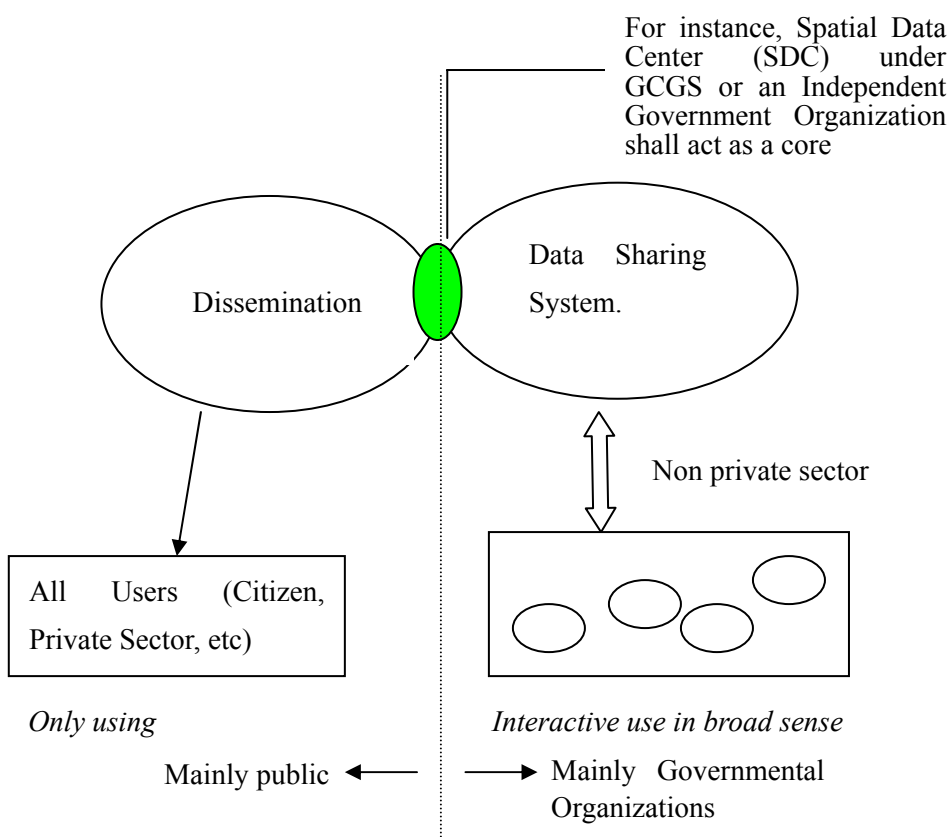## Chapter 7.   Dissemination of Geographic Information and Building a Sharing System

The newly created digital topographic map data of scale 1:50,000 will expectedly contribute greatly to political decision-making in Georgia's land development and preservation for not only GCGS but also for all the other ministries.   Thus, an effective and practical system for the optimum dissemination of geographic information including this and building a sharing system are very important.   Data dissemination will include selling of spatial data and its promotion for extensive use to public.   Similarly, the Data Sharing System shall include interactive use of spatial data among the governmental organizations, especially among the Ministries.   To make these two components successful, a responsible organization, for instance, Spatial Data Center (SDC) needs to act as a core for handling the spatial data.


Concept of Dissemination and Sharing of Geographic Information

Thus, along with the description of Spatial Data Center (SDC), this chapter describes the two (2) main components; Dissemination of Geographic Information and Data Sharing Systems.

7.1.   Spatial Data Center

For the efficient and timely dissemination of Topographic data of this Project as well as other spatial data available or planned to be created within the Ministry to the data users, an organization for controlling the data would be essential.   This organization will also be responsible for updating all the spatial data whenever required.   Thus, this will help in bringing uniformity in various spatial and will promote their dissemination.   Designated organization, for instance, can be named as "Spatial Data Center (SDC)".

Throughout the realization of this Project, GCGS has been involved.   At present, the Agency is the legal identity of Ministry of Environment to create spatial data for GCGS and other services of this Ministry.   Considering this, the Study Team's proposal is to establish SDC under GCGS or under the Agency as presented as **Option1** and **Option2** in the below Figure.   Depending upon the Georgian Government's decision, it can be established as an independent organization as **Option3** enabling direct communication with other Ministries.

Option1:SDC under GCGS   **Option2**: SDC under SIA   **Option3:** SDC as Independent Organization
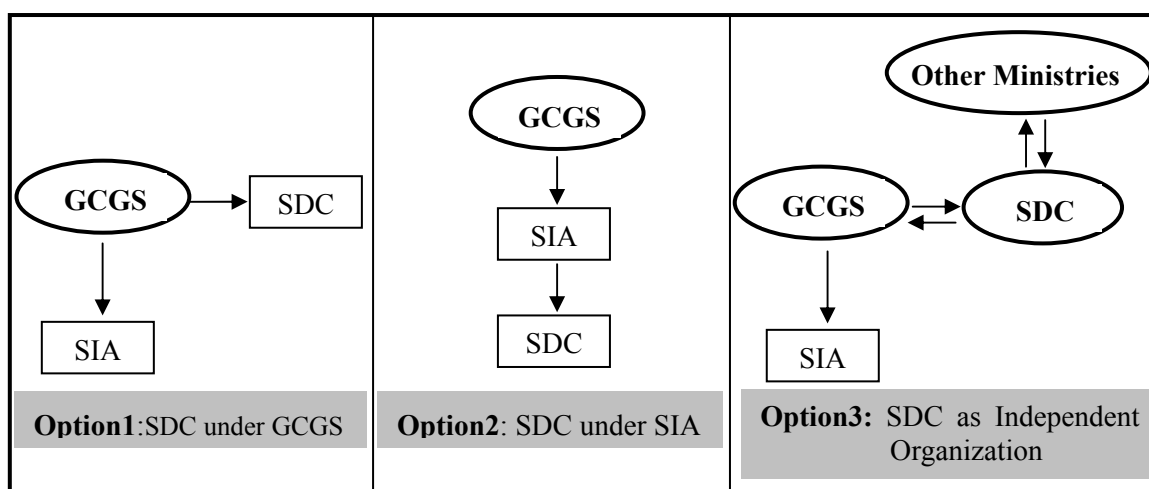
※The Agency (SIA)

Figure 7.1.1   Options for Establishing the Spatial Data Center (SDC)

7.1.1. Systemizing Spatial Data Center

In order to systemize the Spatial Data Center (SDC), followings need to be underlined:

a)   Specific role of this center in spatial data creation and maintaining.

b)   Formulation of system for updating map data.

c)   Feasible infrastructure that will be able to prepare tentatively:

・   Raising the Project team

・   Composition of hardware to work practically

- Software to be installed.

Budgetary plan for the preparation of the above points needs to be included in the Government Action plan including Bill, if required for the realization.

7.1.2. Functions of Spatial Data Center

The major functions of Spatial Data Center (SDC) are underlined as follows:

- Promotion for data dissemination
- Facilitating for data sharing systems
- Creating, Maintaining and updating spatial data
- Setting standards for spatial data
- Others.

Moreover, in case of SDC functioning as **Option3**, it will have additional responsibility of acting as central body for coordinating among the various Ministries regarding the spatial data.

7.2. Dissemination of Topographic Data (including GIS Database)

For the wider use of spatial data including this Topographic data, an attempt of its liberalization would be necessary. For this, the Study Team proposes selling and the circulation system of the geographic information. Selling of spatial data should be opened to all related organizations whichever wants to buy the data. However, the points like types of data to be sold and clear cut pricing policy need to be clarified. Similarly, Need appraisal shall be conducted time to time to know the demand trend of spatial data users. Moreover, promotional activities such as presenting demonstrations using the model systems created under this Project will be necessary. These all will also help to maintain and to carry out activities at the SDC effectively.

For selling Spatial Data, two (2) cases are basically discussed; direct management by GCGS, and consignment to the agent including private enterprise.
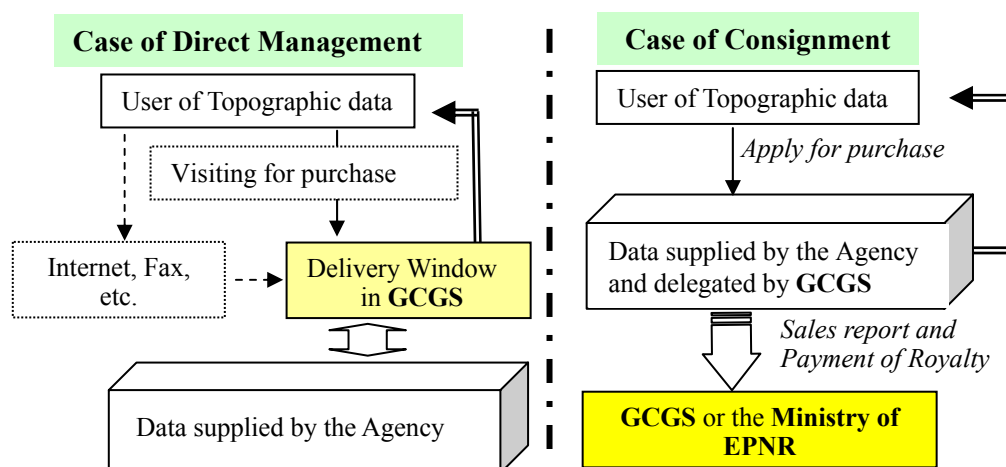
Figure 7.2.1   Cases of Dissemination of Topographic Data

With the case of the direct management, GCGS performs maintenance of 1:50,000 topographical maps as well as GIS database so produced by the Agency as a sole organization of unifying all the geographic information.   In addition, GCGS distributes the topographic data free of charge or with payment upon the requests by playing a central role of building positively a system by which GCGS shall conduct distribution of the mapping products.

With the case of entrusting to the subordinate body like the Agency on the other hand, the Agency collectively performs sale and the supply upon the order from a user. Then, the Agency will have a obligation to submit a sales report concerning numbers of distribution on a regular basis to GCGS or the ministry.   In addition, the consignee is to pay a copyright royalty, too.

Items to be sold: Even from this Project, there are different forms of Data products; such as, Printed maps, Digital Maps, GIS database, etc.   And, with the concept of Spatial Data Center, various products will be piled in future.   Thus, it will be essential to decide about the Product types to be disseminated through selling.

7.2.1. Need Appraisal

In order to assess the demands for geographic information to be produced under this Project, the Study Team conducted Need Appraisal through questionnaire to various

organizations.   The sample of questionnaire is presented in Appendix@.   Altogether, the response from 16 organizations was received, which is presented in below table. From the above table, following could be inferred:

a) Geographic data has been used in all the responded organizations and out of them; eleven (11) organizations use it very often.

b) Both printed maps and digital data have been used in these organizations.

c) All organizations have expressed their intention and plans for use of Geographic data in future.

d) Almost all organizations (15 out of 16) have expressed intention to buy the Geographic data in future, if available.

e) As expectation and request towards GCGS, Governmental organizations (Ministries) have emphasized to build up the system to share the database at inter-ministry level.   And, other organizations have expressed for faster supply of data and build a systematic database management.

Table 7.2.1   Result of User's Stance on the Usage of Map Data

S.N.	Organization	Frequency of Maps Usage	Type of used Maps	Prefered Map Format	PC and LAN	Expectation from SGC for more Extensive Data Use
1	Min. of Environmental P. & N,R, Dept of Protected Areas	◎	Printed Map 1/10-25,000	Digital CD, DVD	PC : ○ LAN: ok	Conduct data sharing
2	Min. of Environmental P. & N,R, Dept of Land Resources	◎	Printed Map all scale	Printed map, Digital CD, DVD	PC : ○ No Internet	Conduct data sharing
3	Min. of Culture, Monument, Protection and Sports	◎	Printed or Digital all scale	Printed map, Digital, Internet	PC : ○ LAN: Limited	Conduct data sharing
4	Min. of Education & Science	◎	Printed Map 1/10,000-25,000	Digital CD, DVD	PC : ○ LAN: ok	Manage database systematically
5	Min. of Education & Science, EMIS	○	Printed Map small scale	Digital CD, DVD	PC : ○ LAN: ok	Quick supply, technical support
6	Min. of Education Polytechnic College	◎	Printed Map 1/10,000-25,000	Printed map, Digital CD, DVD	PC : **X** LAN: No	Conduct data sharing
7	Min.of Agriculture Land Management Dept.	◎	Digital 1/5,000-10,000	Digital CD, DVD	PC : ○ LAN: ok	Conduct data sharing
8	Min.of Defense	◎	Printed Map 1/50,000	Printed map	PC : ○ LAN: No	Quick supply, technical support
9	Min. of Internal Affairs Border Police	◎	Printed Map all scale	Printed map, Digital CD, DVD	PC : **X** LAN: No	Quick supply, technical support
10	Min. of Energy	△	Printed Map 1/10,000	Printed map	PC : ○ LAN: Limited	Conduct data sharing
11	Min. of Health & Social Affairs	○	Printed Map 1/10,000-25,000	Digital CD, DVD	PC : ○ LAN: Limited	Quick supply, data sharing
12	Tbilisi Municipal Office (Urban planning Div.)	○	Printed map 1/10,000-25,000, Digital 1/50,000	Printed map	PC : ○ LAN: ok	Ttechnical support, Supply necessary data
13	Min. of Education & Science, Tblisi State University	◎	Digital 1/25,000	Digital CD, DVD	PC : ○ LAN: ok	Data sharing, management, quick supply
14	Gerogia Technical Univ.	◎	Printed Map all scale	Digital CD, DVD	PC : ○ LAN: ok	Manage database systematically
15	US AID	○	Printed Map 1/500,000	Printed map	PC : ○ LAN: ok	Quick supply, data sharing
16	Caucasus Environmental NGO Network	◎	Digital 1/50,000	Through the Internet	PC : ○ LAN: ok	Quick supply, data sharing

Note: Frequency: ◎ - Very Often, ○ - Sometimes, △ - Seldom

PC: ○ - Available, **X** - Not available

Besides the above organizations, from which the Team could obtain the questionnaire response, according to SGS, there are about eight (8) organizations (such as; Ministry of foreign affairs, Ministry of Refugee and Resettlements, and others) use the geographic data often.

The JICA Study Team considers that Need Appraisal being important way to know the demand and trend of GIS data users, it should be conducted time to time, in future.

7.2.2. Building Network for Marketing

Up to now the topographic maps are not available for all kinds of user except for by the process of applying for approval of the release to the authority concerned.

It is quite desirable to create a measure to disseminate the products of topographic map through the public windows such as book shops, municipality offices, and so on by manner of selling with certain price. Internet can be also employed for building network for Marketing. These ways will result more extensive and easier delivery of the topographic data to anybody who needs the geographic information. Thus, the following is the conceptual diagram of dissemination system.
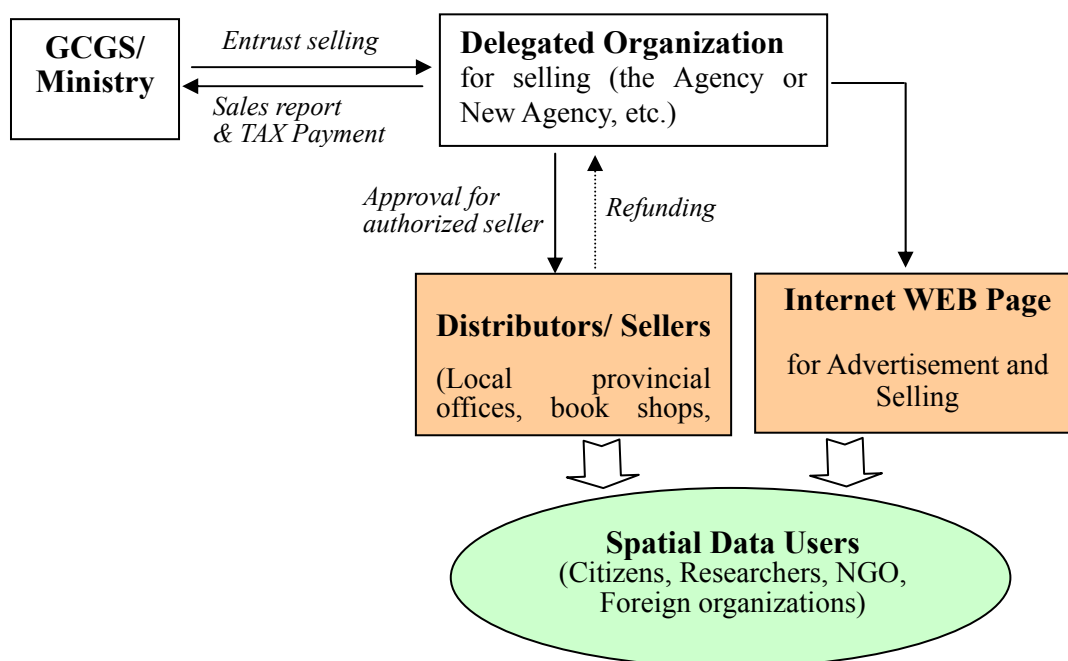

Figure 7.2.2   Diagram of a Model Showing the Scheme of Selling Mapping Data

Internet has having varieties of options; a policy decision will be needed about up to

what degree really it can be adopted in the selling process. For instance, it can be used just to advertise the spatial data by creating WEB page and providing information about the availability of data along with its technical detail, and lastly mentioning to contact to the authority to put order or to get additional information. On the other hand, it can be adopted for full flag selling system; that is not only putting order but also even collecting the cost through Internet, though in this case higher degree of security system will be required to avoid illegal spreading of data.

7.2.3. Rough Estimate of Sales by the Enterprise

(1) Case by Direct Management

For the time being the GCGS is not admitted legislatively to undertake business activities such as selling of topographic data on commercial base under the current Decree* in Georgia.

: Decree No.xxxx??, 1.Jan.,2007

However, in case the function of GCGS as an organization belonging to the ministry would be strengthen in near future and admitted to conduct as an enterprise, it will be useful to forecast even roughly a gain from selling the mapping data in any format. Moreover that will contribute to consider the possibility to become governmental enterprise with independence. Hence, following study is made for this purpose.

i) Setting the price of products:

Clear pricing policy would be vital to get the data sold in large volume. For pricing of the data products of this Project, the Study Team has considered the result of Questionnaire analysis so mentioned above in Item 7.2.1 as well as held discussions with the counterpart. With all these, the Team's recommendation for the unit price of these data products is as follows:

Table 7.2.2   Pricing of Data Products

	Low Unit Price	Medium Unit Price	High Unit Price
Printed map	US$ 5/ sheet	US$ 10/ sheet	US$ 20/ sheet
Digital Map	US$ 20/sheet	US$ 40/sheet	US$ 60/sheet

ii) Prospect of Demands and Expected Sales Income:

a. In Case of Printed Map:

Demands for the topographic printed maps will greatly range with the assumptions that vary under the several circumstances. The Study Team has assumed that low

unit price will result in more demand of map sheets and vice versa. Thus, considering the Low unit price, Medium unit price, and High unit price, the Study Team has raised 3 cases of demand assumption; Demand Case -1, Demand Case -2, and Demand Case 3, respectively. Also, the spatial data users have been categorized into four (4) major users for estimation, who are likely to use the printed maps.

- **Ministries:** All the thirteen (13) Ministries have been considered for this estimation of demand quantity expediently. These are:

    1) Ministry of Education and Science

    2) Ministry of Environment Protection and Natural Resources

    3) Ministry of Economic Development

    4) Ministry of Defense

    5) Ministry of Justice

    6) Ministry of Refugees and Settlement

    7) Ministry of Foreign Affairs

    8) Ministry of Agriculture

    9) Ministry of Finance

    10) Ministry of Internal Affairs

    11) Ministry of Labor, Health and Social Affairs

    12) Ministry of Energy

    13) Ministry of Culture, Monument Protection and Sports

- **NGO and Foreign Donors:** These include non-profitable organizations and International agencies such as UNDP. For instance, setting number of such organizations as 20 for assumption.
- **Private Companies:** For instance, setting number of companies as 20 for assumption.
- **Citizens:** For instance, out of total population of 5.6 million (approximately) of Georgia, setting 1% as general group for spatial data users, and out of that 5% can be likely to buy the spatial data for their private use.

With these mentioned criteria, the demand quantity in all three (3) cases can be set tentatively as follows:

Table 7.2.3   **Prospected Demand Estimated under Certain Assumption for Printed Maps (Demand Case – 1)**

Demands from	Rough Estimate (Map Sheets)	Grounding by	Remarks
Ministries	2,500	39 sheets x 13 Ministries x 5 times	
NGO, Foreign Donors	1,200	39 sheets x 15 x 2 times	Assuming 15 bodies
Private Companies	500	5 sheets x 20 x 5 times	
Citizens	5600	5.6 million x 0.01 x 0.05 x 2 times	5% of 1% population
Total- 1	9,800		Including Ministries
Total -2	7,300		Excluding Ministries

Table 7.2.4   **Prospected Demand Estimated under Certain Assumption for Printed Maps (Demand Case – 2)**

Demands from	Rough Estimate (Map Sheets)	Grounding by	Remarks
Ministries	1,300	20 sheets x 13 Ministries x 5 times	
NGO, Foreign Donors	600	20 sheets x 15 x 2 times	Assuming 15 bodies
Private Companies	300	5 sheets x 20 x 3 times	
Citizens	2,800	5.6 million x 0.01 x 0.05 x 1 time	5% of 1% population
Total- 1	5,000		Including Ministry
Total -2	3,700		Excluding Ministry

Table 7.2.5   **Prospected Demand Estimated under Certain Assumption for Printed Maps (Demand Case – 3)**

Demands from	Rough Estimate (Map Sheets)	Grounding by	Remarks
Ministries	900	20 sheets x 9 Ministries x 5 times	70% of the ministry

NGO, Foreign Donors	300	20 sheets x 15 x 1 time	Assuming 15 bodies
Private Companies	180	3 sheets x 20 x 3 times	
Citizens	1,700	5.6 million x 0.01 x 0.03 x 1 time	3% of 1% population
Total- 1	3,100		Including Ministry
Total -2	2,200		Excluding Ministry

The above estimation reveals that the demand quantity excluding the Ministries will high at Demand Case -1 (7,300 sheets/year) and low at Demand Case-3 (2,200 sheets/year).

Estimation of Expected Sales Income: With the concept of developing sharing system among the Ministries (refer to section 7.3), the estimation of sales income has been made considering other three (3) data user groups.   Considering the above mentioned unit prices and demand cases, the expected sales income has been estimated for the above estimated demand quantity as follows:

Table 7.2.6   Comparison of Sales Amount in 3 Cases

User Groups	Demand Case-1	Demand Case-2	Demand Case-3	Remarks
NGO , Foreign Donors	US$ 5 x 1,200	US$10 x 600	US$ 20 x 300	
Private Companies	US$ 5 x 500	US$10 x 300	US$ 20 x 180	
Citizens	US$ 5 x 5,600	US$10 x 2,800	US$ 20 x 1,700	
Sum of amount	**US$ 36,500/year**	**US$ 37,000/year**	**US$ 43,600/year**	

b.   In case of Digital Map:

In case of Digital map, demands for the product will be limited resulting in the following estimate as single demand case.   Moreover, the user group "Citizens" has not been included in this demand estimate, considering that compared to printed map product, the digital maps will not be easy for them to use.

Table 7.2.7   Prospected Demand Estimated under Certain Assumption for Printed Map

Demands from	Rough Estimate (Map Sheets)	Grounding by	Remarks
Ministries	1000	39 sheets x 13 Ministries x 2 times	

| NGO, Foreign Donors | 300 | 39 sheets x 15 x 0.5 x 1 time | Assuming 50% 0f 15 bodies |
| Private Companies | 200 | 10 sheets x 10 x 2 times | 10 organization |

Estimation of Expected Sales Income: With the concept of developing sharing system among the Ministries (refer to section 7.3), this user group has not been included in the estimation of sales income.   Moreover, considering the three cases of Unit price; Low, Medium, and High as mentioned in Table 7.2.2, the sales amount of the printed maps thus can be prospected in the way as following:

Table 7.2.8   Comparison of Sales Amount in 3 Cases of Unit Price

User Groups	at Low Unit Price	at Medium Unit Price	at High Unit Price	Remarks
NGO , Foreign Donors	US$ 20 x 300	US$ 40 x 300	US$ 60 x 300	
Private Companies	US$ 20 x 200	US$ 40 x 200	US$ 60 x 200	
Sum of amount	**US$ 10,000/year**	**US$ 20,000/year**	**US$ 30,000/year**	

This shows the expectation of sales amount from both products printed and digital topographic maps will be altogether up to nearly 73,000 US dollars in the highest case.

(2)   Case by Consignment

For the Printed Topographic maps, the case of consignment can be considered.   In this case, the income from sales of the products will be revenue excluding costs that comprise of a royalty and maintenance fee to GCGS.   The royalty will amount 10 % of total income from the product sales for instance and 15 to 25 % might be charged for the maintenance of data.   Therefore GCGS or the ministry will be recipient body having income of 25 –35% from the total amount of the products.

By this assumption, the following revenue as indirect sales of the printed maps will be expected roughly.

Demand Case -1: US$ 36,500 x 25% –30% = US$ **9,125 to 10,950 /year**.. *(Maximum Revenue)*
Demand Case -2: US$ 37,000 x 25% –30% = US$ **9,250 to 11,100 /year**.. *(Minimum Revenue)*
Demand Case -3: US$ 44,000 x 25% –30% = US$ **10,900 to 13,080 /year**.. *(Medium Revenue)*

This means that in Demand Case - 1, the revenue will be Maximum from a kind of copyright could cover the wages for nearly 2.7 staff by setting US$ 400/month/peroson

as a salary.

7.3. Data Sharing System

Along with the implementation of sale and promotion of spatial data as mentioned in section 7.2, a sound system for sharing such data should be established among the governmental organizations that have frequent opportunity to use them.   This will play a great role in achieving effective control over redundant investments in spatial data creation in various Ministries.   Also, it will make easier in standardizing the dataset resulting an increased dissemination.

7.3.1. Basic Policy of Data Sharing

All the data produced from this Project can be considered for sharing, however, the data from other Project or possessed by other Ministry may be needed to decide case by case.   Thus, some sort of deciding body need to be formed and this can be named, for instance, as Council for National Spatial Data Sharing (CNSDS).   This council will guide the policy as well as control the way of Spatial Data sharing system. Following tasks need to be decided out as basic policies:
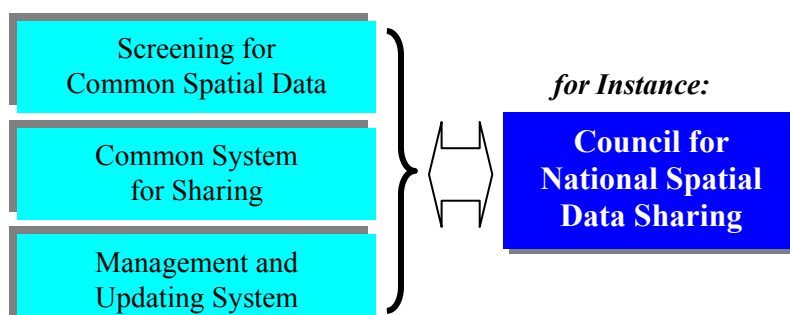
Figure 7.3.1   Tasks for Building Data Sharing System

a) **Screening for common spatial data:** There might be bundles of spatial data possessed by various Ministries.   Thus, among the possessed Spatial data possessed, the Data that demonstrate more effect by sharing than the average of the geographic information, are screened.

b) **Common system for sharing:** The common system that meets spreading conditions etc. among the Ministries need to be decided.   Moreover, security countermeasures need to be considered if in the future decided to upload the data on the Internet.

c) **Management and Updating system:** Data update is indispensable to maintain the effect of the Sharing system. Depending upon the type of spatial data, policy needs to be set about the time interval for their updating.

For the implementation of items like b) and c), financial arrangement will be required.

7.3.2. Methodology of Data Sharing

(1) Concept

To implement the above mentioned data sharing policies, a group of technical staff from various Ministries need to discuss each and every detail of technical points about its methodology. For instance, if it is decided to employ Internet to facilitate a shear volume of data sharing, following scheme can be taken into consideration.
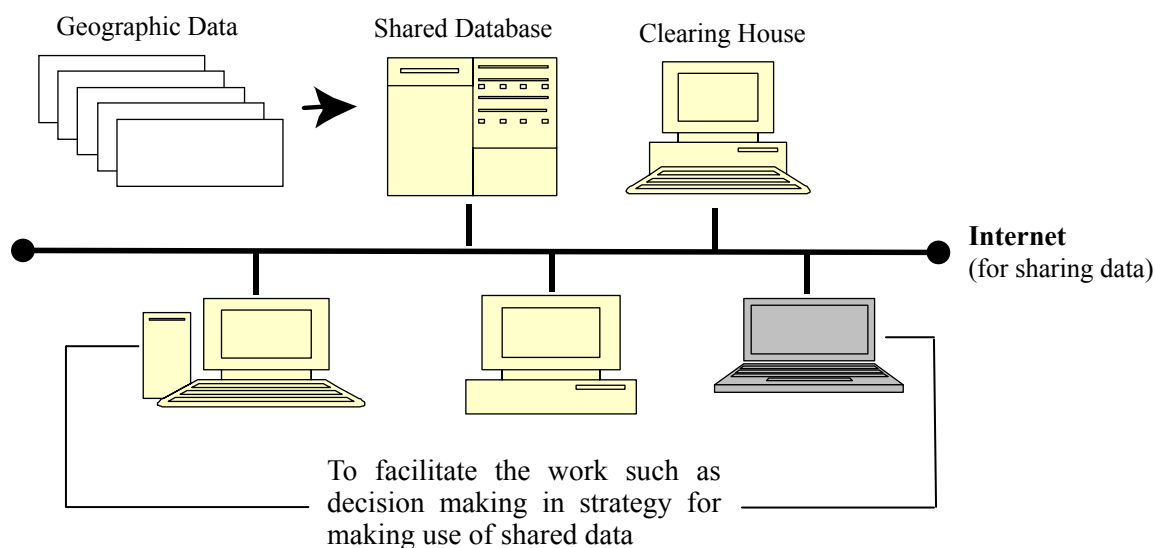
Figure 7.3.2 **Concept to help figure out the System Image**

As presented in the above scheme, first all the Geographic data possessed by various Ministries need to be listed and then after going through each one in detail, decision shall be taken to sort out for database to be shared among the Ministries. To make the data in final shape for sharing, some may require modification and updating. Thus, after preparing the final version, the data shall be uploaded on the Internet and for this a PC needs to be assigned as Server.

The whole procedure is presented in comprehensive way by the following flow chart

as shown in Figure 7.3.3.

```
┌──────────────────────────────────────────────┐
│ Call the related organizations to share the GIS database │
│ under the coordination of SGC, Ministry of EPNR │
└──────────────────────────────────────────────┘
                        │
                        ▼
┌──────────────────────────────────────────────┐
│ Organize the function to deal with data sharing to │
│ formulate consensus │
└──────────────────────────────────────────────┘
                        │
                        ▼
┌──────────────────────────────────────────────┐
│ Play a central role in listing up the data possessed by │
│ various Ministries │
└──────────────────────────────────────────────┘
                        │
                        ▼
┌──────────────────────────────────────────────┐
│ Go through the list and sort out the spatial data that can │
│ be shared │
└──────────────────────────────────────────────┘
                        │
                        ▼
┌──────────────────────────────────────────────┐
│ Manage for necessary updating that is required to give │
│ the sharable data final form │
└──────────────────────────────────────────────┘
                        │
                        ▼
┌──────────────────────────────────────────────┐
│ Decide and Implement the methods for data sharing such │
│ as Internet │
└──────────────────────────────────────────────┘
```
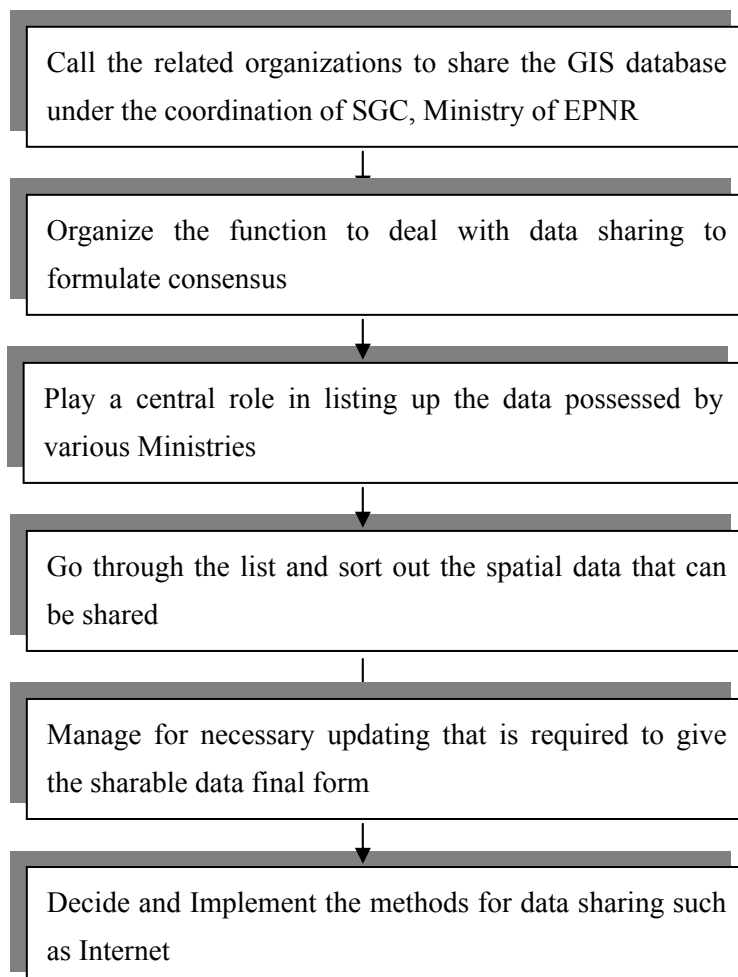
Figure 7.3.3   Ideal Steps for Realization of Data Sharing Systems

(2)   Setting up basic standards

To make easier in accessing and making use of shared data, standardizing the dataset will be crucially required among the users. Some of the points to be considered are listed below:

·   **Data Capacity:** With the commence of sharing system, frequent data transaction will be required. Considering this, it will be preferable to allot certain space for each involved organization, which can be used to upload the data into the server. Also, there should be proper allocation from where the other agency can down load the desired data.

·   **Data Size:** For geographic data, the data size increases with the increase of area coverage. Thus, it will be preferable to provide appropriate data for the

size according to the quality of the information requested by the users for thematic map creation.

· **Data format:** This will not be obstacle depending on the software that the user uses. The formats of geographic data are generally common to be opened using other GIS Software. For instance, using ArcGIS, the data format can be as Shape File (*.shp*), which can be used with a number of GIS Software. Thus, Shape file is said to be a standard format of the GIS industry.

Chapter 8. Issues to be considered in Future

8.1. Application of Acquired Technology

During the implementation of this Project, counterpart staffs have gained technical knowledge both through OJT and training in Japan. The technical transfer covered all components of mapping such as Geodetic survey, Plotting, Field completion, Symbolization. Also, the creation of GIS database and their analysis including creation of GIS Model Systems were transferred. Thus, the Study Team is confident that their technical level has got raised up and currently, they have more technical capability compared to commencement of this Study.

After the completion of this Project, this acquired technical know-how will be required to apply on day to day basis by challenging the followings;

- To make the best use of aerial photographs covering the rest of area where this study did not pursue the updating.

- To transfer the skills in mapping technology to new staff who will be assigned from Geology Service or other department by an OJT basis using donated equipment.

- To strengthen an ability to maintain and improve the quality of newly created topographic data by the aid of appropriate experts invited from experienced countries.

- To continue to foster enough number of specialists to supervise the future employee in terms of growing technically qualified engineers.

8.2. Promotion of uses of Topographic Data

8.2.1. Methodology

During this Project, the Study Team tried its best to spread the importance of Maps and map data through the repeated discussions with members of Coordinating Committee and members of its Task Force. The Team also arranged Seminar and Workshop where outputs of the Study including the GIS Model Systems were presented in front of potential map data users including the members of Coordinate Committee. Such event will be necessary to be continued in future as the part of

promotional activity.   Moreover, to promote the use of topographic data followings need to implemented:

- **Liberalization of maps to general users:** The maps should be open to general public with the clear cut pricing policy and easy way for supply.

- **Need appraisal assessment:** Survey, through such as questionnaire, will be required to conduct time to time in order to know the demand trend of users regarding the map data.   And, subsequently.

- **Building network for marketing the data:** Public windows such as book shops, municipality offices, etc. need to be considered in this regard.

- **Data sharing System:** A sound spatial data sharing system needs to be implemented among the Ministries to incorporate standards, to avoid duplicate creation, and to maintain the data quality by updating.

- **Use of Internet:** This option shall be considered as far as illegal copy of data can be avoided.

8.2.2. Organizational Development

During the period of this Project, the counterpart has gone through organizational change two times.   At present, with the inclusion of Geology staff, its name is Geology-Cartography and Geodesy Services (GCGS) and is under Ministry of Environment Protection and Natural Resources.   In future, with the concept of increment in its mapping activities, more resources will be required.   Thus, to develop this organization for producing and managing the map data including topographic in future, development in the following aspects will be needed, such as:

- Increment in the office infrastructure.

- Addition/upgrading of Hardware and Software

- Increment in the number of staff.   Also, along with In-house training, there should be provision of getting staff training at other agency or abroad wherever suitable.

- Allocation of Budgetary plan for the above points.

8.3.   Promotion of wider utilization in applying GIS models

8.3.1 Popularization of GIS application

(1) Basic consideration

To widen the users of GIS for variety of fields, various means of dissemination methods; such as presenting demonstration, distributing picture book, advertisement through Internet, organizing workshop, providing training, etc. need to be

implemented as much as possible.   This will increase demand of GIS data including that the topographic data as presented below:
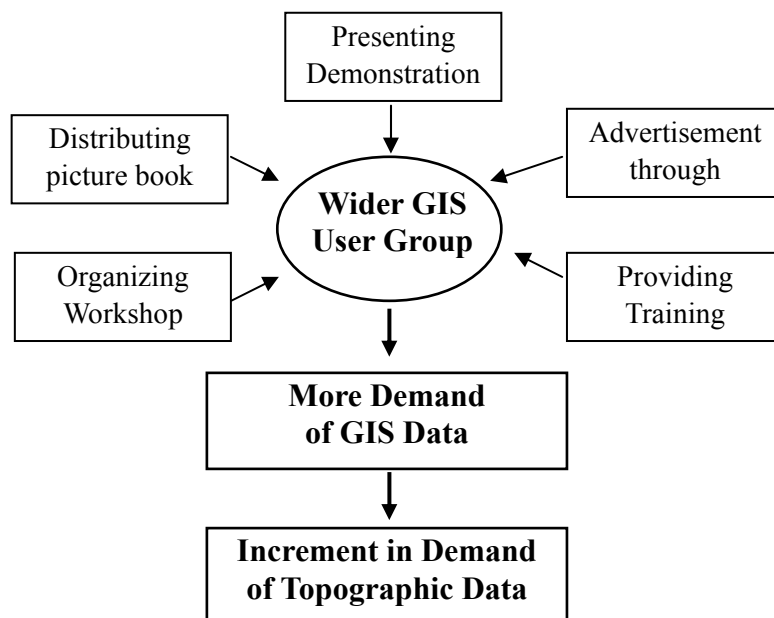
```
                      ┌─────────────┐
                      │ Presenting  │
                      │Demonstration│
                      └──────┬──────┘
                             │
┌────────────┐              ▼              ┌─────────────┐
│Distributing│         ╭─────────╮         │Advertisement│
│picture book├────────▶│Wider GIS│◀────────┤  through    │
└────────────┘         │User Group│        └─────────────┘
                       ╰─────────╯
┌────────────┐         ▲   │   ▲           ┌─────────────┐
│ Organizing ├─────────┘   │   └───────────┤  Providing  │
│ Workshop   │             │               │  Training   │
└────────────┘             ▼               └─────────────┘
                    ┌──────────────┐
                    │ More Demand  │
                    │ of GIS Data  │
                    └──────┬───────┘
                           │
                           ▼
                 ┌────────────────────┐
                 │ Increment in Demand│
                 │of Topographic Data │
                 └────────────────────┘
```

Figure8.3.1   Dissemination methods for wider use of GIS

(2) Points to realize user- friendly extensive use of GIS

1)   Some issues to be resolved

To promote the use of GIS data using the above mentioned dissemination methods, system required, especially the Software, to use the created GIS data and GIS Models need to be underlined.   Regarding this, it should be noted that all the GIS data (including that for GIS Models) have been created using ArcGIS and can be opened using other GIS Software, though the display system of GIS Models comprising the customized program linked to ArcGIS can be displayed only using ArcGIS.   Hopeful way to overcome this inconvenience, more simple and inexpensive alternatives should be collectively considered.

2)   Encouraged to use Free software

Display and updating extent of the created GIS data using other Software will depend upon its capability to do so.   Besides ArcGIS, Software like MapInfo, Erdas Imagine are powerful to handle the updating and analysis of spatial features.   In case of difficult to afford these Software, the users can try with the free Software.   There are number of free Software and some are listed below:

Table8.3.1   List of free software for GIS utilization

S.N.	Software Name	Main operations	WEB Home Page
1	Grass GIS	Displaying, Updating, and analysis	http://grass.itc.it/index.html
2	TNTlite	Displaying, Updating, and analysis (÷)	http://www.microimages.com/tntlite/index.htm
3	MapWindow	Displaying	http://www.mapwindow.org/mapwinapp.php
4	ArcExplorer	Displaying	http://www.esri.com/software/arcexplorer/explorer.html
5	ERDAS MapSheets Express	Displaying	http://gi.leica-geosystems.com/LGISub2x289x0.aspx
6	GeoMedia Viewer	Displaying	http://www.intergraph.com/gviewer/

(÷) - TNTlite is for small-scale projects.

3)   Variation of practical use of free Software

The above mentioned Software are can be downloaded free of charge from the above WEB Home Page.   Out of these Software, Grass GIS and TNTlite offer display as well as updating and analysis with the greater extents.   Others Software have mainly provision for displaying the GIS data, where one or more GIS layers can be displayed at one time.   Thus, the provision of displaying two or more GIS layers together will provide depth of understanding regarding how one feature is overlaying upon another; such as:

✧   Whether feature of a GIS layer is lying just beneath of feature of another GIS layer.

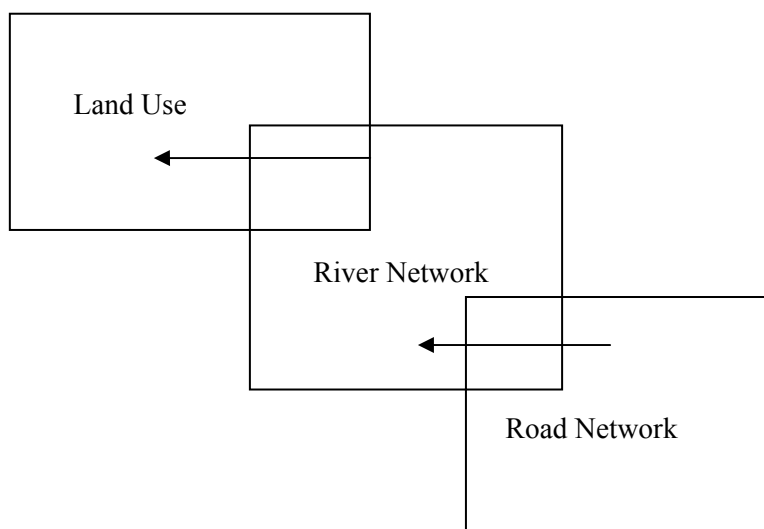✧   If not, how much one is farther from another.

Figure8.3.2   Examples of Thematic layers

Thus, the comparison can be made by simply overlaying several layers for extracting the useful information that can be vital in the decision making process.

4)   Human resources development

  - GCGS shall arrange training, seminar/workshop involving spatial data users time to time for the introduction of GIS application along with the use of these created six (6) models.   This will not only inspire the users to include GIS more in their routine work but also interaction will increase resulting more opportunity for GCGS for collecting their feedback, which can be a good source for improving the spatial data further.

  - GCGS shall supply GIS database with a brief guidance on utilization of free Software.   With this, the spatial data users will have easier in using the database.

8.4.   Discussion on the possibility of updating the remaining map sheets

Due to the reorganization of the ministry, the area to be newly plotted into digital map has been diminished, leaving an area of approximately 6,000 km^2 unmapped.   This area corresponds to 10 map sheets, based on the new width.   If the GCGS is to plot these maps by themselves using the technologies transferred, the HRD project needs to take the following perspectives into account in formulating measures for expansion of the GCGS's operational structure and budgeting.

1） Recruitment of technical staff (securement of human resources)

Fortunately, the remaining 10 sheets cover an area with relatively few chronological changes. Thus, the most appropriate mapping technique to be employed to this end is basically the updating adopted in this project.

When implementing updates on the maps, they need to perform ground feature correction, editing, field completion and map symbolization. The necessary manpower was calculated by assuming the technical level of the counterpart as 1/2.5 of that of Japanese experts, and derives as 3 man-months for correction of ground features and editing and 2.5 man-months for map symbolization, totaling to 5.5 man-months per sheet. Therefore, updating of the ten sheets requires approximately 55 months, or nearly 60 months.

2） Necessary period of time and rough estimate of necessary expenses

Based on the above calculation, the updating of the remaining ten map sheets will roughly require:

* ＊ 60 months/12 months → 5 years if one person is assigned.
* ＊ 30 months/12 months → 2.5 years if two persons are assigned.
* ＊ 20 months/12 months → 1.7 years if three persons are assigned.

Accordingly, if three GCGS staff members are dedicated to the updating work, it will require 1.7 years to complete the job. Considering that their skills are still not mature enough, two years shall be estimated at the minimum.

In this case, an overall cost necessary for the updating work can be estimated at **US$200 x 3 persons x 24 months (for two years) = US$14,400**, based on the assumption that the monthly salary of GCGS staff is US $200. In addition to that, costs for field completion, procurement of necessary hardware and software, etc. will also be incurred, which will lead to a total necessary fund being **US$25,000**.

3） Securement of budget for the updating work

Any department in the Georgian Ministry of Environment Protection and Natural Resources is financially restricted; hence it will most likely be extremely difficult to secure budgets necessary for early implementation of the above development work. Accordingly, it is a practical option to give thoughts to allocating of a part of revenues from sale of map data, as analyzed in Chapter 7, to the financial source of the development work.

According to a mid-level sales forecast, the revenue from direct sales of printed maps will be **US$37,000 per year.** If about 50％ of the revenue is allocated to the budget

for map development, approximately US$38,000 will be secured in two years, which will suffice the necessary development cost described above.