital topographic maps (Draft version) were modified many times during the implementation of technical training in the 1st year and 2nd year of BDMAP. Finally, in the 3rd year of BDMAP, the final version of technical specifications of 1:25,000 scale digital topographic maps was prepared by the staff of SOB and approved officially by SOB.

3.1.10 Preparation of 1:25,000 scale sample map

The size of symbols, colors, line width, size of text and so on has to be checked on the 1:25,000 scale digital topographic map. If not, it is difficult to judge whether the size of map symbols, line width, color and so on are suitable for 1:25,000 scale digital topographic maps or not.

For this purpose, the sample map of 1:25,000 scale digital topographic map was prepared by the staff of SOB under the instruction of BDMAP using the 1:5,000 scale digital topographic data of Dhaka City area which were prepared by JICA and SOB in 2004.

Based on the sample map, the size of symbols, line width, colors and so on were checked. Based on the results of checking, the specifications of 1:25,000 scale digital topographic maps were modified.

3.1.11 Preparation of specifications of the process and products of digital mapping

SOB has various types of technical specifications concerning survey and mapping. However, these technical specifications were prepared in the old days, and the contents of some of the technical specifications are already old fashioned and does not coincide with the modern technology of survey and mapping.

Furthermore, these technical specifications are prepared item by item of survey and mapping (i.e. aerial photography, GPS survey, leveling and so on), and there is no technical specifications covering whole digital photogrammetric mapping from planning up to digital plotting and compilation.

Therefore, it was judged that technical specifications of the process and products of digital photogrammetric mapping are essential for the staff of SOB for the planning and implementation of digital photogrammetric mapping. BDMAP prepared the draft of technical specifications for digital photogrammetric mapping and requested SOB to check and modify this considering the situation of SOB and so on.

The lower grade staff of SOB is not so fluent in English. Therefore, the technical specifications for digital photogrammetric mapping were translated into Bengali by the cooperation with the local engineers hired by BDMAP and the staff of SOB.

3.1.12 Technical training of digital plotting

According to the original plan of BDMAP, technical training to the staff of SOB was planned to be executed using the equipment and software which will be procured by SOB. The technical training to the staff of SOB was planned to be started from the beginning of December 2009.

However, due to the decision to cancel of the tender for the procurement of photogrammetric equipment and software by the Government of Bangladesh, technical training of digital plotting was executed using the equipment and software prepared by BDMAP in the 1st year of BDMAP as mentioned in Chapter 2 “Important Assumptions of BDMAP”.

Due to the reason of the numbers of available digital plotting system, hours of technical training per one person was approximately 1/10 of the original plan. Considering this situation, the technical training of digital plotting was aimed at the fundamental technique of digital plotting as mentioned below:

- 1) Height measurement by 3D using digital plotting system
- 2) Data acquisition of line data such as road, railway, river and so on

- 3) Data acquisition of area data such as vegetation, lake and pond, village boundary and so on

3.1.13 Technical training of aerial triangulation

The fundamental technique of aerial triangulation is the height measurement by 3D using digital plotting system. Therefore, the technical training of aerial triangulation was started from the height measurement by 3D using digital plotting system same as digital plotting.

The technical training of aerial triangulation was executed using the aerial triangulation system prepared by BDMAP in the 1st year of BDMAP. The aerial photo images and ground control point survey data of 1:5,000 scale digital mapping in Dhaka City area in 2004 by JICA and SOB, and also the data prepared by BDMAP in Japan were used for the technical training of aerial triangulation.

3.1.14 Technical training of digital compilation

The knowledge and basic operation of GIS and CAD software was transferred to the staff of digital compilation section in the 1st year of BDMAP.

Also, a 1:25,000 scale sample map, using the 1:5,000 scale digital topographic data of Dhaka City area, was prepared by the staff of digital compilation section under the instruction of BDMAP.

3.1.15 Lecture of basic of survey and mapping, and basic training of computer

Due to the limited human resources of SOB, many of the staff of SOB has no knowledge of the basic of survey and mapping, especially photogrammetric mapping, and also the basic of computer. Therefore, before starting the technical training of digital mapping, it was necessary to execute basic training concerning the knowledge of survey and mapping and the basic operation of computer and software to the staff of SOB who are lacking the experience and knowledge of survey and mapping and computer.

For this purpose, lecture for the basic of photogrammetric mapping, and practice of computer operation were executed by BDMAP in the 1st year of BDMAP. After the completion of lecture and practical training by BDMAP, SOB executed lecture and practical training by themselves continuously.

3.1.16 Paper test and practical test

One (1) months after starting of training, practical test for the height measurement by 3D and

paper test for the basic of survey and mapping were executed on the end of January 2010. The second practical test for the height measurement by 3D and paper test for the basic of survey and mapping were executed on 9 and 10 of March 2010.

3.1.17 Intensive lecture on the theory of aerial triangulation and photogrammetry

For the planning and implementation of photogrammetric mapping, the knowledge of the theory of photogrammetry and aerial triangulation are essential. However, most of the staff of SOB has only the knowledge and experience of some part of photogrammetric mapping, and does not have an overall knowledge and experience of topographic mapping by photogrammetric method.

Considering this situation, BDMAP executed intensive lecture on the theory of photogrammetry and aerial triangulation to the main staff of SOB as follows:

- | | | |
|------------------------|-----------------------------------|--------|
| 1) First time lecture | 12 December 2009~24 December 2009 | 4 days |
| 2) Second time lecture | 28 February 2010~4 March 2010 | 4 days |

3.1.18 Technical training of geoid model

Considering the flat topographic feature in Bangladesh, the digital topographic maps to be prepared by IDMS have to keep the enough height accuracy. For this purpose, it is recommended to establish the height control points for aerial triangulation as much as possible.

There are two methods to decide the height of control points for aerial triangulation. One is to decide the height of control point by direct or in-direct leveling from the existing BMs. Another is to decide the height of control point by GPS survey. To determine the height value from the national leveling network system by GPS survey, the precise geoid model is essential.

The technical training of the precise geoid model preparation to the staff of geodesy of SOB was executed by the short-term expert of JICA.

3.1.19 Activities for the utilization of the outputs of IDMS

For the effective utilization of the outputs of IDMS by the governmental and non-governmental organizations in Bangladesh, the suggestion and recommendation were made by the long-term expert of JICA.

3.1.20 Counterpart training in Japan

The counterpart training in Japan was executed for the following purposes:

- 1) To understand the role and contents of work of governmental survey and mapping organization in Japan. Based on the understanding, future organization and scope of work of SOB and so on will be considered.
- 2) To understand the planning and management method of topographic mapping by photogrammetric method.

The details of the counterpart training in Japan are described in Chapter 7 “Counterpart Training in Japan”.

3.1.21 Preparation of project progress report I

At the end of the activities of the 1st year of BDMAP, project progress report I was prepared by BDMAP and submitted and explained to SOB.

3.2 Outline of the outputs of BDMAP (1st year)

The outline of the outputs of BDMAP (1st year) are as follows:

- 1) **Report**
 - a) Inception Report for Bangladesh Digital Mapping Assistance Project (1st Year)
 - b) Outline of digital plotting
 - c) Bangladesh Digital Mapping Assistance Project (BDMAP) 1st Year, Project Progress Report I
- 2) **Training plan**
 - a) Technical training plan for digital plotting
 - b) Training plan for aerial triangulation
- 3) **Results of paper test and practical test on January 2010**
 - a) Results of practical test of height measurement by 3D
 - b) Results of paper test for survey and mapping
- 4) **Results of paper test and practical test on March 2010**
 - a) Results of practical test of height measurement by 3D
 - b) Results of paper test for survey and mapping
- 5) **Aerial photography plan**
 - a) Flight plan for 1:25,000 scale digital mapping

- b) Flight plan for 1:5,000 scale digital mapping (Sylhet, Rajshahi, Chittagong, Khulna and Barisal)

6) Sheet index plan

- a) 1:25,000 scale digital topographic map sheet index plan (Draft)
- b) 1:5,000 scale digital topographic map sheet index plan (Draft)

7) Sheet numbering plan

- a) 1:25,000 scale digital topographic map sheet numbering plan (Draft)
- b) 1:5,000 scale digital topographic map sheet numbering plan (Draft)

8) Ground control point plan

- a) Ground control point distribution plan for 1:25,000 scale digital topographic mapping
- b) Ground control point distribution plan for 1:5,000 scale digital topographic mapping (Sylhet, Rajshahi, Chittagong, Khulna and Barisal)

9) Operation manual

- a) Operation manual of digital plotting (Preliminary version)
- b) Operation manual of aerial triangulation (Preliminary version)
- c) Operation manual of geoid model preparation

10) Specifications (Draft)

- a) Specifications of the process and products of digital mapping (Draft)

11) Etc.

- a) Map style and map symbols for 1:25,000 scale digital topographic map
- b) Marginal information of 1:25,000 scale digital topographic map

3.3 Materials used for the technical training in BDMAP (1st year)

The materials used for the technical training in the 1st year of BDMAP are as follows:

1) Lecture on theory of photogrammetry and aerial triangulation

- a) Theoretical and practical aspects of aerial triangulation in photogrammetry for topographic mapping (Part 1)
- b) Theoretical and practical aspects of aerial triangulation in photogrammetry for topographic mapping (Part 2)

2) Lecture on basic of survey and mapping

- a) Final Report of the Study on Urban Information Management for Greater Dhaka City in the People's Republic of Bangladesh, August 2004, Japan International Cooperation Agency
- b) Terms of photogrammetry, January 2010
- c) Seminar on determination of horizontal and vertical datum for Bangladesh, 5th September 1995, Survey of Bangladesh and Japan International Cooperation Agency
- d) Introduction to photo interpretation, September 1988
- e) Text book for the group training course in survey and mapping Vol. II-1 Mapping (1), Japan International Cooperation Agency

3) Practical training of ArcGIS and AutoCAD

- a) Manual on introductory ArcGIS
- b) Manual on intermediate ArcGIS
- c) Using ArcCatalog

3.4 Outline of the outputs of IDMS (1st year)

The outline of the outputs of IDMS (1st year) are as follows:

3.4.1 Tender for aerial photography

The tender for aerial photography for 1:25,000 scale and 1:5,000 scale digital photogrammetric mapping was executed by SOB. However, this tender was finally decided as a cancel by the Government of Bangladesh on October 2009. Immediately after the decision by the Government of Bangladesh, SOB took a necessary action for the fresh tender (2nd tender) for aerial photography.

3.4.2 Tender for the procurement of photogrammetric equipment and software

The tender for the procurement of photogrammetric equipment and software was executed by SOB. However, this tender was finally decided as a cancel by the Government of Bangladesh on October 2009. Immediately after the decision by the Government of Bangladesh, SOB took a necessary action for fresh tender (2nd tender) for the procurement of photogrammetric equipment and software.

3.4.3 Technical training by SOB

The lecture and training for the basic knowledge of survey and mapping, computer and software

to the staff of SOB were executed by SOB after the basic training of computer by BDMAP.

3.5 Outline of the activities of BDMAP (2nd year)

The outline of the activities of BDMAP (2nd year) are as follows:

3.5.1 Discussion and amendment of plan of operation of BDMAP (2nd year)

Just before starting the activities of the 2nd year of BDMAP, the fresh tender (2nd tender) for the procurement of photogrammetric equipment and software by SOB was cancelled by the Government of Bangladesh. BDMAP received this information through JICA Bangladesh Office just before departure from Japan to Bangladesh.

It was estimated that the photogrammetric equipment and software procured by SOB would not be used for the technical training according to the schedule mentioned in Plan of Operation of the 2nd year of BDMAP. Therefore, it was necessary to modify the Plan of Operation of the 2nd year of BDMAP which were already prepared in Japan before departure to Bangladesh.

Immediately after arrived at Dhaka, BDMAP started to obtain the information of the present situation of the tender for procurement of photogrammetric equipment and software, and also the tender for aerial photography by SOB.

Based on the obtained information and through the discussion with JICA Bangladesh Office, SOB and BDMAP, BDMAP prepared the revised Plan of Operation by the middle of March 2010 and explained the contents of the revised Plan of Operation of the 2nd year of BDMAP to SOB.

Due to the delay of the procurement of photogrammetric equipment and software, the technical training, especially aerial triangulation, digital plotting, DEM and orthophoto production, was executed using the equipment and software prepared by BDMAP in the 2nd year of BDMAP.

The minutes of meeting on the Plan of Operation of the 2nd year of BDMAP is shown in Appendix 12.2 “Minutes of Meeting on Plan of Operation for Bangladesh Digital Mapping Assistance Project (2nd Year)”.

3.5.2 Technical training of aerial triangulation

The technical training of aerial triangulation to the staff of aerial triangulation unit of IDMS was executed using the equipment and software prepared by BDMAP in a similar way of the 1st year

of BDMAP.

3.5.3 Technical training of DEM and orthophoto production

The technical training of DEM and orthophoto production to the staff of DEM/orthophoto unit of IDMS was executed using the equipment and software prepared by BDMAP in a similar way of the 1st year of BDMAP.

3.5.4 Technical training of digital plotting

The technical training of digital plotting to the staff of digital plotting unit of IDMS was executed using the equipment and software prepared by BDMAP in a similar way of the 1st year of BDMAP.

3.5.5 Technical training of GIS basic data production

The technical training of GIS basic data production to the staff of GIS section was executed using the equipment and software prepared by SOB.

3.5.6 Technical training of digital compilation

The technical training of digital compilation to the staff of cartography section was executed using the equipment and software prepared by SOB.

3.5.7 Evaluation of technical training of digital plotting

To check the results of technical training of digital plotting, the evaluation of digital plotting data, which were obtained by the staff of digital plotting unit of IDMS through the technical training, was evaluated. The evaluation items of digital plotting data were as follows:

- 1) Data volume (total number of node points)
- 2) Number of errors
- 3) Data acquisition time (total working hours)

Based on the evaluation results, the productivity of digital plotting of the staff of digital plotting unit of IDMS was estimated.

3.5.8 Modification of specifications for 1:25,000 scale digital topographic maps

Based on the findings during the technical training in the 2nd year of BDMAP, the specifications

for 1:25,000 scale digital topographic maps which were prepared in the 1st year of BDMAP were modified.

3.5.9 Lecture on project management

To strengthen the capability of planning and management for the digital topographic mapping by photogrammetric method necessary for the implementation of IDMS, lecture on the planning and management of digital mapping project including earned value management (EVM) to the main staff of SOB was executed.

3.5.10 Technical training of the establishment of air photo signal

The training for the establishment of air photo signal on the ground control point to the staff of SOB was executed before starting the aerial photography in the courtyard of SOB and in the site.

3.5.11 Modification of aerial photography plan and ground control point plan

The digital camera to be used for aerial photography by the contractor was decided as UltraCam XP through the negotiation between SOB and the contractor.

The aerial photography plan, which was made in the 1st year of BDMAP, was made by using DMC as a digital camera for aerial photography. The focal length, pixel size and number of pixels of UltraCam XP are different from DMC.

Therefore, it was necessary to prepare a new aerial photography plan using UltraCam XP, not DMC. Furthermore, it was necessary to prepare a new ground control points plan due to the change of digital camera to be used for aerial photography.

3.5.12 Technical training of pricking and eccentric survey

It were decided that air photo signals would be established mainly on the horizontal control points (GPS points) considering the total number of control points and period before starting the aerial photography. Therefore, pricking method was applied for vertical control points for aerial triangulation.

Before starting the pricking work in site, training for pricking and eccentric survey was executed in the courtyard of SOB and in site.

3.5.13 Arrangement of the existing GPS points and BMs data

For the planning of ground control point survey, aerial triangulation, digital plotting and so on, it is necessary to set the information of the existing GPS points and BMs in order. For this purpose, the list of the horizontal coordinates of the existing GPS points and BMs were prepared by Excel file to be able to plot these points on AutoCAD and Google Earth.

3.5.14 Estimation of the productivity of digital plotting and so on

To prepare the work schedule of IDMS, following information is essential.

- 1) Number of equipment
- 2) Average working days per month
- 3) Average working hours per day
- 4) Productivity of each work

Therefore, the productivities of the digital mapping work such as aerial triangulation, digital plotting, orthophoto production and so on by the staff of SOB were estimated based on the results of the technical training in the 1st and 2nd year of BDMAP. The critical path of IDMS is digital plotting. Therefore, the estimation of the productivity of digital plotting is a key factor for the preparation of work schedule of IDMS.

3.5.15 Preparation of the work schedule (EVM) of IDMS

Based on the estimated productivities of digital mapping by the staff of SOB, the work schedule of IDMS (EVM) was prepared using Excel to be able to execute the simulation of work schedule and monitoring of work progress of IDMS.

At the end of the 3rd year of BDMAP, the work schedule of IDMS was modified based on the actual productivities obtained through the implementation of IDMS, and the monitoring of work progress of IDMS was executed using this EVM.

The work schedule of 1:25,000 scale and 1:5,000 scale digital mapping (EVM) are shown in Appendix 3.1 “Estimated Work Schedule of 1:25,000 Scale Digital Mapping” and Appendix 3.2 “Estimated Work Schedule of 1:5,000 Scale Digital Mapping”.

3.5.16 Support for mid-term evaluation

On November 2010, the mid-term evaluation of BDMAP was executed by JCIA Bangladesh Office, and BDMAP supported the activities of the mid-term evaluation team organized by JICA

Bangladesh Office.

3.5.17 First seminar

The contracts of aerial photography and procurement of photogrammetric equipment and software were concluded between SOB and the contractors. Therefore, it was decided to hold a seminar to explain the outline and schedule of IDMS to the stakeholders of IDMS on 3rd October 2010 jointly by JICA Bangladesh Office and SOB.

The detail of seminar is described in Chapter 12 “JCC and Seminar”.

3.5.18 Counterpart training in Japan

The counterpart training in Japan was executed from the beginning of November 2010 up to the beginning of December 2010 and the details of the counterpart training in Japan are described in Chapter 7 “Counterpart Training in Japan”.

3.5.19 Preparation of project progress report II

At the end of the activities of the 2nd year of BDMAP, the progress report II was prepared by BDMAP and submitted and explained to SOB.

3.6 Outline of the outputs of BDMAP (2nd year)

The outline of the outputs of BDMAP (2nd year) are as follows:

1) Report

- a) Plan of Operation for Bangladesh Digital Mapping Assistance Project (2nd Year)
- b) Revised Plan of Operation for Bangladesh Digital Mapping Assistance Project (2nd Year)
- c) Bangladesh Digital Mapping Assistance Project (BDMAP) 2nd Year, Project Progress Report II

2) Evaluation of technical training

- a) Evaluation report for digital plotting trainees
- b) Evaluation report for DEM/orthophoto trainees
- c) Evaluation report for aerial triangulation trainees
- d) Evaluation report for GIS and cartography trainees

- 3) Aerial photography plan (using UltraCam XP)**
 - a) Flight plan for 1:25,000 scale and 1:5,000 scale digital mapping
 - b) Details of flight plan for 1:25,000 scale digital mapping

- 4) Operation manual**
 - a) What data can be obtained and how to obtain them by photogrammetric plotting?
(Based on the digital plotting training): 28 July 2010
 - b) Logical check of digital plotting data using AutoCAD Map 3D
 - c) Operation manual for aerial triangulation (Preliminary version)
 - d) Operation manual for DEM extraction (Preliminary version)
 - e) Operation manual for orthophoto generation (Preliminary version)
 - f) Operation manual for orthophoto mosaic (Preliminary version)
 - g) Work manual of digital plotting (Preliminary version)
 - h) Production manual of digital compilation (Preliminary version)
 - i) Introduction for “GIS basic data” (Spatial data framework) (Preliminary version)

- 5) Project management**
 - a) Explanation of outline and essence of project management
 - b) Explanation and exercise of earned value management (EVM)

- 6) Establishment of air photo signal and pricking**
 - a) Establishment of air photo signal
 - b) Pricking of height point
 - c) Pricking of horizontal point

- 7) Modification of the specifications of 1:25,000 scale digital topographic maps**
 - a) Digital plotting specification (August 2010)
 - b) Map specification (1:25,000) (January 2011)
 - c) Topo database-GIS (January 2011)

- 8) Estimation of the productivity of digital plotting, etc.**
 - a) Productivity of digital plotting
 - b) Productivity of aerial triangulation
 - c) Productivity of DEM/orthophoto making

- 9) Estimation of work schedule of IDMS**
 - a) Work schedule of 1:25,000 scale digital plotting using aerial photos
 - b) Work schedule of 1:5,000 scale digital plotting using satellite images
 - c) Work schedule of IDMS Project (All works)

3.7 Outline of the activities of IDMS (2nd year)

The outline of the activities of IDMS (2nd year) are as follows:

3.7.1 Aerial photography

The contract of aerial photography was concluded between SOB and the contractor on October 2010. The preparation work for aerial photography by the contractor started from around November 2010. Accordingly, the schedule of aerial photography delayed approximately 12 months from the original plan of IDMS.

After the checking of the results of aerial photography by the staff of SOB, it was found that some flight runs needed re-flight of aerial photography. Therefore, re-flight of aerial photography by the contractor was executed during the period around December 2011 up to March 2012.

3.7.2 Ground control point survey

The ground control point survey (GPS observation and leveling) at northern part of Bangladesh was started from around October 2010 before execution of aerial photography by the contractor.

3.7.3 Pricking of height points

Considering the total number of control points and working period necessary for the establishment of air photo signals, pricking method was applied for height point for aerial triangulation.

For this purpose, leveling from the existing BMs to height points, and pricking of height points on the photo images were executed by the staff of SOB.

3.7.4 Procurement and setting up of photogrammetric equipment and software

The contract for the procurement of photogrammetric equipment and software was concluded around October 2010 between SOB and the contractor. Therefore, it was estimated that the delivery and setting up of equipment and software would be executed from around January 2011.

However, due to the reason of transportation and custom clearance issues, the delivery and

setting up of equipment and software was started from around February 2011 and all works including checking and site training was completed around June 2011.

Accordingly, the schedule of procurement of photogrammetric equipment and software delayed approximately eighteen (18) months from the original plan.

3.7.5 Factory training and site training by the contractor

Based on the contract between SOB and the contractor, the factory training by the contractor was executed in Bangkok City in Thailand from around December 2010, and the site training was executed in SOB from around March 2011.

3.7.6 First seminar

To explain the outline and outputs of IDMS to the stakeholders of IDMS, seminar was executed on 3rd October 2010 jointly by JICA Bangladesh Office and SOB. The detail of seminar is described in Chapter 12 “JCC and Seminar”.

3.8 Outline of the activities of BDMAP (3rd year)

The outline of the activities of BDMAP (3rd year) are as follows:

3.8.1 Activities for the planning and management of IDMS

The actual office works of IDMS such as aerial triangulation, digital plotting, DEM and orthophoto production and so on started from the 3rd year of BDMAP. Therefore, the necessary support and assistance to the staff of SOB for the planning and management such as preparation of implementation plan and schedule of aerial triangulation, digital plotting, DEM production, orthophoto production and so on was executed by BDMAP

3.8.2 Activities for the quality control of IDMS

The quality of digital topographic maps will be decided mainly by the accuracy and quality of digital plotting data. Therefore, during the period of the 3rd year of BDMAP, the necessary support and assistance to the staff of SOB for the quality control of digital photogrammetric mapping, especially quality control of digital plotting data, was executed by BDMAP.

3.8.3 Activities for the schedule control of IDMS

During the implementation of the project, it is necessary to monitor the progress of works. In IDMS, the schedule control of digital plotting is the most important due to the reason of critical pass of IDMS.

Therefore, the support and assistance for the schedule control to the staff of SOB, especially schedule control of digital plotting, was executed by BDMAP. Based on the actual progress of digital plotting started from the 3rd year of BDMAP, the work schedule (EVM) prepared at the end of the 2nd year of BDMAP was revised.

The revised work schedules (EVM) of 1:25,000 scale and 1:5,000 scale digital topographic mapping are shown in Appendix 3.1 “Estimated Work schedule of 1:25,000 Scale Digital Mapping” and Appendix 3.2 “Estimated Work Schedule of 1:5,000 Scale Digital Mapping”.

The SPI (Schedule Performance Index) of 1:25,000 scale digital plotting as of the end of February 2012 is “0.70”. This value of SPI means that the work progress of digital plotting is behind the schedule.

This delay was caused mainly by the huge time for the check and correction of the geometry mistakes, code number mistakes and photo interpretation mistakes by the operators due to the reason of the first actual 1:25,000 scale digital plotting work (Block-4) of IDMS.

Also, the modification of data acquisition standard of 1:25,000 scale digital plotting during the implementation of 1:25,000 scale digital plotting was one of the reasons of the delay of 1:25,000 scale digital plotting from the schedule.

However, the main issues and points to be improved in 1:25,000 scale digital plotting were already found through the implementation of 1:25,000 scale of digital plotting of Block-4. Therefore, it is estimated that the digital plotting of second block (Block-1) will be able to execute more smoothly than the first block (Block-4) and the value of SPI of 1:25,000 scale digital plotting will become 1.0 or more large value.

3.8.4 Activities for the trouble shooting of IDMS

After starting the actual work of digital topographic mapping, IDMS encountered many issues and troubles that were not expected by the staff of SOB before starting the digital photogrammetric mapping works. Therefore, it was necessary to solve these issues one by one. Furthermore, it was necessary to analyze the causes of the issues and to take a necessary countermeasure not to repeat the same issues again.

As is obvious, this kind of knowledge and capability can be obtained only by the experience of actual works. Therefore, the support and assistance for the trouble shooting to the staff of SOB was executed through the implementation of actual work of IDMS by BDMAP as On the Job Training.

3.8.5 Preparation of operation manual (Final version)

Due to the delay of the procurement of photogrammetric equipment and software, the technical training of digital mapping to the staff of SOB was executed using the digital plotting system prepared by BDMAP.

Therefore, the operation manuals prepared for the technical training to the staff of SOB on the 1st and 2nd year of BDMAP were preliminary version, and the final version, was prepared in the 3rd year of BDMAP after procurement of equipment and software by SOB.

On the 3rd year of BDMAP, the final version of operation manuals corresponding to the software procured by SOB were prepared based on the preliminary version of operation manuals.

The operation manuals have to be modified based on the finding and issues which will be encountered during the implementation of IDMS. Therefore, the final operation manuals will be completed at the time of completion of IDMS.

3.8.6 Second seminar

To explain the outline of IDMS and schedule to the stakeholders of IDMS, the first seminar was held in October 2010 jointly by JICA Bangladesh Office and SOB.

In the 3rd year of BDMAP, to show and to explain the outputs prepared by IDMS such as 1:25,000 scale digital topographic maps, DEM data, orthophoto and so on , and work schedule of IDMS to the stakeholders, the second seminar was held on 15 March 2012 jointly by JICA Bangladesh Office and SOB.

The detail of seminar is described in Chapter 12 “JCC and Seminar”.

3.8.7 Publicity activities

As publicity activities on the 3rd year of BDMAP, following pamphlets were prepared and delivered to the stakeholders through the JICA Bangladesh Office to explain not only the outline of IDMS, but also the past projects between JICA and SOB.

- 1) 1:5,000 scale digital topographic mapping project at Dhaka City area
- 2) Establishment of national geodetic networks in Bangladesh
- 3) Outline of IDMS

3.8.8 Support for the terminal evaluation

The terminate evaluation of BDMAP was executed from 22 November 2011 up to 10 December 2011 by the terminal evaluation team members organized by JICA Bangladesh Office and experts from Japan. BDMAP supported the activities of the terminal evaluation team such as provision of the necessary data, interview and so on.

3.8.9 Counterpart training in Japan

The counterpart training in Japan in the 3rd year of BDMAP was executed from 14 January 2012 up to 12 February 2012 (30 days).

The detail of counterpart training in Japan in the 3rd year of BDMAP is described in Chapter 9 “Counterpart Training in Japan”.

3.8.10 Preparation of final report

At the end of the activities of the 3rd year of BDMAP, final report on “Bangladesh Digital Mapping Assistance Project” was prepared by BDMAP. Also, the specifications and operation manuals and so on during the implementation of BDMAP were prepared.

3.9 Outline of the outputs of BDMAP (3rd year)

The outline of the outputs of BDMAP (3rd year) is as follows:

1) Report

- a) Plan of Operation for Bangladesh Digital Mapping Assistance Project (3rd Year)
- b) Final Report of Bangladesh Digital Mapping Assistance Project (BDMAP)

2) Operation manual

- a) Operation manual for aerial triangulation on Match-AT (Ver. 2.0, August 2011)
- b) Operation manual for DTM & Orthophoto (Ver. 1.0, August 2011)
- c) Operation manual for GIS data management (Ver. 1.0, August 2011)
- d) Operation manual for digital plotting (Ver. 1.2, December 2011)

- e) Operation manual for digital compilation (Ver. 2.0, October 2011)

3) Project management and lecture

- a) Outline and essence of project management
- b) Explanation and exercise of earned value management
- c) Estimated work schedule of 1:25,000 and 1:5,000 scale digital topographic map production
- d) Lecture for pricking, establishment of air photo signals and aerial photography planning

4) Specifications

- a) Standard technical specifications of topographic mapping
- b) 1:25,000 scale digital topographic map specifications
- c) 1:5,000 scale digital topographic map specifications

3.10 Outline of the output of IDMS (3rd year)

The activities and outputs of the 3rd year of BDMAP are described as below. The purposes of the activities of BDMAP are to execute the technical training to the staff of SOB and to support the implementation of IDMS from the technical, planning and management aspects.

Therefore, the outputs of the activities of BDMAP will be expressed as the executing rate of the production and quality of the outputs of IDMS. The executing rates of the main outputs of IDMS as of the end of February 2012 are as follows:

3.10.1 Aerial triangulation

From around May 2011, aerial triangulation of Block-4 was started by the aerial triangulation unit of IDMS. The aerial triangulation of Block-4 was completed by the middle of July 2011.

After completion of aerial triangulation of Block-4, aerial triangulation of Block-1 was completed by the end of October 2011 and Block-2 was completed by the end of February 2012.

The blocks of aerial triangulation for 1:25,000 scale digital topographic mapping are shown in Appendix 3.4 “Aerial Triangulation Block for 1:25,000 Scale Digital Mapping”.

The progress of the implementation of aerial triangulation as of the end of February 2012 is shown in Table 3.10.1 “Production of aerial triangulation as of the end of February 2012”.

Table 3.10.1 Production of aerial triangulation as of the end of February 2012

Aerial Triangulation (1:25,000 scale digital mapping)			Aerial Triangulation (1:5,000 scale digital mapping)		
Block No.	Model	Situation	City Name	Model	Situation
Block-1	855	Finished	Sylhet	75	Finished
Block-2	985	Finished	Rajshahi	74	Finished
Block-3	1,073	Not yet	Chittagong	226	Not yet
Block-4	566	Finished	Khulna	133	Not yet
Block-5	262	On going	Barisal	70	Not yet
Block-6	1,343	Not yet			
Block-7	833	Not yet			
Block-8	991	Not yet			
Block-9	1,050	Not yet			
Block-10	984	Not yet			
Block-11	1,014	Not yet			
Block-12	715	Not yet			
Block-13	591	Not yet			
Total	11,262		Total	578	

Note: The value of model is approximate values.

Accordingly, the executing rate of aerial triangulation as of the end of February 2012 is as follows:

- 1) The executing rate of aerial triangulation for 1:25,000 scale digital mapping:
 $\text{Approx. } 2,406 \text{ models} \div 11,262 \text{ models} = 0.213$ $\text{Approx. } 21.3 \%$

- 2) The executing rate of aerial triangulation for 1:5,000 scale digital mapping:
 $\text{Approx. } 149 \text{ models} \div 578 \text{ models} = 0.257$ $\text{Approx. } 25.7 \%$

3.10.2 Digital plotting

From the end of July 2011, digital plotting for 1:25,000 scale digital photogrammetric mapping (Block-4) was started and digital plotting for 1:5,000 scale digital photogrammetric mapping (Sylhet City) was started from February 2012 by digital plotting unit of IDMS. Also, from the end of February 2012, digital plotting for 1:25,000 scale digital photogrammetric mapping (Block-1) was started.

The production of 1:25,000 scale digital plotting from August 2011 up to February 2012 is shown in Appendix 3.5 “Production of 1:25,000 Scale Digital Plotting”.

The progress of the implementation of digital plotting as of the end of February 2012 is shown on Table 3.5 “Production of digital plotting as of the end of February 2012”.

Table 3.10.2 Production of digital plotting as of the end of February 2012

1:25,000 Scale Digital Plotting			1:5,000 Scale Digital Plotting		
Block No.	Area (km ²)	Situation	City Name	Area (km ²)	Situation
Block-1	7,298	On going	Sylhet	178	Just started.
Block-2	10,139	Not yet	Rajshahi	185	Not yet
Block-3	9,907	Not yet	Chittagong	575	Not yet
Block-4	5,784	56% finished	Khulna	329	Not yet
Block-5	1,642	Not yet	Barisal	148	Not yet
Block-6	14,160	Not yet			
Block-7	8,519	Not yet			
Block-8	11,345	Not yet			
Block-9	11,804	Not yet			
Block-10	8,669	Not yet			
Block-11	5,150	Not yet			
Block-12	6,524	Not yet			
Block-13	4,352	Not yet			
Border area	38,707	Not yet			
Total	144,000		Total	1,417	

- Note:
- 1) The area of Bangladesh territory is approx. 144,000 km².
 - 2) The value of area (km²) is an approximate value.

Accordingly, the executing rate of digital plotting as of the end of February 2012 is as follows:

- 1) The executing rate of 1:25,000 scale digital plotting:
 $\text{Approx. } 3,239 \text{ km}^2 \div 144,000 \text{ km}^2 = 0.022$ Approx. 2.2 %
- 2) The executing rate of 1:5,000 scale digital plotting:
 $\text{Approx. } 0 \text{ km}^2 \div 1,417 \text{ km}^2 = 0.000$ Just started.

3.10.3 DEM production

From the end of July 2011, DEM production was started and the progress of the implementation of DEM production as of the end of February 2012 is shown on Table 10.3 “Production of DEM as of the end of February 2012”.

Table 3.10.3 Production of DEM as of the end of February 2012

1:25,000 Scale DTM Production			1:5,000 Scale DTM Production		
Block No.	Area (km ²)	Situation	City Name	Area (km ²)	Situation
Block-1	7,298	Not yet	Sylhet	178	Not yet
Block-2	10,139	Not yet	Rajshahi	185	Not yet

Block-3	9,907	Not yet	Chittagong	575	Not yet
Block-4	5,784	30% finished	Khulna	329	Not yet
Block-5	1,642	Not yet	Barisal	148	Not yet
Block-6	14,160	Not yet			
Block-7	8,519	Not yet			
Block-8	11,345	Not yet			
Block-9	11,804	Not yet			
Block-10	8,669	Not yet			
Block-11	5,150	Not yet			
Block-12	6,524	Not yet			
Block-13	4,352	Not yet			
Border area	38,707	Not yet			
Total	144,000		Total	1,417	

- Note: 1) The area of Bangladesh territory is approx. 144,000 km².
2) The value of area (km²) is an approximate value.

Accordingly, the executing rate of DEM production as of the end of February 2012 is as follows:

- 1) The executing rate of 1:25,000 scale DEM production:
Approx. $1,750 \text{ km}^2 \div 144,000 \text{ km}^2 = 0.012$ Approx. 1.2 %
- 2) The executing rate of 1:5,000 scale DEM production:
Approx. $0 \text{ km}^2 \div 1,417 \text{ km}^2 = 0.000$ Not yet started.

3.10.4 Orthophoto production

From the end of July 2011, orthophoto production was started and the progress of the implementation of orthophoto production as of the end of February 2012 is shown on Table 3.10.4 “Production of orthophoto as of end of February 2012”.

Table 3.10.4 Production of orthophoto as of the end of February 2012

1:25,000 Scale Orthophoto Production			1:5,000 Scale Orthophoto Production		
Block No.	Area (km ²)	Situation	City Name	Area (km ²)	Situation
Block-1	7,298	On going	Sylhet	178	Not yet
Block-2	10,139	Not yet	Rajshahi	185	Not yet
Block-3	9,907	Not yet	Chittagong	575	Not yet
Block-4	5,784	Finished	Khulna	329	Not yet
Block-5	1,642	Not yet	Barisal	148	Not yet
Block-6	14,160	Not yet			
Block-7	8,519	Not yet			
Block-8	11,345	Not yet			
Block-9	11,804	Not yet			
Block-10	8,669	Not yet			
Block-11	5,150	Not yet			
Block-12	6,524	Not yet			
Block-13	4,352	Not yet			
Border area	38,707	Not yet			
Total	144,000		Total	1,417	

- Note: 1) The area of Bangladesh territory is approx. 144,000 km².
2) The value of area (km²) is an approximate value.

Accordingly, the executing rate of orthophoto production is as follow:

- 1) The executing rate of 1:25,000 scale orthophoto production:
Approx. $5,784 \text{ km}^2 \div 144,000 \text{ km}^2 = 0.040$ Approx. 4.0 %
- 2) The executing rate of 1:5,000 scale orthophoto production:
Approx. $0 \text{ km}^2 \div 1,417 \text{ km}^2 = 0.000$ Not yet started.

3.10.5 GIS basic data production

The work of GIS section was started from January 2012. The polygon data for water area such as river, lake, pond, vegetation and so on were created and the suitable code number according to the specification of GIS database was applied to the digital plotting data based on the field identification and so on.

The GIS basic data prepared by GIS section was delivered to cartographic section for the digital compilation that is the last step of digital topographic map production.

The progress of the implementation of GIS basic data creation as of the end of February 2012 is shown on Table 3.10.5 “Production of GIS basic data as of the end of February 2012”.

Table 3.10.5 Production of GIS basic data as of the end of February 2012

1:25,000 Scale GIS Basic Data Production			1:5,000 Scale GIS Basic Data Production		
Block No.	Area (km ²)	Situation	City Name	Area (km ²)	Situation
Block-1	7,298	Not yet	Sylhet	178	Not yet
Block-2	10,139	Not yet	Rajshahi	185	Not yet
Block-3	9,907	Not yet	Chittagong	575	Not Yet
Block-4	5,784	6% finished	Khulna	329	Not yet
Block-5	1,642	Not yet	Barisal	148	Not yet
Block-6	14,160	Not yet			
Block-7	8,519	Not yet			
Block-8	11,345	Not yet			
Block-9	11,804	Not yet			
Block-10	8,669	Not yet			
Block-11	5,150	Not yet			
Block-12	6,524	Not yet			
Block-13	4,352	Not yet			
Border area	38,707	Not yet			
Total	144,000		Total	1,417	

- Note: 1) The area of Bangladesh territory is approx. 144,000 km².
2) The value of area (km²) is an approximate value.

Accordingly, the executing rate of GIS basic data production is as follow:

- 1) The executing rate of 1:25,000 scale GIS basic data production:
 $\text{Approx. } 375 \text{ km}^2 \div 144,000 \text{ km}^2 = 0.0026$ Approx. 0.26 %
- 2) The executing rate of 1:5,000 scale GIS basic data production:
 $\text{Approx. } 0 \text{ km}^2 \div 1,417 \text{ km}^2 = 0.000$ Not yet started.

3.10.6 Digital compilation (Production of digital topographic maps)

Digital topographic map is the outputs of cartography section in IDMS. The first sheet of 1:25,000 scale digital topographic maps in Block-4 was completed by the end of February 2012.

The progress of the implementation of digital compilation (Production of digital topographic map) as of the end of February 2012 is shown on Table 3.10.6 “Production of digital compilation as of the end of February 2012 (Production of digital topographic map)”.

Table 3.10.6 Production of digital compilation as of the end of February 2012
(Production of digital topographic map)

1:25,000 Scale Digital Topographic Map Production			1:5,000 Scale Digital Topographic Map Production		
Block No.	Area (km ²)	Situation	City Name	Area (km ²)	Situation
Block-1	7,298	Not yet	Sylhet	178	Not yet
Block-2	10,139	Not yet	Rajshahi	185	Not yet
Block-3	9,907	Not yet	Chittagong	575	Not yet
Block-4	5,784	3% finished	Khulna	329	Not yet
Block-5	1,642	Not yet	Barisal	148	Not yet
Block-6	14,160	Not yet			
Block-7	8,519	Not yet			
Block-8	11,345	Not yet			
Block-9	11,804	Not yet			
Block-10	8,669	Not yet			
Block-11	5,150	Not yet			
Block-12	6,524	Not yet			
Block-13	4,352	Not yet			
Border area	38,707	Not yet			
Total	144,000		Total	1,417	

- Note:
- 1) The area of Bangladesh territory is approx. 144,000 km².
 - 2) The value of area (km²) is an approximate value.

Accordingly, the executing rate of digital compilation (Production of digital topographic maps) is as follow:

- 1) Executing rate of 1:25,000 scale digital compilation (Production of digital topographic map):

Approx. $175 \text{ km}^2 \div 144,000 \text{ km}^2 = 0.0012$

Approx. 0.12 %

- 2) Executing rate of 1:5,000 scale digital compilation (Production of digital topographic map):
Approx. $0 \text{ km}^2 \div 1,417 \text{ km}^2 = 0.000$ Not yet started.

The sheet index of 1:25,000 scale and 1:5,000 scale digital topographic maps are shown in Appendix 3.6 “Index to Sheet of Bangladesh (1:25,000)”, Appendix 3.7 “Index to Sheets of Sylhet (Scale 1:5,000)”, Appendix 3.8 “Index to Sheets of Rajshahi (Scale 1:5,000)”, Appendix 3.9 “Index to Sheets of Khulna (Scale 1:5,000)”, Appendix 3.10 “Index to Sheets of Barisal (Scale 1:5,000)” and Appendix 3.11 “Index to Sheets of Chittagong (Scale 1:5,000)”.

The first 1:25,000 scale digital topographic map prepared by IDMS is shown in Appendix 3.12 “1:25,000 scale digital topographic map prepared by IDMS (Reduced version)”.

3.10.7 Procurement of satellite image data and training by the contractor

Based on the contract for the procurement of satellite image data between SOB and the contractor, factory training for the digital plotting using satellite image data was executed from the beginning of February 2012 in Bangkok City by the contractor.

The actual work of data acquisition for 1:25,000 scale digital topographic map using satellite image data at the border area will be started from around April 2012 after completion of the delivery of satellite image data to SOB from the contractor.

Chapter 4 Implementation Schedule of BDMAP

Chapter 4 Implementation Schedule of BDMAP

As described in Chapter 1 “Outline of the Project”, the purpose of BDMAP is to execute the technical training to the staff of SOB, and also to support IDMS from technical, planning and management aspects. Therefore, the activities of BDMAP depend on the capability of the staff of SOB and the actual schedule of IDMS.

The schedule and contents of activities of BDMAP were drastically changed from the original plan of BDMAP due to the changes of important assumptions occurred in the 1st year and 2nd year of BDMAP.

4.1 Original plan of BDMAP

The basic concept of the original plan of BDMAP before starting BDMAP (1st year) was as follows:

1) First year of BDMAP

Outline of the activities of BDMAP

- a) Preparation of the implementation plan of IDMS
- b) Technical training of digital photogrammetric mapping to the staff of SOB (Lecture and practical training)

Outline of the activities of IDMS

- a) Aerial photography
- b) Procurement of photogrammetric equipment and software
- c) Ground control point survey (Northern part of Bangladesh)

2) Second year of BDMAP

Outline of the activities of BDMAP

- a) On the Job Training
- b) Trouble shooting
- c) Quality control
- d) Project planning and management support

Outline of the activities of IDMS

- a) 1:25,000 and 1:5,000 scale digital mapping
 - Aerial triangulation
 - Digital plotting
 - DEM and orthophoto production
 - GIS basic data production

- Digital compilation (Preparation of digital topographic map)
- b) Ground control point survey (Central part of Bangladesh)
- c) Field identification for digital plotting completion area
- d) Aerial photography, in case not completed in the first year

3) Third year of BDMAP

Outline of the activities of BDMAP

- a) On the Job Training
- b) Trouble shooting
- c) Quality control
- d) Project planning and management support

Outline of the activities of IDMS

- a) 1:25,000 and 1:5,000 scale digital mapping
 - Aerial triangulation
 - Digital plotting
 - DEM and orthophoto production
 - GIS basic data production
 - Digital compilation (Preparation of digital topographic map)
- b) Ground control point survey (Southern part of Bangladesh)
- c) Field identification for digital plotting completion area

According to the original schedule of BDMAP, the technical training to the staff of SOB was planned to be executed in a short period of time, approximately from the beginning of December 2009 up to the end of March 2010, and in a concentrated manner (1 computer per 1 person). During this period, it was planned that the basic technique of digital mapping is transferred to the staff of SOB.

From the 2nd year of BDMAP, through the implementation of the actual work of 1:25,000 and 1:5,000 scale digital photogrammetric mapping of IDMS, necessary technique and knowledge for the implementation of IDMS, such as a capability of trouble shooting, quality control, project planning and management and so on, was planned to be transferred to the staff of SOB to be able to execute IDMS smoothly.

4.2 Modification of the implementation schedule and activities of BDMAP

Due to the change of the important assumptions of BDMAP at the beginning of the 1st year of BDMAP, it was impossible to execute the activities of BDMAP according to the original plan and schedule of BDMAP.

Through the discussion with JICA Bangladesh Office, SOB and BDMAP, BDMAP decided to modify the implementation schedule and contents of the activities of BDMAP to minimize the delay of the schedule of IDMS caused by the change of the important assumptions of BDMAP.

Finally, the implementation schedule and contents of the activities of BDMAP were drastically changed from the original plan as mentioned on Table 4.2.1 “Alteration of the implementation schedule of the activities of BDMAP”.

4.3 Original and actual schedule of BDMAP and IDMS

The original and actual schedule of main items of BDMAP and IDMS are shown in Figure 4.3.1 “Original and actual schedule of BDMAP and IDMS.”

Table 4.2.1 Alteration of the implementations schedule of BDMAP

Activities	Original Plan			Revised Plan			Note
	1st Year	2nd Year	3rd Year	1st Year	2nd Year	3rd Year	
A Contents of Activities							
1	Preparation of Inception Report	○		○			No change
2	Counterpart training in Japan	○	○	○	○	○	No change
3	Explanation meeting of Inception Report	○		○			No change
4	Confirmation of procurement of equipment and aerial photography	○		○	○	○	Due to the delay of aerial photography and procurement of photogrammetric equipment and software
5	Preparation of the process and products of digital mapping	○		○	○		Due to the delay of checking of translation from English to Bengali by SOB
6-1	Preparation of operation manual of aerial triangulation	○		○	○	○	Due to the delay of the procurement of software, final version of operation manual was prepared in the 3rd year of BDMAP.
6-2	Technical transfer of aerial triangulation	○	○	○	○		Technical training was executed using the equipment and software prepared by BDMAP due to the delay of procurement
6-3	Quality and schedule control of aerial triangulation		○			○	The actual work of IDMS started from the 3rd year of BDMAP
7-1	Preparation of operation manual of orthophoto production	○			○	○	Due to the difference of software, provisional version of operation manuals were prepared.
7-2	Technical transfer of orthophoto production	○	○		○		Technical training was started from the 2nd year using the equipment and software prepared by BDMAP
7-3	Quality and schedule control of orthophoto production		○			○	Actual work of IDMS was started from the 3rd year of BDMAP
8-1	Preparation of operation manual of DEM production	○			○	○	Due to the delay of the procurement of software, final version of operation manual was prepared in the 3rd year of BDMAP.
8-2	Technical transfer of DEM production	○	○		○		Technical training was executed using the software prepared by BDMAP in the 2nd year of BDMAP.
8-3	Quality and schedule control of DEM production		○			○	Actual work of IDMS was started from the 3rd year of BDMAP.
9-1	Preparation of operation manual of digital plotting	○		○	○	○	Due to the difference of software, final version of operation manual was prepared in the 3rd year of BDMAP.
9-2	Technical transfer of digital plotting	○	○	○	○		Technical training was executed in the 1st and 2nd year using the software prepared by BDMAP.
9-3	Quality and schedule control of digital plotting		○			○	Actual work of IDMS was started from the 3rd year of BDMAP.
10-1	Preparation of operation manual of digital compilation		○		○	○	Provisional version was prepared in the 2nd year and final version was prepared in the 3rd year of BDMAP.
10-2	Technical transfer of digital compilation		○	○	○	○	Technical training was started from the 1st year of BDMAP considering the capability of the staff of SOB.
10-3	Quality and schedule control of digital compilation		○			○	Actual work of IDMS was started from the 3rd year of BDMAP.
11-1	Preparation of operation manual of GIS basic data production		○		○	○	Provisional version was prepared in the 2nd year and final version was prepared in the 3rd year of BDMAP.
11-2	Technical transfer of GIS basic data production		○	○	○	○	No change
11-3	Quality and schedule control of GIS basic data production			○		○	Actual work of IDMS was started from the 3rd year of BDMAP.
12-1	Preparation of operation manual of map printing		○				Deleted Based on the recommendation by terminal evaluation, this activity was deleted from PDM.
12-2	Technical transfer of map printing			○			Deleted Based on the recommendation by terminal evaluation, this activity was deleted from PDM.
12-3	Preparation of maintenance plan of printing machine			○			Deleted Based on the recommendation by terminal evaluation, this activity was deleted from PDM.
13-1	Lecture of photogrammetry and aerial triangulation	○		○			No change
14	Preparation of map specifications	○		○	○	○	Draft was prepared in the 1st year and necessary amendment was executed in 2nd and 3rd year of BDMAP.
15	Preparation of map sheet index and map numbers	○		○	○	○	Draft was prepared in the 1st year and necessary amendment was executed in 2nd and 3rd year of BDMAP.
16	Preparation of sample map	○		○	○	○	Draft was prepared in the 1st year and necessary amendment was executed in 2nd and 3rd year of BDMAP.
17	Preparation and discussion of P/O				○	○	Due to the change of the important assumption, P/O on 2nd and 3rd BDMAP were necessary.
18	Preparation of aerial photography plan				○	○	No activity on the original plan. Executed on the 1st and 2nd year.
19	Preparation of GCP plan (Northern part)				○		No activity on the original plan. Executed on the 1st year.
20	Preparation of GCP plan (Southern part)				○		No activity on the original plan. Executed on the 2nd year.
21	Assistance for aerial triangulation implementation planning				○	○	No activity on the original plan. Executed on the 2nd and 3rd year.
22	Assistance for orthophoto production planning				○	○	No activity on the original plan. Executed on the 2nd and 3rd year.
23	Assistance for DEM production planning				○	○	No activity on the original plan. Executed on the 2nd and 3rd year.
24	Assistance for digital plotting implementation planning				○	○	No activity on the original plan. Executed on the 2nd and 3rd year.
25	Assistance for digital compilation implementation planning				○	○	No activity on the original plan. Executed on the 2nd and 3rd year.
26	Assistance for GIS basic data production planning				○	○	No activity on the original plan. Executed on the 2nd and 3rd year.
27	Training of pricking (Height point)				○		No activity on the original plan. Executed on the 1st year.
28	Training of eccentric survey (Horizontal position)				○	○	No activity on the original plan. Executed on the 2nd year.
29	Lecture of project management				○		No activity on the original plan. Executed on the 2nd year.
30	Alteration of PDM					○	Based on the recommendation of the terminal evaluation, PDM was modified.
31	Confirmation of equipment procured by SOB					○	Due to the delay of aerial photography and procurement of equipment and software,
32	Confirmation of the activities of IDMS					○	The activities of IDMS during the period between 2nd and 3rd year is necessary.
33	Project management of IDMS					○	For the smooth implementation of IDMS, this activity were necessary.
34	Finalization of operation manuals					○	Final version was prepared based on the provisional version prepared on 1st and 2nd year.
35	Support for mid-term evaluation team		○		○		No change
36	Support for terminal evaluation team			○		○	No change
37	Preparation and explanation of report	○	○	○	○	○	No change
38	Publicity activities	○	○	○	○	○	No change
39	Printing and binding of final report			○		○	No change
B Common activities							
	Data collection of evaluation	○	○	○	○	○	No change
	Attendance for meeting and submission of monthly report	○	○	○	○	○	No change
	Execution and support for seminar	○	○	○	○	○	Due to the delay of aerial photography, seminar on the 1st year was decided not to be executed.
C Outputs of the activities							
	Inception Report	○		○			No change
	Project Progress Report I	○		○			No change
	Technical specification of digital mapping (Draft)	○		○	○		Check of the translation from English to Bengali was executed on the 2nd year.
	Operation manual of aerial triangulation (Draft)	○		○	○	○	Provisional version was prepared on the 1st and 2nd year and final version was prepared on the 3rd year.
	Operation manual of orthophoto production (Draft)	○		○	○	○	Provisional version was prepared on the 1st and 2nd year and final version was prepared on the 3rd year.
	Operation manual of DEM production (Draft)	○		○	○	○	Provisional version was prepared on the 1st and 2nd year and final version was prepared on the 3rd year.
	Operation manual of digital plotting (Draft)	○		○	○	○	Provisional version was prepared on the 1st and 2nd year and final version was prepared on the 3rd year.
	Marginal information (Draft)	○		○			Prepared on the 1st year and modification was executed on the 2nd and 3rd year if necessary.
	Map specification (Draft)	○		○			Prepared on the 1st year and modification was executed on the 2nd and 3rd year if necessary.
	Preparation of 1:25,000 scale sample map	○		○	○		Prepared on the 1st and 2nd year.
	Sheet index and numbering plan	○		○	○	○	Prepared on the 1st year and modification was executed on the 2nd and 3rd year if necessary.
	Technical training plan	○	○	○	○	○	No change
	Plan of operation of the 2nd year of BDMAP					○	Due to the change of the activity plan and schedule, P/O was necessary to be prepared.
	Project Progress Report II		○		○		No change
	Operation manual of digital compilation		○		○	○	Provisional version was prepared on the 2nd year and final version was prepared on the 3rd year.
	Operation manual of GIS basic data production		○		○	○	Provisional version was prepared on the 2nd year and final version was prepared on the 3rd year.
	Technical training plan		○		○		No change
	Plan of operation of the 3rd year of BDMAP					○	Due to the change of the activity plan and schedule, P/O was necessary to be prepared.
	Final report			○		○	No change
	Technical specification of digital mapping (Draft)			○		○	No change
	Operation manual (Final version)			○		○	No change
	Project management and lecture			○		○	No change
	Operation manual of map printing (Draft)			○			Deleted Based on the recommendation of the terminal evaluation, this activity was deleted.
	Maintenance plan of printing machine (Draft)			○			Deleted Based on the recommendation of the terminal evaluation, this activity was deleted.
	Technical training plan			○			Deleted Based on the recommendation of the terminal evaluation, this activity was deleted.

Note

- "Red" is the activity not mentioned on the original plan or PDM.
- "Blue" is the activity deleted from PDM based on the recommendation of the terminal evaluation.

Chapter 5 Inputs of BDMAP

Chapter 5 Inputs of BDMAP

The inputs of BDMAP (July 2009~March 2012) are as follows:

5.1 Inputs of BDMAP (1st year)

The inputs of the 1st year of BDMAP are as follows:

- 1) Contract amount: Yen 83,115,900.- (Including consumption tax: Yen 3,957,900.-)
- 2) Contract period: From 24 July 2009 to 26 March 2010
- 3) Contract M/M, assignment and name of experts:

<u>Assignment</u>	<u>Name of Expert</u>	<u>Contract M/M</u>
Chief/Technical specification	Mr. Toru Watanabe	5.50 M/M
Photogrammetry/Aerial triangulation theory	Dr. Mitsuru Nasu	0.80 M/M
Aerial triangulation/Orthophoto & DEM (1)	Mr. Takashi Harada	4.00 M/M
Aerial triangulation/Orthophoto & DEM (2)	Mr. Yoshiteru Matsushita	1.00 M/M
Digital plotting	Mr. Tsuneo Terada	3.50 M/M
Digital compilation	Mr. Yoshiteru Matsushita	3.50 M/M
GIS management	Mr. Shigeru Ono	0.50 M/M
Administrative support (1)	Ms. Michi Hayashi	1.00 M/M
<u>Administrative support (2)</u>	<u>Ms. Kazue Uchiyama</u>	<u>1.00 M/M</u>
Total	Including administrative support	20.80 M/M
	Excluding administrative support	18.80 M/M

5.2 Inputs of BDMAP (2nd year)

The inputs of the 2nd year of BDMAP are as follows:

- 1) Contract amount: Yen 95,604,600.- (Including consumption tax: Yen 4,552,600.-)
- 2) Contract period: From 27 April 2010 to 31 March 2011

3) Contract M/M, assignment and name of experts:

<u>Assignment</u>	<u>Name of Expert</u>	<u>Contract M/M</u>
Chief/Technical specification	Mr. Toru Watanabe	4.00 M/M
Aerial triangulation/Orthophoto & DEM (1)	Mr. Takashi Harada	4.50 M/M
Aerial triangulation/Orthophoto & DEM (2)	Mr. Koji Yamazaki	3.50 M/M
Digital plotting	Mr. Tsuneo Terada	6.00 M/M
Digital compilation	Mr. Yoshiteru Matsushita	6.50 M/M
GIS management	Mr. Shigeru Ono	1.00 M/M
<u>Administrative support (1)</u>	<u>Ms. Michi Hayashi</u>	<u>2.00 M/M</u>
Total	Including administrative support	27.50 M/M
	Excluding administrative support	25.50 MM

5.3 Inputs of BDMAP (3rd year)

The inputs of the 3rd year of BDMAP are as follows:

- 1) Contract amount: Yen 78,171,450.- (Including consumption tax: Yen 3,722,450.-)
- 2) Contract period: From 26 May 2011 to 25 March 2012
- 3) Contract M/M, assignment and name of experts:

<u>Assignment</u>	<u>Name of Expert</u>	<u>Contract M/M</u>
Chief/Technical specification	Mr. Toru Watanabe	7.13 M/M
Aerial triangulation/Orthophoto & DEM (1)	Mr. Takashi Harada	1.50 M/M
Aerial triangulation/Orthophoto & DEM (2)	Mr. Koji Yamazaki	0.83 M/M
Digital plotting	Mr. Tsuneo Terada	7.06 M/M
Digital compilation	Mr. Yoshiteru Matsushita	3.83 M/M
GIS management	Mr. Shigeru Ono	1.67 M/M
<u>Administrative support (1)</u>	<u>Ms. Michi Hayashi</u>	<u>2.00 M/M</u>
Total	Including administrative support	24.02 M/M
	Excluding administrative support	22.02 MM

5.4 Inputs of whole BDMAP (1st year~3rd year)

The inputs of whole BDMAP (1st year~3rd year) are as follows:

- 1) Contract amount: Yen 256,891,950.-
(Including consumption tax: 12,232,950.-)
- 2) Contract period: From 24 July 2009 to 25 March 2012
- 3) Contract M/M, assignment and name of expert:

<u>Assignment</u>	<u>Name of Expert</u>	<u>Contracted M/M</u>
Chief/Technical specification	Mr. Toru Watanabe	16.63 M/M
Photogrammetry/Aerial triangulation theory	Dr. Mitsuru Nasu	0.80 M/M
Aerial triangulation/Orthophoto & DEM (1)	Mr. Takashi Harada	10.00 M/M
Aerial triangulation/Orthophoto & DEM (2)	Mr. Koji Yamazaki	4.33 M/M
Digital plotting	Mr. Tsuneo Terada	16.56 M/M
Digital compilation	Mr. Yoshiteru Matsushita	14.83 M/M
GIS management	Mr. Shigeru Ono	3.17 M/M
Administrative support (1)	Ms. Michi Hayashi	5.00 M/M
<u>Administrative support (2)</u>	<u>Ms. Kazue Uchiyama</u>	<u>1.00 M/M</u>
Total	Including administrative support	72.32 M/M
	Excluding administrative support	66.32 M/M

Chapter 6 Actual Assignment Periods of the Experts of BDMAP

Chapter 6 Actual Assignment Periods of the Experts of BDMAP

The actual assignment periods of the experts of BDMAP are as follows:

6.1 Actual assignment periods of the experts of BDMAP (1st year)

The actual assignment periods of the experts on the 1st year of BDMAP are as follows:

<u>Assignment</u>	<u>Name of Expert</u>	<u>Assignment Period</u>	<u>Days</u>
Chief/Technical Specification	Mr. Toru Watanabe	05/09/2009 – 18/12/2009	105 days
		10/01/2010 – 20/03/2010	70 days
Photogrammetry/Aerial triangulation theory	Dr. Mitsuru Nasu	17/12/2009 – 28/12/2009	12 days
		23/02/2010 – 06/03/2010	12 days
Aerial triangulation/Ortho-photo & DEM (1)	Mr. Takashi Harada	30/08/2009 – 28/09/2009	30 days
		21/12/2009 – 20/03/2010	90 days
Aerial triangulation/Ortho-photo & DEM (2)	Mr. Yoshiteru Matsushita	01/02/2010 – 20/03/2010	48 days
Digital plotting	Mr. Tsuneo Terada	19/11/2009 – 20/03/2010	122 days
Digital compilation	Mr. Yoshiteru Matsushita	05/09/2009 – 18/12/2009	105 days
GIS management	Mr. Shigeru Ono	28/09/2009 – 12/10/2009	15 days
Administrative support (1)	Ms. Michi Hayashi	30/08/2009 – 29/10/2009	61 days
		10/12/2009 – 19/01/2010	41 days
<u>Administrative support (2)</u>	<u>Ms. Kazue Uchiyama</u>	<u>26/02/2010 – 20/03/2010</u>	<u>23 days</u>
Total	Including administrative support		734 days
		Excluding administrative support	609 days

6.2 Actual assignment periods of the experts of BDMAP (2nd year)

The actual assignment periods of the experts on the 2nd year of BDMAP are as follows:

<u>Assignment</u>	<u>Name of Expert</u>	<u>Assignment Period</u>	<u>Days</u>
Chief/Technical Specification	Mr. Toru Watanabe	10/05/2010 – 08/06/2010	30 days
		04/07/2010 – 02/09/2010	61 days
		15/09/2010 – 05/12/2010	72 days
		30/01/2011 – 20/03/2011	50 days
Aerial triangulation/Ortho-photo & DEM (1)	Mr. Takashi Harada	20/07/2010 – 02/09/2010	45 days
		25/11/2010 – 07/01/2011	44 days
		03/02/2011 – 20/03/2011	46 days

Aerial triangulation/Ortho-photo & DEM (2)	Mr. Koji Yamazaki	10/05/2010 – 08/07/2010	60 days
		24/11/2010 – 07/01/2011	45 days
Digital plotting	Mr. Tsuneo Terada	01/06/2010 – 29/08/2010	90 days
		10/10/2010 – 29/08/2010	90 days
Digital compilation	Mr. Yoshiteru Matsushita	10/05/2010 – 07/08/2010	90 days
		27/09/2010 – 08/10/2010	12 days
		24/10/2010 – 16/11/2010	24 days
		26/11/2010 – 07/01/2011	43 days
		23/02/2011 – 20/03/2011	30 days
GIS management	Mr. Shigeru Ono	25/09/2010 – 24/10/2010	30 days
Administrative support (1)	Ms. Michi Hayashi	10/05/2010 – 08/06/2010	30 days
		07/02/2011 – 20/03/2011	42 days
Total		Including administrative support	934 days
		Excluding administrative support	852 days

Note: The number of trips of Mr. Matsushita increased due to the reason of passing away of his father during the period of the 2nd year of BDMAP.

6.3 Actual assignment periods of the experts of BDMAP (3rd year)

The actual assignment periods of the experts on the 3rd year of BDMAP are as follows:

<u>Assignment</u>	<u>Name of Expert</u>	<u>Assignment Period</u>	<u>Days</u>
Chief/Technical Specification	Mr. Toru Watanabe	30/05/2011 – 27/08/2011	90 days
		09/09/2011 – 28/10/2011	50 days
		18/11/2011 – 20/03/2012	124 days
Aerial triangulation/Ortho-photo & DEM (1)	Mr. Takashi Harada	08/07/2011 – 21/08/2011	45 days
Aerial triangulation/Ortho-photo & DEM (2)	Mr. Koji Yamazaki	06/12/2011 – 30/12/2011	25 days
Digital plotting	Mr. Tsuneo Terada	06/06/2011 – 19/08/2011	75 days
		09/09/2011 – 28/10/2011	50 days
		25/12/2011 – 20/03/2012	87 days
Digital compilation	Mr. Yoshiteru Matsushita	09/09/2011 – 28/10/2011	50 days
		09/12/2011 – 11/04/2012	65 days
GIS management	Mr. Shigeru Ono	09/09/2011 – 28/10/2011	50 days
Administrative support (1)	Ms. Michi Hayashi	06/06/2011 – 05/07/2011	30 days
		20/02/2012 – 20/03/2012	30 days
Total		Including administrative support	771 days

Excluding administrative support 711 days

6.4 Actual assignment periods of the experts of whole BDMAP (1st year~3rd year)

The actual assignment period of the experts of whole BDMAP (1st year~3rd year) are as follows:

<u>Assignment</u>	<u>Name</u>	<u>Trips</u>	<u>Total Days</u>
Chief/Technical specification	Mr. Toru Watanabe	9 times	652 days
Photogrammetry/Aerial triangulation theory	Dr. Mitsuru Nasu	2 times	24 days
Aerial triangulation/Orthophoto & DEM (1)	Mr. Takashi Harada	6 times	300 days
Aerial triangulation/Orthophoto & DEM (2)	Mr. Koji Yamazaki	3 times	130 days
Digital plotting	Mr. Tsuneo Terada	6 times	514 days
Digital compilation	Mr. Yoshiteru Matsushita	9 times	467 days
GIS management	Mr. Shigeru Ono	3 times	95 days
Administrative support (1)	Ms. Michi Hayashi	5 times	234 days
Administrative support (2)	Ms. Kazue Uchiyama	1 times	23 days
Total	Including administrative support		2439 days
	Excluding administrative support		2182 days

Chapter 7 Counterpart Training in Japan

Chapter 7 Counterpart Training in Japan

The counterparts training in Japan was executed as follows:

7.1 Participants and period of counterpart training in Japan

The participants and period of counterparts training in Japan are as follows:

1) Counterparts training in Japan of BDMAP (1st year)

Participant: Col. Mahumudun Nabi, psc
Director of Defense Survey Directorate
Mr. Ganesh Chandra Roy
Assistant Superintendent of Survey, Geodetic Detachment

Period: From 24 January 2010 to 21 February 2010 (29 days)

2) Counterparts training in Japan of BDMAP (2nd year)

Participant: Lt. Col. Shameem Ahsan Jagul, psc
Director of Development Survey Directorate
Mr. Md. Ibrahim Khalil
Sub. Assistant Superintendent, No.2 Digital Cartographic Office

Period: From 6 November 2010 to 5 December 2010 (30 days)

3) Counterparts training in Japan of BDMAP (3rd year)

Participant: Mr. Md. Mustafijur Rahman
Assistant Director (Survey)
Ms. Jahanara Sultana
Sub. Assistant Superintendent

Period: From 14 January 2012 to 12 February 2012 (30 days)

7.2 Purpose and contents of counterpart training in Japan

The purpose and contents of counterpart training in Japan are as follows:

1) Purpose of counterpart training in Japan

- To understand the role and contents of work of government survey and mapping

organization in Japan, and also the present situation of topographic map data release method in Japan.

Based on the above understanding, future organization and scope of work of SOB and so on will be considered.

- To understand the planning and management method of topographic mapping by photogrammetric method.

2) Contents of training in Japan

- Present situation of topographic maps and data in Japan and future plan
- Present situation of data release of topographic maps and digital data in Japan
- Geoid model in Japan
- Transformation from Bessel to World Geodetic System in Japan
- Role of GSI Japan and business content
- Utilization of satellite images for topographic mapping
- Modern technology of survey and mapping
- Planning and management of topographic mapping
- Countermeasures for computer virus and utilization of computer server for office work
- Explanation of server system
- Survey law in Japan
- Utilization of GIS in Japan
- Quality control method for topographic mapping in Japan
- Permanent GPS station in Japan
- Clearing house and Web system for digital topographic data in Japan
- Other topics based on the request from the participants

7.3 Visiting Places

The main visiting places during the counterpart training in Japan are as follows:

- Japan International Cooperation Agency, Head Office in Tokyo
- Geospatial Information Authority of Japan (former Geographical Survey Institute of Japan)
- Geospatial Information Authority of Japan, Kinki Regional Survey Department
- College of Land, Infrastructure, Transport and Tourism
- Japan Map Center
- Japan Association of Surveyor
- Japan Aerospace Exploration Agency (JAXA)
- Remote Sensing Technology Center of Japan (RESTEC)

- Tokyo SPOT Image K.K.
- Asia Air Survey Co., Ltd.
- Aero Asahi Corporation
- Book store, etc.

Chapter 8 Equipment Used for BDMAP and IDMS

Chapter 8 Equipment Used for BDMAP and IDMS

The equipment and software procured and prepared by BDMAP and SOB, and the equipment and software donated to SOB from BDMAP are as follows:

8.1 Equipment and software procured by BDMAP

The equipment and software procured by BDMAP at the 1st year of BDMAP are listed in Table 8.1.1 “Equipment and software procured by BDMAP”.

Table 8.1.1 Equipment and software procured by BDMAP

Name of Equipment & Software	Details of Equipment & Software	No.
A. Equipment and software procured in Bangladesh		
1) Computer	DELL Precision T3500, Xeon X5550 2.66 GHz	1
	DELL Precision T3500, Xeon W3520 2.66 GHz	4
2) Laser Printer (B/W with Copier)	Canon image CLASS, MF6550	1
3) Laser Printer (Color, A3 size)	Canon LASER SHOT LBP5970	1
4) Large Format Printer (Plotter)	Canon Image PROGRAF iPF710	1
5) UPS		5
6) Back Up Power Supply		1
7) OS	Micro-Office 2007 Professional	5
8) Adobe Acrobat	Adobe Acrobat Standard 9	5
9) Antivirus software	Symantec Norton 360	5
10) Graphic software	Photo Shop CS4 Extended	5
11) Graphic software	Illustrator CS4	5
12) Network		1
B. Equipment and software procured in Japan		
1) Computer	CF-52W1AAS	1
2) OS	WIN-XP-PRO-SP3/OEM/E	1
3) OS	Micro-Office 2007 PRO	1
4) Graphic software	Illustrator CS4	1
5) Hard-disc	250 GB, IO-DATA, 1.5 inch	10

8.2 Equipment and software prepared by BDMAP

According to the original plan of BDMAP, technical training to the staff of SOB would be executed using the equipment and software which would be procured by SOB. It was estimated that the equipment and software, to be procured by SOB, could be used from the beginning of December 2009.

However, the tender for the procurement of photogrammetric equipment and software executed by SOB was decided as a cancel by the Government of Bangladesh in the middle of October 2009. Therefore, it was impossible to execute the technical training to the staff of SOB

according to the original plan of BDMAP.

Facing this issue, through the discussion with JICA Bangladesh Office, SOB and BDMAP, BDMAP decided to prepare the minimum number of equipment and software, especially digital mapping system necessary for the technical training of aerial triangulation and digital plotting, by BDMAP by its own cost (Refer to Appendix 12.4 “Record of Discussion on 8 December 2009”).

At the beginning of the 2nd year of BDMAP, the fresh tender (2nd tender) for the procurement of photogrammetric equipment and software by SOB was decided as a cancel again by the Government of Bangladesh. Therefore, it was estimated that the photogrammetric equipment and software to be procured by SOB was not able to use for the technical training to the staff of SOB before around the end of February 2011.

Therefore, during the period of the 2nd year of BDMAP, the technical training to the staff of SOB had to be executed using the digital plotting systems which were already prepared by BDMAP on the 1st year of BDMAP.

Considering the efficiency of the technical training to the staff of SOB, BDMAP decided to increase the number of digital plotting systems (Total 12 sets) by BDMAP by its own cost.

The equipment and software prepared by BDMAP for the implementation of technical training to the staff of SOB in the 1st and 2nd year of BDMAP are listed on Table “Equipment and software prepared by BDMAP”.

Table 8.2.1 Equipment and software prepared by BDMAP

Name of Equipment & Software	Details of Equipment & Software	No.
1) Computer	Dell Latitude D630	7
2) UPS		7
3) 3D monitor	Zalman	12
4) Digital mapping software	Zukameijin (English version)	12
5) Mouse		7

8.3 Equipment and software procured by SOB

The equipment and software, necessary for the implementation of IDMS, procured by SOB are listed on Table 8.3.1 “Equipment and software procured by SOB”. The setting up of the equipment and software in SOB was started from around the beginning of February 2011 and completed by the end of May 2011.

Table 8.3.1 Equipment and software procured by SOB

Item of equipment	Name of equipment	No.
1. Photogrammetric equipment		
Aerial triangulation software	Inpho Match-AT	3
3D plotting software	Inpho Summit Evolution with Autodesk AutoCAD Map 3D	40
Accessory	Monitor, glass, 3D mouse	53
DTM computation and orthophoto generation software	Inpho DTM Box and Inpho Ortho Box	10
Computer		53
Furniture		53
2. Digital compilation equipment		
Cartographic software	ESRI ArcGIS, ArcEditor, PLTS	45
Computer		45
Furniture		45
3. GIS equipment		
GIS software	ESRI ArcGIS, ArcEditor, PLTS	16
Computer		16
Furniture		16
4. Server		
Server		1
4. Other equipment		
UPS		1
AVR		1
Air conditioner		As required numbers

Chapter 9 Implementation Procedure of BDMAP

Chapter 9 *Implementation Procedure of BDMAP*

The issues, implementation procedure of BDMAP and IDMS, lessons learned and recommendation are as follows:

9.1 Issues on the implementation of BDMAP and IDMS

Many problems happened during the implementation of BDMAP and IDMS. Especially, the personal difference of the capability among the staff of SOB, such as an experience of actual work, technical capabilities, comprehension and so on, was one of the issues for the implementation of BDMAP and IDMS.

The main issues encountered during the implementation of BDMAP and IDMS excluding the technical aspects of digital mapping are as follows:

9.1.1 Lack of the experience of actual work of digital photogrammetric mapping of the staff of SOB

Some of the staff of SOB has an experience of analogue photogrammetric mapping using aerial photos. However, most of the staff of SOB has no experience of analogue and digital photogrammetric mapping using aerial photos.

Meanwhile, SOB has several staff who received training in digital photogrammetric mapping abroad. However, these persons of SOB had no experiences of actual work of digital photogrammetric mapping after training. The knowledge and capability of these persons of SOB is just a paper knowledge ability of digital photogrammetric mapping. Therefore, the idea or plans made by these persons were not suitable or not realistic from the view point of the implementation of actual works of digital photogrammetric mapping.

This is a typical pattern of the middle class staff of SOB and these persons will contribute little to the implementation of actual work of digital photogrammetric mapping of IDMS.

Therefore, it is necessary to build up the capability of the middle class staff of SOB through the experience of actual work of digital photogrammetric mapping.

9.1.2 Lack of the planning capability of the staff of SOB

The purpose of BDMAP is not only to execute the technical transfer of digital photogrammetric mapping using aerial photo to the staff of SOB, but also to assist the 1:25,000 scale and 1:5,000

scale digital mapping project smoothly by the staff of SOB based on the results of technical training to the staff of SOB.

However, the actual digital photogrammetric mapping can not be executed only by the technical knowledge such as aerial triangulation, digital plotting and so on. For the implementation of the actual work such as IDMS, many works such as estimation of productivity, cost estimation, preparation of implementation plan, preparation of work schedule, quality control planning, schedule control planning and so on are essential.

These works have to be executed by the middle class staff of SOB such as in charge of section or team leader of each section of IDMS. However, most of the middle class staff of SOB has no experience and capability of the project planning of digital photogrammetric mapping.

Therefore, it was necessary to build up the capability of project planning of the middle class staff of SOB for the implementation of IDMS.

9.1.3 Lack of the project management capability of the staff of SOB

For the implementation of huge project such as IDMS, not only proper project planning, but also proper project management is essential for the smooth implementation of the project. In IDMS, overall management will be executed by the top management of SOB and the management of the work of each section will be executed by the middle class staff of SOB such as these in charge of section and so on.

However, the capability of project management of the middle class staff of SOB, such a person charge of section and team leader, are low due to the lack of knowledge of project management and an experience of actual work of digital photogrammetric mapping using aerial photos.

Therefore, the middle class staff of SOB can not execute the necessary management of IDMS. Furthermore, the middle class staff of SOB does not know the basic concept of the project management as “Plan→Do→Check→Action”.

Generally speaking, many staff of SOB starts the work without plan and schedule, no check of the outputs of work, no idea of the countermeasures not to repeat the same issues and troubles. Therefore, the buildup of the capability of project management of the middle class staff of SOB was essential for the implementation of IDMS.

9.1.4 Lack of the trouble shooting capability of the staff of SOB

The project (actual work of the project) will not be implemented according to the plan due to the

reason of unexpected issues which will be occurred during the implementation of the project. Therefore, it is necessary to solve the issues one by one during the implementation of the project.

For the smooth implementation of the project, the capability of trouble shooting and the capability to grasp the source of issues are essential. However, these capabilities can be obtained only by the building up experience of actual works, and it is difficult to obtain this capabilities only by the lecture and training.

Most of the staff of SOB has no experience of actual work of digital photogrammetric mapping using aerial photos. Therefore, it was necessary to build up the capability of trouble shooting of the staff of SOB through the engagement of the actual work of digital photogrammetric mapping of IDMS.

9.1.5 Sense of self-independence of the staff of SOB

One of the big issues of the staff, especially low class staff of SOB is the lack of the sense of self-independence. The typical attitudes of the low class staff of SOB are as follows.

- 1) Not to consider by themselves and always, ask for answer to Japanese experts.
- 2) Not to study by themselves
- 3) No action, talk only
- 4) No own opinion
- 5) Only do the work that is ordered
- 6) Unpunctuality
- 7) No check of the outputs of the work

9.2 Implementation procedure of BDMAP

To solve the above mentioned issues, BDMAP executed the activities as mentioned below:

9.2.1 Improvement of the basic capability focusing on the basics of computer operation and photogrammetric mapping

Considering the work volume of IDMS, SOB had to assign many staff of SOB to IDMS. The total number of staff necessary for the implementation of IDMS was estimated as approximately 200 persons for indoor works such as aerial triangulation, digital plotting, GIS basic data production, cartography work and so on.

However, the human resources of SOB for digital photogrammetric mapping were limited. SOB had to assign the newly recruited staff and old generation staff to IDMS to secure the required number of people necessary for the implementation of IDMS even though some of the staff are lacking the experience of actual work and basic knowledge of survey and mapping and computer operation.

Therefore, BDMAP decided to execute the following basic training of survey and mapping, especially basic knowledge of photogrammetric mapping, and also computer operation to the staff of SOB to establish the foundation necessary for digital photogrammetric mapping before starting the technical training.

- 1) Lecture of the basics of survey and mapping, especially photogrammetric mapping
- 2) Lecture of the basics of computer
- 3) Lecture and training of basic software such as Excel, Office, AutoCAD and ArcMap and so on

The lecture and training of survey and mapping and computer operation to the staff of SOB was continued in the 2nd year of BDMAP by SOB.

9.2.2 Weight on the actual work and on-the-job training

It is impossible to teach all aspects of digital photogrammetric mapping, such as technique, planning, management and trouble shooting aspects, only by the lecture and training.

As described to hereinafter, the theory of digital photogrammetric mapping can not be applied directly and simply to the actual work of digital photogrammetric mapping without the consideration of the conditions and circumstances of the project.

Of course, the lecture and training are important as the method to obtain new knowledge and information. However, real technical capability will be built up only by the engagement in actual work and accumulation of actual work experience based on the knowledge obtained by lecture and training.

Therefore, the most important training to the staff of SOB is “On the Job Training” that is to solve the issues which will occur during the implementation of actual works of digital photogrammetric mapping.

According to the original plan of BDMAP, on the job training was planned to be executed in the 2nd year and 3rd year of BDMAP as shown on Table 9.2.1 “Original plan and actual implementation of BDMAP and IDMS”.

Table 9.2.1 Original plan and actual implementation of BDMAP and IDMS

Year	Original Plan	Actual Implementation
1 st year September 2009 ~ March 2010	<p>BDMAP</p> <ul style="list-style-type: none"> - Preparation of implementation plan - Lecture and training <p>IDMS</p> <ul style="list-style-type: none"> - Procurement of equipment - Aerial photography - Ground control point survey 	<p>BDMAP</p> <ul style="list-style-type: none"> - Preparation of implementation plan - Lecture and training <p>IDMS</p> <ul style="list-style-type: none"> - Pricking of BMs
2 nd year May 2010~ March 2011	<p>BDMAP</p> <ul style="list-style-type: none"> - On the Job training - Technical transfer of project planning and management - Technical transfer of quality control - Technical transfer of schedule Control - Trouble shooting <p>IDMS</p> <ul style="list-style-type: none"> - Ground control point survey - Field identification - Office works of digital mapping 	<p>BDMAP</p> <ul style="list-style-type: none"> - Revision of implementation plan - Lecture and training <p>IDMS</p> <ul style="list-style-type: none"> - Ground control point survey - Aerial photography - Procurement of equipment
3 rd year May 2011~ March 2012	<p>BDMAP</p> <ul style="list-style-type: none"> - On the Job Training - Technical transfer of project planning and management - Technical transfer of quality control - Technical transfer of schedule control - Trouble shooting <p>IDMS</p> <ul style="list-style-type: none"> - Field identification - Office works of digital mapping 	<p>BDMAP</p> <ul style="list-style-type: none"> - On the Job Training - Technical transfer of project planning and management - Technical transfer of quality control - Technical transfer of schedule control - Trouble shooting <p>IDMS</p> <ul style="list-style-type: none"> - Re-flight of aerial photography - Ground control point survey - Field identification - Office works of digital mapping

However, due to the delay of the procurement of photogrammetric equipment and software, on the job training for digital plotting was executed only for the period of approximately seven (7) months, and on the job training for GIS basic data production and digital cartography was executed only for the period of approximately two (2) months in the 3rd year of BDMAP.

9.2.3 Buildup of the project management capability

Even though the staff of SOB obtains the capability of digital photogrammetric mapping technique, the staff of SOB can not execute the digital photogrammetric mapping project such as IDMS.

For the implementation of the project, the knowledge and experience such as project planning,

project management, quality control, schedule control, project team making, budget management, labor management and so on are essential.

Without such knowledge and experience, it is impossible to implement the huge project such as IDMS. Therefore, Technical transfer of the project planning and management to the staff of SOB was decided to be executed as one of the activities of BDMAP even though not described in PDM of BDMAP.

9.2.4 Planning and implementation of IDMS by the staff of SOB by themselves

After completion of BDMAP, SOB has to manage IDMS by the staff of SOB themselves. For this, the middle class staff of SOB such as in charge of a section and team leaders of each section has to execute all necessary planning, management and trouble shooting by themselves.

On the 3rd year of BDMAP, after starting the actual work of IDMS, project planning and management such as preparation of implementation plan, work schedule, personnel distribution for the work, quality control, schedule control and so on were executed by the staff of SOB as much as possible under the instruction of BDMAP to build up the capability of project planning and management of the staff of SOB.

9.2.5 To solve the issues and troubles as much as possible at the beginning stage of IDMS

Humans learn a lot of lessons from failures or mistakes, but less from success. The reason is that the cause and effect relationship in the case of failures or mistakes is generally clear, but in the case of success, it is difficult to define the cause and effect relationship clearly.

Generally, at the beginning stage of the project, many issues and troubles may occur during the implementation of the actual works. As mentioned above, it is possible to learn a lot of lessons from the issues and troubles. However, it is necessary to avoid the fatal issues or troubles that will be a cause of the heavy damage to the work schedule of the project.

Therefore, it is necessary to set up the first working area as a pilot area to solve the issues troubles during the implementation of the actual works as much as possible, and to establish the suitable work procedures. Through the implementation of actual work of the first working area, it is possible to build up the capability of project planning, management and trouble shooting of the staff of the project. It is considered that the subsequent working area can be implemented more smoothly than the first working area. For this purpose, in IDMS, Block-4 was decided as the first working area (Pilot area).

Accordingly, Block-4 is the position of the integration of the training of digital photogrammetric

mapping that was executed in the 1st year and 2nd year of BDMAP, and the real actual work of digital photogrammetric mapping of IDMS will be started from the second working area (Block-1).

9.2.6 Basic concept of “Plan→Do→Check→Action”

It is impossible to avoid the issues and troubles during the implementation of the project. Therefore, the project will be implemented by solving issues and troubles one by one. For the smooth implementation of the project, the staff of SOB has to understand clearly the basic concept of project management that is “Plan→Do→Check→Action”.

The working procedure of the staff of SOB before starting IDMS is only “Plan→Do” in an extreme case. Many staff of SOB has no idea that the outputs of work, including intermediate outputs, must be checked appropriately and correctly. Furthermore, many staff of SOB has no idea of “Check→Action” that is a countermeasure to prevent the same issues or troubles occurring again.

IDMS is the first digital photogrammetric mapping project for SOB. Therefore, it is expected that many issues or troubles will occur especially at the beginning stage of the actual work of IDMS.

The important point is to develop and establish the production procedure of digital photogrammetric mapping in SOB by solving the issues and troubles one by one not to occur the same issues and troubles at the beginning stage of actual work of IDMS based on the project management concept as “Plan→Do→Check→Action”.

9.2.7 Communication among the sections of IDMS

The main issue of the failure of the project is the lack of the communication among the project team.

The digital photogrammetric mapping is the accumulation of each steps of digital photogrammetric work such as aerial triangulation, digital plotting, field identification and so on. Therefore, close communication among sections and teams is essential for the smooth implementation of the project.

However, before starting the actual work of IDMS, the communication among sections and teams are practically nonexistent.

Therefore, the suggestion and instruction for the close communication among digital plotting

section, GIS section and cartography section for the determination of role of each section, data delivery, data correction and so on was executed by BDMAP.

9.3 Lessons learned through the implementation of BDMAP and IDMS

The lessons learned through the implementation of BDMAP are as follows:

9.3.1 For the implementation of the project, not only the technical capability, but also planning and management capability are essential

The digital photogrammetric mapping project can not be implemented only by the training of the technical aspects such as aerial triangulation, digital plotting and so on.

Of course, the capability of digital photogrammetric mapping such as aerial triangulation, digital plotting and so on is essential for the implementation of digital photogrammetric mapping project. In addition to these capabilities, capabilities of project planning, project management, labor management, trouble shooting and so on are also required for the implementation of the project, especially huge project such as IDMS.

Without these capabilities, it is difficult to execute the project smoothly and also according to the schedule.

9.3.2 Lecture and training are not enough for capacity development

The technical, planning and management capabilities will be obtained and boosted up through the engagement in a actual work. Of course, the lecture and training are one of the methods to obtain the new knowledge and information. However, the important factor for capacity development is to engage in the actual works based on the knowledge obtained by the lecture and training.

Many staff of SOB participated in the training abroad. However, the persons who engaged in the actual works after the completion of training in abroad are limited.

Frankly speaking, the technical, planning and management capabilities of the persons who were engaged in the actual work after the completion of the training in abroad are improved and boosted up. However, the persons who are not engaged in the actual work are not, and the capability of such person will drop as time advance.

Furthermore, the idea and opinion of such persons are always not a realistic and logical idea or

an opinion based on the desk theory, not considering the real situation of the project. And such person will often become an obstacle for the planning and implementation of the project.

9.3.3 Theory can not be automatically applied to the actual work (Project)

The theory is the basis of engineering. However, actual work often can not be executed according to the theory. When the digital photogrammetric mapping plan is made, it is necessary to pay attention to the fact that even though the plan is theoretically possible, it may not be possible to be implemented.

In actual work, always, it is necessary to consider the resources necessary for the implementation of the project. If not, the plan may be an impracticable idea.

According to the present project management theory, the project plan will be prepared based on the condition that the resources are always limited. And also, it is necessary to consider the restriction elements at the time of the preparation of project plan.

Therefore, the project, which can not secure the necessary resources, cannot be executed according to the plan. Also, the project, without the consideration of the restriction elements, cannot be executed according to the plan.

Persons, without the experience of actual works, have an inclination to make a plan or to state an opinion based on the theory or knowledge obtained from the textbook or specifications shown on the catalogue of products, and without the consideration of resources and restriction elements. Therefore, often times, such a plan or opinion becomes an unrealistic plan or opinion.

This phenomenon can be found typically in the middle class staff without the experience of actual work in SOB.

In general, the resources and restriction element in the digital photogrammetric mapping are considered as follows;

1) Budget

In general, the total amount of project budget is decided before starting the project and it is impossible to increase the budget of the project without limitation. In general, the budget of the project will become short.

2) Work period

In general, the work period of the project is decided before starting the project and the project team is requested to complete project within the decided work period. The work

period will be decided by the various reasons and has a tendency toward the short work period.

3) Technology

In case no technology necessary for the implementation of the project is available, it is necessary to take measures to meet the situation. If impossible, the project can not be implemented.

4) Human resource

For the implementation of the project, it is necessary to secure the necessary number of personnel who has the necessary capabilities for the implementation of the project. If not, the project will not be implemented according to the plan. In general, human resources are always limited and short.

5) Equipment

For the implementation of the project, it is necessary to secure the necessary number of equipment. If not, the project will not be implemented according to the plan.

6) Natural condition such as weather, topography and so on

The digital photogrammetric mapping includes not only office works, but also field works such as aerial photography, ground control point survey, field identification and so on. The work schedule of field works will be affected by the natural condition such as topography, accessibility, weather condition and so on.

7) Required accuracy

Of course, the high accuracy of the outputs of digital photogrammetric mapping is better than low accuracy of the outputs. However, to obtain the high accuracy of the outputs of digital photogrammetric mapping, the long work period is necessary, the high technical skills are necessary, more budget are necessary, and more high level of equipment is necessary.

Above-mentioned seven (7) items have a mutual relation and the balance of these seven (7) items must be harmonious. If not, the project plan is not a realistic plan.

Therefore, the middle class staff of SOB always has a point of view as “The plan is theoretically possible or not, and also, practically possible or not” considering the above-mentioned seven (7) items.

9.3.4 Engagement in the actual work is the best teacher

As already mentioned, the real capability can not be obtained only by the lecture and training. The real capability will be built up by the engagement in actual work and solving the issues encountered through the implementation of the project. Therefore, an engagement in actual work of the project is the best teacher for the buildup and skill up of the capability.

Especially, trouble shooting capability can be obtained only by the experience of the actual works. Furthermore, it is necessary to clearly understand that it is impossible to execute and manage the project only by the book knowledge and desk theory.

However, before starting actual work of IDMS, most of the staff of SOB believed that the theory and functions mentioned in the textbooks and product catalogues can be automatically applied to the actual work of the project.

Unfortunately, the theory and functions mentioned in the textbooks and product catalogues can be applied under the condition that all factors are perfect, and such case is a rare in the actual work of the project due to the various reasons.

Therefore, it is necessary to accumulate actual work experience to build up and skill up of the capability of the digital photogrammetric mapping.

9.3.5 Humans learn only from one's failures

Humans learn a lot of lessons from failures or mistakes, but less from success. The reason why is that the cause and effect relationship in the case of failures or mistakes is generally clear, but in the case of success, it is difficult to define the cause and effect relationship clearly.

Therefore, before the implementation of the big project, it is recommended to execute the small project using same technology as a pilot project. Through the implementation of the pilot project, it is necessary to solve the issues and troubles which are not expected before starting the actual work and to establish the production procedure for the smooth implementation of the big project.

The actual work of digital photogrammetric mapping of Block-4 serves as a pilot project in IMDS. Therefore, during the implementation of Block-4, the staff of SOB encountered many issues and troubles which are not expected by the staff of SOB before starting the actual work of IDMS. Therefore, it took more time to complete the work of Block-4, especially digital plotting, comparing with the work schedule prepared before starting the actual work.

However, the real capability of the staff of SOB will be built up and leveled up by solving the issues and troubles during the implementation of the actual work of IDMS. However, the important point of project management is that the same issues and mistakes will not be repeated time and again.

9.4 Recommendations

The recommendations to SOB at the completion of the three years activities of BDMAP are as follows:

9.4.1 Work schedule of IDMS and improvement of the productivity

Generally, the work schedule of digital photogrammetric mapping will be decided mainly by the work schedule of digital plotting. The work schedule of IDMS also will be decided by the work schedule of digital plotting.

The estimated work schedules of 1:25,000 and 1:5,000 scale digital mapping at the end of the 3rd year of BDMAP are shown in Appendix 3.1 “Estimated Work Schedule of 1:25,000 Scale Digital Mapping” and Appendix 3.2 “Estimated Work Schedule of 1:5,000 Scale Digital Mapping”.

According to these estimated work schedules, 1:25,000 scale digital mapping is estimated to be completed around November 2018 and 1:5,000 scale digital mapping is estimated to be completed around October 2018.

Also, 1:25,000 scale digital plotting is estimated to be completed around August 2017 and 1:5,000 scale digital plotting is estimated to be completed around December 2017.

To shorten the whole work schedule of IDMS, it is necessary to shorten the work schedule of digital plotting. Following measures will be useful to shorten the work schedule of digital plotting of IDMS.

1) To improve the productivity of digital plotting

Frankly speaking, the productivity of digital plotting estimated by the digital plotting unit is low. It is considered that the improvement of the productivity of digital plotting is possible by proper labor management, quality control, works distribution to the staff of digital plotting unit and so on.

2) To reduce the loss time caused by the trouble of server and UPS, and computer crash

It is estimated that an approximately 15% of total working time of digital plotting was lost by the trouble of server and UPS, and computer crash. Therefore, it is necessary to keep a

good condition of server, UPS and computer at all times not to lose the working time.

3) To reduce the loss time caused by the insufficient project planning and management

For the big project such as IDMS, careful project planning and management, and also labor management are essential. Even though the loss time at one time caused by the insufficient management is small, in case such poor management continues during the implementation of the project, the total loss time caused by the poor management will become huge.

4) Different production line for data acquisition using satellite images

The data acquisition using satellite images will be executed by 2D, and it is not necessary to use the digital plotting systems. Therefore, it is recommended that the data acquisition using satellite image using will be executed by the production line different from 3D data acquisition using digital plotting system.

5) To increase the number of digital plotting systems

This is the most popular method to shorten the work period of digital plotting. In IDMS, total number of the digital plotting system is already fixed. Therefore, it is difficult to increase the number of digital plotting systems under present circumstance.

6) To increase the working hours per day or per month

It is possible to increase the volume of outputs per day or per month by this method. However, proper labor management and work distribution to the staff of digital plotting unit are essential, and budget for overtime may be necessary.

7) Outsourcing of the work

Some portion of the digital mapping work will be executed by outsourcing. However, this is the final option to shorten the work schedule of digital mapping of IDMS.

9.4.2 Attention on the 90 % syndrome of the work

In general, the actual work from the start up to an approximately 90 % completion will be executed smoothly. However, it will take a long time to complete the remaining 10 % (from an approximately 90 % up to completion). This phenomenon is called as “90 % syndrome of the work” in project management.

For example, in the digital photogrammetric mapping, it will take a long time for checking and correction of the data at each step of the works. The work of checking and correction in the digital photogrammetric mapping corresponds to this remaining 10 % of the work.

Therefore, the establishment of the proper checking system and checking procedure of the data produced at each section are the important key factors in the digital photogrammetric mapping project.

9.4.3 Future main work, organization and distribution of personnel of SOB

After completion of IDMS, SOB will possess new 1:25,000 scale digital topographic maps and data covering whole Bangladesh territory and 1:5,000 scale digital topographic maps and data covering main cities in Bangladesh.

However, it is necessary to pay attention that 1:25,000 scale and 1:5,000 scale digital topographic maps and data will be prepared based on the aerial photos and satellite image which were taken in 2011 and 2012.

This means that the information shown on the 1:25,000 scale and 1:5,000 scale digital topographic maps and data is the information as of 2011 and 2012. Therefore, approximately 5 or 6 years will be passed when the digital topographic maps and data on the last stage of IDMS is completed.

Comparing with the satellite images on Google Earth and 1:5,000 scale digital topographic maps covering Dhaka City area prepared in 2004 by JICA and SOB (Aerial photos were taken in January 2002), it is found that the secular change during the past ten (10) years is big. Therefore, it is judged that secular change correction is necessary due to the rapid change of urbanization especially surrounding area of main part of Dhaka City.

According to the economic development in Bangladesh, the secular change in the urban area will be more drastic comparing with the past 10 year's change. Therefore, within the short period of the completion of IDMS, it is expected that the secular change correction, especially urban area, will be necessary for the updating of the digital topographic maps which will be prepared by IDMS.

Considering this situation, the future main works, restructuring of the organization, suitable distribution of personnel of SOB and so on have to be planned before the completion of IDMS.

9.4.4 Alteration of generations of the staff of SOB

The technology of survey and mapping was already shifted from analogue to digital, especially in photogrammetric mapping. Therefore, the basic knowledge of computer and software are essential for the persons who are engaging in survey and mapping.

However, the knowledge of computer and software of the old generations of the staff of SOB is low from the view points of the present survey and mapping technology. And it is difficult to build up the capability of computer and software of the old generations of the staff of SOB.

Meanwhile, the young generation of the staff of SOB has the knowledge and experience of computer and software or has a capacity to deal with the computer and software necessary for the survey and mapping comparing with the old generation of the staff of SOB. However, the knowledge for the theory of survey and mapping and the actual work experience are lacking or shortage.

Considering the future vision of SOB, especially digitalization of survey and mapping works, buildup of the capability of the young generation of SOB is necessary for the alteration of generations of SOB. And, also, the person in charge of the sections of SOB will be sifted from the old generations to young generations smoothly and rapidly.

At the time of alteration of generations, it is necessary to count not only the academic record, but also the experience of the actual work of the project, planning and management capability and labor management capability of the persons.

The high academic record does not always mean the capability for the implementation of the actual works and also the capability necessary for the section manager of the organization.

9.4.5 Improvement of the consciousness of the staff of SOB

The capability of the staff of SOB may be able to build up by the lecture or training to a certain degree. However, without the conscious mind of self-learning of the staff of SOB, the effect of the lecture and training is limited. Therefore, the staff of SOB should have a mind to study by themselves.

Lack of social imperative of the low class staff of SOB, especially being less than punctual and no sense of responsibility, may be the typical issue of the government sector in Bangladesh including SOB. These issues may not be solved by the lecture and training of technical aspects. These are the issues of labor management of the government sector in Bangladesh, and it will take a long time to solve these issues or improve the present situation.

Chapter 10 Amendment of PDM

Chapter 10 Amendment of PDM

The PDM of BDMAP was amended as follows:

10.1 Original PDM (PDM Version 0.1)

The original PDM of BDMAP was prepared by the Japanese Implementation Study Team for Bangladesh Digital Mapping Assistance Project during the period from 10 November 2008 to 28 November 2008. The original PDM of BDMAP is shown in Appendix 10.1 “PDM (Version 0.1, 24 November 2008).

However, this original PDM has several matters in question as mentioned below. Through the discussion between JICA and BDMAP, it was decided that the minimal amendment for the original PDM was applied.

- 1) The activities and input of short-term expert (Geoid model) are not included in the original PDM (Version 0.1).
- 2) The project purpose of BDMAP and the relation between BDMAP and IDMS is not clearly mentioned on the original PDM (Version 0.1).
- 3) The activities mentioned on the PDM (Version 0.1) are only the technical transfer concerning the digital mapping technique and does not include the support necessary for the implementation of IDMS such as project planning, project management, quality control and so on.

10.2 First amendment of PDM (PDM Version 2.0)

Considering the above-mentioned matters and based on the proposal which were made by BDMAP, minimum amendment of PDM (Version 0.1) was executed and PDM (Version 2.0) was prepared before starting the activities of the 1st year of BDMAP through the discussion between JICA and BDMAP. This minimum amended PDM is shown in Appendix 10.2 “PDM (Version 2.0, 6 August 2008).

This minimum amended PDM (Version 2.0) was submitted and explained to the Bangladesh side on the explanation meeting of Inception Report of BDMAP at the beginning of the 1st year of BDMAP and agreed by both parties.

The activity plan of BDMAP had to be modified due to the change of the important assumptions of BDMAP, and also the activities which were not mentioned on PDM (Version 2.0) had to be executed for the implementation of IDMS.

Considering these situation, it was mentioned that the PDM (Version 2.0) should be modified according to the change of the important assumptions of BDMAP at the time of mid-term evaluation. Finally, the PDM (Version 2.0) was amended at the time of terminate evaluation of BDMAP which was executed at the beginning of December 2011.

10.3 Second amendment of PDM (PDM Version 3.0)

The terminate evaluation of BDMAP was executed from 22 November 2011 up to 10 December 2011 by JICA. The influence caused by the change of important assumptions of BDMAP, countermeasures taken by BDMAP and SOB and the activities not mentioned on the PDM (Version 2.0) which were executed by BDMAP and so on were evaluated in the terminate evaluation of BDMAP.

Based on the results of terminal evaluation, new PDM (Version 3.0) was prepared and explained in the terminal evaluation meeting which was held on 8 December 2011. On this terminal evaluation meeting, the PDM (Version 3.0) was approved by JCC. The PDM (Version 3.0) is shown in Appendix 10.3 “PDM (Version 3.0, 23 November 2011)”.

The main items of amendment of PDM are as follows:

- 1) The items which could not be executed due to the change of the important assumptions of BDMAP and so on were eliminated from the activities of PDM (Version 2.0) of BDMAP.
- 2) The activities, not including in PDM, which were already executed during the implementation of BDMAP were added to new PDM (Version 3.0) of BDMAP.

Chapter 11 JCC and Seminar

Chapter 11 JCC and Seminar

During the implementation of BDMAP, JCC and seminar were held as mentioned below:

11.1 Holding of JCC

During the implementation of BDMAP, JCC meetings were held as follows:

11.1.1 First JCC meeting

Due to the reason of a cancel of the tender for the procurement of photogrammetric equipment and software by the Government of Bangladesh, it was estimated that the equipment and software can not be used before around the end of February 2011.

Therefore, the plan of operation of the 2nd year of BDMAP, which were prepared in Japan, had to be modified. Through the discussion with JICA Bangladesh Office and SOB, BDMAP prepared the revised version of plan of operation of the 2nd year of BDMAP.

The explanation meeting for the revised plan of operation of the 2nd year of BDMAP between SOB and BDMAP was executed on 25 May 2010. After this meeting, JCC meeting for the explanation and discussion of the revised plan of operation of the 2nd year of BDMAP and the issues on the implementation of BDMAP and IDMS was held on 31 May 2010.

The minutes of meeting was prepared after completion of JCC meeting and the participants of JCC meeting are as follows:

Bangladesh side

Survey of Bangladesh

1. Brig. General Md. Mominul Haque, afwc, psc
Surveyor General
2. Colonel Mahmudun Nabi, psc
Director, Defense Survey Directorate
3. Major Md. Nurul Amin Chowdhury
Project Manager, Surveyor General Office
4. Major Md. Anisur Rahman
In charge Photogrammetry Unit
5. Mr. Md. Abdur Rouf Haolader
Officer in charge, No.2 Cartographic Office
6. Major Md. Zamil Hossain Munshi

Project Officer (Technical), Surveyor General Office

Ministry of Finance

1. Ms. Nasreen Akhtar Chowdhury
Deputy Secretary, Economic Relation Division

Ministry of Defense

1. Colonel Md. Ashfakul Islam

Japan side

JICA Bangladesh Office

1. Mr. Shigeki Furuta
Senior Representative, JICA Bangladesh Office
2. Mr. Tamaoki Watanabe
Project Formulation Adviser, JICA Bangladesh Office

BDMAP

1. Mr. Toru Watanabe
Chief/Technical specifications
2. Mr. Yoshiteru Matsushita
Digital compilation
3. Mr. Koji Yamazaki
Orthophoto & DEM (2)
4. Ms. Michi Hayashi
Administrative support (1)

JICA long-term expert

1. Mr. Bokuro Urabe

The minutes of meeting signed by four (4) parties is shown in Appendix 12.2 “Minute of Meeting on Plan of Operation for Bangladesh Digital Mapping Assistance Project (2nd year)”.

11.1.2 Second JCC meeting

The joint mid-term evaluation meeting was held on 1st December 2010 by JCC. On this meeting, the results of mid-term evaluation and the points to be considered for the activities during the remaining period of BDMAP were discussed. The participants of the joint mid-term evaluation meeting are as follows:

Bangladesh side evaluation member

Survey of Bangladesh

1. Brig. General Md. Mominul Haque, afwc, psc
Surveyor General
2. Colonel Mahmudun Nabi, psc
Director, Defense Survey Directorate
3. Major Md. Nurul Amin Chowdhury
Project Manager, Surveyor General Office

Ministry of Finance

1. Ms. Nasreen Akhtar Chowdhury
Deputy Secretary, Economic Relation Division

Ministry of Defense

1. Colonel Md. Ashfakul Islam

Japan side evaluation member

JICA Bangladesh Office

1. Mr. Shigeki Furuta
Senior Representative, JICA Bangladesh Office
2. Mr. Tamaoki Watanabe
Project Formulation Adviser, JICA Bangladesh Office

Observer

BDMAP

1. Mr. Toru Watanabe
Chief/Technical Specifications

JICA long-term expert

1. Mr. Bokuro Urabe

11.1.3 Third JCC meeting

The joint terminal evaluation meeting was held on 8 December 2011 by JCC. On this meeting, the results of terminal evaluation of BDMAP, and the points to be considered for the activities during the remaining period of the 3rd year of BDMAP were discussed by JCC. The participants of the joint terminal evaluation meeting are as follows:

Bangladesh side evaluation member

Survey of Bangladesh

1. Brig. General Md. Mominul Haque, afwc, psc
Surveyor General
2. Colonel Mahmudun Nabi, psc
Director, Defense Survey Directorate
2. Major Md. Zamil Hossain Munshi
In charge GIS Section

Ministry of Finance

1. Ms. Khadiza Begum
Deputy Secretary, Economic Relation Division

Ministry of Defense

1. Mr. Shamimuzzaman
Senior Assistant Chief

Japan side evaluation member

JICA Bangladesh Office

1. Mr. Shigeki Furuta
Senior Representative, JICA Bangladesh Office
2. Mr. Hideki Katayama
Project Formation Adviser, JICA Bangladesh Office

Observer

BDMAP

1. Mr. Toru Watanabe
Chief/Technical specifications
2. Mr. Koji Yamazaki
Orthophoto & DEM (2)

JICA long-term expert

1. Mr. Bokuro Urabe

11.1.4 Fourth JCC meeting

At the end of the activities of BDMAP, fourth JCC meeting was held on 18 March 2012. BDMAP explained the activities, present situation of IDMS, important aspects on the implementation of IDMS and so on to the members of JCC. After the explanation by BDMAP, JICA Bangladesh office explained the plan for BDMAP extension to the members of JCC. The participants of the fourth JCC meeting are as follows:

Bangladesh side

Survey of Bangladesh

1. Brig. General Md. Mahidul Islam Talukder, ndc, afwc, psc
Surveyor General
2. Colonel Mahmudun Nabi, psc
Director, Defense Survey Directorate

Ministry of Finance

1. Ms. Khadiza Begum
Deputy Secretary, Economic Relation Division

Ministry of Defense

1. Mr. Shamimuzzaman
Senior Assistant Chief

Japan side

JICA Bangladesh Office

1. Mr. Shigeki Furuta
Senior Representative, JICA Bangladesh Office
2. Mr. Hideki Katayama
Project Formation Adviser, JICA Bangladesh Office
3. Ms. Salma Akter
Program Officer, JICA Bangladesh Office

BDMAP

1. Mr. Toru Watanabe
Chief/Technical specifications
2. Mr. Tsuneo Terada
Digital plotting
3. Ms. Michi Hayashi
Administrative support (1)

JICA long-term expert

1. Mr. Bokuro Urabe

11.2 Seminar

During the implementation of BDMAP, seminars were held in the 2nd year and 3rd year of BDMAP as follows:

11.2.1 First Seminar

To explain the outline and outputs of BDMAP and IDMS to stakeholders and the users of digital topographic maps and GIS basic data such as Bangladesh governmental organizations, international organizations, private sector and so on, the first seminar organized by SOB and JICA Bangladesh Office was held on 3rd October 2010. The outline of the seminar is as follows:

- 1) Name of seminar: Creation and Use of Digital Map & Geospatial Data for Digital Bangladesh
- 2) Organizer: SOB and JICA Bangladesh Office
- 3) Date: 3rd October 2010, 10:00~16:30
- 4) Place: Grand Ball Room of Pan Pacific Sonargaon Hotel
- 5) Guest: Chief Guest of the Seminar
Major General (Retd) Tarique Ahmed Sddique, rcds, psc
Defence Adviser to the Honourable Prime Minister
Special Guest of the Seminar
H.E. Mr. Tamotsu Shinotsuka
Ambassador of Japan
Guest of Honour
Dr. Takao Toda
Chief Representative, JICA Bangladesh Office
- 6) Chairperson: Brigadier General Md Mominul Haque, afw, psc
Surveyor General of Bangladesh
- 7) Guest of seminar: Approximately 150 organization (Approx. 250 persons)
- 8) Outline of seminar:
Inaugural Session
 1. Welcome address by Surveyor General of Survey of Bangladesh
 2. Key Note Presentation on Digital Geospatial Data by Director, Defence survey
 3. Presentation by Representative of Geospatial Information Authority of Japan
 4. Presentation by Chief Adviser of BDMAP, JICA
 5. Address by Chief Representative, JICA Bangladesh Office
 6. Address by H.E. Ambassador, Embassy of Japan
 7. Address by Defence Advisor to the Honourable Prime Minister, Government of the People's Republic of Bangladesh
 8. Vote of Thanks by Director, Development Survey

Technical Session

1. Presentation on Improvement of Digital Mapping System (IDMS)
Project by Major Zulfikar Hydar
2. Presentation on Improvement of Digital Mapping System (IDMS)
Project by Major Jamil Hossain Munshi
3. Open Discussion
4. Closing Remarks by Chairperson

11.2.2 Second Seminar

The second seminar was held on 15 March 2012 mainly to explain and to show the outputs and schedule of IDMS to the stakeholders of IDMS jointly by SOB and JICA Bangladesh Office. The outline of the second seminar is as follows:

- 1) Name of seminar: Digital Topographic Maps for Digital Bangladesh
- 2) Organizer: SOB and JICA Bangladesh Office
- 3) Date: 15 March 2012, 10:00~16:30
- 4) Place: Grand Ball Room of Ruposhi Bangla Hotel
- 5) Guest: Chief Guest of the Seminar
H.E. Architect Yeafesh Osman
Minister of State for Science and Technology
Special Guest of the Seminar
H.E. Mr. Shiro Sadoshima
Ambassador of Japan
Mr. Khondaker M. Asaduzzaman
Secretary, Ministry of Defence
Guest of Honour
Dr. Takao Toda
Chief Representative, JICA Bangladesh Office
- 6) Chairperson: Brigadier General Md. Mahidul Islam Talukder, ndc, afwc, psc
Surveyor General of Bangladesh
- 7) Guest of seminar: Approximately 150 organization (Approx. 250 persons)
- 8) Outline of seminar:
Inaugural Session
 1. Welcome address by Surveyor General of Survey of Bangladesh
 2. Address by Chief Representative of JICA Bangladesh Office
 3. Address by Secretary, Ministry of Defence
 4. Address by HE. Ambassador of Japan
 5. Address by HE. State Minister, Ministry of Science and Technology

6. Address by the Secretary MOD

Technical Session

1. Key note presentation on Digital Geospatial Data by Director, Survey of Bangladesh
2. Presentation by Representative of Trimble, Singapore
3. Presentation by Representative of Geospatial Information Authority of Japan
4. Presentation by Chief Advisor of JICA to Survey of Bangladesh
5. Presentation on Photogrammetry by Mohammad Masudur Rahman, Survey of Bangladesh
6. Presentation on GIS by Major Zamil Hossain Munshi, Survey of Bangladesh
7. Presentation on Cartography by Syed Mohammad Masum, Survey of Bangladesh

Chapter 12 Minutes of Meeting

Chapter 12 Minutes of Meeting

The minutes of meeting signed between BDMAP and SOB are as follows:

12.1 Minutes of meeting on the inception report for BDMAP (1st year)

The inception report of BDMAP was prepared in Japan before starting the activities of BDMAP in Bangladesh. However, due to the change of the important assumptions of BDMAP which occurred at the beginning of the 1st year of BDMAP, it was impossible to execute the activities of BDMAP according to the inception report prepared by BDMAP beforehand. Therefore, it was necessary to modify the inception report of BDMAP drastically and immediately.

The schedule of the fresh tender by SOB and the contents of the activities of the 1st year of BDMAP were discussed by JICA Bangladesh Office, SOB and BDMAP. Based on the discussion, the revised inception report was prepared by BDMAP.

The explanation meeting of the revised plan of operation was held on 22 October 2010 by JICA Bangladesh Office, SOB and BDMAP and the minutes of meeting on the revised inception report of BDMAP was signed by the three parties.

The minutes of meeting for the revised inception report of BDMAP is shown in Appendix 12.1 “Minutes of Meeting on Inception Report for Bangladesh Digital Mapping Assistance Project”.

12.2 Minutes of meeting on the plan of operation for BDMAP (2nd year)

The plan of operation in the 2nd year of BDMAP was prepared in Japan before starting the activities in Bangladesh. However, just before starting the activities of the 2nd year of BDMAP, the fresh tender (2nd tender) for the procurement of photogrammetric equipment and software by SOB was cancelled by the Government of Bangladesh. BDMAP received this information through JICA Bangladesh Office several days before departure from Japan to Bangladesh.

Therefore, it was estimated that the photogrammetric equipment and software procured by SOB could not be used for the technical training according to the schedule that was planned on the end of the 1st year of BDMAP.

Facing this issue, the BDMAP discussed with JICA Bangladesh Office and decided to take the following actions.

- 1) BDMAP has already prepared the plan of operation of the 2nd year of BDMAP. This plan of operation has to be modified according to the delay of the procurement of photogrammetric equipment and software by SOB. However, there was not enough time to modify the plan of operation on the 2nd year of BDMAP due to the short period before departure of BDMAP from Japan to Bangladesh.
- 2) Furthermore, to modify the plan of operation of the 2nd year of BDMAP, the information of the new schedule of re-fresh tender (3rd tender) and delivery and setting up of equipment and software to SOB are essential. However, BDMAP could not get necessary information from JICA Bangladesh Office and SOB.
- 3) BDMAP decided to depart from Japan to Bangladesh on schedule and the plan of operation on the 2nd year of BDMAP will be modified through the discussion with JICA Bangladesh Office and SOB and the revised plan of operation on the 2nd year of BDMAP will be made.

Immediately after arrived at Dhaka, BDMAP started to obtain the information of the present situation of the tender for the procurement of photogrammetric equipment and software (3rd tender), and the tender of aerial photography (2nd tender) from SOB.

Based on the obtained information, BDMAP prepared the revised plan of operation by the middle of May 2010 and explained the contents of the revised plan of operation on the 2nd year of BDMAP to JICA Bangladesh Office and SOB.

Based on the revised plan of operation prepared by BDMAP, the minutes of meeting on the plan of operation on the 2nd year of BDMAP was signed among JICA Bangladesh Office, SOB and BDMAP on 31 May 2010.

The minutes of meeting on the plan of operation on the 2nd year of BDMAP are shown in Appendix 12.2 “Minutes of Meeting on Plan of Operation for Bangladesh Digital Mapping Assistance Project (2nd year)”.

12.3 Minutes of meeting on the plan of operation for BDMAP (3rd year)

The plan of operation of the 3rd year of BDMAP was prepared in Japan and explained to SOB at the beginning of the activities of the 3rd year of BDMAP. Based on the explanation and discussion between SOB and BDMAP, the minutes of meeting on the plan of operation of the 3rd year of BDMAP was signed by SOB and BDMAP on 2nd June 2011.

The minutes of meeting signed by SOB and BDMAP is shown in Appendix 12.3 “Minutes of

Meeting on Plan of Operation for Bangladesh Digital Mapping Assistance Project (3rd year)”.

12.4 Record of discussion on 8 December 2009

According to the original plan of BDMAP, the technical training to the staff of SOB was planned to use the equipment and software procured by SOB by the end of October 2009, and the training was planned to start from the beginning of November 2009. However, due to the reason of delay of the procurement of photogrammetric equipment and software, it became impossible to execute the technical training to the staff of SOB according to the original plan.

Therefore, BDMAP had to modify the technical training plan to the staff of SOB in full scale. At the time of modification of the technical training plan, it was necessary to consider the following points.

- 1) How to arrange the necessary numbers of computers for the technical training.
- 2) How to arrange the software such as digital plotting system, Arc GIS and AutoCAD and so on necessary for the technical training.
- 3) How to execute the training considering the limited number of available computers and software.
- 4) When the photogrammetric equipment and software will be delivered to SOB. It is necessary to modify the technical training plan of the 2nd year of BDMAP or not.

Through the discussion between SOB and BDMAP, both parties agreed to execute the technical training to the staff of SOB by the following method.

- 1) BDMAP will bring 4 sets of digital plotting system (finally 12 sets) from Japan and basic training of aerial triangulation and digital plotting will be executed using these digital plotting systems.
- 2) Considering the available number of digital plotting systems, the technical training of orthophoto making and DEM making will be executed in the 2nd year of BDMAP.
- 3) The technical training of digital compilation, which is planned in the 2nd year of BDMAP, will be started from the 1st year of BDMAP. Considering the present capability and knowledge of the staff of SOB, especially young generation of the staff of SOB, the lecture of survey and mapping including photogrammetric mapping will be executed.

- 4) The final products of the first year of BDMAP will be modified based on the modification of the activities of the first year of BDMAP.

The items agreed between SOB and BDMAP are shown in Appendix 12.4 “Record of Discussion on 8 December 2009”.

12.5 Minutes of Meeting on the draft final report

At the end of the activities of BDMAP, the draft final report was prepared by BDMAP and submitted to SOB around the beginning of March 2012. The meetings on the draft final report were held between BDMAP and SOB. The draft final report was corrected based on the comments from SOB and final report was prepared in Japan.

The minutes of meeting on the draft final report is shown in Appendix 12.5 “Minutes of Meeting on Draft Final Report for Bangladesh Digital Mapping Assistance Project (BDMAP)”.

Appendix

Appendix 3.1	Estimated Work Schedule of 1:25,000 Scale Digital Mapping
Appendix 3.2	Estimated Work Schedule of 1:5,000 Scale Digital Mapping
Appendix 3.3	Progress and SPI of 1:25,000 Scale Digital Plotting
Appendix 3.4	Aerial Triangulation Block for 1:25,000 Scale Digital Mapping
Appendix 3.5	Production of 1:25,000 Scale Digital Plotting
Appendix 3.6	Index to Sheets of Bangladesh (Scale 1:25,000)
Appendix 3.7	Index to Sheets of Sylhet (Scale 1:5,000)
Appendix 3.8	Index to Sheets of Rajshahi (Scale 1:5,000)
Appendix 3.9	Index to Sheets of Khulna (Scale 1:5,000)
Appendix 3.10	Index to Sheets of Barisal (Scale 1:5,000)
Appendix 3.11	Index to Sheets of Chittagong (Scale 1:5,000)
Appendix 3.12	1:25,000 Scale Digital Topographic Map prepared by IDMS (Reduced Version)
Appendix 10.1	PDM (Version 0.1, 24 November 2008)
Appendix 10.2	PDM (Version 2.0, 6 August 2009)
Appendix 10.3	PDM (Version 3.0, 23 November 2011)
Appendix 12.1	Minutes of Meeting on Inception Report for Bangladesh Digital Mapping Assistance Project
Appendix 12.2	Minutes of Meeting on Plan of Operation for Bangladesh Digital Mapping Assistance Project (2 nd Year)
Appendix 12.3	Minutes of Meeting on Plan of Operation for Bangladesh Digital Mapping Assistance Project (3 rd Year)
Appendix 12.4	Record of Discussion on 8 December 2009
Appendix 12.5	Minutes of Meeting on Draft Final Report for Bangladesh Digital Mapping Assistance Project (BDMAP)

Appendix 3.1 Estimated Work Schedule of 1:25,000 Scale Digital Mapping

Work Schedule of 1:25,000 Scale Digital Mapping

Prepared on 17 January 2012

Calendar grid showing months from 2011 to 2014, with colored bars indicating work periods for different blocks.

1:25,000 digital plotting

Table with 6 columns: Block No, Area covered by photos, Border area, Total area, Working order, Accumulated area (By photo), and Accumulated (Total).

Note: Border area is the area between border line and 15 km line. Area does not include water area. Area is an approximate value.

Schedule and volume of digital plotting Scale 1:25,000 by photos. Target area 105,293 km2. Includes monthly and daily work schedules.

Schedule and volume of digital plotting Scale 1:25,000 by satellite images. Target area 33,940 km2. Includes monthly and daily work schedules.

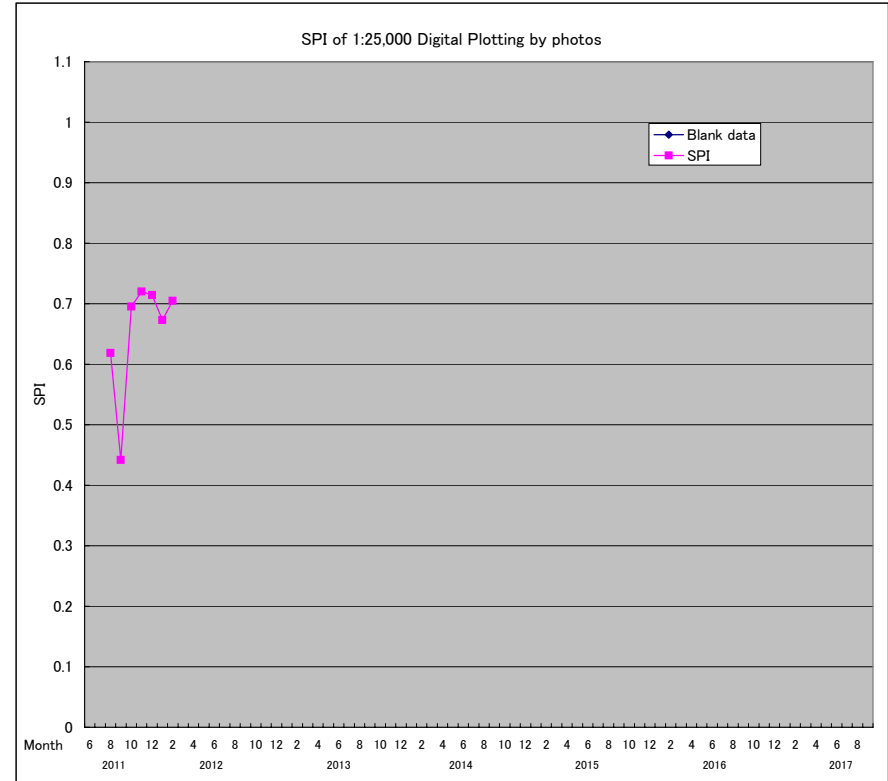
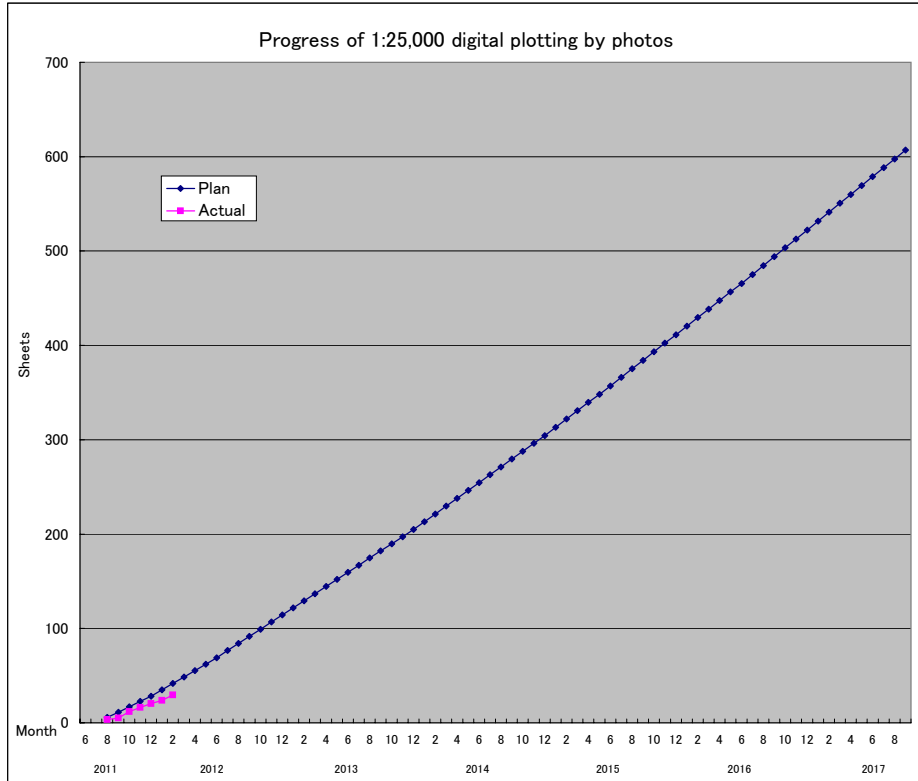
Schedule and volume of data of correction and field identification Scale 1:25,000. Target area 144,000 km2. Includes monthly and daily work schedules.

Schedule and volume of data of data input, classification and structuring Scale 1:25,000. Target area 144,000 km2. Includes monthly and daily work schedules.

Schedule and volume of data of cartography Scale 1:25,000. Target area 144,000 km2. Includes monthly and daily work schedules.

Appendix 3.2 Estimated Work Schedule of 1:5,000 Scale Digital Mapping

Appendix 3.3 Progress and SPI of 1:25,000 Scale Digital Plotting



Digital Plotting

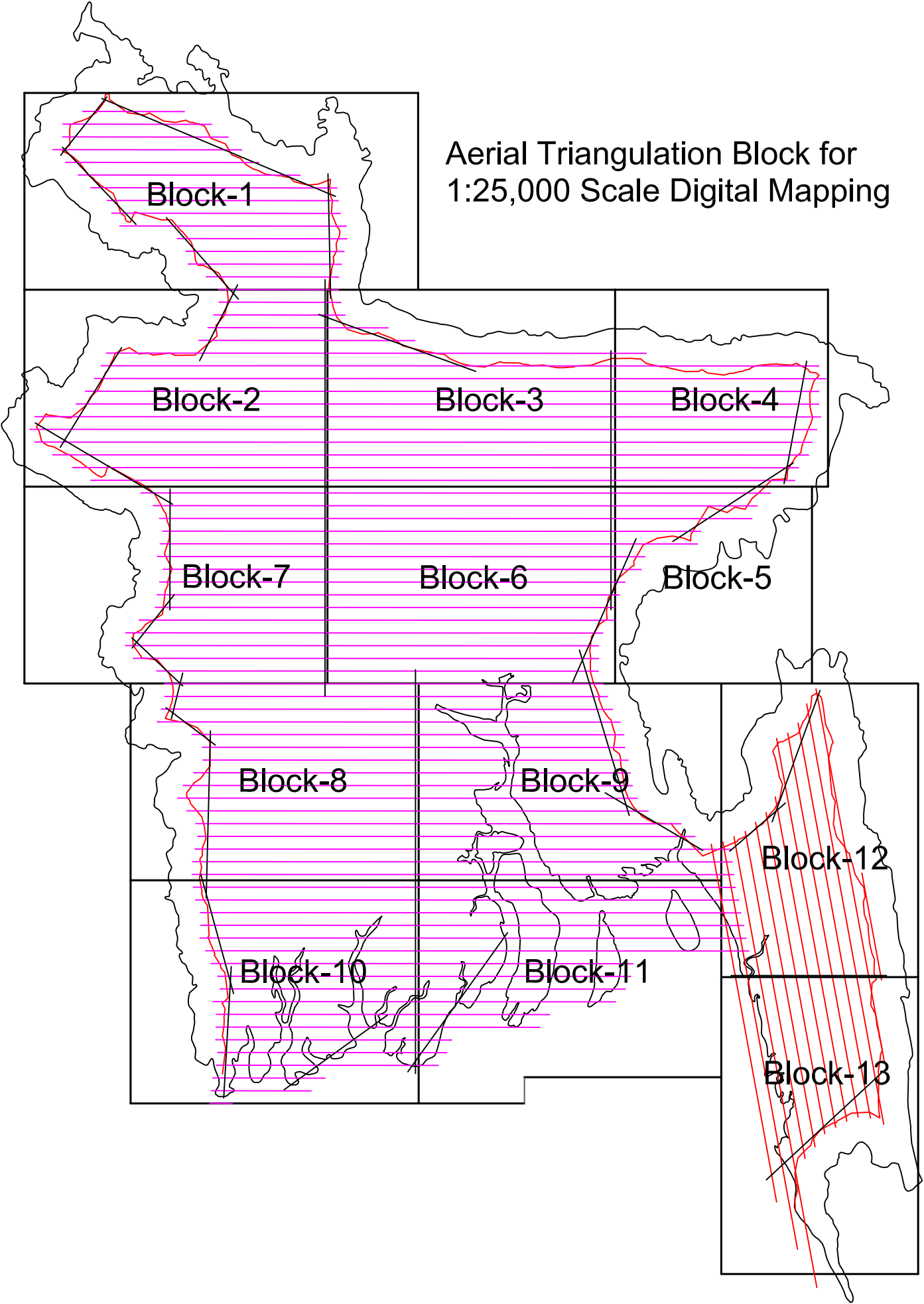
BAC **91 Months**

SPI at (Month) (Year) **2 2012** **0.70**

Estimated months for completion **129 Months**

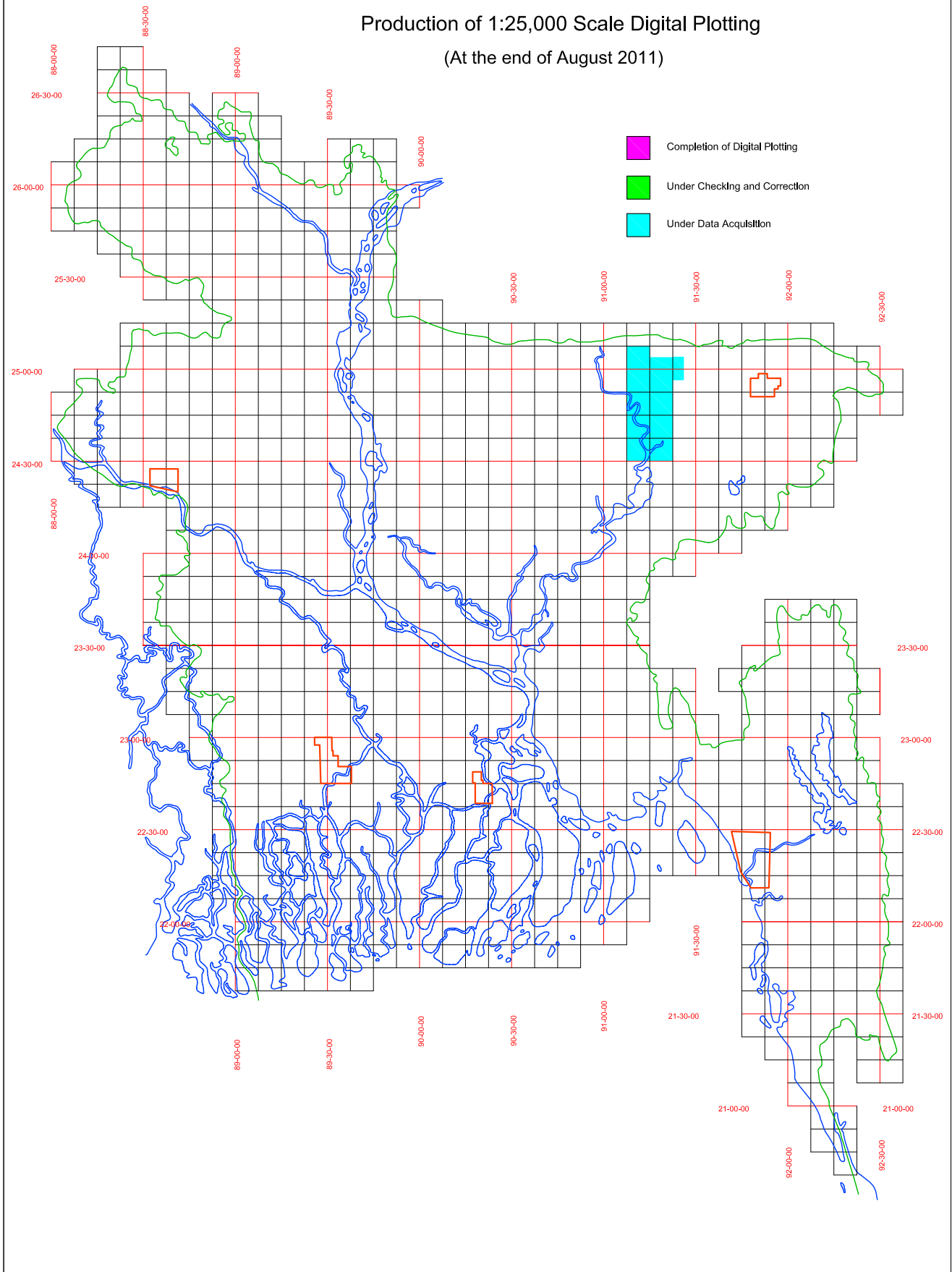
Appendix 3.4 Aerial Triangulation Block for 1:25,000 Scale Digital Mapping

Aerial Triangulation Block for
1:25,000 Scale Digital Mapping

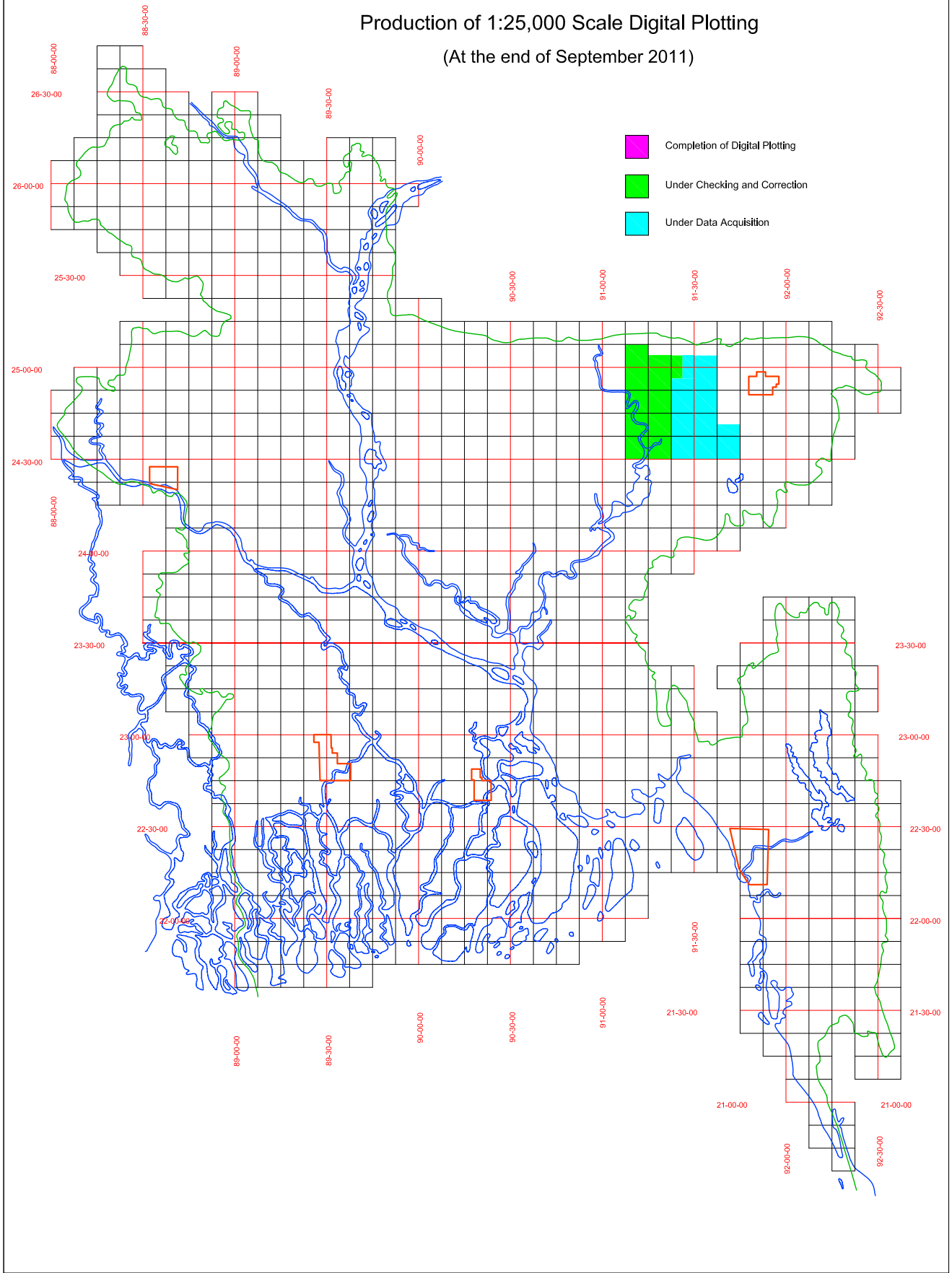


Appendix 3.5 Production of 1:25,000 Scale Digital Plotting

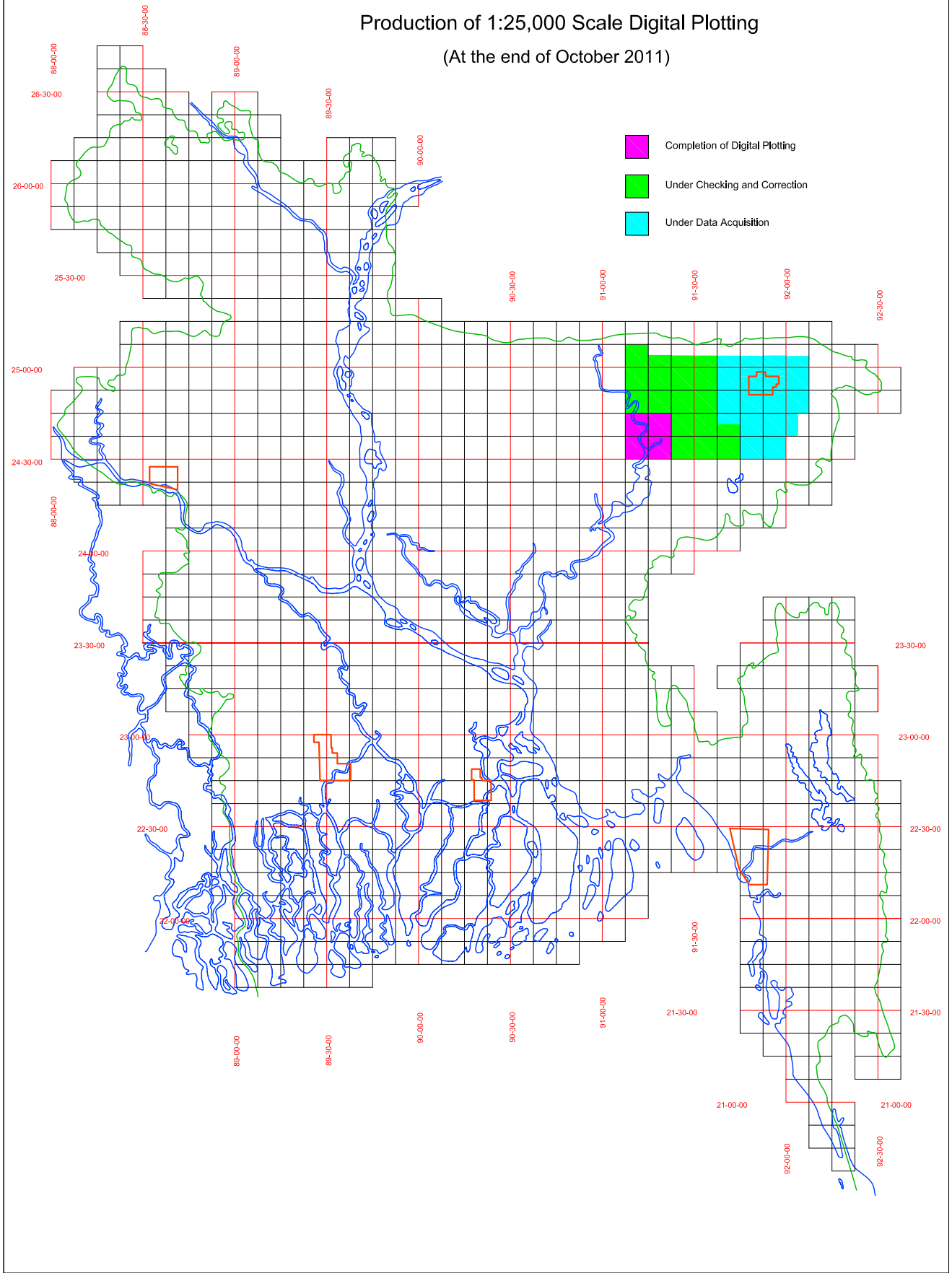
Production of 1:25,000 Scale Digital Plotting (At the end of August 2011)



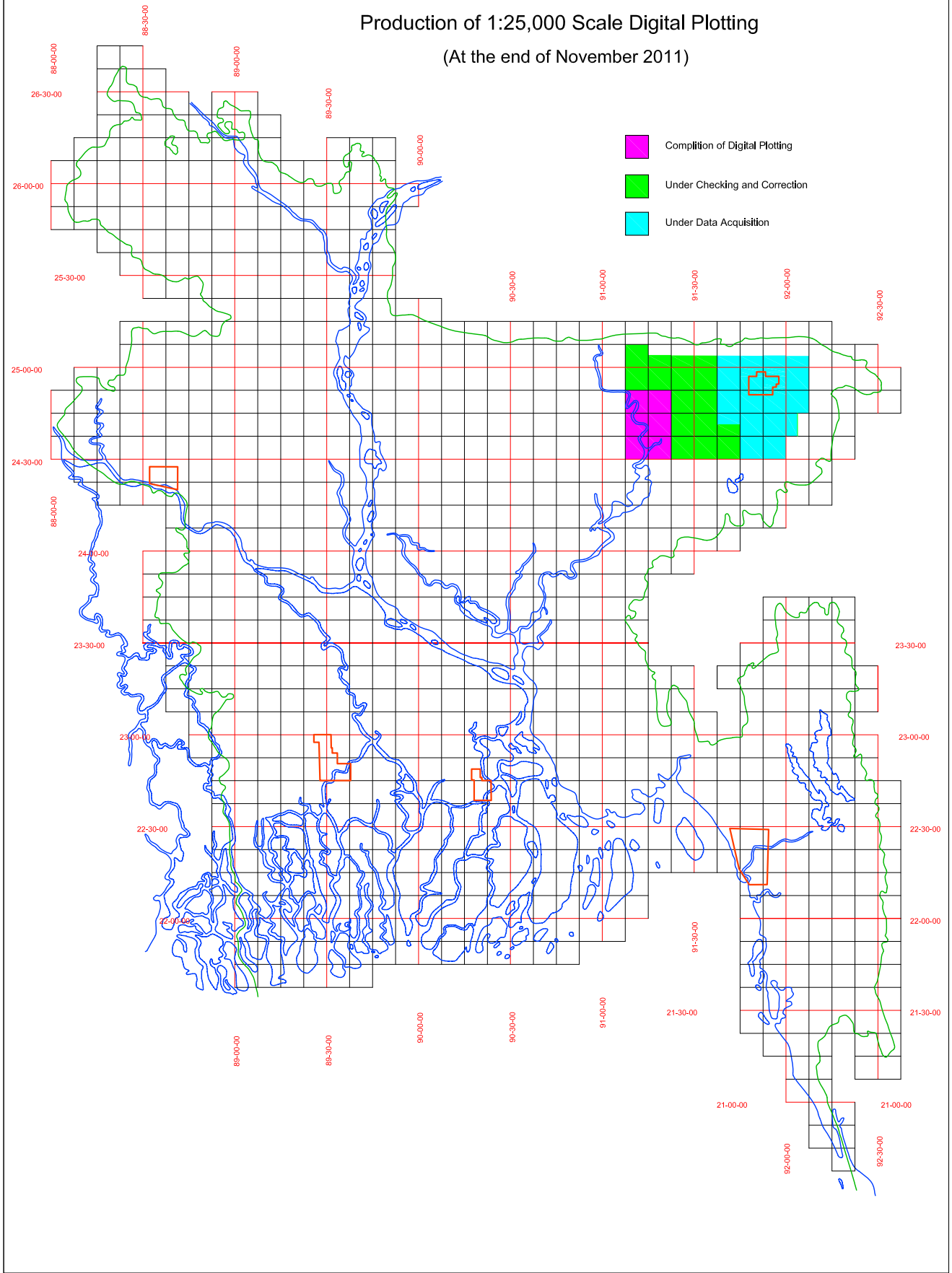
Production of 1:25,000 Scale Digital Plotting (At the end of September 2011)



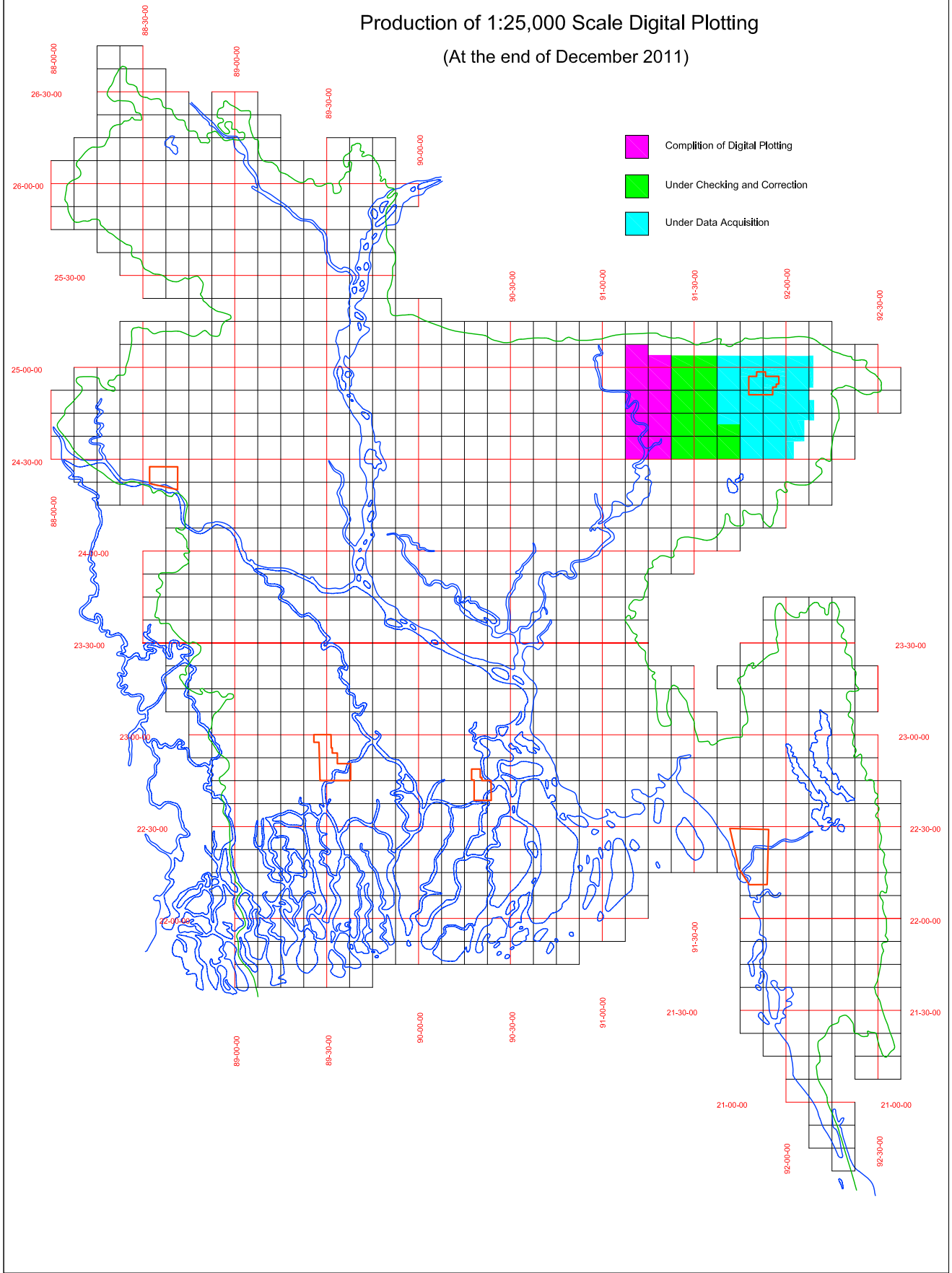
Production of 1:25,000 Scale Digital Plotting (At the end of October 2011)



Production of 1:25,000 Scale Digital Plotting (At the end of November 2011)

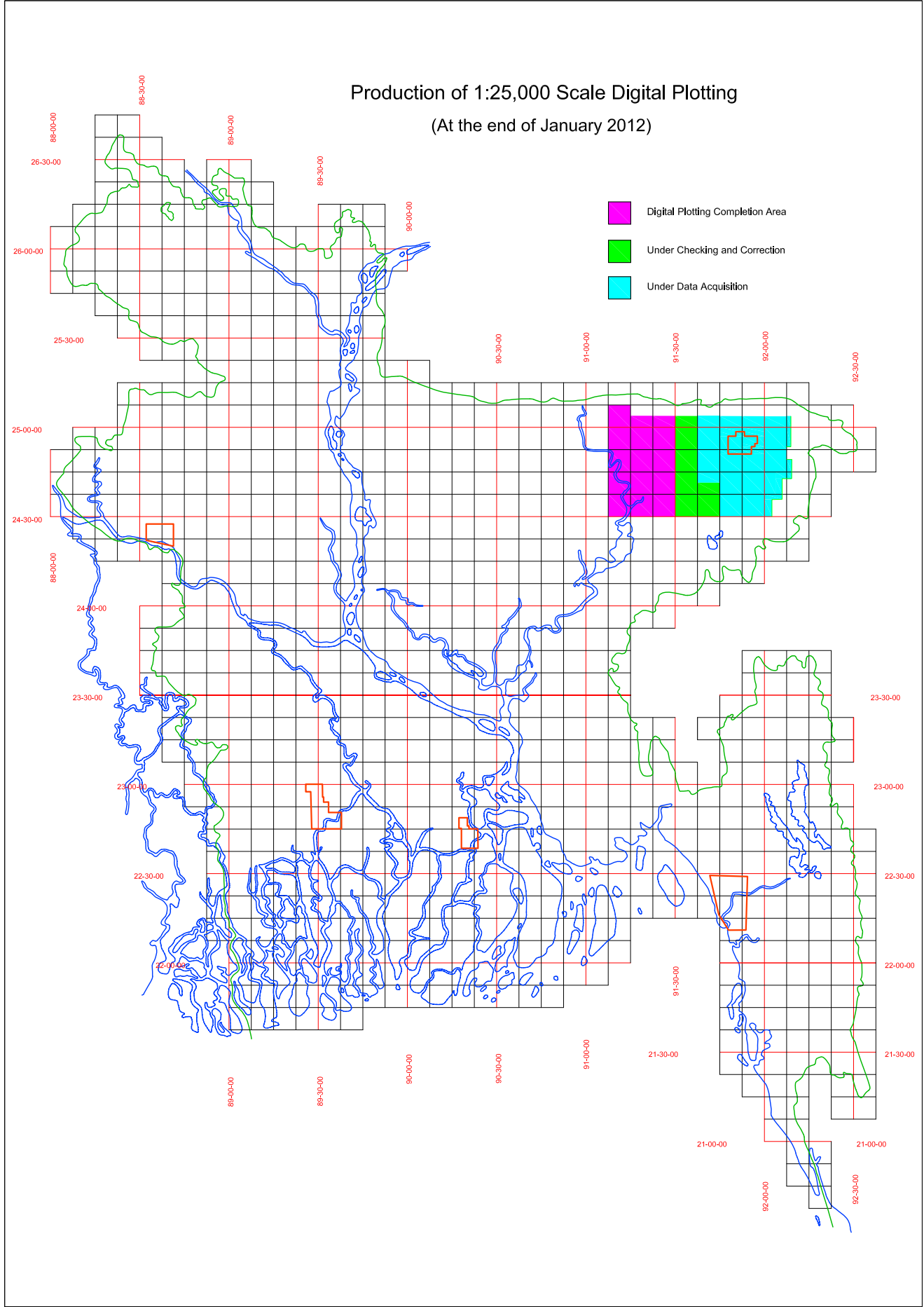


Production of 1:25,000 Scale Digital Plotting (At the end of December 2011)



Production of 1:25,000 Scale Digital Plotting

(At the end of January 2012)



Production of 1:25,000 Scale Digital Plotting (At the end of February 2012)

