

Preface

In response to a request from Survey of Bangladesh in the People's Republic of Bangladesh (hereinafter referred to as "SOB"), The Government of Japan decided to conduct "The Study on Urban Information Management for Greater Dhaka City in the People's Republic of Bangladesh" (hereinafter referred to as "the Study") and entrusted the Study to Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA selected and dispatched a study team headed by Mr. Toru WATANABE of Asia Air Survey Co., Ltd. to Bangladesh from November 2002 to July 2004 (hereinafter referred to as "the Study team").

The Study team held discussion with the officials concerned of SOB and conducted field survey at the Study area. Upon returning to Japan, the study team conducted further studies and prepared this final report.

I hope that this report will contribute to SOB and also to the promotion of the development projects in the Study area in Bangladesh.

Finally, I wish to express my sincere appreciation of the officials concerned of SOB for their close cooperation extended to the study team.

August 2004

Kazuhisa Matsuoka
Vice President
Japan International Cooperation Agency

Letter of Transmittal

August 2004

Mr. Kazuhisa Matsuoka
Vice President
Japan International Cooperation Agency

Dear Mr. Matsuoka

It is my great pleasure to submit herewith the Final Report for the Study on Urban Information Management for Greater Dhaka City in the People's Republic of Bangladesh.

The Study team consists of Asia Air Survey Co., Ltd. (AAS) and Aero Asahi Corporation (AAC) conducted field survey in Bangladesh during the period from November 2002 to March 2004, and office work such as digital topographic mapping during the period from February 2003 to March 2004 as per the contract with the Japan International Cooperation Agency.

During the field survey in Bangladesh, discussions with the officials of Survey of Bangladesh in the People's Republic of Bangladesh (SOB) were held. Based on the results of the discussions with SOB, digital topographic maps, other final results and final report were prepared.

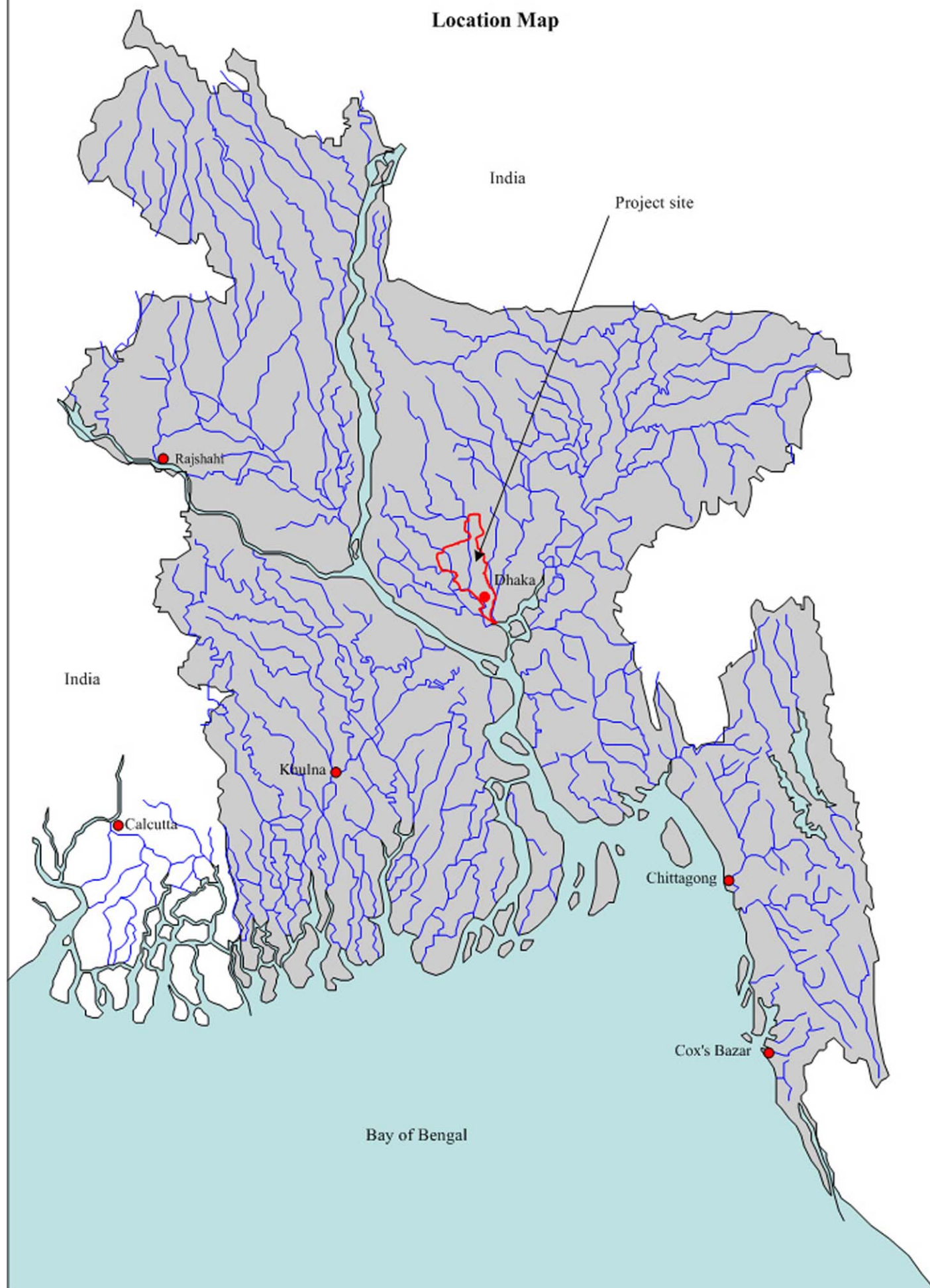
On behalf of the Study team, I would like to express my heartfelt appreciation to SOB in Bangladesh and other authorities concerned for their diligent cooperation and assistance and for the heartfelt hospitality which they extended to the Study team during our stay in Bangladesh.

I am also greatly indebted to the Japan International Cooperation Agency, the Ministry of Foreign Affairs and the Embassy of Japan in Bangladesh for giving us valuable suggestion and assistance during the preparation of this report.

Yours faithfully,

Toru Watanabe
Team Leader for the Study on Urban Information Management
for Greater Dhaka City in the People's Republic of Bangladesh

Location Map



Abbreviation of the Organization Names in Bangladesh

| Abbreviation | Name of User of Topographic Data and GIS |
|--------------|--|
| AD | Archaeology Department |
| BDR | Bangladesh Rifles |
| BARC | Bangladesh Agricultural Research Council |
| BB | Ban Bhaban (Forest Department) |
| BBS | Bangladesh Bureau of Statistics |
| BCL | Bangladesh Consultancy Limited |
| BEG | Bets Group |
| GSB | Geological Survey of Bangladesh |
| BIWTC | Bangladesh Inland Water Transport Corporation |
| BR | Bangladesh Railway |
| BRTA | Bangladesh Road Transport Authority |
| BSI | Bangladesh Survey Institute |
| BTB | Bangladesh Tea Board |
| BUET | Bangladesh University of Engineering & Technology |
| CCC | Chittagong City Corporation |
| CDA | Chittagong Development Authority |
| CEC | Concord Engineering & Construction |
| CEGIS | Center for Environmental & Geographical Information Services |
| DCC | Dhaka City Corporation |
| DDC | Development Design Consultant Limited |
| DESA | Dhaka Electric Supply Authority |
| DLRLS | Department of Land Records & Settlement Surveys |
| DMP | Dhaka Metropolitan Police |
| EAS-D | External Advertising Sub-Division |
| EGIS | Environment & GIS Support Project |
| IEB | Institute of Engineers, Bangladesh |
| FD | Fishery Department |
| FS&CD | Fire Service & Civil Defense |
| HBRI | Housing & Building Research Institute |
| IDE | International Development Enterprises |
| IGP PHQ | IGP, Police Head Quarter |
| JICA | JICA Bangladesh Office |
| JOC | Japan Overseas Consultant Co., Ltd. |
| JRC | Joint River Commission |
| KCC | Khulna City Corporation |
| KEP | Kearn Enargy PLC |
| KDA | Khulna Development Authority |
| LGED | Local Government Engineering Department |
| MAPPA | The MAPPA |
| MOC | Ministry of Commerce |
| MOH | Ministry of Home |
| MWPD-1 | Micro Wave Preserver Division-1 |
| PDB | Power Development Board |
| PHED (DC) | Public Health Engineering Department (Drainage Circle) |
| PWD | Public Works Department |
| RAJUK | Rajdhani Unnayan Kartripakkha |
| RCC | Rajshahi City Corporation |
| R&H | Road & Highway Department |
| RIC | Resource Integration Center |
| RRI | River Research Institute |
| SOB | Survey of Bangladesh |
| SPARRSO | Space Research & Remote sensing Organization |

| | |
|---------|--|
| SRDI | Soil Resource Development Institute |
| SRI | Soil Resource Institute |
| SSL | Sthapati Sangshad Limited |
| SUC | Survey Corporation Pvt. Limited |
| SUMISHO | Sumitomo Corporation |
| SWMC | Surface Water Modeling Centre |
| T&T | Bangladesh Telegraph & Telephone Board |
| WARPO | Water Resources Planning Organization |
| WASA | Water Supply and Sewerage Authority |

Summary of the Study

| Item of Work | | Volume of Work |
|---------------------------------|----------------------|------------------------------------|
| 1. Aerial photography | | |
| Photo scale | | 1:20,000 |
| Aerial photography area | | 960km ² |
| Positive film making | | 1 set, 330 sheets |
| Contact film making | | 1 set, 330 sheets |
| Scanning of positive film | | 1 set, 330 sheets |
| 2. Interview survey | | |
| Interview survey | | 1 set |
| 3. Ground control point survey | | |
| Monumentation | | 23 points |
| Establishment of photo signals | | 14 points |
| GPS observation | | Existing: 6 points, New: 24 points |
| Leveling | | 160 km |
| Pricking | | 46 points |
| Field identification | 581km ² | 1 set |
| 4. Aerial triangulation | | |
| Aerial triangulation | 30 runs, 330 sheets | 307 models |
| 5. Digital topographic mapping | | |
| Map scale | | 1:5,000 |
| Mapping area | | 581 km ² |
| Number of sheet | | 122 sheets |
| Contour interval | Intermediate contour | 2 m |
| 6. GIS basic data creation | | |
| Scale | | 1:5,000 |
| Area | | 581 km ² |
| 7. Production of CD-ROM, etc. | | |
| Digital topographic map data | | 2 sets |
| GIS basic data | | 100 sets |
| Printing film | | 1 set |
| PS-plate | | 1 set |
| 8. Printing of topographic maps | | |
| 1:5,000 scale printing map | Printed by SOB | 500 sets |

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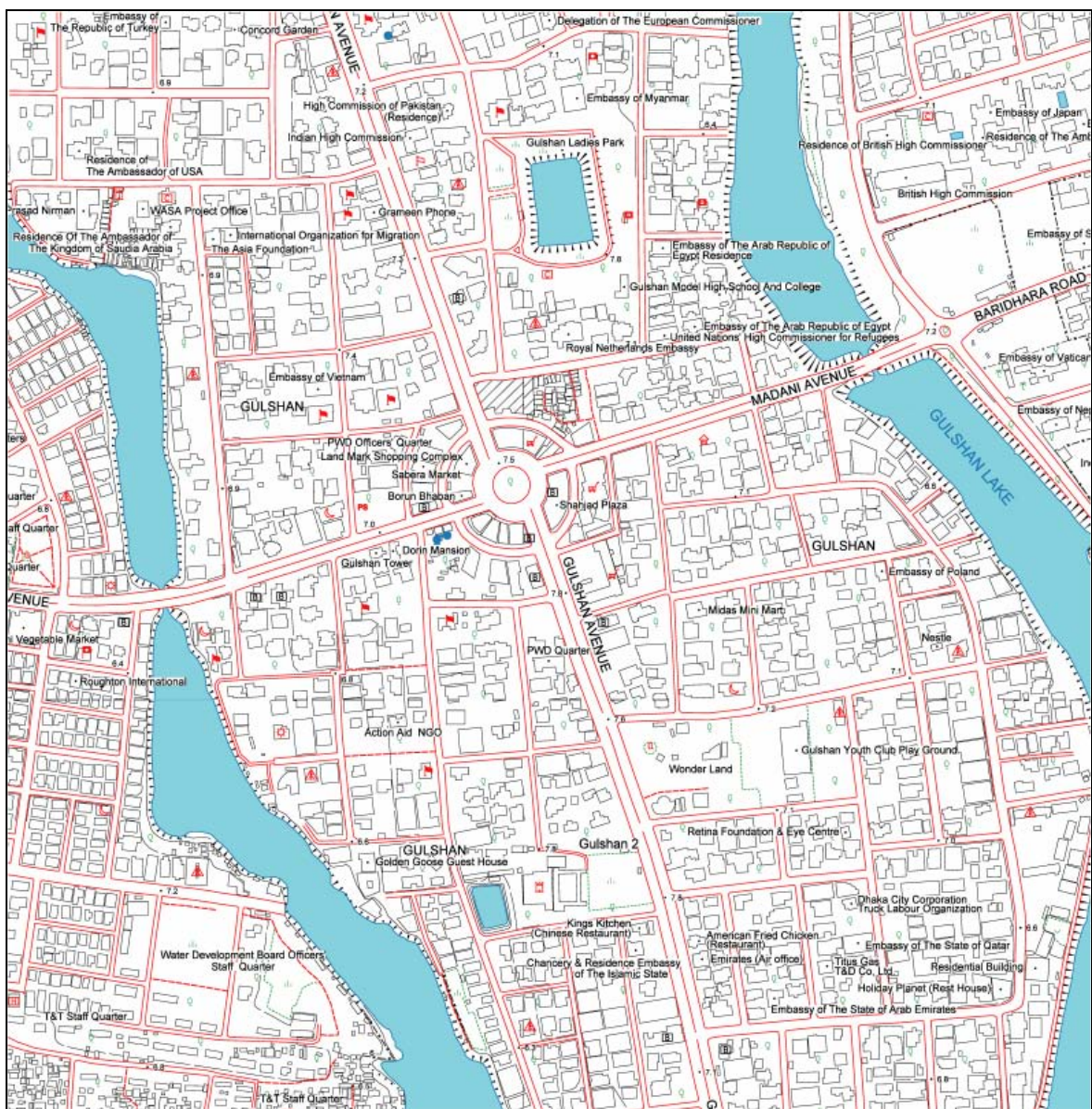
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Chapter 1 Outline of the Study



Sample of 1:5,000 digital topographic map
Location: Gulshan Circle 2

Chapter 1 Outline of the Study

The outline of the Study is described as follows:

1.1 Background of the Study

In response to the request made by the Government of the People's Republic of Bangladesh (hereinafter referred to as "GOB"), the Government of Japan has decided to conduct "The Study on Urban Information Management for Greater Dhaka City in the People's Republic of Bangladesh (hereinafter referred to as "the Study")", in accordance with the relevant laws and regulation in force in Japan.

The Japan International Cooperation Agency (hereinafter referred to as "JICA"), an official agency responsible for the implementation of the international technical cooperation programs of the Government of Japan, sent a Japanese Study Team (hereinafter referred to as "the Study team") and the Study team carried out the Study in close cooperation with Survey of Bangladesh (hereinafter referred to as "SOB") and other Bangladesh authorities concerned.

The Study areas including the Dhaka Metropolitan Area are as follows:

- | | | |
|----|--|---------------------|
| 1) | 1:20,000 scale aerial photography area | 960 km ² |
| 2) | 1:5,000 scale digital mapping area | 581 km ² |
| 3) | 1:5,000 scale GIS basic data creation area | 581 km ² |



Photo 1.1.1 "Main Building of SOB"

The Study area is shown in Figure 1.1.1 "1:5,000 Scale Digital Topographic Mapping Area".

1.2 Objectives of the Study

Dhaka Metropolitan Area is now expanding and urbanizing without any plan due to the reason of rapid increase of population in this area. Furthermore, necessary countermeasures such as urban planning, urban management and so on cannot be executed due to the lack of precise large-scale topographic maps. Due to the reason of this rapid expanding and urbanizing of Dhaka Metropolitan Area, many urban problems such as deterioration in administration services and residential conditions, expansion of slums area, heavy traffic congestion, lack of infrastructure and so on become serious in this area.

In the Dhaka Metropolitan Area, many projects such as "Eastern Embankment Construction Plan", "Dhaka City Bypass Construction Plan" and so on have been planned and precise large-scale topographic maps, and

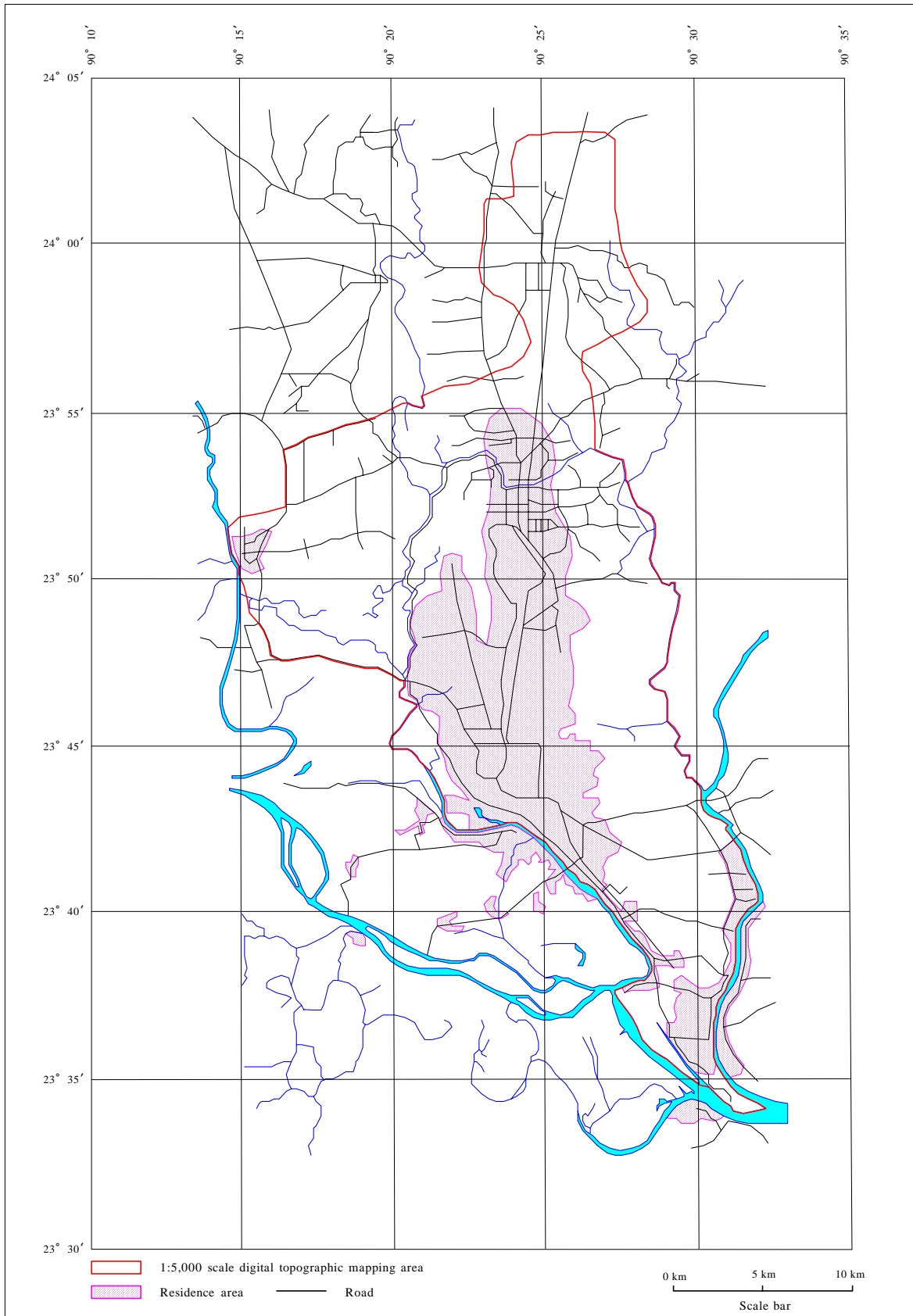


Figure 1.1.1 "1:5,000 Scale Digital Topographic Mapping Area"

digital topographic data are highly needed for the implementation of these plans and also for solving the urban problems caused by the rapid expansion of Dhaka Metropolitan Area.

The objectives of the Study is to produce 1:5,000 scale digital topographic maps and GIS basic data in the Dhaka Metropolitan Area immediately to assist the planning and implementation for solving the urban problems to be tackled in this area. Furthermore, technology of large to medium scale digital topographic mapping and production of GIS basic data will be transferred to the counterparts of SOB through the implementation of the Study.

1.3 The Period and Items of the Study

The Study was started from the middle of November 2002 and to be completed by the end of July 2004. The Study items and the period of the Study of each year were as follows:

1.3.1 The 1st year's Study

The outline of the 1st year's Study was as follows:

1) Preparation work in Japan

Work period: From the middle of November 2002 to the end of November 2002

- Work item:
- 1) Collection of the existing data and information
 - 2) Preparation of inception report

2) The 1st fieldwork in Bangladesh

Work period: From the end of November 2002 to the middle of March 2003

- Work item:
- 1) Inception report meeting
 - 2) Aerial photography
 - 3) Discussion of map style and map symbols (1)
 - 4) Ground control point survey
 - 5) Field identification (1)
 - 6) Interview survey
 - 7) Production of 1:5,000 digital orthophotos

3) Office work in Japan

Work period: From the middle of March 2003 to the end of March 2003

- Work item:
- 1) Scanning of positive films
 - 2) 1:5,000 scale digital topographic map sheet planning

1.3.2 The 2nd year's Study

The outline of the 2nd year's Study was as follows:

1) The 1st office work in Japan

Work period: From the beginning of May 2003 to the end of May 2003

Work item: 1) Preparation of Progress report
2) Aerial triangulation
3) Preparation of a sample of 1:5,000 scale digital topographic maps

2) The 2nd fieldwork in Bangladesh

Work period: From the middle of May 2003 to the end of June 2003

Work item: 1) Progress report meeting
2) Discussion of map style and map symbols (2)
3) Discussion of GIS basic data
4) Field identification (2)

3) The 2nd office work in Japan

Work period: From the middle of May 2003 to the end of September 2003

Work item: 1) Digital mapping
2) Digital compilation (1)
3) Preparation of work manual
4) Preparation of interim report

4) The 3rd fieldwork in Bangladesh

Work period: From the middle of August 2003 to the end of August 2003

Work item: 1) Procurement of necessary equipment for technology transfer

5) The 4th fieldwork in Bangladesh

Work period: From the beginning of October 2003 to the beginning of March 2004

Work item: 1) Interim report meeting
2) Field identification (3)
3) Technology transfer Digital mapping
 Digital compilation and symbolization
 GIS basic data production
 Quality control and schedule management
4) Procurement of printing materials
5) Returning of positive films to SOB

6) The 3rd office work in Japan

Work period: From the beginning of October 2003 to the end of March 2004

Work item: 1) Digital compilation (2) and symbolization
2) Structuralization (GIS basic data production)
3) Printing film, PS-plate and CD-ROM making

4) Preparation of draft final report

1.3.3 The 3rd year's Study

The outline of the 3rd year's Study was as follows:

1) The 5th fieldwork in Bangladesh

Work period: From the end of June 2004 to the end of July 2004

- Work item:
- 1) Seminar
 - 2) Follow-up of the technology transfer
 - 3) Draft final report meeting

2) The 4th office work in Japan

Work period: From the beginning of August 2004 to the end of August 2004

- Work item:
- 1) Preparation of final report

1.4 Flow of the Study

The workflow of the Study and actual assignment schedule of the members of the Study team are shown in Figure 1.4.1 "Workflow and Actual Assignment Period of the Study Team".

1.5 Organization of the Study Team

The members and their assignment period of each year's Study were as follows:

1.5.1 The 1st year's Study team

The name of the members and their assignment period of the 1st year's Study team were as follows:

| <u>Assignment</u> | <u>Name</u> | <u>Assignment Period</u> | <u>Days</u> |
|-------------------------------------|-----------------|--------------------------|-------------|
| Team leader | Toru Watanabe | 07/12/2002~05/01/2003 | 30 days |
| | | 01/03/2003~15/03/2003 | 15 days |
| Supervisor of aerial photography | Hidehito Hosoda | 28/11/2002~26/01/2003 | 60 days |
| Leveling and GPS | Kentaro Usuda | 26/12/2002~01/03/2003 | 66 days |
| Field identification | Takashi Harada | 14/02/2003~15/03/2003 | 30 days |
| Technical specifications | Kozo Toyoda | 02/01/2003~31/01/2003 | 30 days |
| Administration support (1) | Ichiro Nonaka | 28/11/2003~27/12/2002 | 30 days |
| | | 29/01/2003~12/02/2003 | 16 days |
| Administration support (2) | Michi Hayashi | 22/12/2002~26/01/2003 | 36 days |

1.5.2 *The 2nd year's Study team*

The members and their assignment period of the 2nd year's Study team were as follows:

| <u>Assignment</u> | <u>Name</u> | <u>Assignment Period</u> | <u>Days</u> |
|----------------------------|-----------------|--------------------------|-------------|
| Team leader | Toru Watanabe | 10/05/2003~24/05/2003 | 15 days |
| | | 15/06/2003~04/07/2003 | 20 days |
| | | 16/08/2003~30/08/2003 | 15 days |
| | | 04/10/2003~18/10/2003 | 15 days |
| | | 12/11/2003~11/12/2003 | 30 days |
| | | 20/02/2004~05/03/2004 | 15 days |
| Field identification | Takashi Harada | 10/05/2003~08/06/2003 | 30 days |
| | | 04/10/2003~17/11/2003 | 45 days |
| Digital mapping | Nobuhiro Sata | 04/10/2003~16/01/2004 | 105 days |
| Digital compilation | Yoshiaki Hirota | 10/05/2003~08/06/2003 | 30 days |
| | | 01/11/2003~29/01/2004 | 90 days |
| GIS | Kazumi Suwabe | 01/06/2003~30/06/2003 | 30 days |
| | | 07/12/2003~05/03/2004 | 90 days |
| Administration support (2) | Michi Hayashi | 10/05/2003~08/06/2003 | 30days |
| | | 13/10/2003~07/11/2003 | 26 days |
| | | 10/03/2004~24/03/2004 | 15 days |

At the beginning of 2004, JICA requested the Study team to produce GIS data to support the Solid Waste Management Study at Dhaka Metropolitan Area started from the end of 2003 by the technical cooperation program of the Government of Japan as an additional work to the GIS basic data production in the Study.

To meet the requirement, following additional members were sent to Bangladesh for the fieldwork in Dhaka Metropolitan Area to collect the necessary data and information for the creation of GIS data.

| <u>Assignment</u> | <u>Name</u> | <u>Assignment Period</u> | <u>Days</u> |
|------------------------|------------------|--------------------------|-------------|
| Team leader | Toru Watanabe | 28/01/2004~11/02/2004 | 15 days |
| Field survey (1) | Kozo Toyoda | 28/01/2004~27/03/2004 | 60 days |
| Field survey (2) | Takayuki Iritani | 28/01/2004~27/03/2004 | 60 days |
| GIS | Shigeru Ono | 28/01/2004~07/03/2004 | 40 days |
| Administration support | Michi Hayashi | 03/02/2004~22/02/2004 | 20 days |

The objectives of this additional work is to produce the following GIS data to support the Solid Waste Management Study using the results of the Study such as 1:5,000 digital topographic data and GIS basic data. Furthermore, the GIS data to be produced will be utilized not only for Solid Waste Management Study, but also for other development projects in Dhaka Metropolitan Area.

- 1) Land use maps
- 2) Land conditions maps
- 3) Social economic conditions maps
- 4) Flood areas maps and flood simulation
- 5) Road type and road width maps
- 6) Administrative boundary maps
- 7) Types and numbers of houses, and estimation of population
- 8) Collecting points and collecting routes of solid waste
- 9) Other necessary GIS data for solid waste management

This final report does not include the contents of GIS data production for solid waste management. The outline and results of GIS data production for solid waste management are described in “Report on GIS Data Production for Solid Waste Management”.

1.5.3 The 3rd year’s Study team

The members and their assignment period of the 3rd year’s Study team were as follows:

| <u>Assignment</u> | <u>Name</u> | <u>Assignment Period</u> | <u>Days</u> |
|--------------------------|--------------------|---------------------------------|--------------------|
| Team leader | Toru Watanabe | 26/06/2004~31/07/2004 | 36 days |
| GIS | Kazumi Suwabe | 26/06/2004~31/07/2004 | 36 days |
| Digital mapping | Nobuhiro Sata | 26/06/2004~31/07/2004 | 36 days |
| Digital compilation | Yoshiaki Hirota | 26/06/2004~31/07/2004 | 36 days |
| GIS (Solid waste) | Shigeru Ono | 26/06/2004~31/07/2004 | 36 days |
| Administration support | Michi Hayashi | 26/06/2004~31/07/2004 | 36 days |

1.6 Key Points for the Implementation of the Study

Followings are the important key points for the implementation of the Study of which the Study team has explained to SOB at the beginning of the Study.

- 1) Through the implementation of the Study, technology transfer to the counterparts of SOB will be executed. The final target of the technology transfer is to make the counterparts capable to produce 1:5,000 scale digital topographic maps on the remaining unmapped area (approximately 371 km²) in the aerial photography area (approximately 960 km²) by SOB themselves.
- 2) In case of large to medium scale topographic mapping, cooperation of relevant organizations in Bangladesh will be truly needed. Furthermore, it is also important that the final results of the Study should be used effectively by the relevant organizations.
- 3) The SOB counterparts will mainly implement the Study and the Japanese members of the Study

team will assist and cooperate the activities of the counterparts of SOB.

- 4) The existing equipment of SOB should be used effectively wherever possible for the implementation of the Study, and the minimum of necessary equipment will be prepared by the Study Team.
- 5) SOB has no experience of 1:5,000 scale digital topographic map production. Therefore, it is necessary to create the map style, map symbols, manual for 1:5,000 scale digital topographic mapping and so on from ABC through the Study. The Study team will prepare the visible samples of above-mentioned items to help the understanding of the counterparts of SOB as much as possible.
- 6) The main items of technology transfer through the Study are “Digital mapping”, “Digital compilation and symbolization”, “Structuralization” and “Field identification”.
- 7) The necessary data and materials for the implementation of the Study in Japan will be brought out from Bangladesh to Japan according to the regulation of the Government of Bangladesh. At the end of the Study, the data and materials brought out to Japan will be surely returned to SOB.

1.7 Project Office

The SOB supplied an office room to the Study team. It is on the 4th floor of the new building located behind the main building of SOB. The room was previously used for the stock room of topographic maps in SOB.



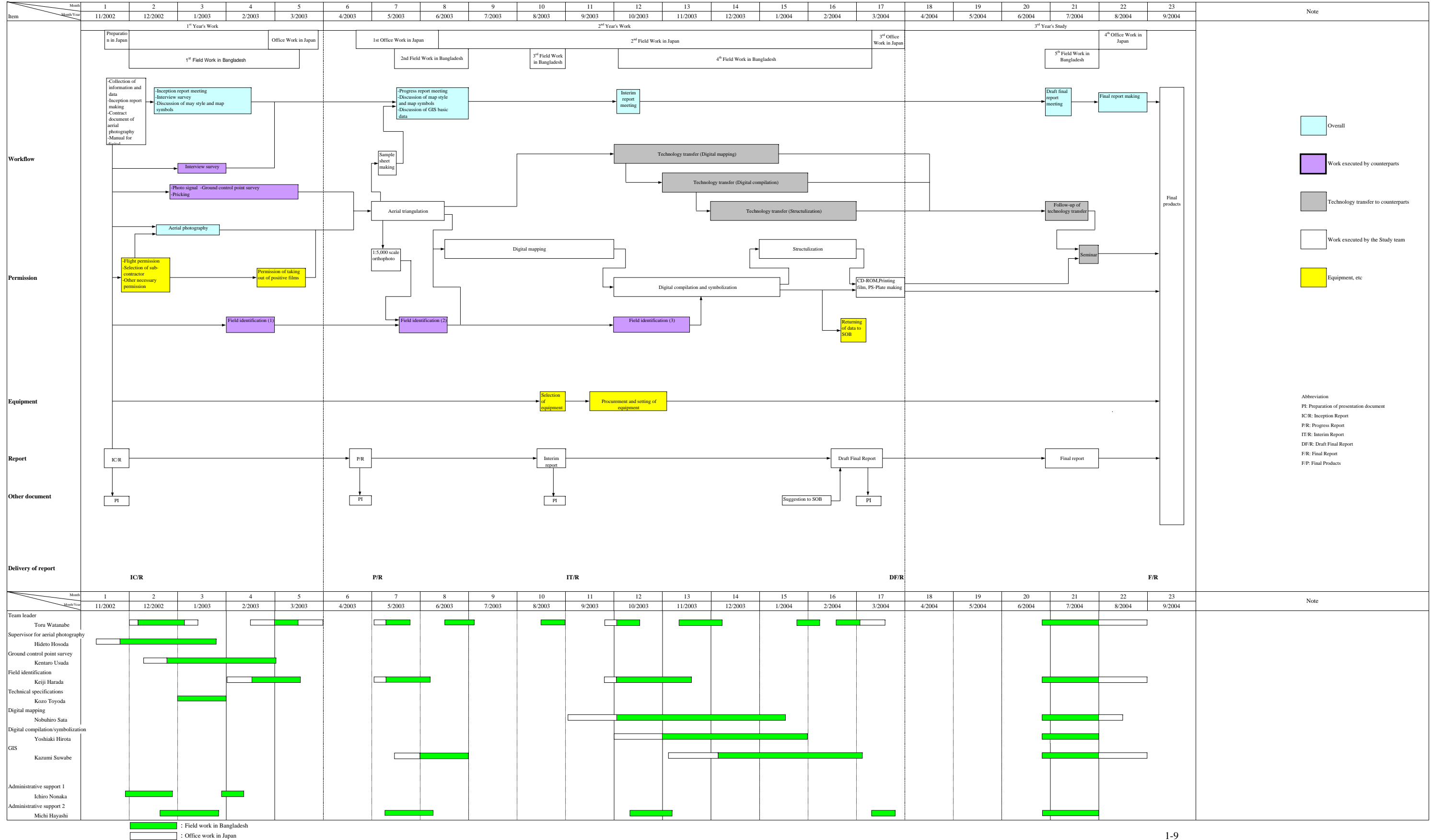
Photo 1.7.1 “Equipment in Project Office”



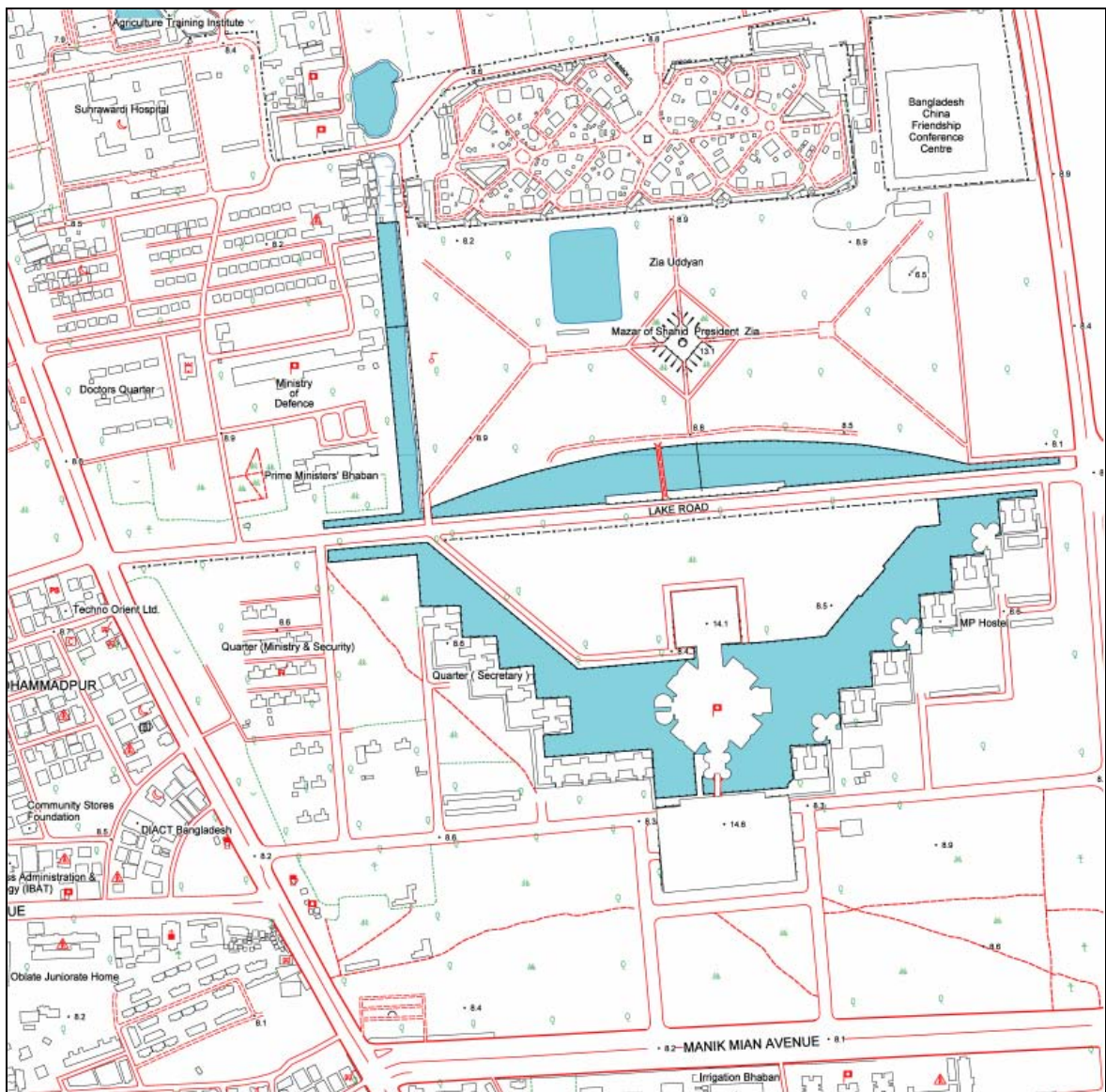
Photo 1.7.2 “Project Office”

This office room has 3 air conditioners, and a telephone line had been already installed into the room. SOB supplied desks, chairs and a table to the Study team. However, due to the shortage of number of desks and chairs, the Study team purchased necessary several desks, chairs and a table for the office. Also, the Study team purchased the necessary office equipment such as computers, a copy machine, a scanner and so on for the execution of the actual work.

Figure 1.4.1 "Workflow and Actual Assignment Period of the Study Team"



Chapter 2 Survey of Bangladesh (SOB)



Sample of 1:5,000 scale digital topographic map
Location: Assembly Hall

Chapter 2 Survey of Bangladesh (SOB)

The outline of Survey of Bangladesh, a counterparts agency of the Study, and its surrounding conditions are described below:

2.1 History of SOB

The Survey of India started the survey in Bengal Region (Bangladesh, India, Pakistan and Myanmar) under the British rule. The Survey of India was established in 1767 and established triangulation and leveling networks covering the Indian sub-continent and its surrounding areas by 1880. The geodetic datum origin of the geodetic network was located at Kalianpur in north India, and they also established 9 tidal observation stations.

In parallel with the execution of these geodetic works, Survey of India produced 1 inch 1 mile topographic maps (map scale is 1:63,360) as well as the surveying and mapping systems in the region, and the technical level of surveying and mapping in Bengal Region became almost as high as European countries by the end of 19th Century.

In 1947, India Region became independent from British. At this time, due to the reason of religion, India region was separated as India and Pakistan, and Survey of Pakistan succeeded the survey works in Pakistan region from Survey of India.

Survey of Pakistan executed the triangulation and leveling survey to establish the geodetic networks for the areas not executed by Survey of India, and also produced 1:50,000 scale topographic maps (total 42 sheets) by compiling the existing topographic maps and aerial photos. These works were executed by a regional office of Survey of Pakistan for East Pakistan located in Dhaka City.

After the independence of Bangladesh from Pakistan, a regional office of Survey of Pakistan for East Pakistan was reorganized as Survey of Bangladesh (SOB). Under these circumstances, SOB started its work with serious problems as described below.

- 1) There was no geodetic datum point in Bangladesh,
- 2) Geodetic control points were not distributed homogeneous,
- 3) Leveling network was divided into two parts due to the Padma River,
- 4) The data and information concerning survey and mapping were stored in India and there were no enough data and information in regional office in Dhaka at the time of the independence, and
- 5) The staffs and equipment succeeded from Survey of India were not sufficient.

Therefore, the establishment of survey and mapping systems in Bangladesh and strengthening SOB were the most important issues for SOB.

2.2 Technical Assistance by the Foreign Countries to SOB

In 1970's, after independence from Pakistan, 1:30,000 scale aerial photography project was carried out by the cooperation of Canada. However, real technical cooperation programs in the fields of surveying and topographic mapping by foreign countries were started from 1990's, after the Government of Bangladesh became stable.

2.2.1 Technical assistance by the government of Japan

The Government of Japan has executed many technical cooperation programs in the fields of surveying and mapping in Bangladesh. It is supposed that the first surveying and mapping work in Bangladesh by the technical cooperation by the Government of Japan was the survey and mapping work for Jamuna Bridge construction plan in 1970's. After this project, the following technical cooperation programs by the government of Japan were executed.

1) The study on the geodetic survey in the Peoples Republic of Bangladesh (1992 ~1995)

To establish new geodetic control points network covering 2/3 of whole territory of Bangladesh except southern part, the following works were executed from 1992 to 1995.

- 1) Establishment of a geodetic control points (GPS points) network,
- 2) Establishment of a leveling network,
- 3) Establishment of a tidal observation station,
- 4) Build up of geodetic datum origin points,
- 5) Determination of mean sea level and
- 6) Technology transfer of the above-mentioned work to the staff of SOB.

The results of this Study are shown in Table 2.2.1 "Results of the Study on the Geodetic Survey in the Peoples Republic of Bangladesh".

Table 2.2.1 "Results of the Study on the Geodetic Survey in the Peoples Republic of Bangladesh"

| | Items | No. | Note |
|----------|---|-----|---|
| Facility | Geodetic datum point | 1 | Horizontal datum point: 1 point Vertical datum point: 1 point Reference point: 2 points |
| | Chittagong tidal observation station | 1 | Building for tidal station: 1 house Tide gauge: 2 sets |
| | Monuments for 1 st order geodetic control point | 115 | A type: 26 points B type: 89 points |
| | Monuments for 1 st order benchmark | 461 | Standard type: 228 points Small type: 233 points |
| Survey | Horizontal coordinates of 1 st order geodetic control points | 141 | New point: 115 points Existing point: 24 points Horizontal datum point: 1 point Vertical datum point for tide gauge: 1 point |

| | | | |
|---------|---|-----|--|
| Results | Elevation of 1 st order Benchmarks | 465 | New point: 461 points Vertical datum point: 1 point Reference point: 2 points Vertical datum point for tide gauge: 1 point |
| | Mean sea level | — | Mean sea level was calculated based on the tidal observation data from 28 th January 1993 to 30 th November 1994 (22 months) |

As a result of this Study, geodetic control points network and leveling network covering approximately 2/3 of whole Bangladesh territory except southern part of Bangladesh were established and a basis of survey and mapping in Bangladesh was brought to realization.

The results of this Study (horizontal coordinates of GPS points and elevations of benchmarks) were supplied to the users from SOB, and also the tidal observation at Chittagong is executed continuously and more than 10 years' data was already accumulated in SOB.

2) *The project for supply of cartographic equipment in the People's Republic of Bangladesh (1998 ~2000)*

Due to the reason of old fashioned or broken down of printing machines for topographic map production in SOB, the Government of Japan decided to supply the latest type of printing machines and other necessary equipment for topographic map printing and also to establish the geodetic control point network and leveling network at the remaining area (southern part of Bangladesh). The names of equipment supplied from the Government of Japan to SOB are shown in Table 2.2.2 'Equipment Supplied by the Project for Supply of Cartographic Equipment'

Table 2.2.2 "Equipment Supplied by the Project for Supply of Cartographic Equipment"

| Type of Equipment | Name of Equipment | Volume | |
|------------------------|----------------------------------|-------------------------------------|--------|
| Printing equipment | 2 color offset printing machine | Komori L-240 Package X 1 set | |
| | Offset proof printing Machine | Dainippon Screen KF-123-GL 1 set | |
| Plate making Equipment | Camera for plate making | Fujirex OC-1200 1 set | |
| | Film development machine | Dainippon Screen LD-T1100 1 set | |
| | Contact printer | Fujirex UP-MH-2 1 set | |
| | PS plate printer | Dainippon Screen P-832-I 1 set | |
| | PS plate development Machine | Fuji Film PS850P 1 set | |
| Survey equipment | GPS receiver | Leica SR9500 6 sets | |
| | Personal computer and attachment | IBM ThinkPad 600 | 2 sets |
| | | Cannon BJC80 | 2 sets |
| | | HP 5000N | 1 set |
| | Digital level | Leica NA3003 2 sets | |
| Total station | Topcon GTS-310 2 sets | | |
| Transceiver | Kenwood VX-3000U 1 set | | |
| Etc. | Air conditioner | Toshiba 1 set | |

After the completion of this equipment supply to SOB, the problems such as shortage of topographic maps, poor quality of topographic map printing were solved and also printing skill in SOB was improved. Furthermore, using the supplied survey equipment, geodetic control point network and leveling point network at southern part of Bangladesh was established by SOB.

3) *Long-term experts (1999 ~present)*

To utilize the results of above mentioned projects effectively, and also to strengthen the capability of SOB and for the smooth supply of the data and information of topographic maps and survey data to the users, SOB requested long-term experts to the Government of Japan. Based on the request from SOB, the Government of Japan dispatched long-term experts from July 1999 up to present to make technical and administrative support to SOB.

2.2.2 Technical assistance by the other foreign government

From 1997 to 2001, IGN International (France) executed the technical cooperation program to SOB for the purpose of the following items:

- 1) Digital topographic map compilation,
- 2) Analysis of satellite image,
- 3) Introducing digital photogrammetric mapping system to SOB,
- 4) Digitalization of the existing topographic maps,
- 5) Correction of digital topographic maps and
- 6) Technical training to the staff of SOB.

As the results of this project, 1:50,000 scale satellite image maps covering Dhaka City was produced on a trial basis. Also, 1:20,000 scale Dhaka City Guide Map was produced and published. The experts dispatched from IGN International executed the technology transfer of the above-items during their stay in Bangladesh. This project was completed on February 2000 and the equipment from IGN international was donated to SOB and presently placed under the control of SOB.

However, concerning the digital mapping, the working procedure transferred from IGN International to the staff of SOB was the map-digitizing method (2 dimensional digital data acquisition). The 3 dimensional digital data acquisition using digital photogrammetric method and GIS data creation technique using the digital topographic data were not transferred to the staff of SOB.

On the other hand, approximately 5 years has already passed since SOB received the equipment of digital mapping system and GIS system from IGN International and no technical follow-up and maintenance for the equipment has been done by IGN International after donation of equipment to SOB.

Due to the reason of the shortage of maintenance budget in SOB, SOB could not take any countermeasures for broken down equipment. Furthermore, the staff of SOB has no capability and knowledge to maintain

the UNIX workstation.

The software for digital compilation system and GIS system supplied from IGN International was Geoconcept. However, other agencies of Bangladesh Government use ArcInfo/Arcview software as GIS software. Due to the lack of knowledge and skill of data conversion, and an experience of actual work of digital topographic mapping and GIS, the staffs of SOB misunderstood that the data conversion was difficult to execute.

2.3 Present Situation of SOB

Necessary information concerning SOB and its surrounding situation was collected to provide the recommendation and suggestion to SOB in the field of survey and mapping. Following is the outline of SOB and its surrounding situation.

2.3.1 Organization

According to the organization chart, total numbers of SOB staffs are 893 persons. However, it is estimated that the total numbers of SOB staffs are 557 persons as of January 2003 (refer to Figure 2.3.1 “Organization of SOB”). It is presumed that the reduction of staffs is caused by the financial condition of SOB.

The Digital Mapping Center that was established by the cooperation of IGN International is not included in the organization chart shown in Figure 2.3.1 “Organization of SOB”, and the Center is now under the direct control of Surveyor General of SOB. The staffs of digital Mapping Center belong to No.1 Cartography Office of Defense Survey.

In 2003, SOB has 4 projects including the Study. Therefore, SOB has encountered a problem of shortage of skilled technical staffs especially for the execution of fieldwork during the execution of the Study.

2.3.2 Staff

The key persons of SOB are officers of the Ministry of Defense and the major key persons are as follows:

- | | |
|------------------------------------|---|
| 1) Surveyor General | 1 person (Brig general) |
| 2) Director | 2 persons (Major or Lieutenant colonel) |
| 3) Survey Superintendent | 3 persons |
| 4) Assistant Survey Superintendent | 4 persons |

2.3.3 Budget

The budgets of SOB in last 5 years are shown in Table 2.3.1 “Budgets of SOB in Last 5 Years”. Approximately 85 % of the budget is the personnel expense and allowance.

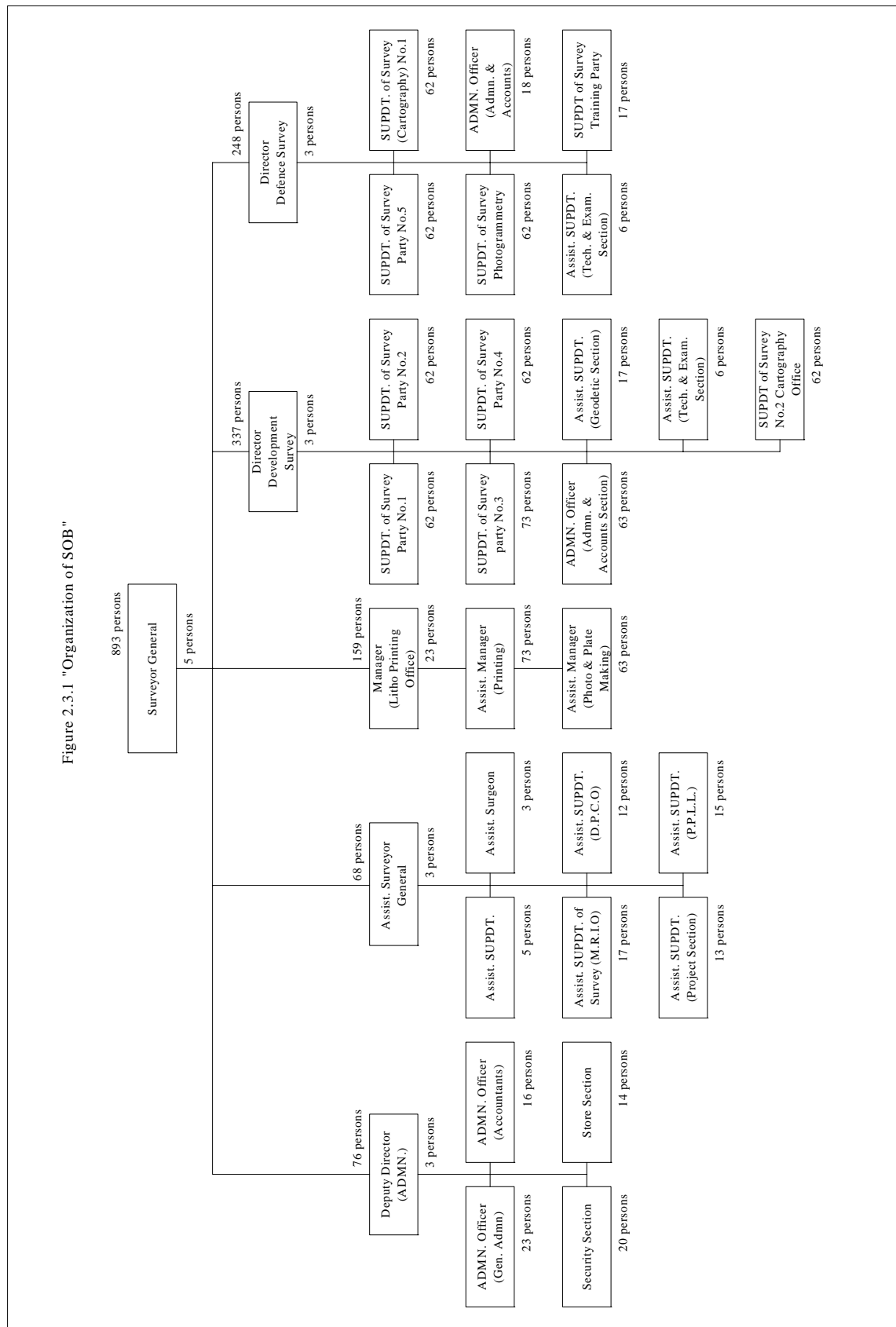


Figure 2.3.1 "Organization of SOB"

Table 2.3.1 “Budgets of SOB at Last 5 Years”

| Item | 1998~1999 | 1999~2000 | 2000~2001 | 2001~2002 | 2002~2003 |
|------------------------|------------|------------|------------|------------|------------|
| Personnel expense | 48,946,000 | 52,700,000 | 53,250,000 | 55,251,000 | 56,156,000 |
| Project cost | 7,804,000 | 7,150,000 | 6,800,000 | 6,499,000 | 7,094,000 |
| Maintenance cost | 250,000 | 250,000 | 250,000 | 250,000 | 250,000 |
| Total budget | 57,000,000 | 60,100,000 | 60,300,000 | 62,000,000 | 63,500,000 |
| % of personnel expense | 85.87% | 87.68% | 88.30% | 89.11% | 88.43% |
| % of project cost | 13.69% | 11.89% | 11.27% | 10.48% | 11.17% |
| % of maintenance cost | 0.43% | 0.41% | 0.41% | 0.40% | 0.39% |

Unit: Taka (1Taka=Approx. 2 Yen)

The percentage of personnel expense is increasing year by year. However, percentage of project cost and maintenance cost is decreasing. Especially, even though the total budget of SOB is increasing year by year, the amount of maintenance cost does not increase. It is presumed that the small amount of maintenance cost is one of the main reasons of imperfect condition of the equipment in SOB.

2.3.4 Training

SOB has sent many technical staffs for the overseas training in foreign countries as follow:

1) IGN International (France)

| | |
|----------------------|------------|
| Photogrammetry | 5 persons |
| Tracing and printing | 6 persons |
| Image processing | 3 persons |
| Total | 14 persons |

2) Other countries

| | |
|-------------------------------|------------|
| India (mainly tracing course) | 16 persons |
| ITC (Netherlands) | 20 persons |
| JICA (Japan) | 10 persons |
| Germany (University) | 5 persons |
| Total | 51 persons |

The duration of overseas training was approximately 28 weeks. Furthermore, several key persons of SOB had overseas training for key personnel in IGN International.

2.3.5 Works of SOB

SOB is executing the geodetic control point survey, leveling survey, topographic mapping and map printing according to the regulation of the Ministry of Defense of Bangladesh. The use of these results is defined on this regulation. Especially, the use of aerial photographs is strictly controlled in Bangladesh.

In case the users want to use the results of survey and mapping owned by SOB, it is necessary to request to SOB with a letter from a governmental agency concerned and the usage of these results is limited within a

period permitted by the Surveyor General of SOB.

The works of SOB is summarized as follows:

- 1) Establishment of geodetic control point network,
- 2) Execution of ground survey,
- 3) Production and revision of each scale topographic maps,
- 4) Determination of national boundary,
- 5) Production of administrative map and atlas and
- 6) Execution of aerial photography, and control and custody of aerial film.

2.3.6 Topographic maps published by SOB

The topographic maps published by SOB at 2003 are as shown in Table 2.3.2 “Topographic Maps Published by SOB at 2003”.

Table 2.3.2 “Topographic Maps Published by SOB at 2003”

| Kind of map | | Area | Sheet | Note |
|-----------------|-----------------|-----------------------------------|-------|--|
| Topographic map | 1:25,000 | Chittagong | 116 | Base map, English, The use is Restricted |
| | 1:50,000 | Whole territory | 267 | Base map, English, The use is Restricted. |
| | 1:250,000 | | 27 | Base map, English, The use is Restricted. |
| | 1:500,000 | | 6 | Base map, English, The use is Restricted. |
| | 1:1,000,000 | | 1 | Base map, English, The use is Restricted. |
| Thematic map | 1 inch 16 miles | | 1 | Guide map, English, Open to use |
| | 1 inch 16 miles | | 1 | Guide map, English, Open to use |
| | 1:1,000,000 | | 1 | Guide map, English, Open to use |
| Miscellaneous | 1:1,000,000 | | 1 | English, Open to use |
| | 1 inch 16 miles | | 1 | English or Bengal, Open to use |
| | 1 inch 32 miles | | 1 | English or Bengal, Open to use |
| City guide map | 1:15,000 | Comilla, Sylhet, Mymensing, Bogra | 4 | English or Bengal, Open to use, Other city is under planning |
| | 1:20,000 | Dhaka, Chittagong, Rajshahi | 3 | English, Open to use, Other city is under planning |

The 1:50,000 scale topographic maps are defined as base maps in Bangladesh. However, this 1:50,000 scale topographic maps have following defects.

- 1) The scale of topographic map is 1:50,000 as metric system, however, contour lines are shown in feet unit.

- 2) Spot elevations are also shown in feet unit.
- 3) The grids shown in this 1:50,000 scale topographic maps are also yard system.
- 4) These 1:50,000 scale topographic maps were revised around 1970's~1980's using aerial photographs. Therefore, topographic features have been already changed especially in urban areas and river shape.

2.3.7 Aerial photos possessed by SOB

The aerial photographs possessed and kept by SOB at present are shown in Table 2.3.3 “Aerial Photos Possessed by SOB”.

Table 2.3.3 “Aerial Photos Possessed by SOB”

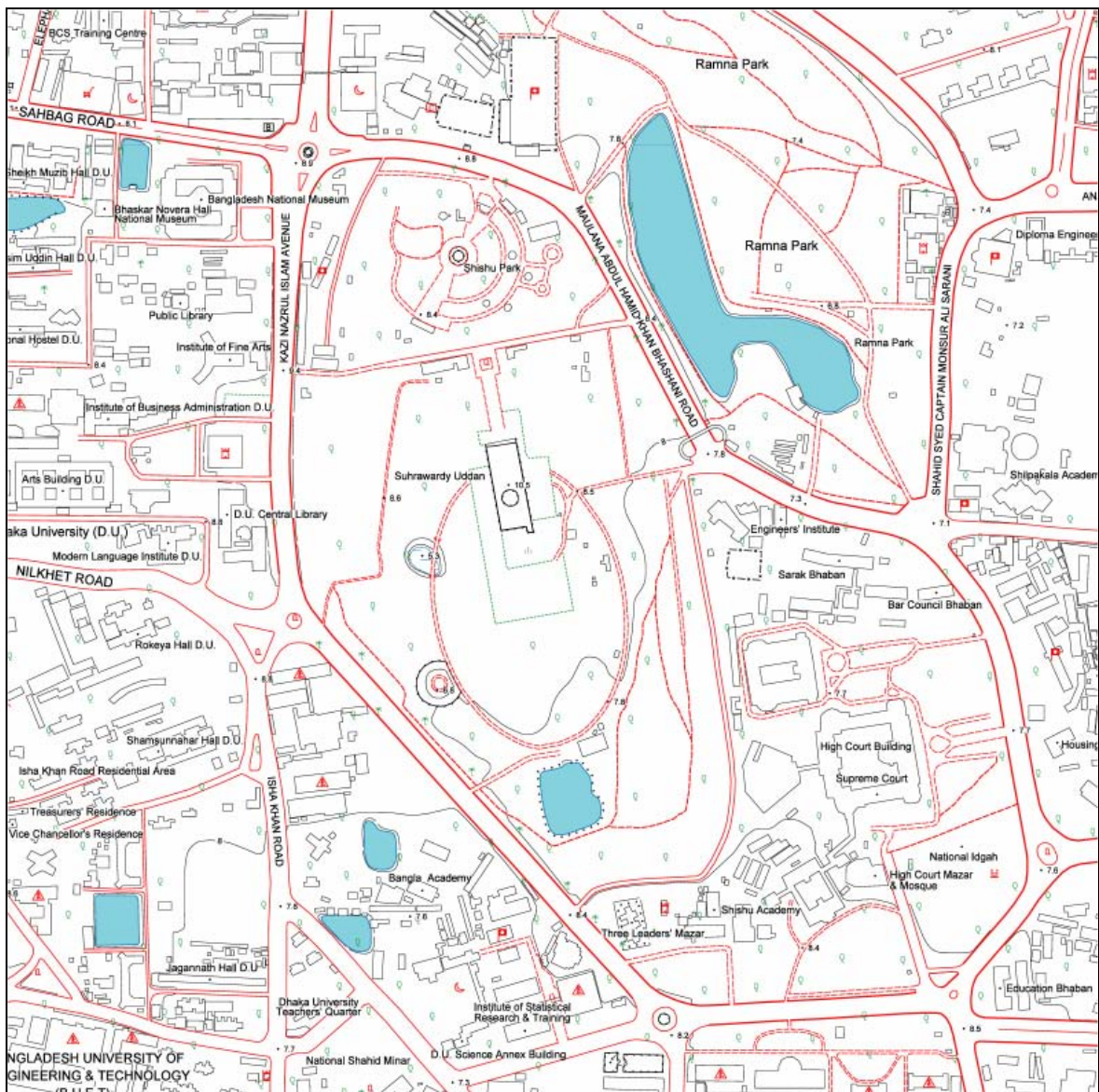
| Date | Scale | Material | Area | Purpose |
|-----------|----------|---------------|-------------------------------------|--------------------------------|
| 1983~1984 | 1:50,000 | Negative film | Whole territory | Correction of topographic maps |
| 1990 | 1:30,000 | Negative film | Coastal area and along Jamuna River | Flood control |
| 1998~2001 | 1:25,000 | Print | Whole territory | Population census |
| 2003 | 1:20,000 | Negative film | Dhaka metropolitan Area | Topographic mapping |

On the above data, 1:25,000 scale negative films taken during 1998~2001 are not yet delivered to SOB from the governmental agency in charge.

From the viewpoint of the budget for topographic map production, aerial photography cost is relatively expensive in developing country. Therefore, it is judged that 1:25,000 scale aerial photo taken during 1998~2001 are very important asset to SOB for updating the existing 1:50,000 scale topographic maps or producing new 1:50,000 scale topographic maps.

It is recommended that SOB must try to obtain the negative films of 1:25,000 aerial photographs immediately from the relevant organization and also to make a plan of updating of the 1:50,000 scale topographic maps using this 1:25,000 scale aerial photographs immediately.

Chapter 3 Discussion with SOB and Other Relevant Organizations



Sample of 1:5,000 scale digital topographic map
Location: Ramna Park

Chapter 3 Discussion with SOB and Other Relevant Organizations

Through the implementation of the Study, following discussions were held with SOB and other relevant organizations.

3.1 Inception Report Meeting

3.1.1 Main items explained by the Study team

Several meetings for the explanation and discussion of Draft Inception Report were held between SOB and the Study team. The Study team explained the scope of work, methodology, work schedule and so on to SOB using Draft Inception Report that was prepared in Japan. The key points for the execution of the Study explained by the Study team were as follows:



Photo 3.1.1 “Inception Report Meeting”



Photo 3.1.2 “Inception Report Meeting
(Right: Surveyor General of SOB)”

- 1) The Study will be implemented mainly by the counterparts of SOB and the members of the Study team will assist the activities of the counterparts of SOB and give the advice to them, if necessary.
- 2) The most important work of the 1st fieldwork is aerial photography. The aerial photography work always depends on the weather condition and the succeeding work cannot be implemented without the results of the aerial photography. Therefore, the aerial photography has the first priority in the 1st fieldwork.
- 3) SOB has no experience of 1:5,000 scale digital topographic map production and SOB has not map style and map symbols for 1:5,000 scale digital topographic map. Therefore, it is necessary to create the map style and map symbols for 1:5,000 scale digital topographic maps before starting the actual digital topographic map production.

The Study team will discuss the map style and map symbols that will be applied to the Study with SOB during the 1st fieldwork in Bangladesh. However, it is difficult to grasp the final image of 1:5,000 scale digital topographic maps without the sample of 1:5,000 scale digital topographic maps.

Therefore, the Study team will prepare the sample of 1:5,000 scale digital topographic maps using the results of 1st year's Study by the beginning of the 2nd year's Study. Map style and map symbols to be applied for the Study will be discussed and decided between SOB and the Study team based on the sample.

- 4) The existing data will be used as much as possible for the production of 1:5,000 scale digital topographic maps. Therefore, the necessary data and information of governmental and public buildings and facilities that will be shown on the 1:5,000 scale digital topographic maps will be collected from the authorities concerned and the governmental and public buildings and facilities list will be prepared based on the collected data and information.

If the governmental and public buildings and facilities are clearly identified on the aerial photographs (orthophoto) using the existing collected data and information, the field check of these public facilities will not be executed. The actual procedures of field identifications and field completion will be as follows:

- The main purpose of “Field identification (1)” of the 1st fieldwork in Bangladesh is to collect the existing data that can be used for the 1:5,000 scale digital topographic mapping. Also, the necessary information of governmental and public buildings and facilities from the authorities concerned will be collected and the governmental and public buildings and facilities list will be made based on the collected information.
 - In “Field identification (2)” of the 2nd fieldwork in Bangladesh, the locations of governmental and public buildings and facilities will be plotted on the four times enlarged photographs (1:5,000 scale orthophoto) based on the collected data and information. The data plotted on 1:5,000 scale orthophoto will be used at the time of digital data acquisition using digital plotter and plotted out topographic maps (manuscript) will be used at the time of field identification (3) of the 4th fieldwork in Bangladesh.
 - In “Field identification (3)” of the 4th fieldwork in Bangladesh, using the plotted out 1:5,000 scale topographic maps (manuscript), the field check of the remaining public facilities and ambiguous points encountered through the execution of digital plotting and digital compilation will be executed. Based on the results of field check, final governmental and public buildings and facilities list will be prepared and digital topographic data will be corrected.
- 5) The 1:20,000 scale aerial photography area and 1:5,000 scale digital topographic mapping area are not clear on the map attached to the Scope of Work. Therefore, The Study team requested SOB to make clear the boundary of 1:20,000 scale aerial photography area and 1:5,000 scale digital topographic mapping area as soon as possible on the 1:50,000 scale topographic maps.

- 6) The Study team requested SOB to make arrangement for implementation of masking of Key Point Installation on positive films, and to obtain permission of bringing the positive films from Bangladesh to Japan for the production of 1:5,000 scale digital topographic maps in Japan.

3.1.2 Question and request from SOB

On the Inception Report meeting, the questions, requests and explanation concerning the Inception Report form SOB were as follows:

Item 1

The area of 1:20,000 scale aerial photography and 1:5,000 scale topographic mapping will be plotted and informed to the Study team as soon as possible.

Item 2

Concerning the equipment that will be used for technology transfer to the counterparts of SOB in Bangladesh, SOB requests the Study team the smooth procurement of equipment, and also to consider the maintenance of equipment in Bangladesh.

Item 3

SOB requests the Study team to execute the technology transfer in Japan for the items not including in the technology transfer program (ex. aerial triangulation and so on) in Bangladesh. SOB requests 3 persons for technology transfer program in Japan, if possible.

Item 4

SOB wants to establish concrete monuments for new GPS points.

Item 5

SOB requests the Study team to supply the necessary materials, chemicals and papers for 1:5,000 scale topographic map printing in Bangladesh that will be executed on the 3rd year's Study.

Item 6

The Key Point Installation (restricted area for topographic mapping) will be eliminated from the area of field identification and field completion. Also, masking on the positive films for the Key Point Installation will be executed immediately after the completion of aerial photography.

Therefore, there will be no obstruction for the production of 1:5,000 scale digital topographic mapping as well as the public use of the final products of the Study. The estimated period necessary for the masking on the positive films will be approximately 3 - 4 days.

Surveyor General of SOB has the power to issue the permission of bring out the positive films from Bangladesh to Japan.

Item 7

The direction of flight that is shown on the Inception Report is east - west. However, the direction of main roads in Dhaka City is mostly north - south. In case the direction of flight of aerial photography is east - west, the tall buildings on the photographs may hide some part of main roads. Therefore, SOB requests the Study team to change the direction of flight from the east - west to the north - south.

Item 8

Concerning the size of air photo signals, SOB requests the Study team to follow the standard of ITC manual.

Item 9

Concerning the quality of negative film, SOB requests the Study team to follow the standard of ITC manual.

3.1.3 Explanation and answer by the Study team

The explanation and answer to the questions and requests from SOB by the Study team were as follows:

Item 1

Considering the weather condition, the Study team wants to start aerial photography as soon as possible. Therefore, the Study team requests SOB to decide the boundary of aerial photography area and 1:5,000 scale digital topographic mapping area as soon as possible. Without these information final flight plan for aerial photography cannot be decided.

Item 2

The Study team is not in a position to make a comment to Item 2. The Study team will convey the request of SOB to the Head Office of JICA in Tokyo.

Item 3

The Study team is not in a position to make a comment to Item 3. The Study team will convey the request of SOB to the Head Office of JICA in Tokyo.

Item 4

If SOB wants to establish the concrete monuments on the GPS points, the Study team will supply the necessary materials for concrete monuments. Unfortunately, the Study team has not enough members and time for the establishment of concrete monuments. Therefore, the Study team requests SOB to execute establishment of concrete monuments by SOB members.

Item 5

The Study team is not in a position to make a comment to Item 5. The Study team will convey the request of SOB to the Head Office of JICA in Tokyo.

Item 6

The Study team requests SOB to execute the masking on the positive films immediately after the completion of aerial photography.

Item 7

The photo scale is 1:20,000. Therefore, the flight altitude is 3,000 m. Considering the heights of the buildings in Dhaka City, the buildings except some tall buildings may not hide the roads. Generally, the flight directions of aerial photography will be set up on east - west except special cases such as the aerial photography along the transmission line, pipe line, highway and so on.

Also, in case aerial photographs of north - south direction were used for digital topographic mapping, an operator of digital mapping may feel some difficulties for photo interpretation at the time of data acquisition due to the reason of the direction of the shadow.

However, in case of larger-scale aerial photography, it is necessary to consider the percentage of over-lapping or direction of flight.

Item 8

There is no problem concerning Item 8. The Study team request SOB to show the size of air photo signals.

Item 9

It is considered that the quality of negative films development specified in the ITC manual can be applied in the case of the best weather condition for aerial photography. However, considering the present weather condition such as the dust in the daytime and the fog in the morning at Dhaka City, the weather condition for aerial photography is far from the best condition.

The quality of aerial photographs mostly depends on the weather condition at the time of the execution of aerial photography. The Study team will try to do the best efforts to get the high quality aerial photos as much as possible. However, it is impossible to commit to fulfill the specifications for quality of aerial photographs specified in the manual of ITC. The key point for judgment of the quality of aerial photographs is whether aerial photographs can be used for digital photogrammetric mapping or not.



Photo 3.1.3 “Weather Condition at Dhaka City”

The weather is fine. However, due to the dust, the visibility over Dhaka City is very limited and weather condition is not suitable for aerial photography.

3.1.4 Minutes of meeting for inception report meeting

Before signing the Minutes of Meeting for Inception Report, the Study team explained the contents of Inception Report to the Secretary of the Ministry of Defense. After several discussion of Inception Report meeting, Minutes of Meeting for Inception Report was prepared, and signed by the representatives of Economic Relation Division of the Ministry of Finance, Survey of Bangladesh and the Study team. The copy of Minutes of Meeting is shown in Appendix 3 “Minutes of Meeting for Inception Report for the Study on Urban Information Management for Greater Dhaka City”.



Photo 3.1.4 “Report to the Secretary of the Ministry of Defense (Second from left: Secretary of the Ministry of Defense)”



Photo 3.1.5 “Signing of Minutes of Meeting”

3.2 Progress Report Meeting

Meeting for the explanation and discussion of Progress Report were held between SOB and the Study team on 20 May 2003. The Study team explained the outline of the results of the 1st year’s Study, and also the plan of the 2nd year’s Study including technology transfer.

3.2.1 Discussion on progress report

The main items discussed between SOB and the Study team was as follows:



Photo 3.2.1 “Progress Report Meeting”



Photo 3.2.2 “Progress Report Meeting”

Item 1

The Study team requested SOB to prepare the adequate space with electricity and air conditioner for the equipment that will be procured by JICA. SOB explained that SOB was already considering the room space and related facilities such as air conditioner, power supply system and so on for the equipment.

Item 2

SOB expressed that the printing of 122 sheets of the 1:5,000 scale topographic maps of the Study will take long time because SOB has routine printing work and printing works for other projects of SOB. Therefore, it is considered that the printing of the 122 sheets topographic maps will not be completed by July 2004 as the printing of large number of sheets like this usually takes 6 to 8 months in normal working schedule. The Study team promised to convey SOB’s anxiety to the JICA Head Office in Tokyo.

Item 3

The Study team requested SOB to collect the necessary data of administrative boundaries and to draw the administrative boundaries on the manuscript of 1:5,000 scale topographic plotted out maps at the 4th field work in Bangladesh and SOB agreed it.

Item 4

SOB requested JICA to supply cartographic and photogrammetric equipment or software compatible to the existing equipment presently used by SOB. The Study team agreed to convey the request of SOB to the JICA Head Office in Tokyo.

3.2.2 Minutes of meeting for progress report meeting

Minutes of Meeting on Progress Report was prepared and signed between SOB and the Study team on 21 May 2003. The copy of Minutes of Meeting is shown in Appendix 4 “Minutes of Meeting on Progress Report for the Study on Urban Information Management for Greater Dhaka City”.



Photo 3.2.3 “Signing of Minutes of Meeting
(Surveyor General)”



Photo 3.2.4 “Signing of Minutes of Meeting”

3.3 Interim Report Meeting

Meeting for the explanation and discussion of Interim Report was held between SOB and the Study team on 7 October 2003. The Study team explained the outline of the results of the first half of the 2nd year’s Study, and also the plan of the later half of the 2nd year’s Study including technology transfer.

3.3.1 Discussion on interim report

The main items discussed between SOB and the Study team were as follows:

Item 1

SOB requested the Study team to deliver the proof prints of 1:5,000 scale topographic maps for checking by SOB before preparing PS plate and SOB explained that it would take about one month for checking by SOB.

The Study team explained that it would be difficult to execute this checking by SOB from the viewpoint of the Study schedule agreed by SOB and JICA on Scope of Work. Therefore, the Study team requested SOB that checking by SOB would be executed using the plotted out manuscript prepared by the Study team for field identification (3) and SOB agreed to it.

Item 2

SOB suggested that equipment to be procured by JICA should be purchased from the local companies in Bangladesh from the viewpoint of maintenance and supply of spare parts.

The Study team explained that Digital Plotting System (SocetSet) would be directly procured from U.S.A. due to the termination of sales agreement between maker of SocetSet and the sales agent. Therefore, it is impossible to procure through a local company in Bangladesh. However, other equipment will be procured through local companies in Bangladesh. SOB accepted the explanation by the Study team.

Item 3

SOB explained that it would take a long time for printing of 1:5,000 scale topographic maps by SOB due to the reason of volume of printing work of the Study and also the SOB routine work and SOB would not be able to complete the printing by the end of the Study.

The Study team understood the situation of SOB concerning the printing by SOB. However, the Study team requested SOB to execute printing work as fast as possible.

Item 4

Concerning the coordinates to be shown on the 1:5,000 scale topographic maps requested by SOB, SOB and the Study team agreed to put the Longitude and Latitude on the 1:5,000 scale digital topographic maps instead of metric coordinates from the viewpoint of public use of the final products of the Study (refer to Item 3.8).

Item 5

Concerning the copyright of 1:5,000 scale digital topographic maps requested by SOB, the Study team explained the official comments of the JICA Head Office in Tokyo to SOB.

SOB explained that SOB is not in a position to decide the some comments of the JICA Head Office in Tokyo. Therefore, SOB also explained that this matter will be discussed with the Government of Bangladesh and the official answer will be informed to the Study team after discussion with the Government (refer to Item 3.9).

3.3.2 Minutes of meeting for interim report meeting

Minutes of Meeting on Interim Report was prepared and signed between SOB and the Study team on 8 October 2003. The copy of Minutes of Meeting is shown in Appendix 5 “Minutes of Meeting on Interim Report for the Study on Urban Information Management for Greater Dhaka City”.



Photo 3.3.1 “Signing of Minutes of Meeting”

3.4 Draft Final Report Meeting

3.4.1 Comments on draft final report

Draft Final Report was submitted to SOB from the Study team at the beginning of the fieldwork of 3rd year’s Study. The Study team requested SOB to give the comments on Draft Final Report to the Study team by the end of the fieldwork of 3rd year’s Study. Finally, SOB gave their comments on Draft Final Report to the Study team on 28 July 2004.

3.4.2 Minutes of meeting on draft final report

Minutes of meeting on Draft Final Report was prepared and signed between SOB and the Study team on 29 July 2004. The copy of Minutes of Meeting is shown in Appendix 6 “Minutes of Meeting on Draft Final Report for The Study on Urban Information Management for Greater Dhaka City”.

3.5 Discussion on 1:5,000 Scale Topographic Map Sheet Plan

1:50,000 scale orthophoto images with BTM coordinates were produced from the scanned aerial photo images and coordinates of principal points of aerial photographs that were obtained by GPS aerial photography. The 1:5,000 scale digital topographic mapping area shown on the 1:50,000 scale topographic maps by SOB was transferred to 1:50,000 scale orthophoto image. The 1:5,000 scale digital topographic map sheet plan was made using this 1:50,000 scale orthophoto images with BTM coordinates under the following conditions.

- 1) The size of map sheet for 1:5,000 scale digital topographic maps shall be A-1.
- 2) The map sheet shall be used as lengthwise.
- 3) Inner size shall be 50 cm × 60 cm.
- 4) The coordinates system shall be BTM
- 5) The numbering system of topographic maps will be 1,2,3.... from left top to right down temporarily.
- 6) Map information shall be at the left down and map symbols shall be at the center and right down of map sheet.

The total number of 1:5,000 scale digital topographic maps is 122 sheets. The sheet index plan shown in Figure 3.5.1 “1:5,000 Scale Digital Topographic Map Sheet Index (for work)” was agreed between SOB and the Study team.

For the implementation of the actual work such as field identification, digital topographic mapping and so on, it is necessary to put the number to each sheet. Therefore, SOB and the Study team agreed that the numbering system of topographic maps was 1,2,3... from left top to right down temporarily. Final numbering of digital topographic maps was decided between SOB and the Study team as shown in Figure 3.5.2 “Final 1:5,000 Scale Digital Topographic Map Sheet Plan and Sheet Number” considering the remaining area of 1:5,000 scale digital topographic mapping.

3.6 Discussion on Map Style and Map Symbols

Up to present, SOB has no experience of 1:5,000 scale digital topographic mapping. Therefore, it is necessary to prepare map style and map symbols to be used for 1:5,000 scale digital topographic maps through the discussion with SOB before starting the actual work of 1:5,000 scale digital topographic maps production.

As already explained in the Inception Report meeting, it is difficult to define the map style and map symbols perfectly at the 1st fieldwork in Bangladesh. It is also difficult to grasp the final image of 1:5,000 scale digital topographic maps without any sample.

Furthermore, new findings concerning topographic features may arise through the execution of actual work such as field identification and digital topographic mapping. Therefore, the Study team explained to SOB the procedures to decide the map style and map symbols as follows:

On the 1st fieldwork in Bangladesh (from the end of November 2002 to the middle of March 2003), “Map Style and Map Symbols for 1:5,000 Scale Digital Topographic Maps (Version 1.0)” will be prepared through the discussion between SOB and the Study team based on the existing 1:50,000 scale topographic maps and 1:20,000 scale Dhaka Guide Maps presently SOB publishing.

- 1) On the 1st office work in Japan (from the beginning of May 2003 to the end of May 2003), sample sheets of 1:5,000 scale digital topographic maps will be prepared based on “Map Style and Map Symbols for 1:5,000 Scale Digital Topographic Maps (Version 1.0)”. Sample sheets of 1:5,000 scale digital topographic map will be prepared both in center and suburb areas of Dhaka City because the features of the 1:5,000 scale digital topographic maps may be completely different.
- 3) “Map Style and Map Symbols for 1:5,000 Scale Digital Topographic Maps (Version 1.0)” will be modified and revised based on the new findings through the preparation of sample sheets of the 1:5,000 scale digital topographic maps.
- 4) On the 2nd field work in Bangladesh (from the middle of May 2003 to the end of June 2003), “Map Style and Map Symbols for 1:5,000 Scale Digital Topographic Maps (Version 2.0)” will be made through the discussion between SOB and the Study team based on the new findings at the time of sample sheet making.
- 5) The 1:5,000 scale digital topographic mapping covering 581 km² will be executed based on this map style and map symbols (Version 2.0). In case some modification of Version 2.0 is necessary, discussion between SOB and the Study team will be held on the 4th fieldwork in Bangladesh (from the beginning of October 2003 to the beginning of March 2004), and “Map Style and Map Symbols for 1:5,000 Scale Digital Topographic Maps (Version 3.0)” will be prepared.
- 6) Finally, the 1:5,000 scale digital topographic maps will be produced based on “Map Style and Map Symbols for 1:5,000 Scale Digital Topographic Maps (Version 3.0)”.

The key points of discussion concerning the map style and map symbols for 1:5,000 scale digital topographic maps between SOB and the Study team were as follows:

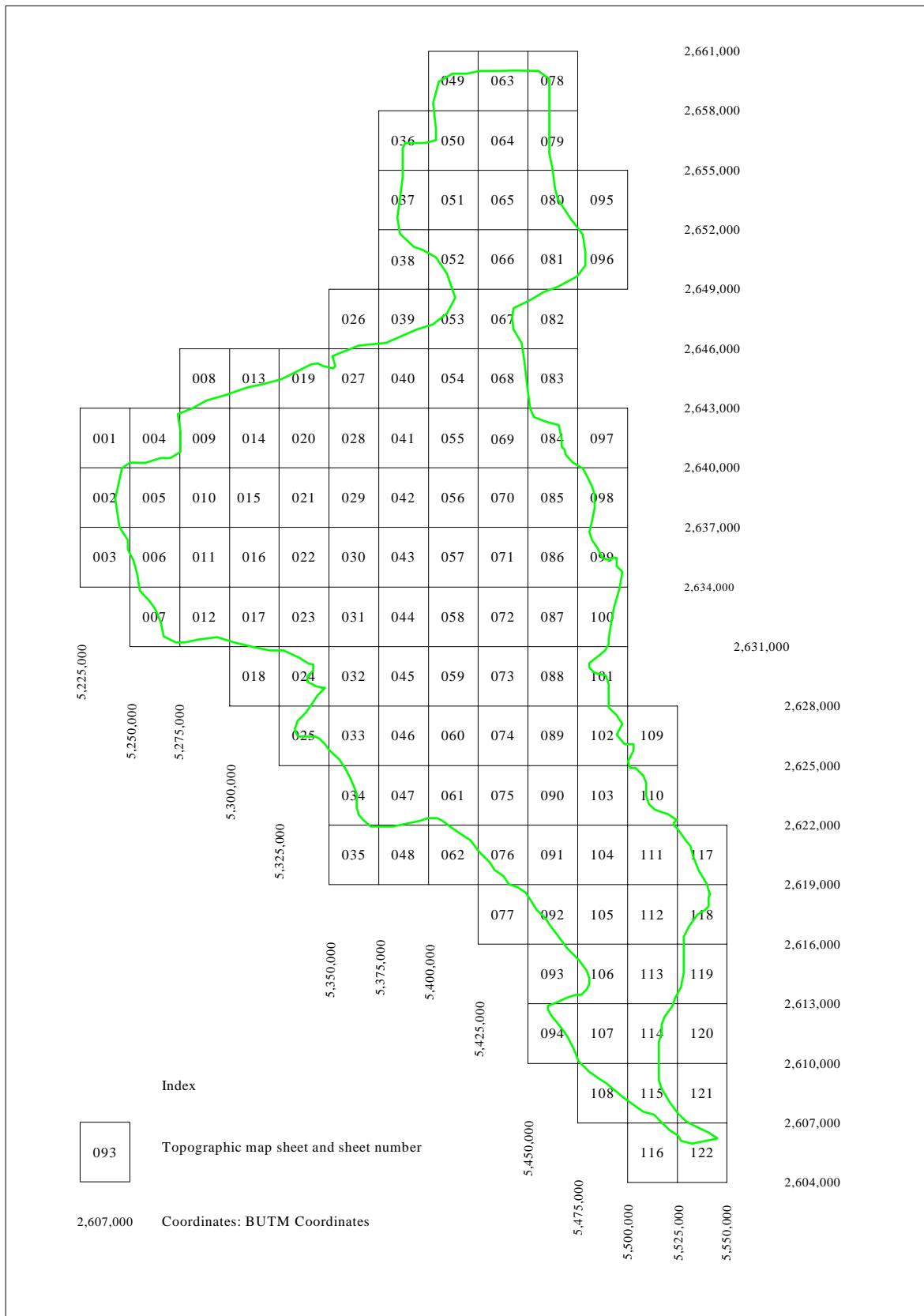


Figure 3.5.1 "1:5,000 Scale Topographic Map Sheet Index (for Working)"

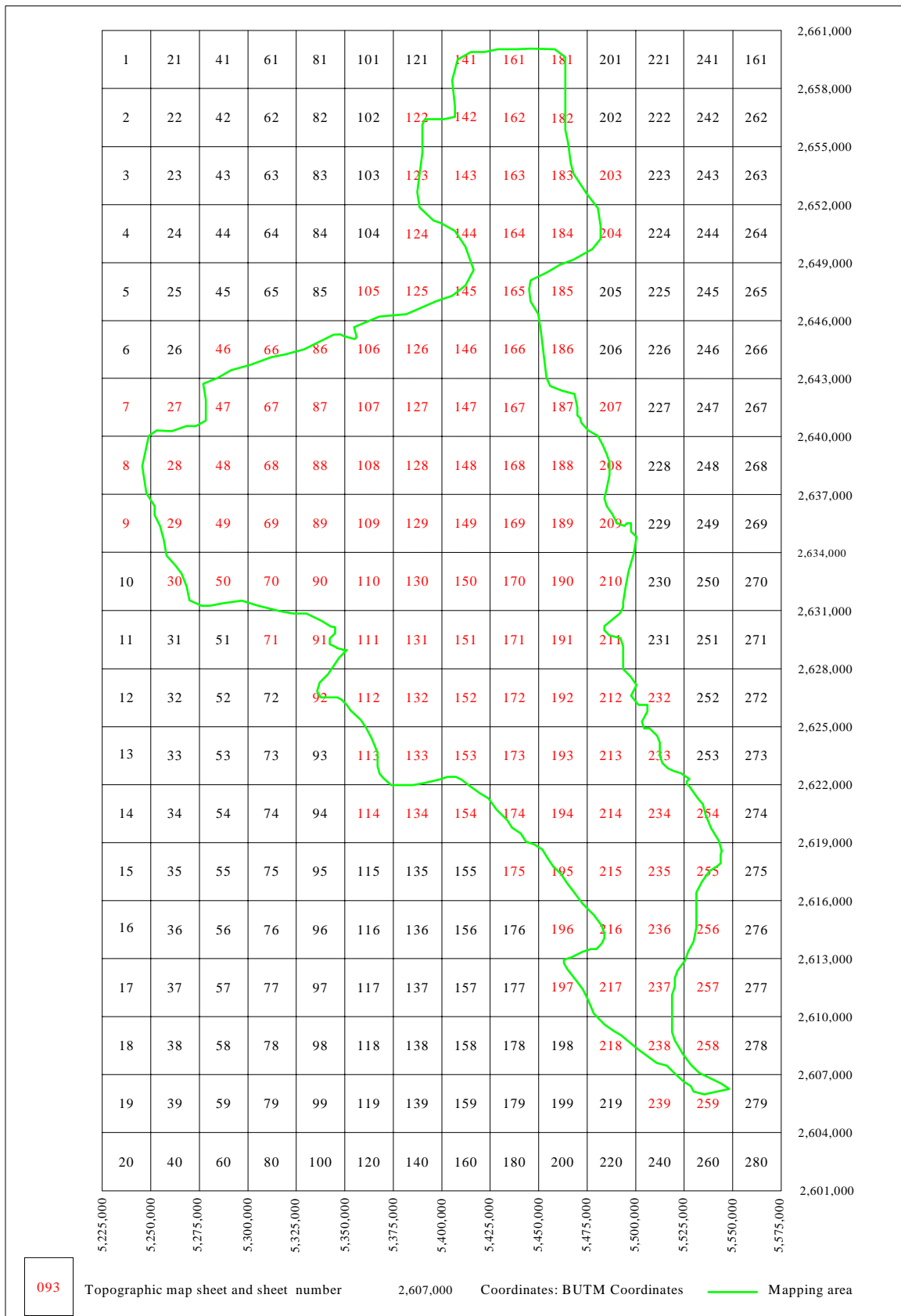


Figure 3.5.2 "Final 1:5,000 Scale Topographic Map Sheet Index and Sheet Number"

- 1) SOB has no experience of production of large to medium scale digital topographic maps. Therefore, the staff of SOB could not grasp the actual image of 1:5,000 scale topographic maps to be produced by the Study.
- 2) Especially, the staffs of SOB did not understand the characteristics of topographic maps by the scales. For example, small-scale topographic maps are the compiled maps. However, topographic features of large to medium scale topographic maps are shown at the true positions with truly scaled sizes as much as possible.
- 3) At first, SOB requested the Study team to apply the map style and map symbols of 1:50,000 scale topographic maps and 1:20,000 scale Dhaka City Guide Map directly for 1:5,000 scale digital topographic maps to be produced by the Study.
- 4) Concerning the colors in 1:5,000 scale digital topographic maps in the Study, at first, SOB requested the Study team as follows:
 - Yellow color (fill) for vegetation
 - Red color (fill) for main roads
 - Red color (line) for buildings and houses
 - Blue color (fill) for water areas such as rivers, lakes and ponds

However, the Study team explained that the color fill technique usually does not apply to the medium to large-scale topographic map. Instead of color fill technique, the differences of topographic features will be expressed by the color of line, line width and kind of line in the medium to large-scale topographic maps.

Furthermore, due to the reason of the scale of topographic maps to be produced by the Study, the covering area by one topographic map sheet is small comparing with small scale topographic map such as 1:50,000 scale topographic map. Therefore, the color image of 1:5,000 scale topographic maps to be produced by the Study will become as follows:

- In the countryside, yellow color (fill) of vegetation will be outstanding.
- In the city area, the red color of road (fill) and building and house (line) will be outstanding.

Finally, SOB and the Study team agreed that blue color (fill) would be applied for water areas such as rivers, lakes and ponds considering the most important topographic features in the Study area.

- 5) SOB also requested that red color would apply to not only for road line but also for the line of building and house. However, due to the same reason of above item 4), SOB and the Study team finally agreed that red color will apply to the road line and black color will apply to the building

and house line.

The discussion between SOB and the Study team were held by showing the visible samples, which enable them to grasp the final image of 1:5,000 scale topographic maps to be produced by the Study team as much as possible.

3.7 Discussion on GIS Basic Data

Discussion of the GIS basic data was held between SOB and the Study team to define the contents of the GIS basic data.

3.7.1 What is GIS basic data?

The GIS basic data is data that compose spatial data infrastructure produced by the data acquired in the digital topographic mapping. Quality and contents of GIS data depend on the purpose of the use and user's demand for GIS, and its attribute is different among users.

There are various kinds of user's needs for the GIS basic data. It is impossible to correspond to the needs of all users by the data acquired at the stage of digital topographic mapping. Therefore, the GIS basic data will be limited to the common items and be supposed to be spatial data infrastructure.

GIS users have to construct their own GIS for their own purpose by using the GIS basic data that will be supplied from SOB. So the GIS users have to collect the necessary data and information for their own purpose by themselves when they construct the GIS. The relation between SOB and the GIS users is shown in Figure 3.7.1 "Relation between SOB and GIS Users".

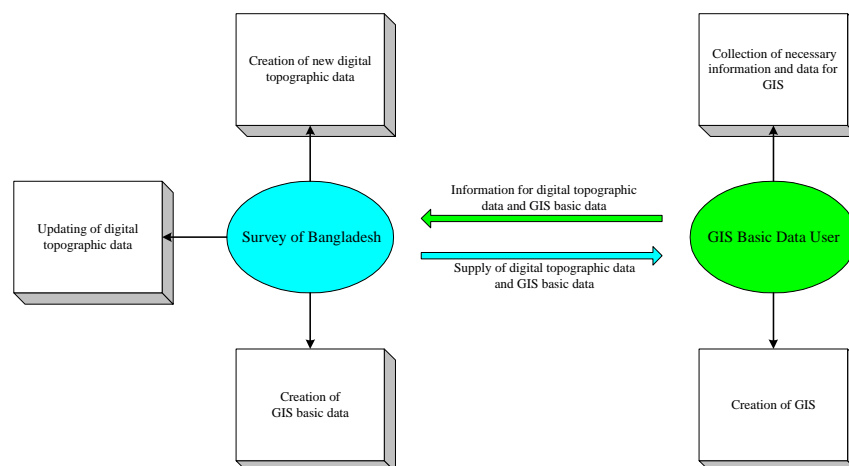


Figure 3.7.1 "Relation between SOB and GIS Users"

3.7.2 Contents of the GIS basic data in the Study

The data and information necessary for the production of digital topographic mapping and construction of the GIS are not same. In general, the data classification of topographic mapping in Japan is defined as shown in Table 3.7.1 “Standard Category of Topographic Data in Japan”.

Table 3.7.1 “Standard Category of Topographic Data in Japan”

| No. | Category | Sub-category | Contents |
|-----|--------------------------------|------------------------|---|
| 1 | Boundary | Boundary | National boundary, Administrative boundary |
| | | Other boundary | |
| 2 | Traffic facility | Road | |
| | | Road facility | Tunnel for road, Overhead walkway, Traffic strip, etc. |
| | | Railway | |
| | | Railway facilities | Tunnel for railway, Platform, etc. |
| 3 | Building, etc. | Building | |
| | | Building appurtenant | Gate, Gateway, etc. |
| | | Symbol of building | Public facilities such as government office, school and etc. |
| 4 | Small objects | Landmark | Monument, Isolated tree, Tower, Pipe line, Electric transmission line, etc. |
| 5 | Water and water Area | Water area | Shore line, River, Wadi, etc. |
| | | Water facility | Jetty, Break water, Dam, Waterfall, Watergate, etc. |
| 6 | Fence, etc. | Fence, etc | Artificial slope, Embankment, Fence, etc. |
| 7 | Open area | Open area | Territory boundary, parking, Garden, Grave, etc. |
| 8 | Vegetation | Vegetation | |
| 9 | Topography, and control points | Contour line | |
| | | Distorted surface Area | Bare rock, Coral reef, etc. |
| | | Control point | Triangulation point, Benchmark, GPS point, etc. |

However, the data category of GIS will totally depend on the purpose of GIS when the users want to construct the GIS.

As already mentioned above, the GIS basic data will be produced using the data and information collected from the digital topographic mapping. The data limited to common items among the users will be structuralized as the GIS basic data.

However, GIS users in Bangladesh collected the data and information by themselves without any relationship with other organizations and also defined the contents of data individually. Therefore, presently it is difficult to share the data and information among the GIS users in Bangladesh.

Considering the above-mentioned matters, the Study team decided the data category of the GIS basic data

and proposed to SOB it as shown in Figure 3.7.2 “Category of GIS Basic Data in the Study ”

Table 3.7.2 “Category of GIS Basic Data in the Study”

| No. | Category | Sub-category | Contents |
|-----|-----------------|---------------------------------|------------------------------|
| 1 | Boundary | Administrative boundary | District, Upazilla, Wards |
| 2 | Road | Main double line road | |
| | | Bridge of main double line road | Except masked bridge |
| 3 | Railway | Railway | |
| | | Bridge on railway | Except masked ridge |
| | | Station | |
| 4 | Public facility | Public building | Building with symbol or text |
| | | Open space for public use | Park, Cemetery, etc. |
| | | Open space for traffic, etc | Bus terminal, Airport, etc. |
| 5 | Water area | Double line river | |
| | | Single line river | |
| | | Lake, pond, dam | |
| | | Canal | |

3.7.3 Systematizing and definition of geographic features in the GIS basic data

To utilize the acquired data in the digital topographic mapping to GIS basic data production, it is necessary to define the quality and the contents of geographic features, and linkage between digital topographic data and the GIS basic data have to be established.

The relation between the digital topographic data defined by “Map Style and Map Symbols for 1:5,000 Scale Topographic Mapping (version 2.0)” and “Category of GIS Data” shown in Table 3.7.2 above are summarized as shown in Figure 3.7.2 “Relation between the Digital Topographic Data and the GIS Basic Data in the Study”.

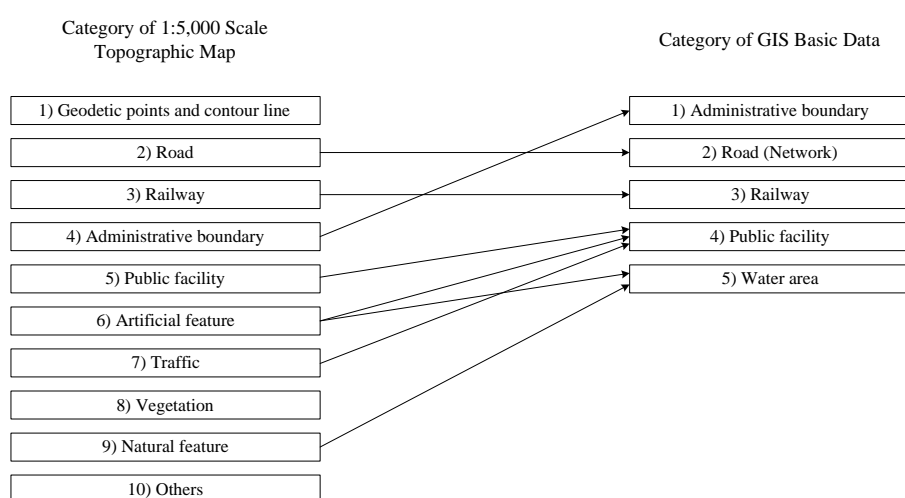


Figure 3.7.2 “Relation between the Digital Topographic Data and the GIS Basic Data in the Study”

The category of GIS basic data and data types to be produced by the Study is shown in Table 3.7.3 “Data Types of GIS Basic Data in the Study”.

Table 3.7.3 “Data Types of GIS Basic Data in the Study”

| Contents of GIS Basic Data | Location of Data Acquisition | Data Type |
|---|------------------------------|-----------|
| 1. Administrative boundary (Upazilla and Wards) | Administrative area | Polygon |
| 2. Road | | |
| Main 2 lines road | Road network* | Line |
| Bridge for main 2 lines road except masked bridge | Center of facility** | Point |
| 3. Railway | | |
| Railway line | Railway network* | Line |
| Bridge | Center of facility** | Point |
| Station | Center of facility** | Point |
| 4. Public facility | | |
| Building of public facility | Center of facility** | Point |
| Area for public use | Center of facility** | Point |
| Traffic site, water management facility, etc. | Center of facility** | Point |
| 5. Water and water area | | |
| 2 lines river | Water area of 2 lines river | Polygon |
| 1 line river | Line of river | Line |
| Lake, pond, dam | Area of lake, pond, dam | Polygon |
| Irrigation/drainage canal | Line of canal | Line |

Note: *and **: means the additional data acquisition by the digital topographic mapping.

*: Network is defined as a line data of the centerline in the road with double line; Railway is defined as same definition.

** : The point is representing the center of the facility.

3.8 Coordinates on the Border of 1:5,000 Scale Digital Topographic Maps

At the time of the discussion of map style and map symbols in the 2nd fieldwork in Bangladesh (from the middle of May 2003 to the end of June 2003), SOB made the following comments concerning the coordinates values to be shown on the border of the 1:5,000 scale digital topographic maps (refer to the Appendix 8 “Comment on Layout of Map Style and Map Symbols”).

- 1) According to the regulation in Bangladesh, it is impossible to open the topographic maps with grids and coordinates in metric system for public use. Therefore, SOB requests the Study team to show the Longitude and Latitude values on 1:5,000 scale topographic maps instead of metric coordinates of BUTM.

The Study team explained to SOB that this matter cannot be decided by the Study team only. Therefore, the study team decided to discuss this matter with the JICA Head Office in Tokyo and official comment

concerning this matter will be decided by the beginning of the 4th fieldwork in Bangladesh (from the beginning of October 2003 to the beginning of March 2004).

The most important thing for the Study is the final products such as printed 1:5,000 scale topographic maps, digital topographic map data and GIS basic data can be used effectively by the many Bangladesh organizations as much as possible. Due to the reason of the regulation in Bangladesh, metric coordinates and grids are obstacles to opening the data for public use, therefore, JICA will agree to show the Latitude and Longitude values on the 1:5,000 scale topographic maps instead of metric coordinates of BTM.

The Study team explained the JICA's official comment for this matter to SOB in the Interim Report meeting held at the beginning of the 4th fieldwork and both parties agreed that the Longitude and Latitude values will be shown on the 1:5,000 scale topographic maps to be produced by the Study (refer to Appendix 5 "Minutes of Meeting on Interim Report for the Study on Urban Information Management for Greater Dhaka City").

3.9 Copyright Sentence on the Marginal Information of 1:5,000 Scale Digital Topographic Maps and Agreement on Copyright

3.9.1 Copyright sentence on the marginal information of 1:5,000 scale digital topographic maps

At the time of discussion of map style and map symbols for 1:5,000 scale topographic maps in the 2nd fieldwork (from the middle of May 2003 to the end of June 2003), SOB expressed the following comment concerning the copyright of the 1:5,000 scale digital topographic maps to be produced by the Study (refer to Appendix 8 "Comment on Layout of Map Style and Map Symbols").

- 1) SOB wants to put the sentence concerning the copyright to forbid any unauthorized copying to the 1:5,000 scale digital topographic maps to be produced by the Study.
- 2) The sentence concerning the copyright will be as follows:

GOVERNMENT OF BANGLADESH
COPYRIGHT RESERVED

It is an offence under the Copyright Act to make and issue any copy or copies of this map or any part of this map, with or without alteration and addition, unless the prior written permission of the Surveyor General of Bangladesh has been obtained.

The Study team explained that the Study team is not in a position to comment this matter. Therefore, the Study team promised that the request of SOB will be conveyed to the JICA Head Office in Tokyo and the official answer of JICA Head Office in Tokyo will be brought to SOB by the beginning of 4th fieldwork in Bangladesh (from the beginning of October 2003 to the beginning of March 2004).

The Study team explained the official answer of the JICA Head Office in Tokyo concerning this matter to SOB at the time of Interim report meeting (refer to Appendix 5 “Minutes of Meeting on Interim Report for the Study on Urban Information Management for Greater Dhaka City”).

- 1) Both SOB and JICA keep the copyright of the final results of the Study.
- 2) JICA agreed copyright sentence would be put to the footnote of 1:5,000 scale digital topographic maps.
- 3) In case JICA wants to use the final products of the Study for Japanese ODA (Official Development Assistance) programs, SOB will agree that the JICA and/or JICA Study team can use the final products with prior notice to SOB from JICA for the execution of the program without any charge.
- 4) In case SOB wants to revise the contents of the final products of the Study, SOB can revise without a notice to JICA.
- 5) An agreement concerning copyright will be made between SOB and JICA before completion of the Study.

SOB explained that SOB is not in a position to decide this matter by himself. SOB also explained that this matter will be discussed with the Government of Bangladesh and the official answer will be informed to JICA study team after discussion with the Government.

On 1st November 2003, an official answer from the Ministry of Defense was delivered to the Study team from SOB by letter (refer to Appendix 13 “Letter from the Ministry of Defense”).

3.9.2 Agreement on copyright

Based on the discussion between SOB and the Study team as mentioned above, agreement on copyright was prepared and signed between SOB and the Study team on 29 July 2004. The copy of agreement is shown in Appendix 14 “Agreement on Copyright”.

3.10 Alteration of 1:5,000 Scale Digital Topographic Mapping Area and Aerial Photography Area

The Study Team started the preparation work for aerial photography based on the information shown in the Scope of Work. On 28 December 2002, SOB made the request of alteration for aerial photography area and 1:5,000 scale digital topographic mapping area to the Study team. The reasons of this alteration of aerial photography area and digital topographic mapping area by SOB were as follows:

- 1) The opposite side of Dhaka City (right bank area of Urhi Ganga River) is flat and swampy area,

and less developed area comparing with the left bank area. Therefore, the necessity of 1:5,000 scale digital topographic maps is low at present.

- 2) The northern part of the originally defined 1:5,000 scale topographic mapping area is rapidly developing area in recent years. Therefore, the necessity of 1:5,000 scale digital topographic maps is very high.
- 3) Revision of the 1:5,000 scale digital topographic mapping area was decided through the discussion with the authorities concerned.

According to the request from the SOB, the Study team prepared the new flight plan for 1:20,000 scale aerial photography, and found that the total number of aerial photos and aerial photography area were not changed from the original plan. Therefore, the Study team agreed to change 1:20,000 scale aerial photography area and 1:5,000 scale digital topographic mapping area as shown in Appendix 7 “Memorandum”.

The above-mentioned situation occurred from 28 December 2002 to 2nd January 2003. The year-end and New Year holiday season had already started in Japan and JICA Bangladesh office was also closed. Therefore, the alteration of 1:20,000 scale aerial photography area and 1:5,000 scale digital topographic mapping area requested from SOB was agreed by the judgment of the team leader of the Study team. The approval of JICA concerning this alteration was obtained after New Year holiday.

3.11 Meeting with Relevant Organizations Concerning Administrative Boundaries

The small-scale topographic map is a compiled map and the topographic features are not shown at the real positions. However, in case of medium to large-scale topographic map, the topographic features are shown at the real positions by really scaled sizes as much as possible. Therefore, special attention will be necessary to show the information of administrative boundaries on the medium to large-scale topographic maps.

Basically, the information concerning the administrative boundaries, administrative names, road names will not be collected in the site. This information shall be collected from the relevant organizations and the information will be shown on the topographic maps. Especially, in case the administrative names and/or area names are in local language and these names are transliterated into English and shown on the topographic maps, the English spelling of administrative names and/or area names shall be same as the name decided by the authorities in charge.

In case of medium to large-scale topographic maps the accurate administrative boundary is necessary, because the topographic features are shown in really scaled sizes and at real positions as much as possible. Therefore, inaccurate administrative boundary may cause the troubles between the organizations and/or residents. To draw the administrative boundary on the medium to large-scale topographic maps, the close

cooperation between the relevant organizations is really needed and joint fieldwork by the relevant organizations is also necessary.

The meeting with relevant organizations to discuss the administrative boundary was held at SOB. The purpose, attendants and items discussed and so on are shown Clause 3.11.1 “Meeting with relevant organizations”.

3.11.1 Meeting with relevant organizations

The outline of the meeting with the relevant organizations concerning the administrative boundaries was as follows:

- 1) Date: 8 December 2003, from 11:15 AM to 13:00 PM
- 2) Location: Conference Room of SOB
- 3) Attendant:

| | |
|------------------------------|---|
| Maj. Khandaker Aftab Hossain | Director, SOB |
| Md. Nurul Islam | Assistant Supdt. of Survey, SOB |
| Mr. Nazmul Ahasan Choudhury | DPCO, Survey of Bangladesh |
| Mr. Md. Asaduzzaman | Research Officer, DCC |
| Mr. Md. Abdul Quaser | A.D.S. DLRS |
| Mr. Munir Siddiquee | Assistant Engineer, GIS, LGED |
| Mr. Gazi Md. Mozammel Hoque | Sr. Assistant Police Commissioner (Estate) D.M.P Dhaka |
| Mr. A.S.M. Quamruzzaman | Cartographer (S.O), BBS |
| Mr. Md. Abul Kalam | PSO, SPARRSO |
| Mr. Md. Atiar Rahman | PSO, SPARRSO |
| Mr. Toru Watanabe | Team Leader, JICA Study Team |
| Mr. Nobuhiro Sata | JICA Study Team |
| Mr. Yoshiaki Hirota | JICA Study Team |
| Mr. Shinji Takazawa | JICA Expert |
- 4) Items of discussion
 - What kind of administrative boundary data will be necessary for the governmental organization in Bangladesh.
 - Does the organizations have the data and information to be able to show the administrative boundaries on the 1:5,000 scale digital topographic maps or not?
 - In case of no data and information to be able to show the administrative boundaries on the 1:5,000 scale digital topographic maps exist, what methodology will be suitable for this

purpose?

5) Conclusion

- Unfortunately, there are no accurate data and information to be able to show the administrative boundaries on the 1:5,000 scale digital topographic maps.
- DCC is now preparing ward maps and as of at this present (December 2003), 33 ward maps (approximately 1/3 of total number of wards) are completed. DCC considers that this ward map can be used to show the administrative boundaries on the 1:5,000 scale digital topographic maps.
- It is considered that inaccurate administrative boundaries may cause troubles. Therefore, the administrative boundary will not be shown on the 1:5,000 scale digital topographic maps in the Study.
- However, the administrative boundary is an essential data and information for any governmental organization. Therefore, further discussion concerning the methodology of this work will be held among the governmental organizations including SOB.
- As the first step, the administrative boundaries will be plotted on 1:5,000 scale digital topographic map using ward maps. Then, suitability of this methodology will be judged and further discussion between relevant organizations will be held based on this results.



Photo 3.11.1 “Meeting with Relevant Organizations”

Chapter 4 Interview Survey



Sample of 1:5,000 scale digital topographic map
Location: National Zoo

Chapter 4 Interview Survey

At the beginning of the 1st year's Study, interview survey to SOB and other organizations in Bangladesh that will be deemed as the users of digital topographic maps and GIS basic data produced by the Study.

4.1 Purpose of Interview Survey

The purpose of the interview survey is to grasp the present situation of the organizations in Bangladesh from the viewpoint of utilization of digital topographic data and GIS, and also to collect the future plan of authorities concerning utilization of digital topographic data and GIS.

For this purpose, following survey was executed.

- 1) Data collection concerning the Study
- 2) Examination of specifications for digital topographic mapping
- 3) Summarization of SOB's inquiry survey
- 4) Interview survey to the users of digital topographic data and GIS
- 5) Survey of present situation of SOB

Based on the collected information and data, following analysis was executed.

- 1) Analysis of the results of SOB's inquiry survey
- 2) Analysis of utilization and future plan of digital topographic data and GIS by the organizations in Bangladesh concerned.
- 3) Analysis of vital issues of SOB
- 4) Selection of equipment necessary for technology transfer
- 5) Preparation of the technical specifications for the digital topographic mapping and GIS basic data production by the Study

4.2 Results of SOB's Inquiry Survey

SOB has executed inquiry survey to the authorities in Bangladesh concerning the utilization of digital topographic data and GIS in February and August 2000. The names of the organizations of SOB's inquiry survey, and the organizations responded to this survey are shown in Table 4.2.1 "List of Organization of Inquiry Survey by SOB".

Many organizations were not responded to SOB's inquiry survey. The main reason of no response to SOB's inquiry survey can be the lack of interest due to the reason of insufficient equipment such as computer, GIS software and also GIS engineers in the organization.

Table 4.2.1 “List of Organization of Inquiry Survey by SOB”

| No. | Name of GIS User | Date of Inquiry | Date of Answer |
|-----|---|-----------------|---------------------------|
| 1 | Bangladesh University of Engineering & Technology | 06/08/2000 | |
| 2 | Ban Bhaban (Forest Department) | 06/08/2000 | 06/03/2000 |
| 3 | Chittagong University | 01/08/2000 | |
| 4 | Road & Highway Department | 06/08/2000 | 18/07/2002 |
| 5 | Bangladesh Bureau of Statistics | 06/08/2000 | |
| 6 | Department of Land Records | 06/08/2000 | |
| 7 | Archaeology Department | 06/08/2000 | |
| 8 | Joint River Commission (Min. of Water Resources) | 06/08/2000 | 14/09/2000 |
| 9 | Dhaka University | 06/08/2000 | |
| 10 | Power Development Board | 06/08/2000 | |
| 11 | Fishery Department | 06/08/2000 | 28/09/2000 |
| 12 | Micro Wave Preserver Division-1 | 06/08/2000 | |
| 13 | Bangladesh Tea Board | 06/08/2000 | |
| 14 | Bangladesh Space Research & Remote sensing Organization | 06/08/2000 | 12/03/2002 |
| 15 | Public Health Engineering Department (Drainage Circle) | 06/08/2000 | |
| 16 | Soil Resources Institute | 06/08/2000 | |
| 17 | Bangladesh Geology Survey Department | 06/08/2000 | 15/04/2002 |
| 18 | Bangladesh Survey Institute | 06/08/2000 | 18/09/2000 |
| 19 | Prime Minister’s Office (Special Affairs Division) | 06/08/2000 | |
| 20 | Fire Service & Civil Defense | 06/08/2000 | |
| 21 | Soil Resources Development Institute | 06/08/2000 | 28/08/2000 |
| 22 | External Advertising Sub-Division | 06/08/2000 | |
| 23 | Water Resources Planning Organization | 06/08/2000 | 29/08/2000 |
| 24 | Commerce Ministry | 06/08/2000 | |
| 25 | Health & Family Welfare Ministry | 06/08/2000 | |
| 26 | Home Ministry | 06/08/2000 | |
| 27 | Religious Affair Ministry | 06/08/2000 | |
| 28 | Bangladesh Ordinance Ministry | 06/08/2000 | |
| 29 | Computer Center of BARC | 06/08/2000 | (refer to 48) |
| 30 | Board of Investment (Prime Minister’s Office) | 06/08/2000 | |
| 31 | Bangladesh Inland Water Transport Corporation | 06/08/2000 | 11/09/2000 |
| 32 | Local Government Engineering Department | 06/08/2000 | 05/09/2000 |
| 33 | Environment & GIS Support Project | 06/08/2000 | |
| 34 | Surface Water Modeling Center | 06/08/2000 | |
| 35 | City Planning & Development Department Bangladesh University of Engineering & Technology | 06/08/2000 | 11/03/2002 (U & R P D) |
| 36 | Water Resources Engineering Department (BUET) | 06/08/2000 | |
| 37 | IFCDR (BUET) | 06/08/2000 | |
| 38 | RAJUK (Capital Development Authority) | 06/08/2000 | |
| 39 | Public Works Department | 06/08/2000 | 14/03/2002 |
| 40 | JICA Bangladesh Office | 06/08/2000 | |
| 41 | The MAPPA | 06/08/2000 | 13/09/2000 |
| 42 | Kearn Enargy PLC | 06/08/2000 | |
| 43 | Sumitomo Corporation | 06/08/2000 | |
| 44 | Bets Group | 06/08/2000 | |
| 45 | International Development Enterprises | 06/08/2000 | 31/08/2000 |
| 46 | Resource Integration Center | 06/08/2000 | |
| 47 | Jahangir Nagar University (Geography & Environment Department) | 06/08/2000 | |
| 48 | Bangladesh Agricultural Research Council | 06/08/2000 | 13/09/2000 |

| | | | |
|----|--|------------|--------------------------|
| 49 | Rajshahi University (Geography Department) | 06/08/2000 | 13/09/2000 |
| 50 | Rajshahi University (Geology & Mineral Department) | 06/08/2000 | |
| 51 | Housing & Building Research Institute | 06/08/2000 | |
| 52 | River Research Institute | 06/08/2000 | |
| 53 | Development Design Consultant Limited | 06/08/2000 | |
| 54 | Japan Overseas Consultant Co., Ltd. | 06/08/2000 | |
| 55 | IGP, Police Head Quarter | 06/08/2000 | |
| 56 | Bangladesh Rifles | 06/08/2000 | 13/09/2000 |
| 57 | Bangladesh Consultancy Limited | 06/08/2000 | |
| 58 | Sthapati Sangshad Limited | 06/08/2000 | |
| 59 | Mayor of Dhaka City Corporation | 06/08/2000 | 13/09/2000 11/03/2002 |
| 60 | Mayor of Chittagong City Corporation | 06/08/2000 | |
| 61 | Mayor of Khulna City Corporation | 06/08/2000 | |
| 62 | Mayor of Rajshahi City Corporation | 06/08/2000 | 05/10/2000 |
| 63 | Engineers' Institute | 06/08/2000 | |
| 64 | Concord Engineering & Construction | 06/08/2000 | |
| 65 | Khulna Development Authority | 06/08/2000 | |
| 66 | Chittagong Development Authority | 06/08/2000 | |
| 67 | Director Administration (Prime Minister's Office) | 06/08/2000 | |
| 68 | Dhaka Electric Supply Authority | 26/02/2000 | |
| 69 | Bangladesh Railway | 26/02/2000 | |
| 70 | Water Supply and Sewerage Authority | 28/02/2000 | |
| 71 | Bangladesh Telegraph & Telephone Board | 28/02/2000 | |
| 72 | Titas Gas Transmission & Distribution Co., Ltd. | 28/02/2000 | |
| 73 | Bangladesh Road Transport Authority | 13/03/2000 | |
| 74 | Center for Environmental & Geographical Information Services | N/A | |

However, the organizations responded to the SOB's inquiry survey are actively utilizing digital topographic data and GIS system and the level of GIS technique is higher than the non-response organizations.

4.3 Interview Survey on Users of Digital Topographic Data and GIS Basic Data

To grasp the present situation of the organization using digital topographic data and GIS, interview survey has been executed by the Study team with the cooperation of counterparts of SOB.

Following information was collected through the interview survey.

- 1) Problems the organizations encountered
- 2) Utilization of digital topographic data and GIS
- 3) Future plan of utilization of digital topographic data and GIS
- 4) Necessary information of digital topographic data and GIS
- 5) Expectation to the Study

Following organizations were selected for the interview survey through the discussion between SOB and the Study team.

- 1) Bangladesh Telegraph & Telephone Board
- 2) Dhaka City Corporation
- 3) Bangladesh University of Engineering & Technology
- 4) Local Government Engineering Department
- 5) Bangladesh Space Research & Remote Sensing Organization
- 6) Center for Environmental & Geographical Information Service
- 7) University of Dhaka
- 8) Public Work Department
- 9) Rajdhar Unnayan Kartrikkha
- 10) Dhaka Electric Supply Authority
- 11) Dhaka Metropolitan Police
- 12) Survey Corporation

The names of organizations, address, persons to have met, telephone numbers, fax numbers and e-mail address if possible are shown in Table 4.3.1 "Names of Organizations participated the Interview Survey by the Study Team".

Table 4.3.1 "Name of Organization of Interview Survey by the Study Team"

| Name of Organization | Abbreviation | Address | Person t | Position | Telephone | Fax | E-mail |
|--|--------------|--|------------------------|--|------------|------------|-----------------------|
| Bangladesh Telephone & Telegraph Board | T&T | 37/E, Eskaton Garden, Dhaka-1000 | Engr. Md. Yousuf Niaz | Divisional Engineer, planning | 02-8314211 | 02-8312277 | niaz@btb.net.bd |
| Dhaka City Corporation | DCC | Nagar Bhaban (10th floor), Furbaria, Dhaka | Tapan Kumar Das Gupta | Chief Town Planner, Urban Planning Department | 02-7110241 | | updde@agmt.com |
| Department of Urban and Regional Planning, Bangladesh University of Engineering and Technology | BUET | Dhaka 1000 | Dr. K.M. Maniruzzaman | Associate Professor | 02-9665634 | | mzaman@urp.buet.ac.bd |
| Local Government Engineering Department | LGED | LGED Bhaban, Level-8 Agargaon, Dhaka-1207 | Saroj Kumar Sarker | Additional Chief Engineer | 02-8116391 | 02-8116390 | saroj@lged.org |
| Bangladesh Space Research & Remote Sensing Organization | SPARRSO | SPARRSO, Ministry of Defense, Mohakash Bigyan Bhaban, Agargaon, Shere Bangla Nagar, Dhaka-1207 | Md. Atiar Rahman | Principal Scientific Officer | 02-9141625 | 02-8113080 | atiar@sparrso.org. |
| Center of Environmental and Geographic Information Services | CEGIS | House 45, Banani, Dhaka-1213 | Mir Abudal Miatin | Coordinator, GIS & Remote Sensing Cluster | 02-8821570 | 02-8823128 | mmatin@cegisbd.com |
| University of Dhaka, Department of Geography and Environment | UOD | Dhaka 1000 | Anamat Ullah Khan | Chairman, Department of Geography & Environment | 02-9661920 | 02-8615583 | amanat@ctechco.net |
| Public Work Department | PWD | | Engr. Emdadul Haq | Additional Chief Engineer | 02-9550507 | | |
| Rajdhar Umayan Karrikha | RAJUK | TAJUK Bhaban (4th floor), Dhaka-1000 | M. Jaharul Hoque | Deputy Town Planner | 02-9552587 | 02-9556161 | mjhq@btb.net |
| Dhaka Electric Supply Authority | DESA | | Engr. Ali Monsur Ahmed | Executive Engineer, Planning and Special Project | 02-9550507 | | |
| Survey Corporation Pvt. Ltd. | SUC | House #643/1, Bara Monghbazar, Dhaka-1216 | M.A. Hayat | Director | 02-8315626 | 02-8314638 | survey@bdcom.com |
| Dhaka Metropolitan police | DMP | 10 Cirkir House Road, Dhaka | Md. Golam Rasul | Additional Deputy Commissioner | 02-832508 | | |



Photo 4.3.1 “Bangladesh University of Engineering and Technology”



Photo 4.3.2 “Dhaka University”

4.4 Analysis of SOB’s Inquiry Survey and Interview Survey by the Study Team

4.4.1 Analysis of survey results

The results of SOB’s inquiry survey and the interview survey by the Study team were analyzed and under-mentioned specific features were found in the field of using of topographic map, digital topographic data and GIS.

Also, the necessary geographic information for each user by the results of SOB’s inquiry survey and interview survey by the Study team are summarized in Table 4.4.1 “Summary of SOB’s Inquiry Survey and Interview Survey by the Study Team”.

1) Specific feature 1

Many organizations have no interest in the inquiry survey of SOB. Only 20 organizations among 74 organizations answered this survey. The organizations not responding to this inquiry survey have not enough equipment, persons and experience to use the digital topographic data and GIS.

2) Specific feature 2

The users that answered the inquiry survey of SOB and the organizations planning to use the digital topographic data actively have acute interests in the products of the Study, because they are planning to establish GIS data base for their own purpose.

3) Specific feature 3

SOB is now using GeoConcept as GIS software. However, other authorities in Bangladesh are using ArcInfo/Arcview as GIS software. Total 6 authorities among 20 organizations that answered the inquiry survey of SOB are using ArcInfo/Arcview as GIS Software.

4) Specific feature 4

The 1:20,000 scale Dhaka City Guide Map has no horizontal coordinates due to the reason of national security. However, the users of topographic maps need the horizontal coordinates,

Table 4.4.1 "Summary of SOB's Inquiry Survey and Interview Survey by the Study Team"

| Items of data acquisition | Inquiry Survey by SOB | | | | | | | | | | | | Interview Survey by the Study Team | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|-------------------------------|----------------|----------------------|-----------------|----------|------------|-----------------|------------------|------------|-------------|----------------|-----------------|------------------------------------|-----------------|-----------------|----------|----------|----------|----------|-----------------|-------------------|-----------------|-----------------|----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|--|--|
| | BB | RHS | JRC (MOWR) | FD | SPARRSO | BGSD | BSI | SRDI | WARPO | BIWTC | LGED | BUET | PWD | MAPPA | IDE | BARC | UOR | BAR | DCC | RCC | T&T | DCC | BUET | LGED | SPARRSO | CEGIS | UOD | PWD | RAJUK | DESA | SUC | DMP | WASA | | | | | | |
| Control point | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benchmark | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Contour line | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spot height | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Railway | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bridge | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Administrative boundary | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Councilor | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Embassy | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Government office | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Police station | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fire station | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hospital | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Health center | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Telephone office | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bank | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Shopping center | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| School | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Community center | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Church and so on | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Grave | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Building/house | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hotel | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Restaurant | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cinema | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Factory | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Warehouse | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gas station | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Transmission station | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pipeline | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tank | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Transmission line | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Transmission tower | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pump station | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Drainage canal | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Irrigation canal | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dam | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Microwave tower | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Monument | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water gate | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water gate | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bus terminal | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Airport | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Heliport | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Harbor | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Light house | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vegetation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boundary of vegetation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lake and pond | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Necessary data for GIS | Land use | Road alignment | River alignment | River alignment | Land use | Land use | Topographic map | Geology | Embankment | Water depth | Infrastructure | Topographic map | Topographic map | Topographic map | Topographic map | Land use | Land use | Land use | Land use | Topographic map | Telephone network | Topographic map | Topographic map | Infrastructure | Land use | Land use | Land use | Land use | Land use | Land use | Land use | Land use | Land use | Land use | Land use | Land use | Land use | | |
| | land condition | Spot elevation | Observation station | Coastal line | Land use | Land use | land condition | Soil | Land use | Chart | Coastal line | Land use | Land use | Land use | Land use | Land use | Land use | Land use | Land use | Land use | Microwave network | Topographic map | Topographic map | Land use | Soil | Land use | Land use | Land use | Land use | Land use | Land use | Land use | Land use | Land use | Land use | Land use | Land use | | |
| | DEM | | Common spot at river | Flood area | Soil | Orthophoto | | Inland transport | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Boundary of forest management | | Ice factory | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Note Available data to be obtained in digital topographic mapping in the Study

because many users are now using GPS for positioning, and also prices of GPS equipment is become lower than before.

5) ***Specific feature 5***

The users of topographic maps have a strong desire for the color topographic maps (color lines) for large to medium scale topographic maps. The main reason to request for color line topographic maps can be considered their lack of experience to use large to medium scale topographic maps. However, it is necessary to consider whether color line topographic maps is suitable for large to medium scale topographic maps or not.

6) ***Specific feature 6***

According to the interview survey, many users of topographic maps are requesting 1.0 m interval contour lines or more accurate contour lines. Considering the topographic features around Dhaka Metropolitan Area, the request of these users can be understood. However, considering the accuracy of photogrammetric mapping and also time schedule of the Study, it is very difficult to meet their request in the Study.

4.4.2 Implementation policy for specific items

Based on the analysis of Inquiry survey of SOB and interview survey by the Study team, the Study team made a decision to execute the Study by the under-mentioned implementation policy.

1) ***For specific feature 1***

For the users lacking the experience of digital topographic data and GIS, the effective using method of digital topographic data and GIS will be presented in the seminar that will be held on the 3rd year's Study. Also, printed topographic maps will be supplied to the organizations not having the necessary equipment and software for using of digital topographic data.

Furthermore, it is necessary to promote the effective use of the digital topographic data produced by the Study to the organizations presently using the digital topographic data and GIS actively through the implementation of the Study such as inviting them to the seminar and supplying the sample data of digital topographic map.

2) ***For specific feature 2***

It is impossible to provide all the necessary information and data to the organizations actively using GIS, because the information and data needed to these organizations are different.

Furthermore, the organizations actively using GIS are capable to collect the necessary information and data by themselves and also capable to construct GIS for their own purpose. Therefore, the purpose of GIS basic data production by the Study is to provide the common information and data that can be used by many organizations.

Table 4.4.1 “Summary of SOB’s Inquiry Survey and Interview Survey by the Study Team“ shows the necessary information and data to each organization known by the inquiry survey of SOB and interview survey by the Study team. On this Table, the users can be divided into two groups as follows:

- 1) Organizations who simply use the topographic maps and digital topographic data.
- 2) Organizations who use the digital topographic data as basic information to produce GIS data by adding necessary information and data.

Some of the organizations such as Dhaka City Corporation and University and so on intend to use the digital topographic data as a basic data for own GIS construction. The differences in the usage of data may be caused by the differences in the contents of work of each organization and also the necessary data for them. Therefore, it is necessary to consider what data will be structuralized for GIS basic data in the Study. Finally, the Study team decided that the contents of GIS basic data would be produced as follows:

- 1) Structuralization will be applied to double line road, but not applied to footpath.
- 2) Structuralization will be applied to railway.
- 3) Structuralization will be applied to the bridge along double line road, but not applied for masked bridge.
- 4) Structuralization will be applied to the administrative boundaries of Upazilla and Wards if accurate administrative boundary information is available.
- 5) Structuralization will be applied to the buildings with symbols, but not applied for building and houses without symbols.
- 6) Structuralization will not be applied to the vegetation boundary.
- 7) Structuralization will be applied to water area such as river, lake and pond, and irrigation/drainage canal.

3) For specific feature 3

Many organizations in Bangladesh use ArcInfor/Arcview as GIS software except SOB. Therefore, The GIS basic data to be produced by the Study will be the ArcInfo/Arcview based data. Furthermore, ArcInfo/Arcview will be selected as GIS software to be used for technology transfer to the counterparts of SOB in the Study.

4) For specific feature 4

The data collection using GPS has already become common methodology. Therefore, horizontal coordinates are essential information for many users of topographic maps and digital topographic data.

In Bangladesh, many organizations are producing GIS data individually and the digital topographic data that is the basic information for GIS also produced by organization by organization. Therefore, the scale and accuracy of digital topographic data used by many organizations are not unified and accuracy of digital topographic data is not enough. Therefore, the GIS data produced by one organization cannot be used by other organization effectively and this is a vital issue of GIS utilization in Bangladesh.

Therefore, through the implementation of the Study and seminar, importance of unification of basic data (accuracy, projection, spheroid, scale and so on of digital topographic data) will be explained and make not only the counterparts of SOB, but also persons in the other organizations understood.

5) For specific feature 5

In general, medium to large-scale topographic maps is produced by Black and White, and color lines are not used. However, many organizations in Bangladesh including SOB expressed the necessity of color line topographic maps. This may be caused by lack of experience in using medium to large-scale topographic maps by the organizations in Bangladesh.

It is necessary to explain the difference between small-scale topographic maps and medium to large-scale topographic maps to SOB and also to other organizations in Bangladesh through the implementation of the Study.

6) For specific feature 6

Considering the topographic features (flat and low elevation) in Dhaka Metropolitan Area, it can be understood that many organizations want 1.0 m interval or 0.5 m interval contour lines. However, considering the accuracy of elevations observed by photogrammetric mapping method, it is difficult to draw the accurate 1.0 m or 0.5 m interval contour lines by the photogrammetric mapping method only.

To draw the accurate 1.0 m or 0.5 m interval contours, it is necessary to observe the leveling points (elevation points decided by leveling work) as much as possible and the contour lines drawn by the photogrammetric method should be corrected and adjusted by the leveling points. However, for this method, especially, leveling work in the site, it will take long time and huge manpower. If other organizations need more accurate contour lines such as 1.0 m or 0.5 m interval contour lines, it is recommended that they execute such work by themselves and correct the contour lines using

the results of the Study.

