PRESENTATION ON

Role of Survey of Bangladesh in Producing and Providing Geospatial data

Md Abul Kalam
Bangladesh

SURVEY OF BANGLADESH PREMISES

PREAMBLE

- Survey of Bangladesh (SOB) is the National Mapping organization of Bangladesh
- SOB is carrying out all Geodetic activities of Bangladesh
- SOB is responsible for taking Aerial photographs in Bangladesh
- SOB Produces and Issues Maps & Map Data to the Users for various development activities

COMMITMENTS

- Preparation of Topographic Base Map of scale 1:25,000
- Topographic Map of scale 1:5,000 (City area)
- Thematic Maps of various types and scales
- Horizontal and Vertical Control Points
- Establishment and Maintenance of GNSS CORS
- Determination of Mean Sea Level (MSL)
- GIS Database of scale 1:50,000, 1:25,000 and 1:5,000
- Aerial Photographs
- Orthophotos
- Digital Terrain Model (DTM)
- Demarcation of International Boundary

GEODETIC ACTIVITIES

ESTABLISHMENT OF NATIONAL HORIZONTAL DATUM

Wettzell
(Germany)

6,787,514.1944m

Tsukuba
(Japan)

4,805,509.9497m

Dhaka

Hartebeesthoek
(South Africa)

8,043,281.7942m

6,156,929.2186m

Yaragadee
(Australia)

NATIONAL DATUM

NATIONAL DATUM YARD

Established: 1994

Gulshan, Dhaka

Horizontal Datum

Vertical Datum

DETERMINATION OF MEAN SEA LEVEL (MSL) AND FIXATION OF VERTICAL DATUM

Location:Chittagong
Established: 1993
Data Records: Every 6 Sec

The station is used by University of Hawaii Sea level centre as Global Sea level observing station (GLOSS) since 2007 for Tsunami Warning of Indian Ocean

TIDAL STATION

GEODETIC CONTROL Netwark

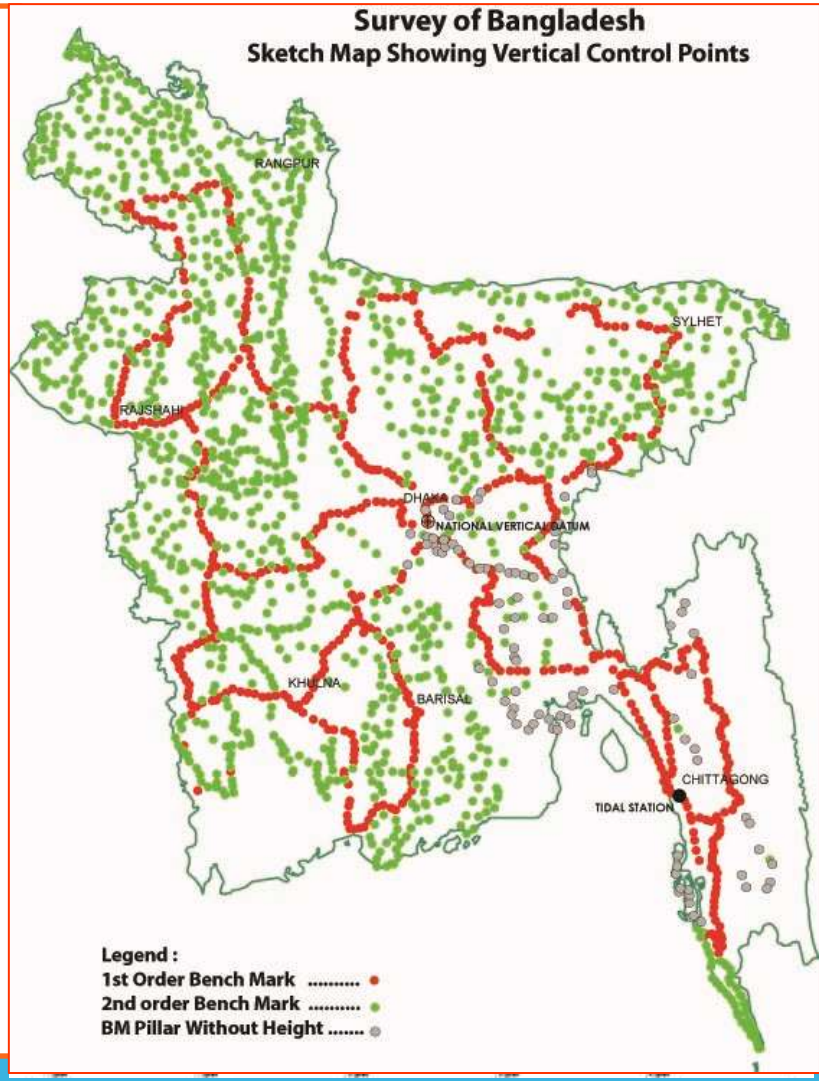
Horizontal Control Points

- 1st Order Horizontal GCP - 260
- 2nd Order Horizontal GCP - 817

Vertical Control Points

- 1st Order Vertical GCP - 662
- 2nd Order Vertical GCP - 1485

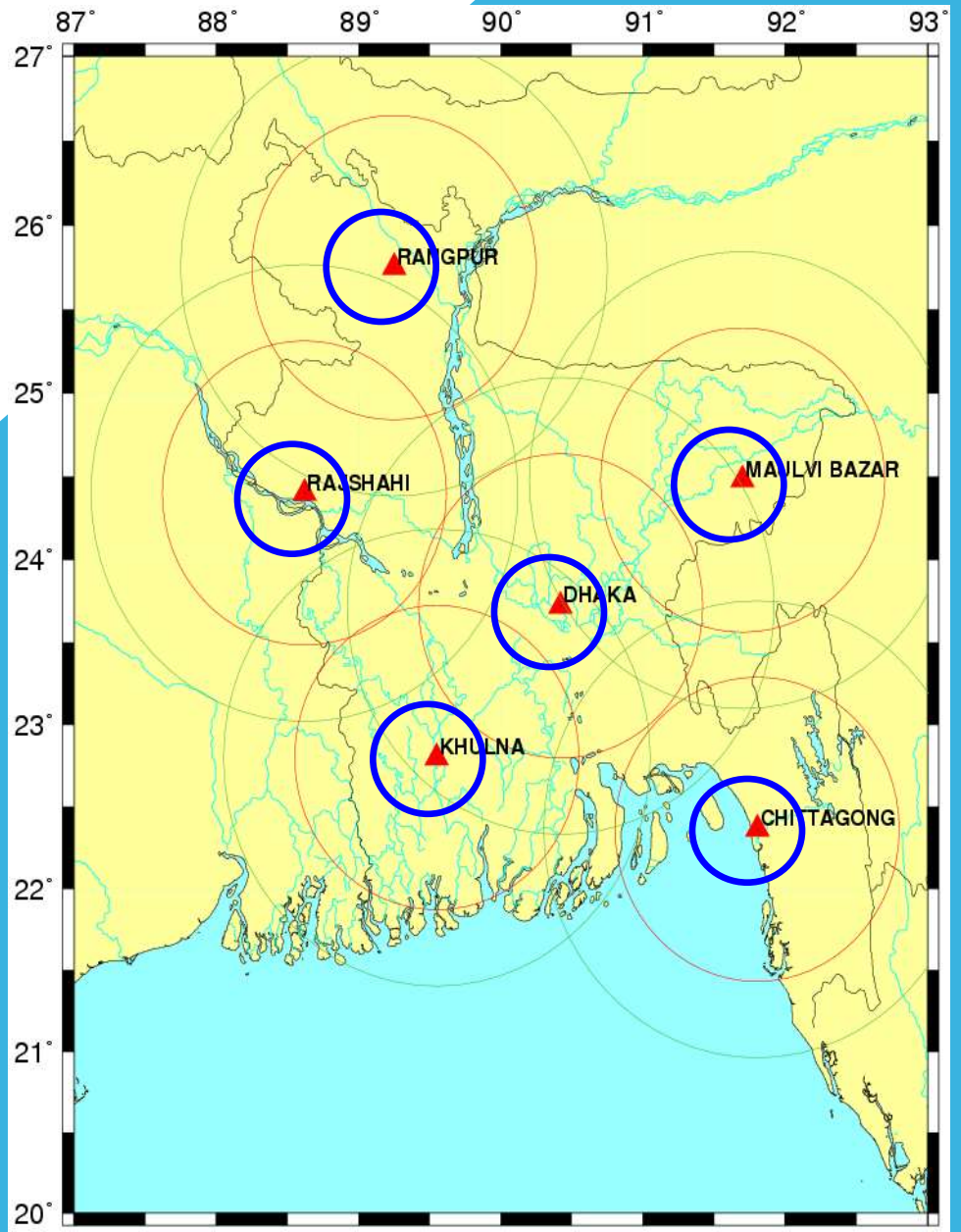
3D Control Points(X,Y,Z) - 765



PERMANENT GNSS STATION (GNSS CORS)

- Six Permanent GNSS Stations Established at Dhaka, Khulna, Rajshahi, Rangpur, Moulvibazar & Chittagong

- Data Collected from Dec 2011 and Supplied to Various Public and private organizations



GNSS STATION

- Receiver : Trimble-Net R9
- Technology: Trimble Pivot Platform
- Data acquisition Interval: 1 Second

SURVEY EQUIPMENTS USED IN SOB

Total Station

Theodolite

GNSS CORS

GNSS Receiver

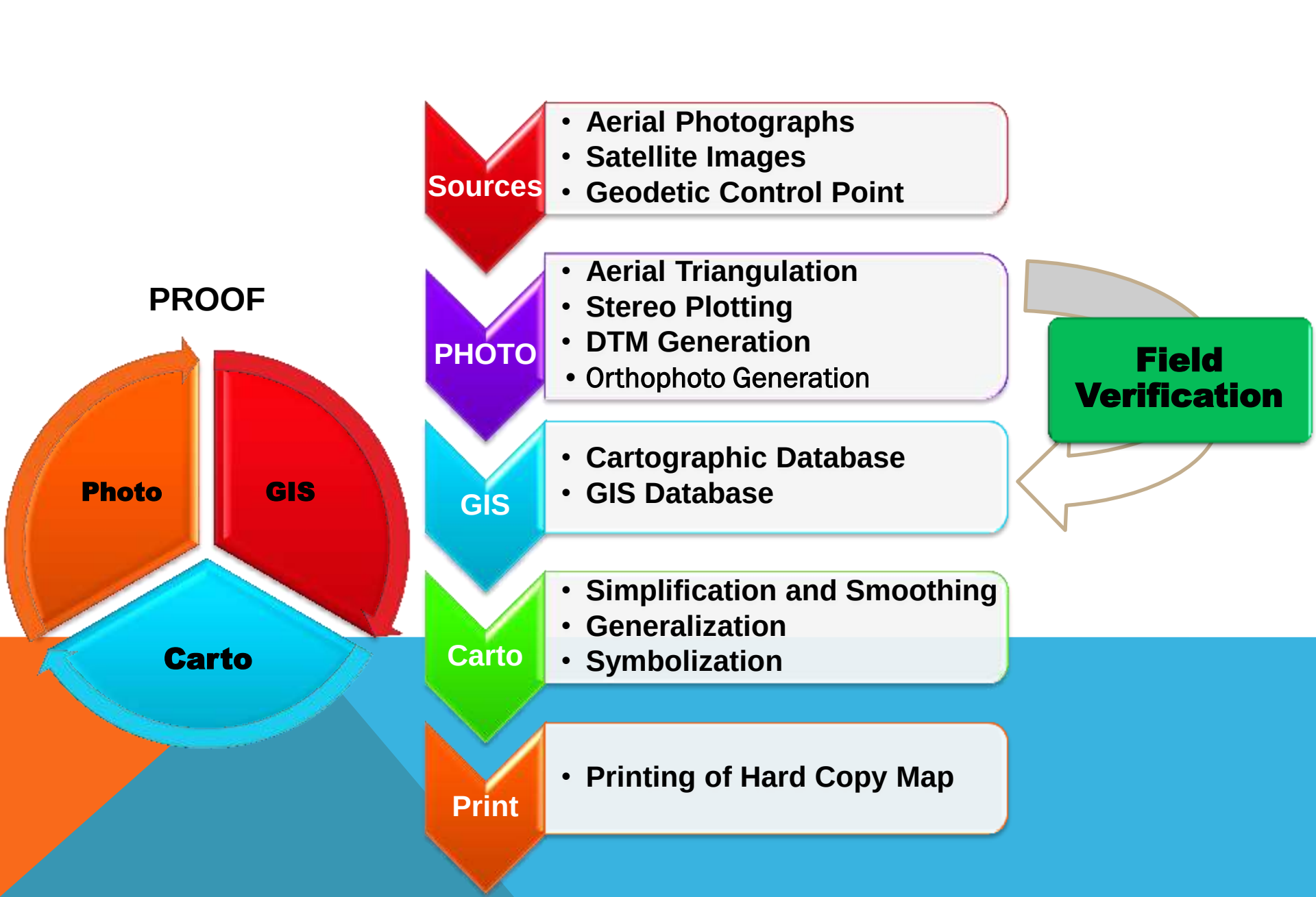
Digital Level

CHRONOLOGICAL HISTORY OF AERIAL PHOTOGRAPHY AND SATELLITE IMAGERY IN BANGLADESH

Sl. No.	Year	Scale	Name of Company	Area
1	1974-75	1:30,000	Capital Air Survey Limited, Canada	All over the country
2	1977	1:5,000	Bangladesh Air Force	Dhaka City
3	1981-82	1:50,000 1:30,000 1:15,000	Capital Ari Survey Limited, Canada	Sundarban & Chittagong
4	1983-84	1:50,000 1:15,000	IGN France	All over the country
5	1990-91	1:50,000 1:30,000 1:20,000	Finnmap International, Finland	Coastal area, Jamuna & Surrounding
6	1995	1:30,000 1:20,000	Quasco Company, Australia	Chittagong, Cox's Bazar, Mymensingh
7	1998	1:50,000	Finnmap International, Finland	Coastal Area
8	1999-2001	1:25,000	Kevron Pvt Ltd. Australia	All over the country
9	2003	1:20,000	SOB/JICA/Asia Air Survey	Dhaka City
10	2010-11	50 cm GSD	Passco Finnmap International	All over the Country
		25cm GSD		Chittagong, Khulna, Rajshahi, Barisal & Sylhet City

Sl. No.	Year	Scale	Name of Company	Area
1	1998-995	1:50,000	Spot, France	Sheet Size images of the riverine area
2	2010-11	2.5m GSD	Spot, France	Along the International Boundary of Bangladesh
3	2016-17	2.5m GSD Stereoscopic	Digital Globe	Along the Important rivers of Bangladesh

FLOW DIAGRAM OF SURVEYING AND MAPPING ACTIVITIES IN



PHOTOGRAMMETRIC ACTIVITIES

- Aerial Triangulation
- Digitization and Compilation
- Digital Surface Model Creation
- Digital Terrain Model Creation
- Orthophoto Generation
- Contour Generation
- Height Creation all over Bangladesh with respect to Mean Sea Level

GIS OUTPUT

- GIS Database with 11 Data sets, 68 Feature Class and 303 Feature Types
- GIS Basic Database for External Users
- Cartographic Database for Topographic Base Map
- Seamless Database for all over Bangladesh

CARTOGRAPHIC OUTPUT

- Topographic Maps of Different Scales
- Thematic Maps According to requirements of stakeholders
- Administrative Maps
- Guide Maps of Important Cities

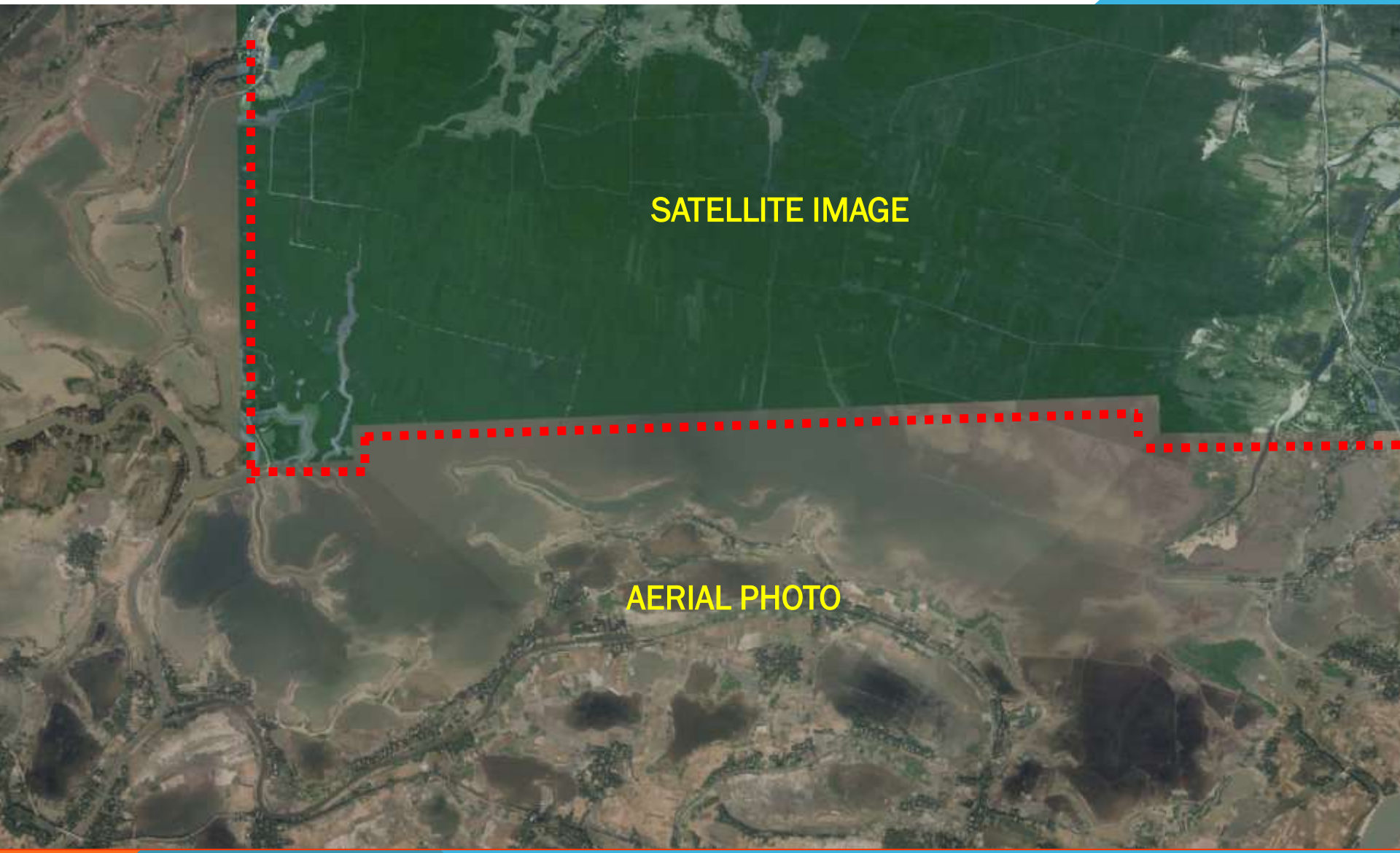
CHARACTERISTICS OF AERIAL PHOTOGRAPHS FOR 1:25,000 SCALE BASE MAP

- Spatial Resolution – 50 cm GSD
- Radiometric Resolution – 8 bit
- Number of Band – 4 Bands (R,G,B,CIR)
- Year of Acquisition – 2010-11
- Covering Area – All over Bangladesh

CHARACTERISTICS OF AERIAL PHOTOGRAPHS FOR 1:5,000 SCALE CITY MAPS

- Spatial Resolution – 25 cm GSD
- Radiometric Resolution – 8 bit
- Number of Band – 4 Bands (R,G,B,CIR)
- Year of Acquisition – 2010-11
- Covering Area – 5 Divisional Cities
- Pixel Size – 6 Micron

AERIAL PHOTO AND SATELLITE IMAGE TOGETHER



We are using satellite image and aerial photo data combined in a map.

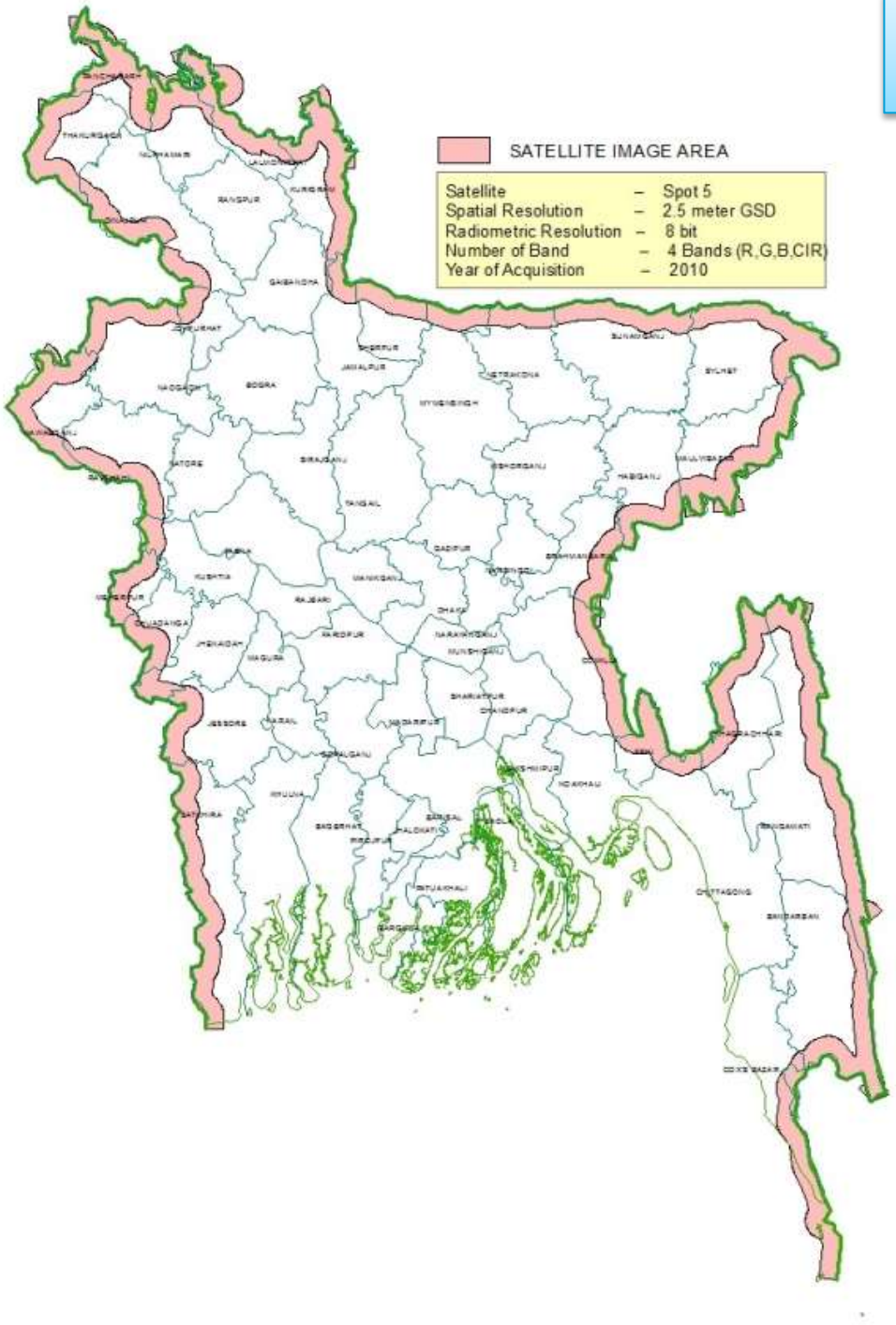
IMAGE PROCESSING SOFTWARE

Recently we purchased two image processing software to update our Base maps in reverine areas using satellite image.

- **ERDAS Imagine Professional 2016**
- **ENVI version 5.3**

Apparently we are using monochromic/Stereoscopi satellite data which were acquisitioned in differen years.

Satellite Imagery o



- Satellite Images – Spo
- Spatial Resolution – 2.5 meter G
- Radiometric Resolution – 8 bit
- Number of Band – 4 Bands
- Year of Acquisition – 2010
- Covering Area – Along the Internation

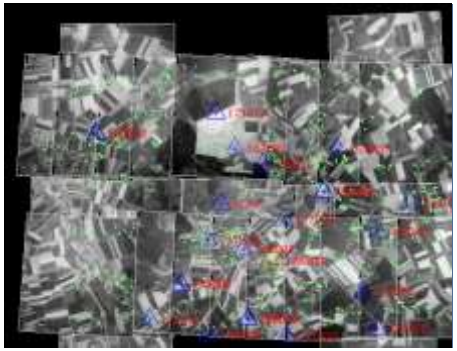
- In the international borde prepared Maps by using mo images
- We need to prepare Maps a using Stereoscopic Satellite

- **Satellite images – World Vi**
- **Spatial Resolution – 0.5 meter G**
- **Radiometric Resolution – 8 bit**
- **Number of Band – 4 Bands (R,G,B; CIR)**
- **Year of Acquisition – 2016**
- **Area covered – Along the Major Rivers**

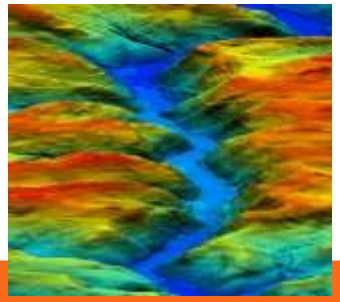
- Used to detect the area of rive erosion
- To Incorporate and update river ba to the base maps

PHOTOGRAMMETRIC WORKFLOW

Aerial Photograph/ Satellite Images



Aerial Triangulation



DTM Generation

Stereo Plotting

Orthophoto Generation

AERIAL TRIANGULATION

+

Air Signal Points (GCP)

=

Relation between image and ground by using minimum GCP to make stereo model

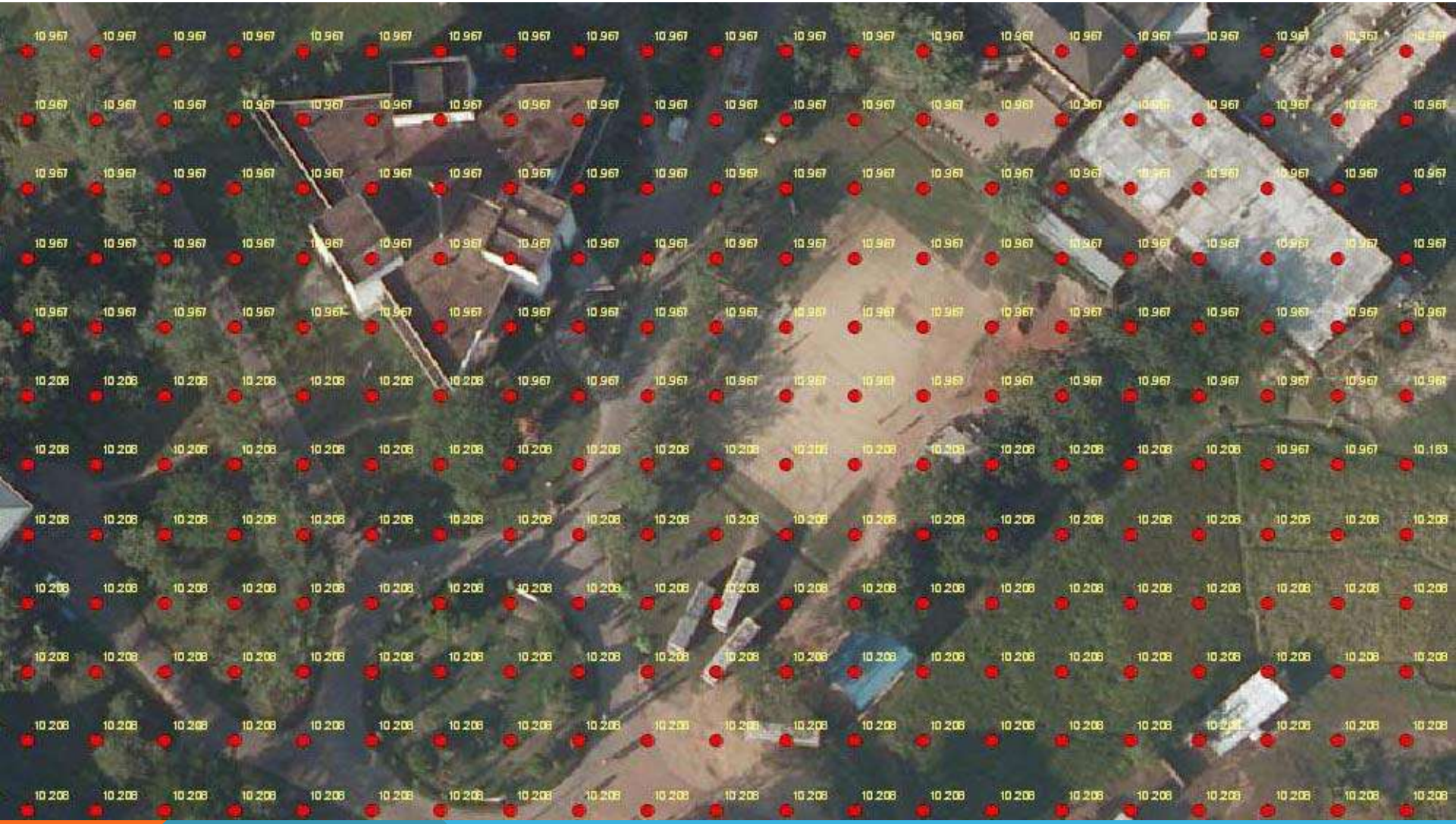
PHOTOGRAMMETRIC SOFTWARE

- **Aerial Triangulation - Inpho Match version AT 5.3.1 (03)**

- **Stereo Plotting - Summit Evolution version 6.1 (40) with Auto CAD Map 3D version 2011 (62)**
  Summit Evolution version 7 (23) with Auto CAD Map 3D version 2016 (23)
  Summit Evolution version 7 with (02) Arc GIS 10.3

- **DTM & Orthophoto - Application Master includes (20)**
  Match T DSM , DTM Edit &
  Ortho Master
  Ortho Vista includes
  SEAM Edit (10 no.)

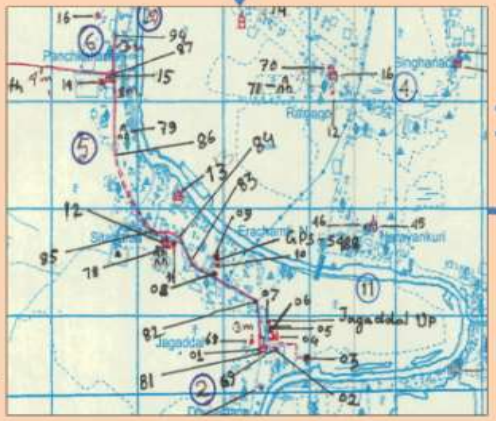
DTM (20m Interval edited DTM)



Working procedure for making GIS and Cartographic Geodatabase from Photogrammetric Data and including Field Surveyed Data

File Geodatabase Creation (Data Loading from 3D digitized data)

Data Classification

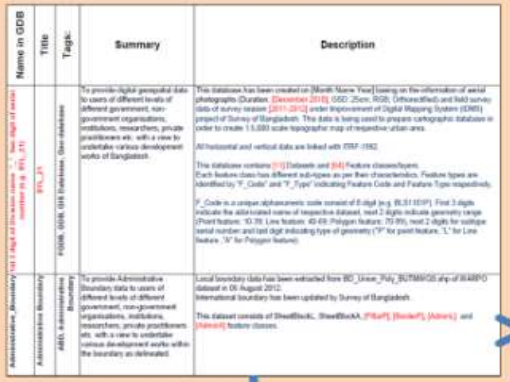


Spatial Data Entry

F_Code	SN	
FCL1301P	1	Jagadal Bazar
FCL1411P	2	Jagadal Bazar
FCL1205P	3	Jagadal Colle
FCL1304P	4	Idgah
FCL1405P	5	Jagadal Com
FCL1106P	7	Jagadal Unio
FCL1202P	8	Jagadal Al-H
FCL1201P	9	Jagadal Govt
FCL1102P	10	Jagadal Post
FCL1206P	11	Jagadal Jam
FCL1301P	12	Jagadal Mad
FCL1301P	13	Jagadal Old
FCL1208P	14	Jagadal Ayur
FCL1301P	15	Uttar Jagada
FCL1201P	16	Shirukhupa
FCL1201P	17	Purba Matia
FCL1301P	18	Purba Matia
FCL1301P	19	Matiapur M
FCL1304P	20	Idgah

Attribute Data Entry

Topological Correction



Name in GDB	Title	Tags	Summary	Description
			To provide digital geospatial data to users of different levels of different government, non-government organisations, institutions, researchers, private practitioners etc. with a view to undertake various development works of Bangladesh.	This database has been created on [Month Name Year] basing on the information of aerial photographs (Duration: [December 2010]). DSD: 25cm; RGB; Orthorectified) and field survey data of survey season [2011-2012] under Improvement of Digital Mapping System (DMS) project of Survey of Bangladesh. This data is being used to prepare cartographic database in order to create 1:1,000 scale topographic map of respective urban area. All horizontal and vertical data are linked with ITRF-1992. This database contains [10] Datasets and [64] Feature classes/layers. Each feature class has different sub-types as per their characteristics. Feature types are identified by "F_Code" and "F_Type" indicating Feature Code and Feature Type respectively. F_Code is a unique alphanumeric code consist of 5 digit (e.g. BL31101P). First 3 digits indicate the abbreviated name of respective dataset, next 2 digits indicate geometry range (Point feature: '01-39; Line feature: 40-69; Polygon feature: 70-99), next 2 digits for subtype serial number and last digit indicating type of geometry ("P" for point feature, "L" for Line feature, "A" for Polygon feature).
Administrative_Boundary	Administrative Boundary	ABD_Administrative Boundary	To provide Administrative Boundary data to users of different levels of different government, non-government organisations, institutions, researchers, private practitioners etc. with a view to undertake various development works within the boundary as delineated.	Local boundary data has been extracted from BD_Union_Poly_BUTMWGS.shp of WARPO dataset in 06 August 2012. International boundary has been updated by Survey of Bangladesh. This dataset consists of [SheetBlockA_ [FillaPt], [BorderPt], [Admin1], and [Admin2] feature classes.

Meta Data Entry

AVAILABLE GIS SOFTWARE

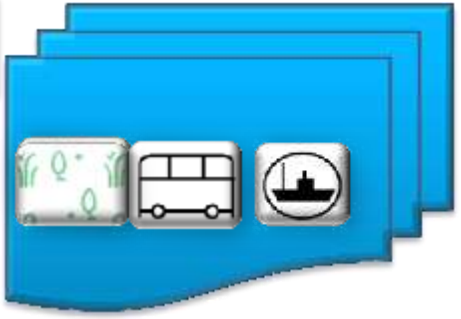
GIS 10	**- 22**
GIS 10.3.1	**- 15**
ta Reviewer	**- 05**
oduction Manager	**- 02**
rk flow manager	**- 04**
SDE 10.0	**- 01**

A	B	C	D	E
		Sheet No. 78C/9C		
		Mr Nasir Uddin Ahmed, Syr, Grade-1		
Serial No	**Record Code**	**Name**	**Easting**	**Northin**
1	43	Jharbari Bazar jame Mosque	369132	2875
2	67	Jharbari Bazar	369128	2875
3	33	Jharbari UP Land Office	369072	2876
4	35	Jharbari Govt. Primary School	369003	2876
5	36	Jharbari High school	368980	2876
6	43		368973	2876
7	76		368844	2876
8	199	Cart Track/Unmetalled Road	368751	2876
9	178	Bridge Unmetal/Cart Track	368651	2876
10	178	Bridge Unmetal/Cart Track	368606	2876
11	37	Jharbari College	368610	2875
12	116		368848	2875
13	72	Grameen Bank	369047	2875
14	52		369037	2875
15	27	Satagram Union Parishad	369038	2875
16	23	PO	369025	2875
17	199	Cart Track/Unmetalled Road	370790	2869

CARTOGRAPHIC WORKFLOW

GIS MAP

CARTOGRAPHIC GEODATABASE



SYMBOL LIBRARY

SYMBOLOGY ADDED MAP

SYMBOLIZATION

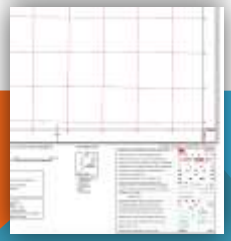
VISUAL SPECIFICATION

GENERALIZED MAP

EDITING & GENERALIZATION

DELINEATION GUIDE

MAP LAYOUT



MARGINAL & GRID INFORMATION

LAYOUT TEMPLATE & GRID TEMPLATE

CARTOGRAPHIC MAP

QUALITY ASSURANCE & PRINTING MAP

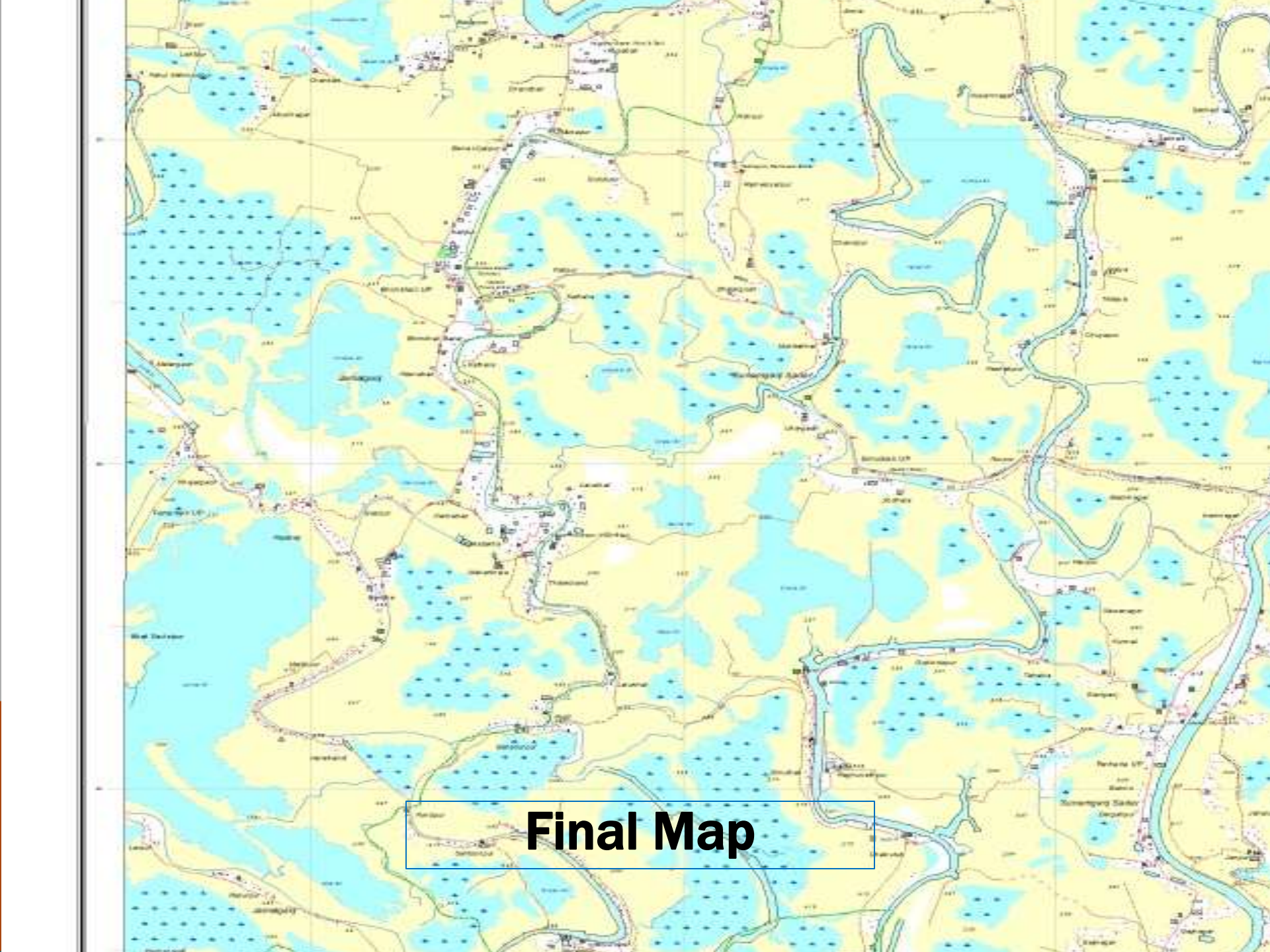
CARTOGRAPHIC SOFTWARE

- Arc GIS 10 - 45
- Production Mapping - 45

STORAGE SERVER

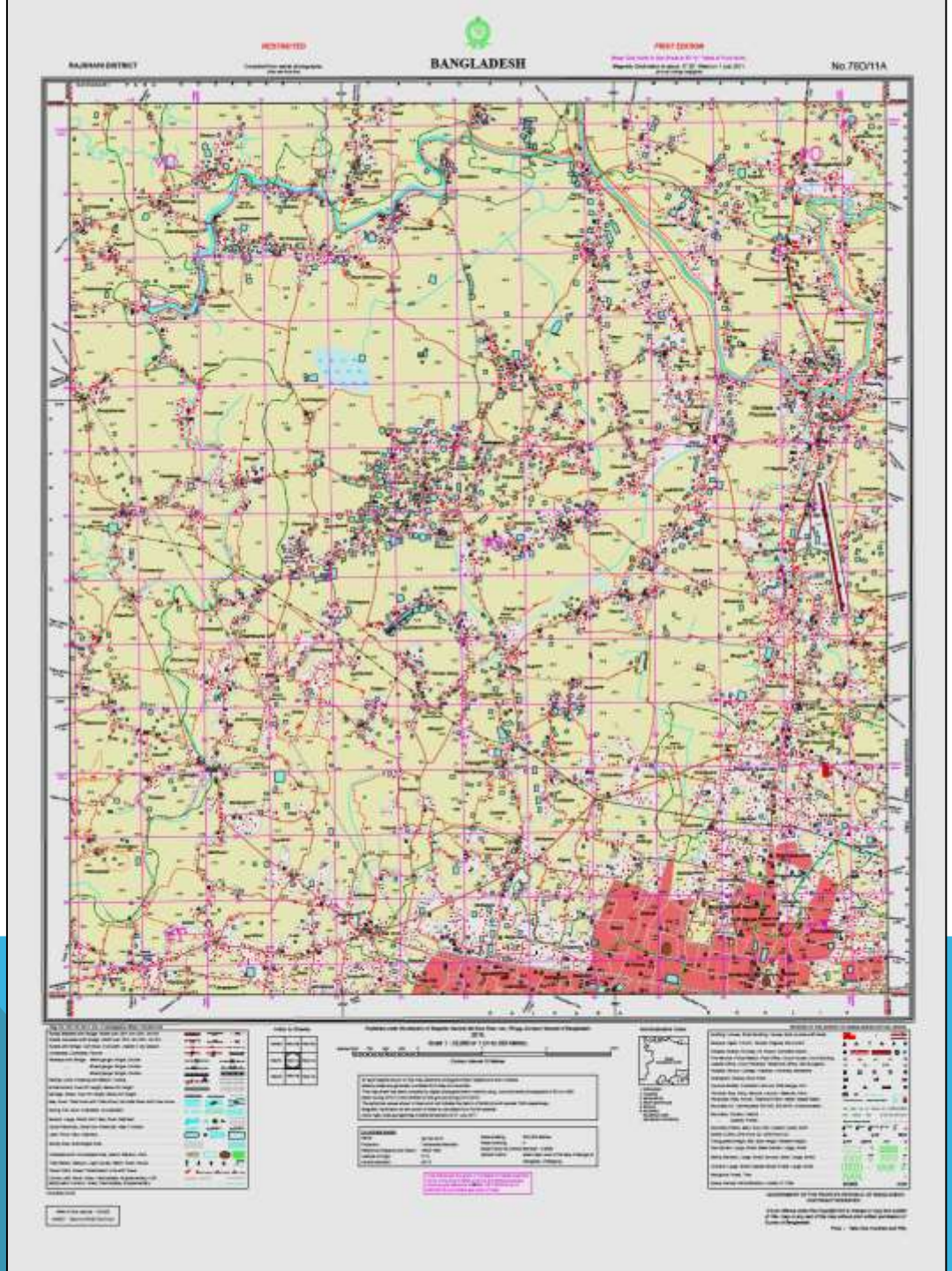
- **Model: HP 580 G-7**
- **Storage Capacity: 65 TB**

PRINTING PRESS


Final Map

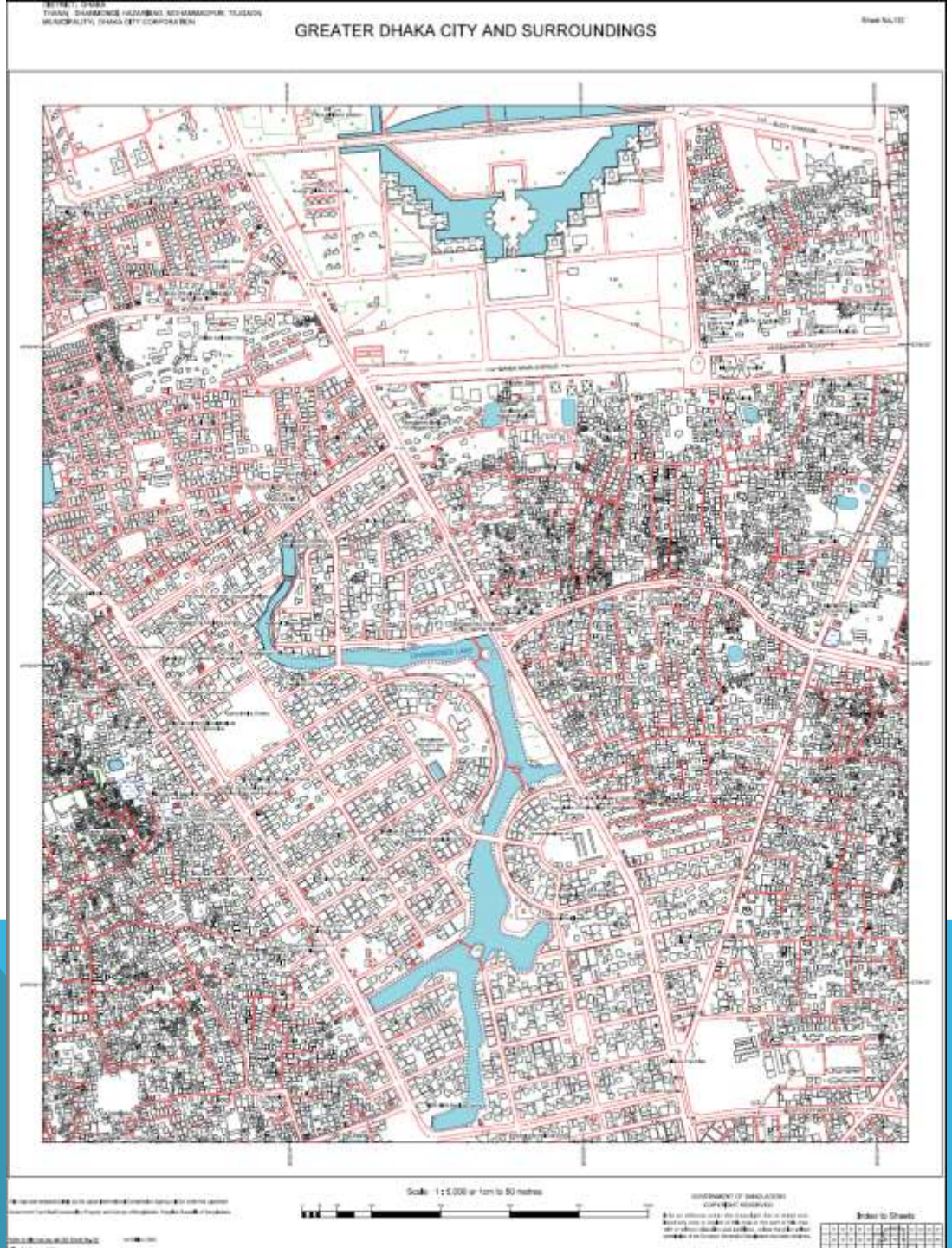
Publish Map

1:25,000 Scale



printed Map

1:5,000 Scale



Challenges-

- Updating of Existing Topographic Base Map and GIS Database (using Stereoscopic High Resolution Multispectral Satellite Imagery)
- Extraction of Features using Satellite Imagery by state of the art technology
- Creation of Precise Digital Terrain Model
- Creation of 3D Model using Remote Sensing Technology
- Administrative and logistic frame work

FUTURE PLAN

- Densification of GNSS CORS Network
- Establish National Spatial Data Infrastructure (NSDI)
- Aerial Survey using Unmanned Aerial Vehicle (UAV)
- Light Detection and Ranging (LiDAR) Survey
- Establishment of more tidal stations
- To carry out Gravity survey all over the country for determination of an accurate Geoid Model

THANKS FOR YOUR PATIENCE HEARING