

GIS

Technology Transfer for GIS

The JICA STUDY TEAM

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Trend of Geospatial Data in Japan

- ❁ The Basic Act on the Advancement of Utilizing Geospatial Information (hereinafter, "AUGI"), which is dubbed NSDI Act of Japan, was enacted on May 30, 2007.
- ❁ The purpose is to advance policies concerning AUGI in a comprehensive and well-planned manner by establishing basic principles and clarifying the responsibilities of State and local governments as well as defining basic elements for policies on AUGI, in view of the fact that AUGI is essential in establishing the economy and society in which the people can live their lives securely and abundantly at present and in the future.

(Quoted from GSI's URL:<http://www.gsi.go.jp/kokusaikoryu/kokusaikoryu-e30004.html>)

Geospatial data in Japan

- ❁ The whole land of Japan is covered at a scale of 1:25,000
 - ❁ The whole land of Japan is covered by about 4,300 sheets of national base map at a scale of 1:25,000.
 - ❁ Preparation and updating of these topographical maps are essential for understanding the topography of the land as it is.

- ❁ Any urban area is covered at a scale of 1:2,500
 - ❁ 1:2,500 scale map is based on urban planning base map which is developed by local government.
 - ❁ This data is compiled per prefecture unit.

Available Geospatial data in Japan

- ❁ Fundamental Geospatial Data
 - ❁ Consist of 13 items (Further information are described on next slide)
- ❁ Digital National Base Map
 - ❁ Digital National Base Map (Map Information)
 - ❁ Digital National Base Map (Ortho Image)
 - ❁ Digital National Base Map (Geographical Name Information)
- ❁ Digital Map
 - ❁ Digital Map 25000 (Map Image)
 - ❁ Digital Map 50000 (Map Image)
 - ❁ Digital Map 2500 (Spatial Data Framework)
 - ❁ Digital Map 25000 (Spatial Data Framework)
 - ❁ Etc.
- ❁ Thematic Map
- ❁ Etc.

What is Fundamental Geospatial Data

- ❁ In AUGI, state and local government are supposed to develop “Fundamental Geospatial Data (FGD)”.
- ❁ Fundamental Geospatial Data refers to positional information, in digital form, that belongs to features, which provide positional reference to geospatial information on a digital map, including geodetic control points, coastlines, boundaries of public facilities, administrative boundaries and others.

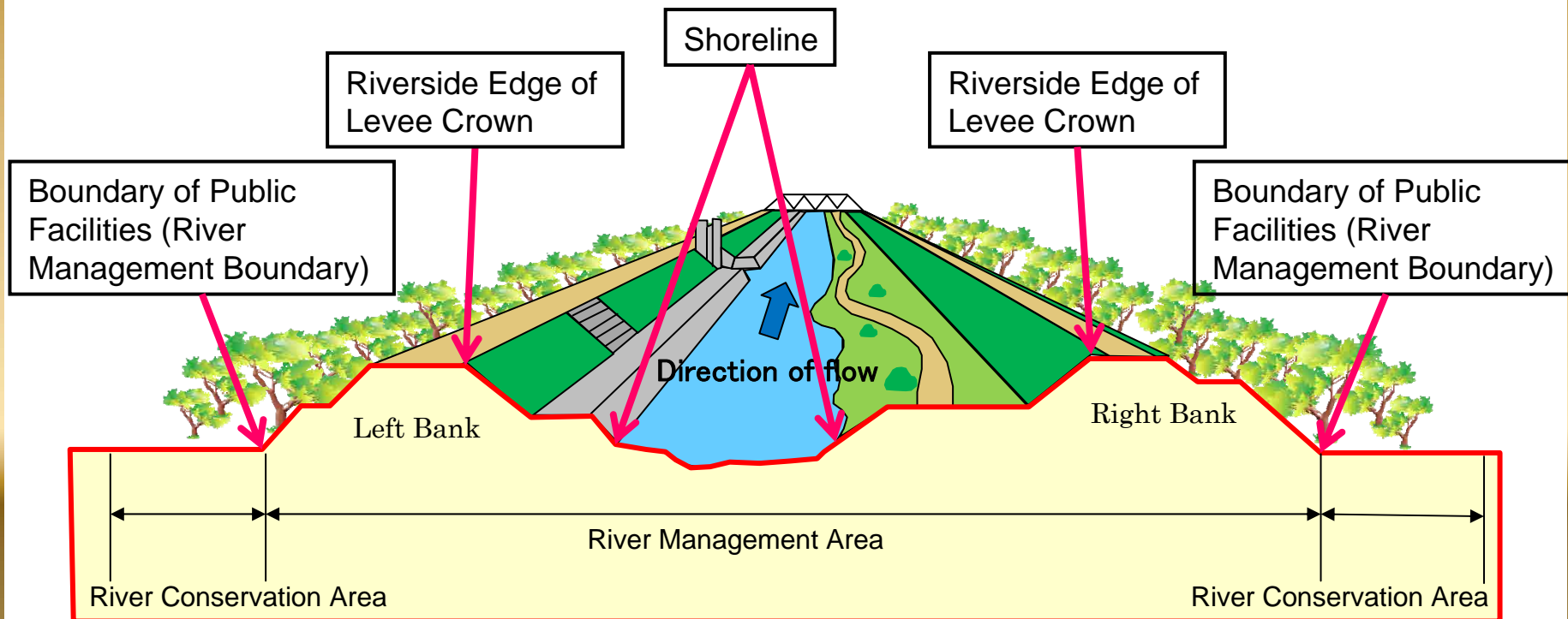
Fundamental Geospatial Data

- ❁ Seamless data for whole country
- ❁ JIS (Japan Industrial Standard) and/or ISO shall be adopted
- ❁ Distribution via Internet (Free of charge)
- ❁ Data which every one can use as base data for GIS
- ❁ Data is developed, revised and distributed by Geospatial Information Authority of Japan (GSI), other state governmental agencies and local government

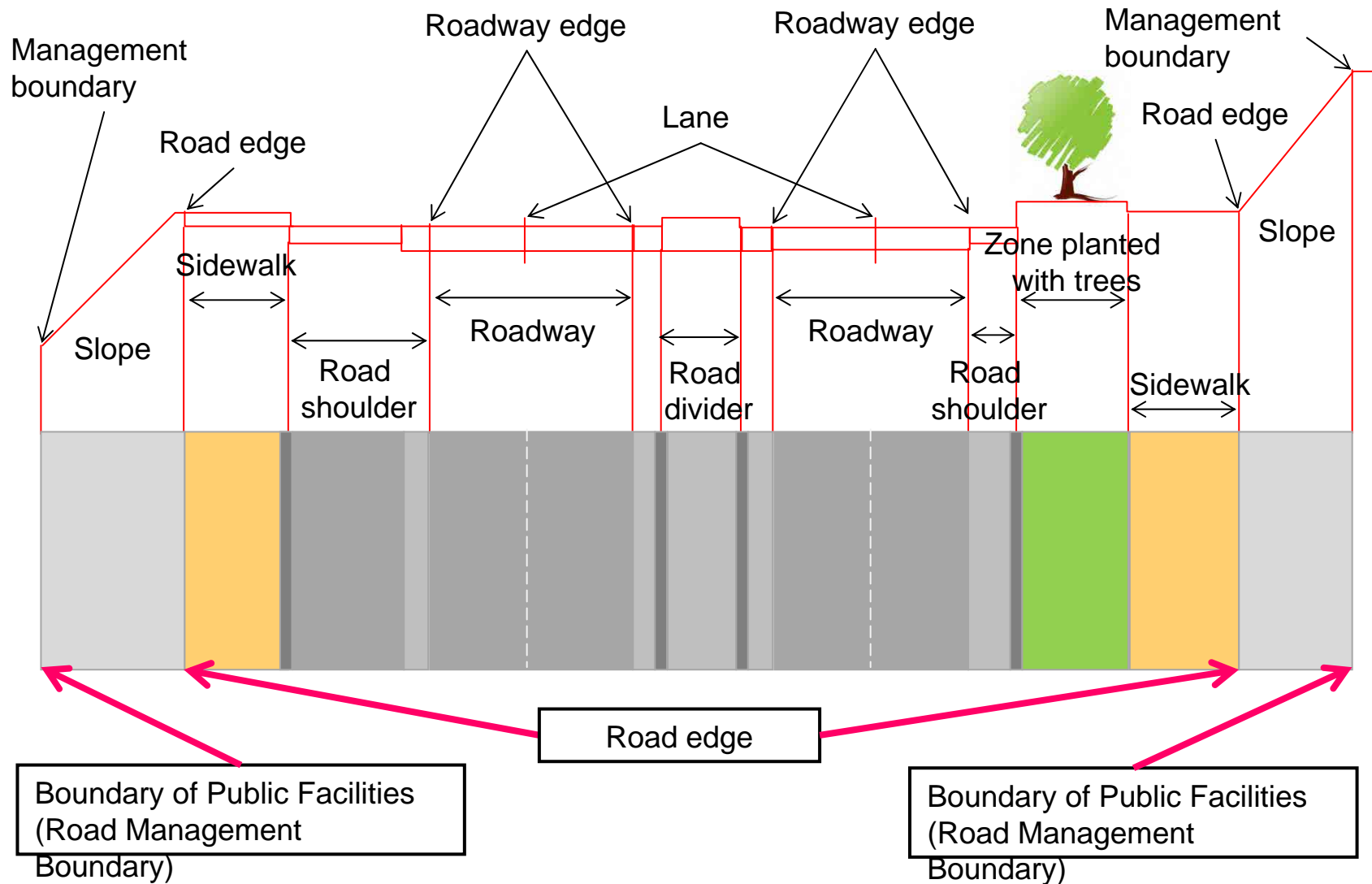
Items of Fundamental Geospatial Data

- ❁ Geodetic Control Point
- ❁ Coastline
- ❁ Boundary of Public Facilities (Road Management Boundary)
- ❁ Boundary of Public Facilities (River Management Boundary)
- ❁ Administrative Boundary (town level; with a point in each polygon)
- ❁ Road Edge
- ❁ Riverside Edge of Levee Crown
- ❁ Railroad Track Centerline
- ❁ Elevation (ground surface point where the elevation is known)
- ❁ Shoreline
- ❁ Building Outline
- ❁ Community Boundary (with a point in each polygon)
- ❁ Street Block Boundary (with a point in each polygon)

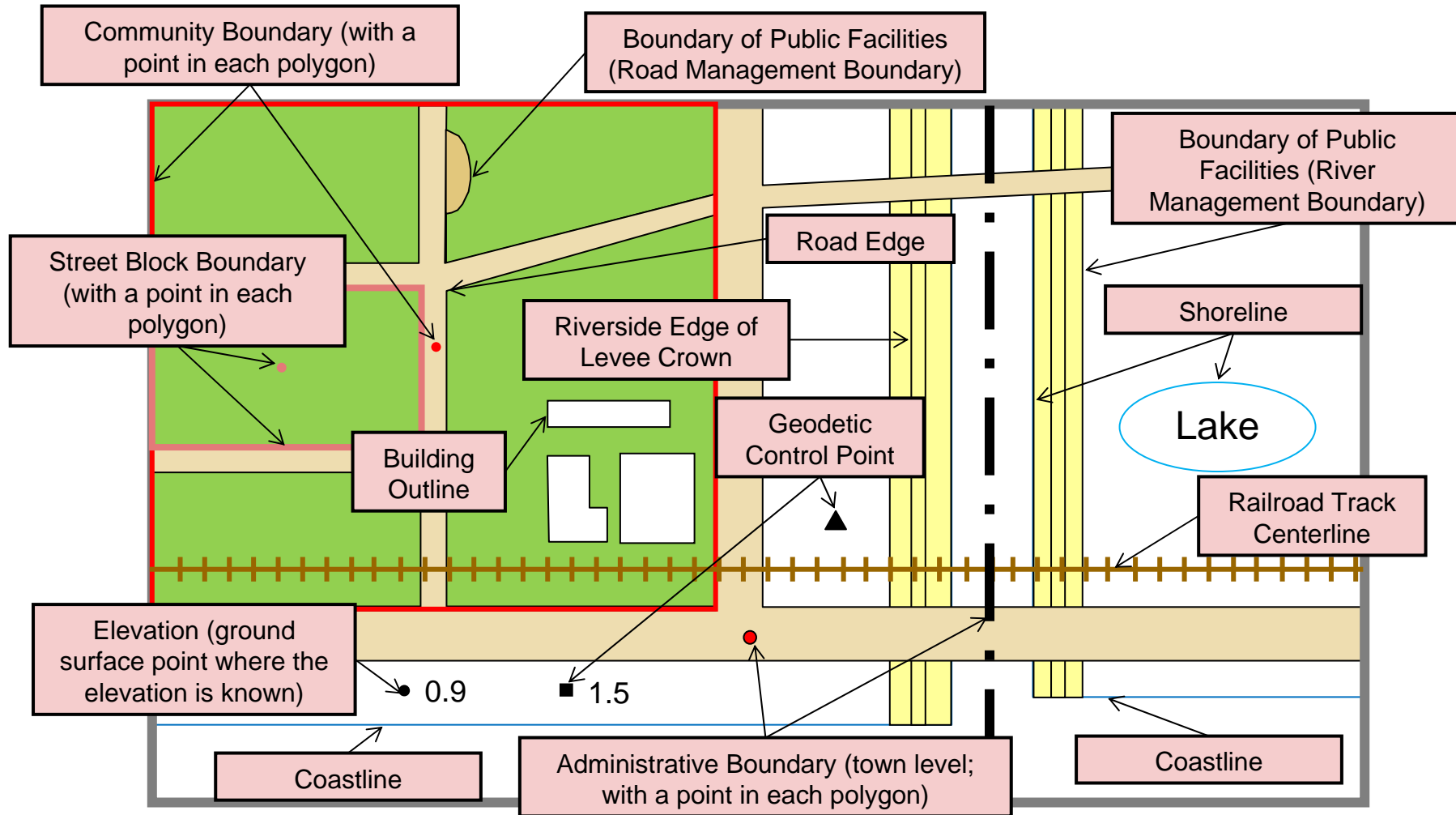
Data Acquisition sample (River)



Data Acquisition sample (Road)

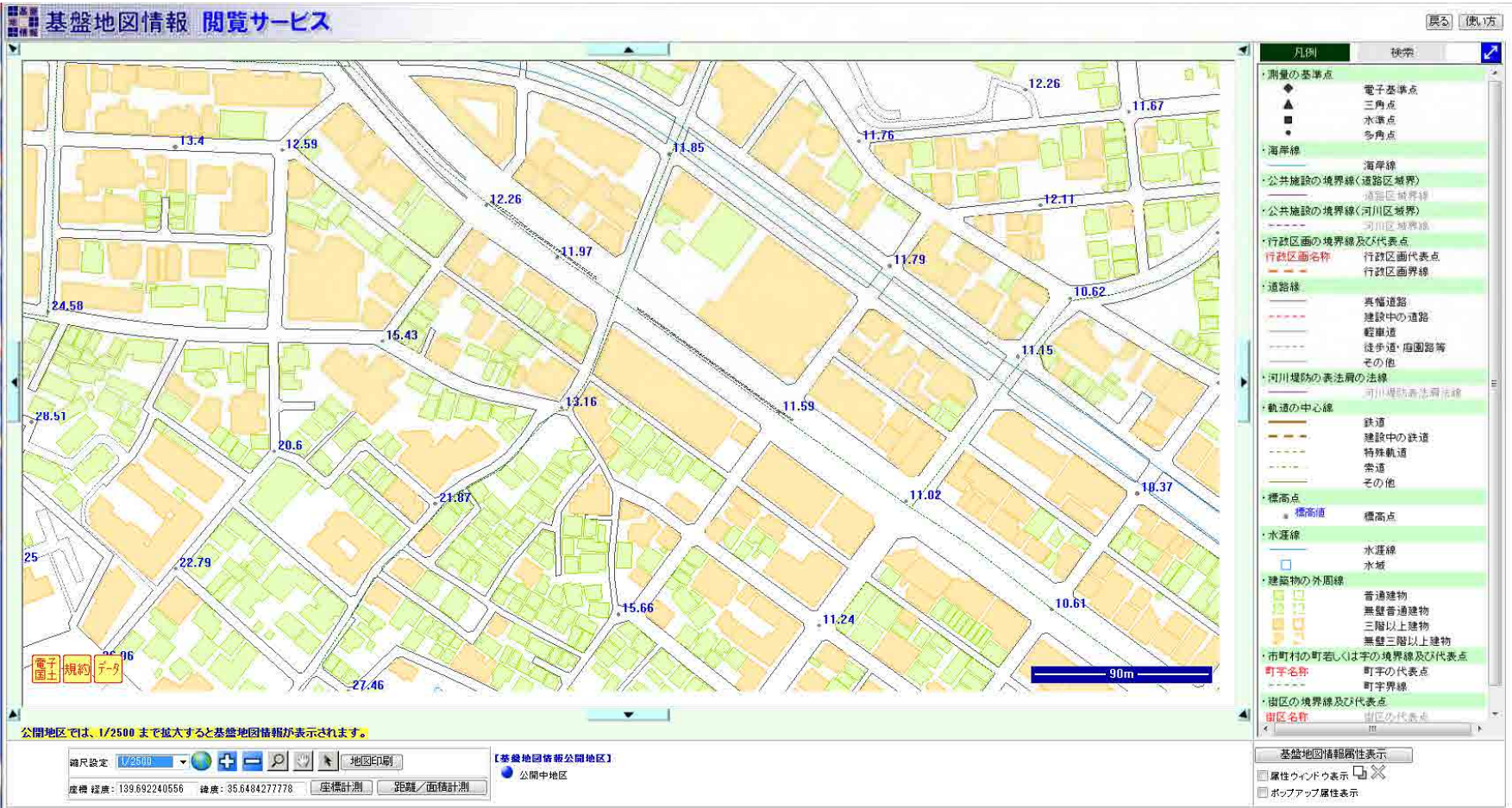


Display image of FGD items



Capture image of FGD (1:2,500)

基盤地図情報 閲覧サービス



公開地区では、1/2500 まで拡大すると基盤地図情報が表示されます。

【基盤地図情報公開地区】
● 公開中地区

縮尺設定: 1/2500

座標 経度: 139.692240556 緯度: 35.648427778

座標計測 距離/面積計測

基盤地図情報属性表示
 属性ウィンドウ表示
 ポップアップ属性表示

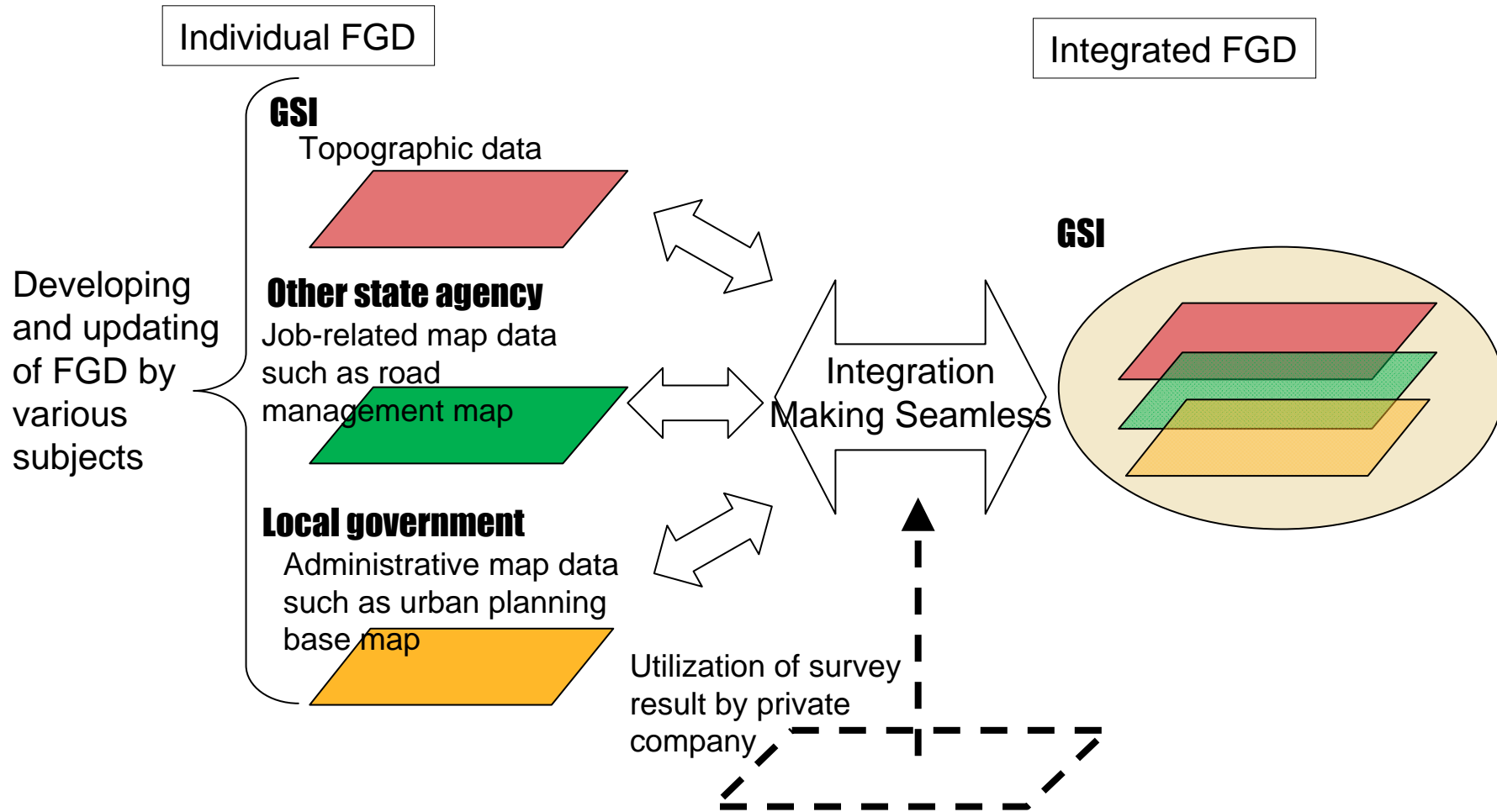
Capture image of FGD (1:2,500)



Accuracy of Fundamental Geospatial Data

- ❁ The positional information shall be a survey result that satisfies the following positional accuracy requirements:
 - ❁ Horizontal Accuracy: better than 2.5 m (Standard Deviation) in areas designated for urban planning or better than 25 m (SD) outside the designated areas; and
 - ❁ Vertical Accuracy: better than 1.0 m (SD) in areas designated for urban planning or better than 5.0 m (SD) outside the designated areas.

Concept of Developing and Updating System of Fundamental Geospatial Data (FGD)



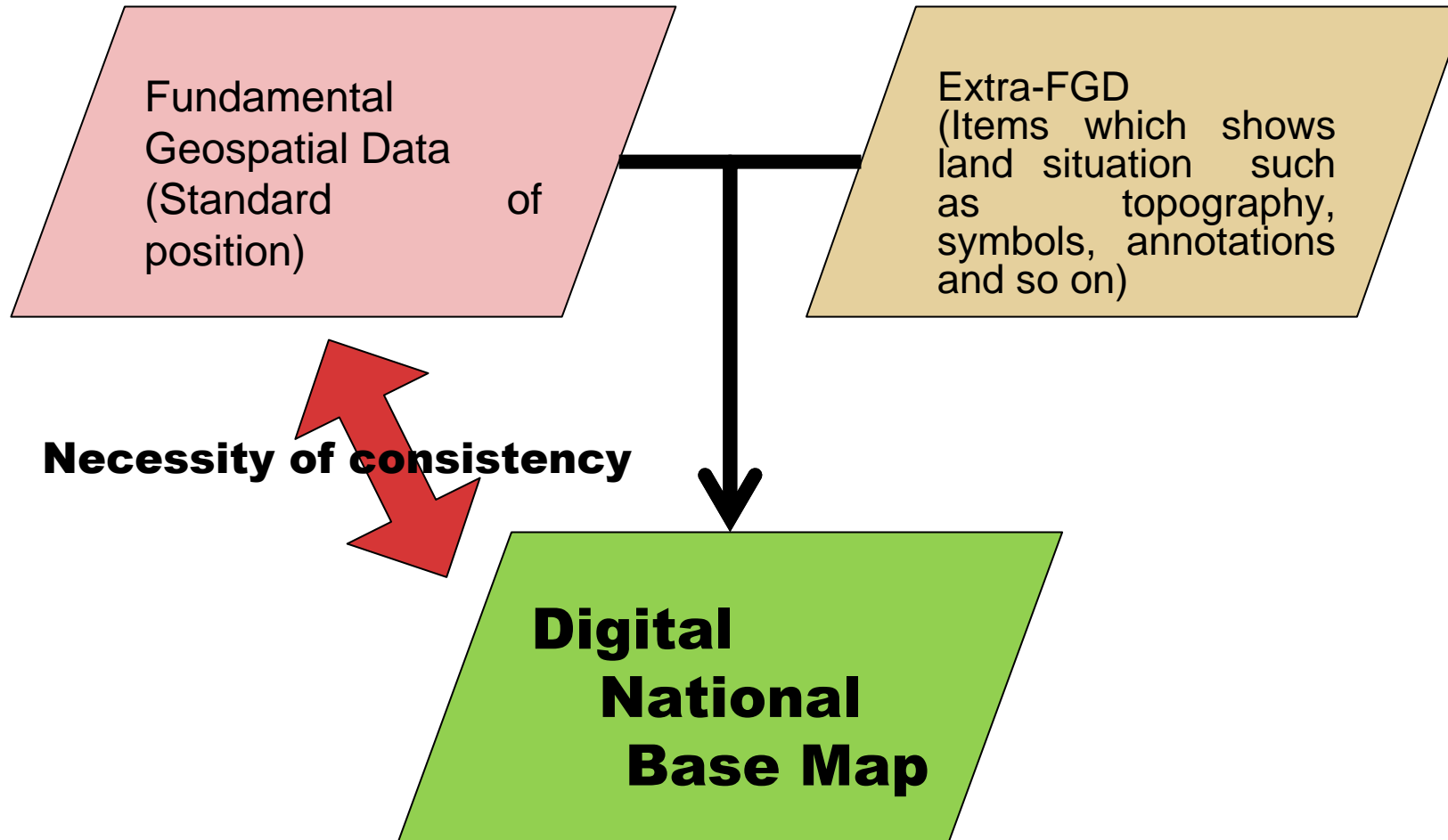
Let's visit FGD site

<http://fgd.gsi.go.jp/view/>

What is Digital National Base Map?

- ❁ GSI has developed and updated topographic map at a scale 1:25,000 as national base map until today.
- ❁ However, GSI started development of Digital National Base Map from year 2009 instead of paper maps because of enactment of the basic act (NSDI act of Japan) and changes of social needs.
- ❁ Digital National Base Map is fundamental information which shows current situation of whole country of Japan developed by government and is fundamental geographic spatial information for other maps.

What is Digital National Base Map?



Type of Digital National Base Map

- ❁ Digital National Base Map (Map Information)
- ❁ Digital National Base Map (Ortho Image)
- ❁ Digital National Base Map (Geographical Name Information)

Digital National Base Map (Map Information)

- ❁ This is alternative to topographic paper map at scale of 1:25,000
- ❁ This data has consistency with FGD of items and information of topographic map at scale of 1:25,000
- ❁ This will be used for;
 - ❁ Development and conservation of territory
 - ❁ Regional policy
 - ❁ Disaster prevention
 - ❁ Disaster response
 - ❁ Etc.

Digital National Base Map (Ortho Image)

- ❁ Ortho-rectified image which are used aerial photo taken at a scale of 1:10,000 or 1:20,000 and digital elevation model
- ❁ This will be used for;
 - ❁ Management of territory
 - ❁ Urban planning map
 - ❁ Fundamental Geospatial Data
 - ❁ Development of Digital National Base Map
 - ❁ Etc.

Digital National Base Map (Geographical Name Information)

- ❁ Digitalized data of geographical name such as mountain, river, prefecture, city, village and so on
- ❁ This will be used for;
 - ❁ Key for searching place
 - ❁ Etc.

Let's visit site

<http://portal.cyberjapan.jp/index.html>

Digital Map

Type	Media	Price (Yen)
Digital Map 25000(Map Image)	CD-ROM	7500
Digital Map 50000(Map Image)	CD-ROM	7500
Digital Map 200000(Map Image)	CD-ROM	7500
Digital Map 10m Grid(Elevation of Active Volcanos)	CD-ROM	7500
Digital Map 5m Grid(Elevation)	CD-ROM	7500
Digital Map 50m Grid(Elevation)	CD-ROM	7500
Digital Map 250m Grid(Elevation)	CD-ROM	7500
Digital Map 2500(Spatial Data Framework)	CD-ROM	7500
Digital Map 25000(Spatial Data Framework)	CD-ROM	7500

Digital Map

Type	Media	Price (Yen)
Digital Map 25000(Administrative Boundary & Coastline)	CD-ROM	7500
Digital Map 25000(Geographical Names & Public Facilities)	CD-ROM	7500
Digital Map 25000(Land Condition)	CD-ROM	7500
Digital Map 5000(Land Use)	CD-ROM	7500
Digital Map 5000000 Japan and Its Surroundings(Integration)	CD-ROM	7500
Digital Data 2km Grid(Geoidal Height)	Floppy	6000
National Atlas of Japan(CD-ROM edition)	CD-ROM	7500

Digital Map 25000 (Map Image)

- ❁ Scanned topographic map at a scale of 1:25,000
- ❁ Tiff format
- ❁ 0.1mm / pixels (254 dpi)
- ❁ 64 map sheets / CD-ROM
- ❁ 75 CD-ROMs cover whole of Japan

Digital Map 25000 (Spatial Data Framework)

- ❁ This data has equivalent accuracy with topographic map at a scale of 25,000.
- ❁ Data is consist of 10 items.

Center line of road	Administrative boundary
Center line of railway	Geodetic control point
Center line of river	Geographical name
Shoreline	Public facility
Coastline	Elevation

- ❁ Data for a prefecture is set in a CD-ROM

Digital Map 2500 (Spatial Data Framework)

- ❁ This data has basically equivalent accuracy with topographic map at a scale of 1:2,500.
- ❁ Data is consist of the following items which are shown in a urban planning map at a scale of 1:2,500 developed by local government

Administrative boundary	Coastline
Center line of road	Geodetic control point
Center line of railway and station	Public building
Area such as park, school, etc.	Street block boundary (Only in the 3 largest cities)
Shoreline	

- ❁ Data for a prefecture is set in a CD-ROM

Available Paper Map

Type of Map	Size	Num. of colors	Price (Yen)
1:10.000 Topographic Map (folded)	52cm* 74cm	5	450
	52cm* 74cm	10	550
1:25.000 Topographic Map	46cm* 58cm	3	270
(folded)	84cm* 59cm	6	500
1:50.000 Topographic Map	46cm* 58cm	3	270
	46cm* 58cm	4	290
1:25.000 Land Use Map	46cm* 58cm	6	320
(folded)	64cm* 94cm	10	700
1:50.000 Land Use Map	46cm* 58cm	8	350
	64cm* 94cm	8	590
Etc.			

Further information :http://www.gsi.go.jp/ENGLISH/page_e30032.html

Access and Order System

- ❁ Fundamental Geospatial Data
 - ❁ Everyone can access to the site. But, to download the data, user registration is required.
 - ❁ In any case of downloading the data, the usage application must be submitted to GSI
- ❁ Digital National Base map
 - ❁ Everyone can access to the site.
- ❁ Digital Map
 - ❁ CD-ROM or Online
 - ❁ Main Book Stores and Map Dealers in Japan
- ❁ Paper Map
 - ❁ Main Book Stores and Map Dealers in Japan

Quality Control in Japan

- ❁ Guideline for public survey
 - When we conduct public survey, we must hew to the guideline.

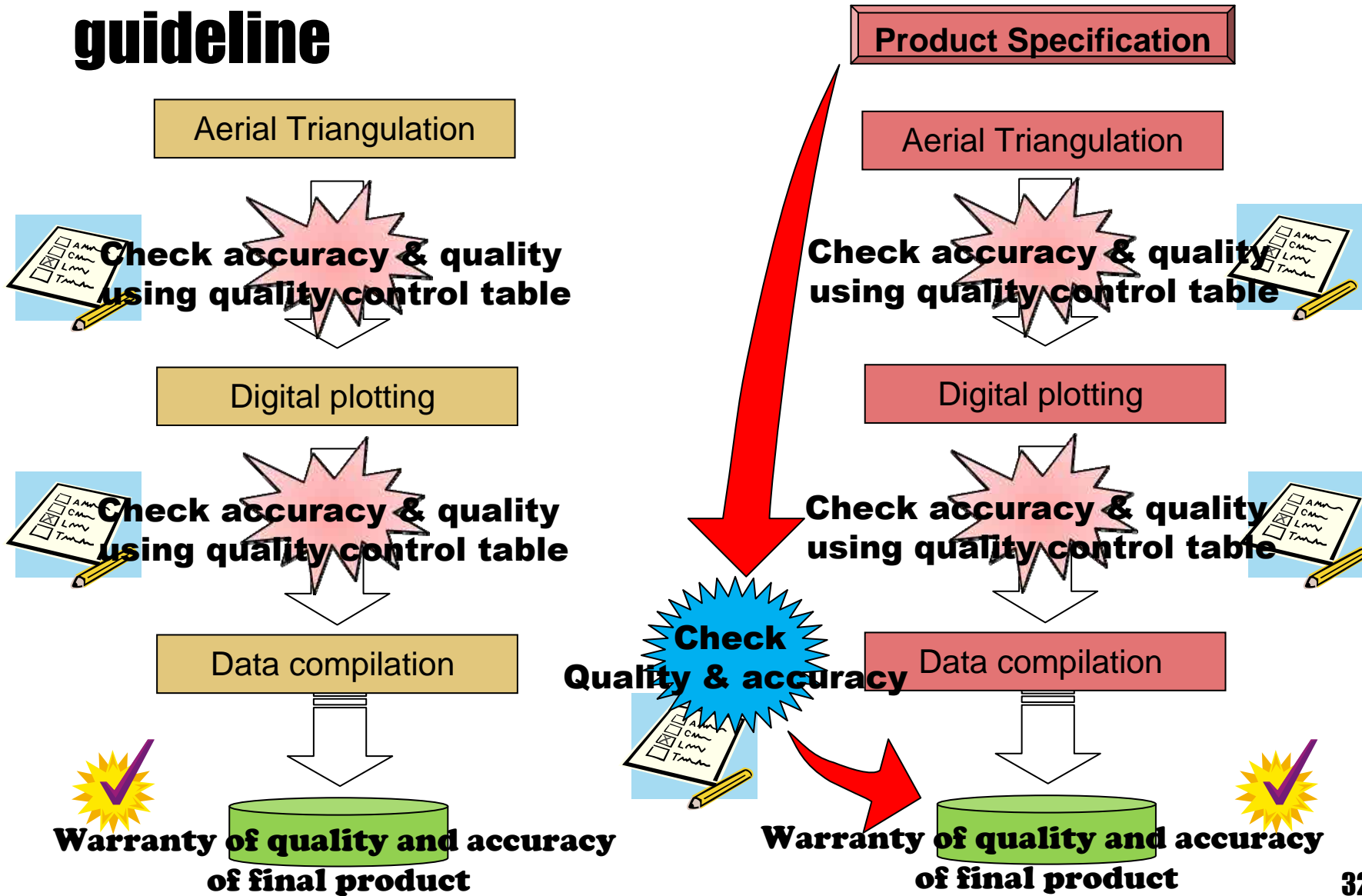
- ❁ Target map scale of the guideline: 500~10000

- ❁ Quality control table will be made for each process.

New Guideline in Japan

- ❁ Guideline for public survey was revised fully in year 2008.
 - ❁ Organization which plans public survey must prepare a product specification.
 - ❁ Means of Survey by new technologies such as laser profiling were included.
 - ❁ Some manuals were integrated into the guideline.
 - ❁ All final product must be digital
 - ❁ Etc.

Concept of difference between new and old guideline



Sample of quality control table

Form 1-2

Quality Control Record for Aerial Triangulation (Sample)

Name of operation/ area (region)		Workload				Adjustment method		Work period				Executing organization		Work leader		○○○○ Seal			
Operation ○○ Area ○○		Number of paths		Number of scenes		Bundle method		From year/month/day		To year/month/day				Checker		○○○○ Seal			
Observation path name	Scene ID	Operation mode	Number of models	Number of control points for orientation		Number of points excluded from computation		Control point residuals				Polynomial method				Independent model method or bundle method			
								Planimetric position		Elevation		Tie point discrepancy		Residuals of pass points and tie points					
				Planimetric position	Elevation	Planimetric position	Elevation	Standard deviation	Maximum	Standard deviation	Maximum	Standard deviation	Maximum	Standard deviation	Maximum	Standard deviation	Maximum	Standard deviation	Maximum
								m	m	m	m	m	m	m	m	µm	µm		
Digital plotter				Operator	○○○○		In-house check period		Man-days		___ man-days		Re-measurement rate		%		Remarks		

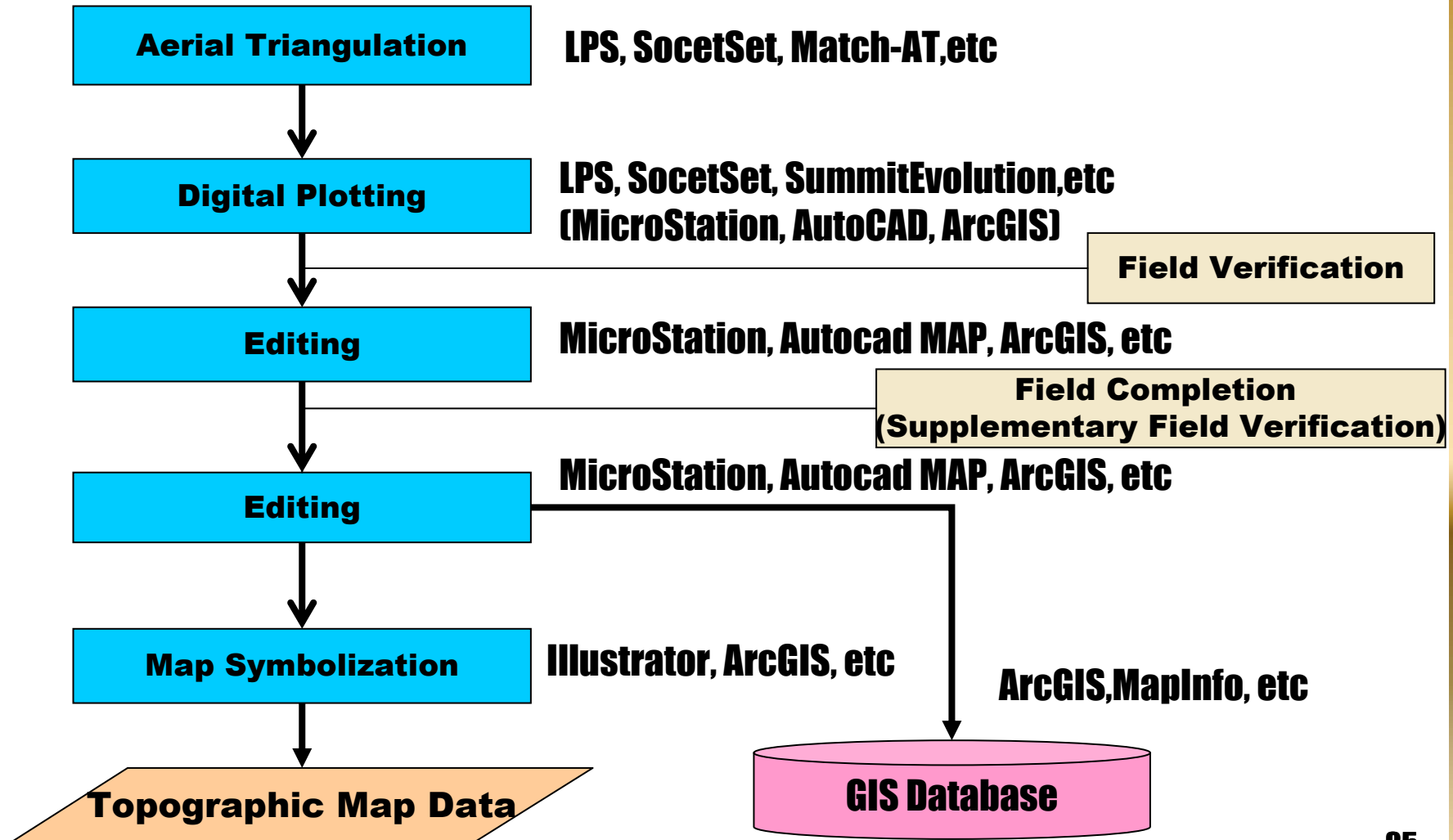
Note: 1. Units for the residuals of pass points and tie points: m for an independent model; µm for the planimetric position in the bundle method
 2. If some points are excluded from computation, indicate the reason in the remarks column.

To disseminate Geospatial data (a case in Japan)

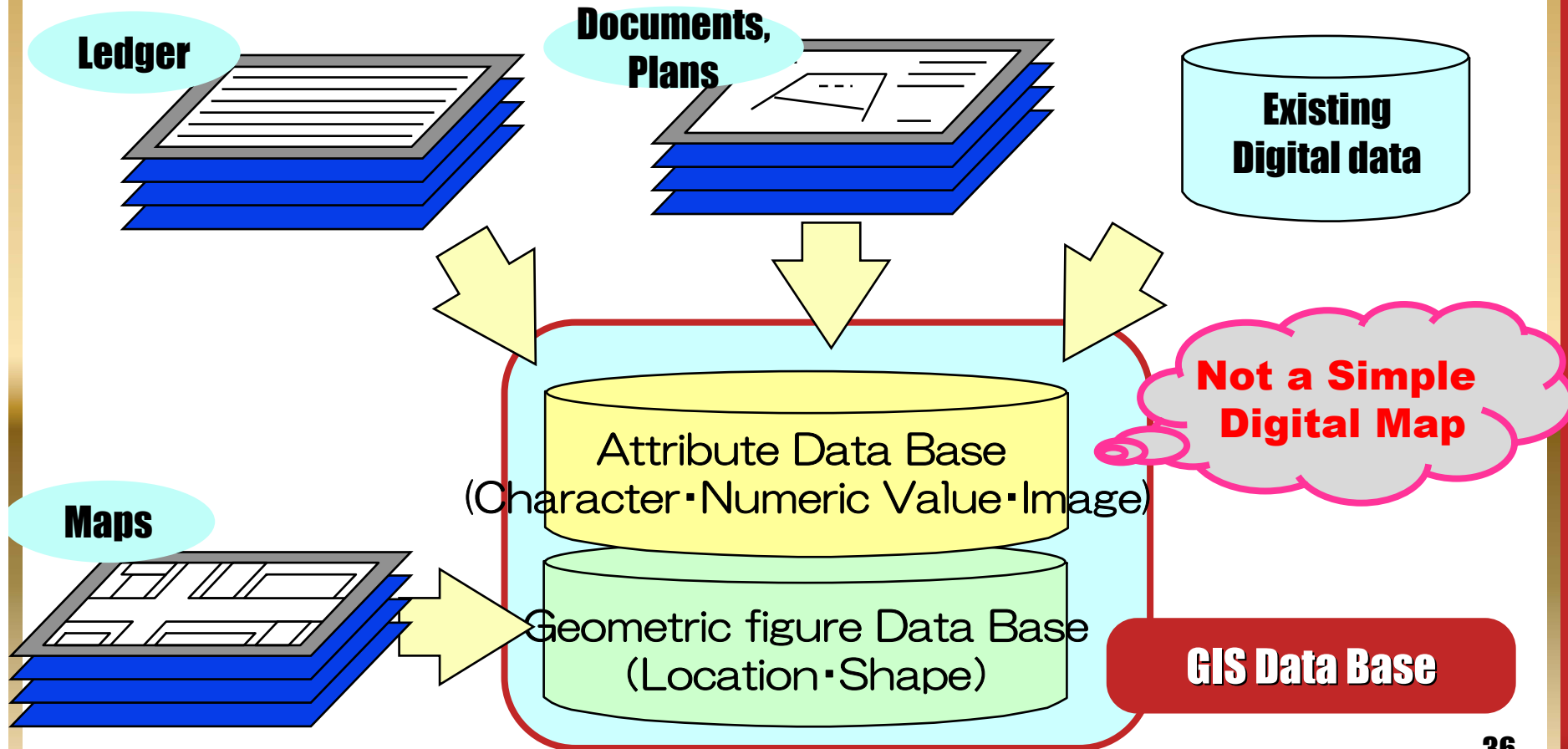
- ❁ To utilize and disseminate geospatial data and its technology for nation and their life, G-Expo is held by government in every year.
- ❁ Not only governmental agencies but also private companies join in the G-Expo.

<http://www.g-expo.jp/index.html>

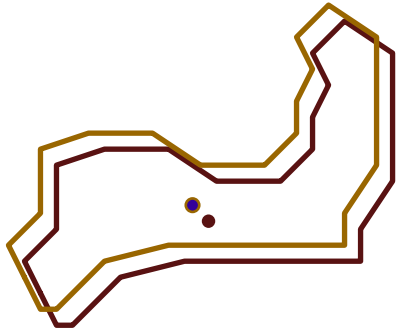
Work Flow of topographic vector data



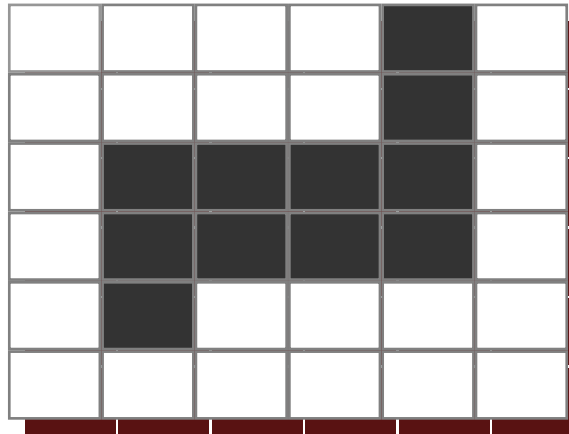
GIS Data Base is fused data base together spatial information which shows location and shapes, and data base which has characters , numeric values ,images and so on.



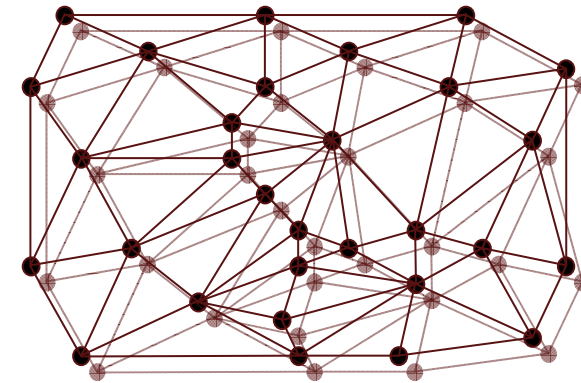
Type of GIS data



Vector data



Raster data

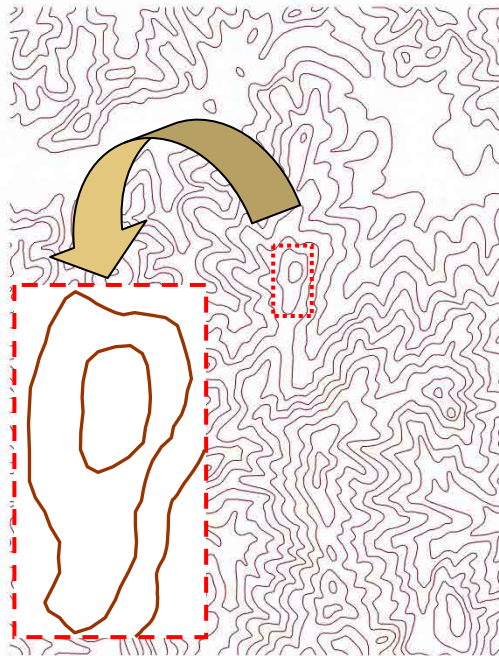


TIN data

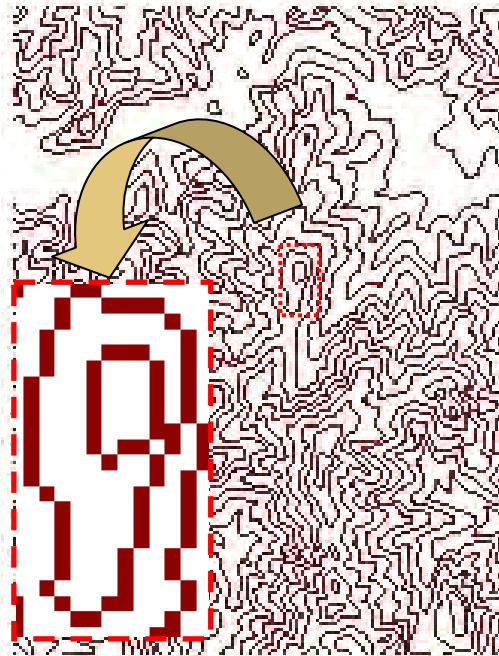
TIN : Triangulated Irregular Network

Type of GIS data (Sample)

Vector



Raster

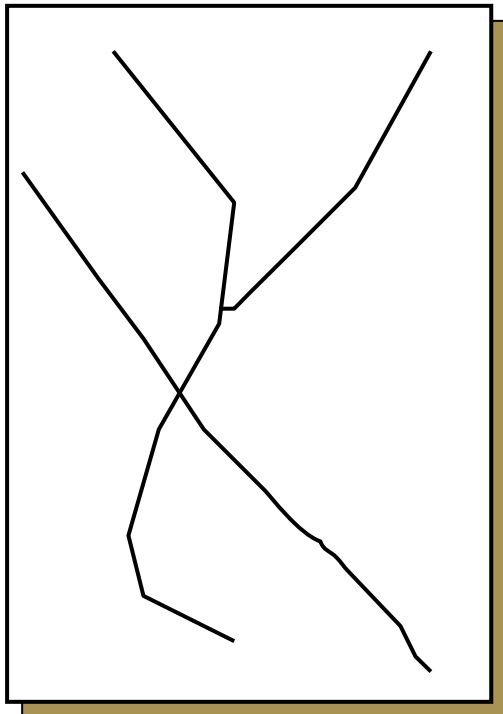


TIN

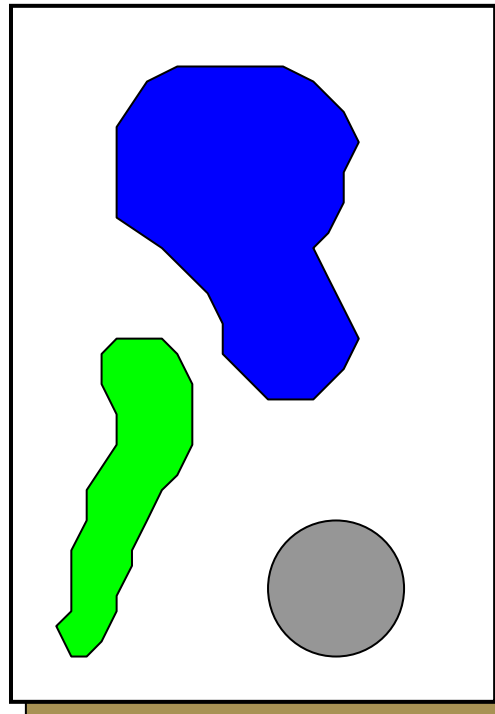


Type of vector data

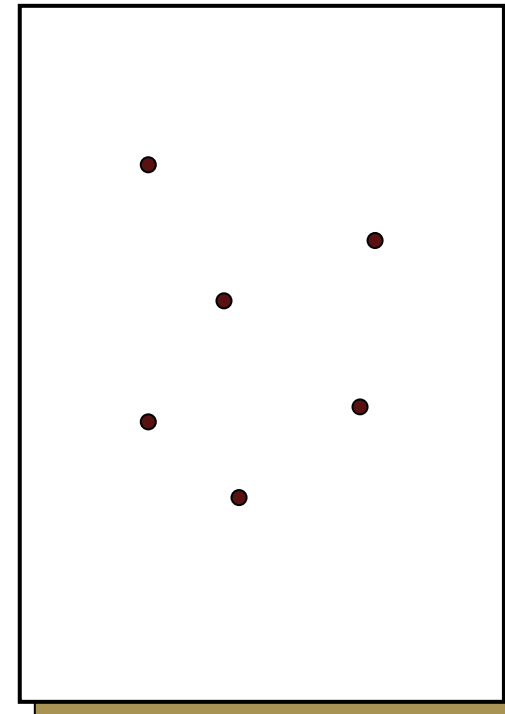
Line



Polygon



Point



Data format in ArcGIS

- ❁ Shape file
 - ❁ General, simple and well-known format for GIS and other software can open directly or import this into other software easily.
 - ❁ Easy to give and take the data with other users who do not have ArcGIS.
 - ❁ Special character is not recognized in attribute table.
- ❁ ArcInfo coverage
 - ❁ ArcGIS's unique format. Any software can open directly. (As far as I know, ERDAS IMAGINE can open this)
 - ❁ However, this format is not used widely now. Old format. This can be edited in ArcInfo Workstation (command base interface) only.
 - ❁ Special character is not recognized in attribute table.

Data format in ArcGIS

- ❁ Geodatabase
 - ❁ ArcGIS's unique format. Any software can open directly. (As far as I know, ERDAS IMAGINE can open this)
 - ❁ It is more complicated to manage than the shape file.
 - ❁ However, there are many functions to manage data such as topology management.
 - ❁ Special character is recognized in attribute table
 - ❁ Necessity of exporting for other users who do not have ArcGIS.

From CAD to GIS data

🌸 Line data

🌸 Polyline \Rightarrow Line data

🌸 Point data

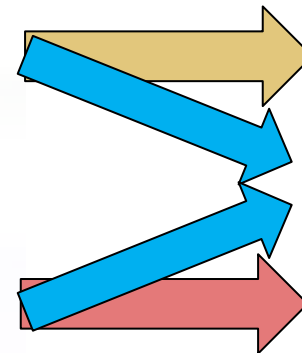
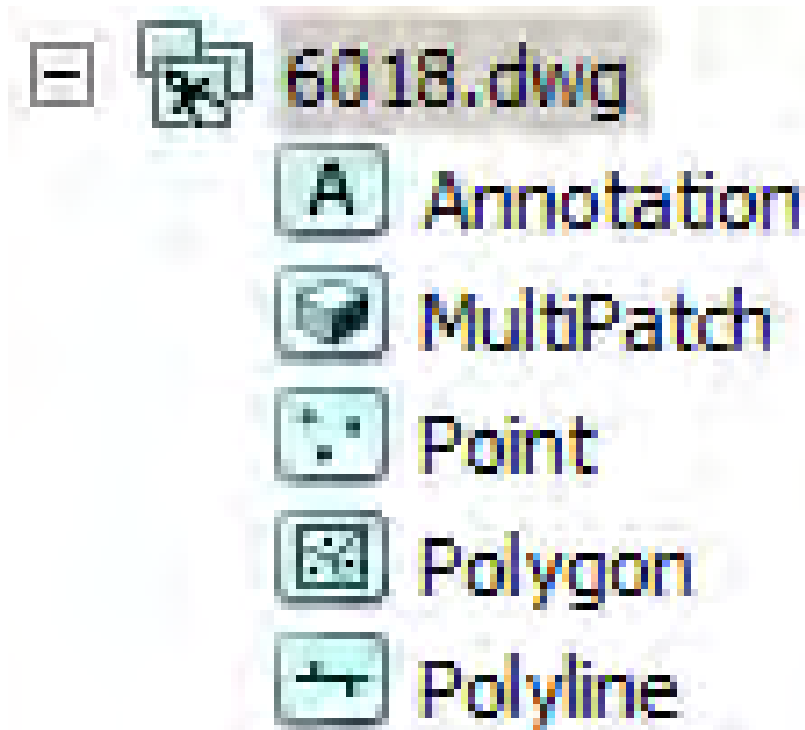
🌸 Point \Rightarrow Point

🌸 Polygon data

🌸 Polyline and point \Rightarrow Polygon data

CAD Data

🌸 Structure of CAD in ArcGIS



Point Data

Polygon Data

Line Data

GIS Data Specification in the Project

- ❁ We should determine GIS data specification to be created from our 1/50,000 topographic map

E N D

Thank you for joining my lecture

