An issue of improvement in Annual land use planning

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Abstract: The part where the mathematic modeling and GIS modeling are being established and formulated is the major system of decision supporting system, and taking into account the criterions of making the GIS modeling, \in this thesis\ it will be easily established using all types of relevant information. Models that base on relevant information and criterions are most likely to effectively serve the decision makers and the users of the modeling. In order to follow the world standard and freely transfer geographic information in an international environment, the process of reforming meta data standard of GIS in Mongolia is basing on researches of international meta data standard of GIS (ISO 19115). Therefore the meta data standard have been processed adapting into certain conditions of Mongolia. The territory of Ulaanbaatar city is selected as the research object and including the total territory, researches on today's pressing issues of land administration, land legislation, land cadastre, and land planning have been made thoroughly and the objectives of this thesis have been put forward in resolving issues in urban land use planning. When processing the land use planning of the capital in 2009, taking into account the results from the 3.3.1 and using the GIS analyzing and GAP assessment tools, it is now possible to extend the serving area. Two types of construction standards those are observed in Mongolia used in order to set\establish serving area of commerce in Ulaanbaatar city. [Nature and Science 2010;8(3):129-138]. (ISSN: 1545-0740).

Keywords: Annual land use planning, Geographic information system, assessment, land administration, meta data

1. Introduction

In recent years, Ulaanbaatar population have increased steeply that from 1998 to 2008 average growth reached 5.3% and this leads to an issue of social, economic and infrastructure service areas not being able to grow at the same rate as the population growth. Master plan of developing Ulaanbaatar city until 2020 was officially approved and being implemented since 2002, however population growth management and monitoring of land use are now the issues that need to be revised.

Land Law of Mongolia was approved in 1995, Land Privatization Law of Mongolia was approved in 2002, and as a result land privatizing, land possessing and land use right have been registered until now, however formulating methodology of annual land use planning for implementing the Master Plan have not been approved yet.

For this reason, corresponding to new approach to land administration in International level, when formulating the annual land use planning method legal legislations relating to land privatization, land possession, land use right need to be taken account. Using highly accurate and relative information that base on GIS, improving the future Ulaanbaatar land use planning by bringing it to other developed county standards and creating system that use high technologies and providing quality training to specialized workforce are crucial.

One of the objectives of the thesis is to uncover the ways of improving the operations of Capital land use planning. Within this objective, following issues are put forward for resolution. These are:

- Looking out for ways of improving the future Capital land use planning by evaluating current Capital land use planning.
- Formulating land use plan basing on GIS and investigate whether the plan is feasible.

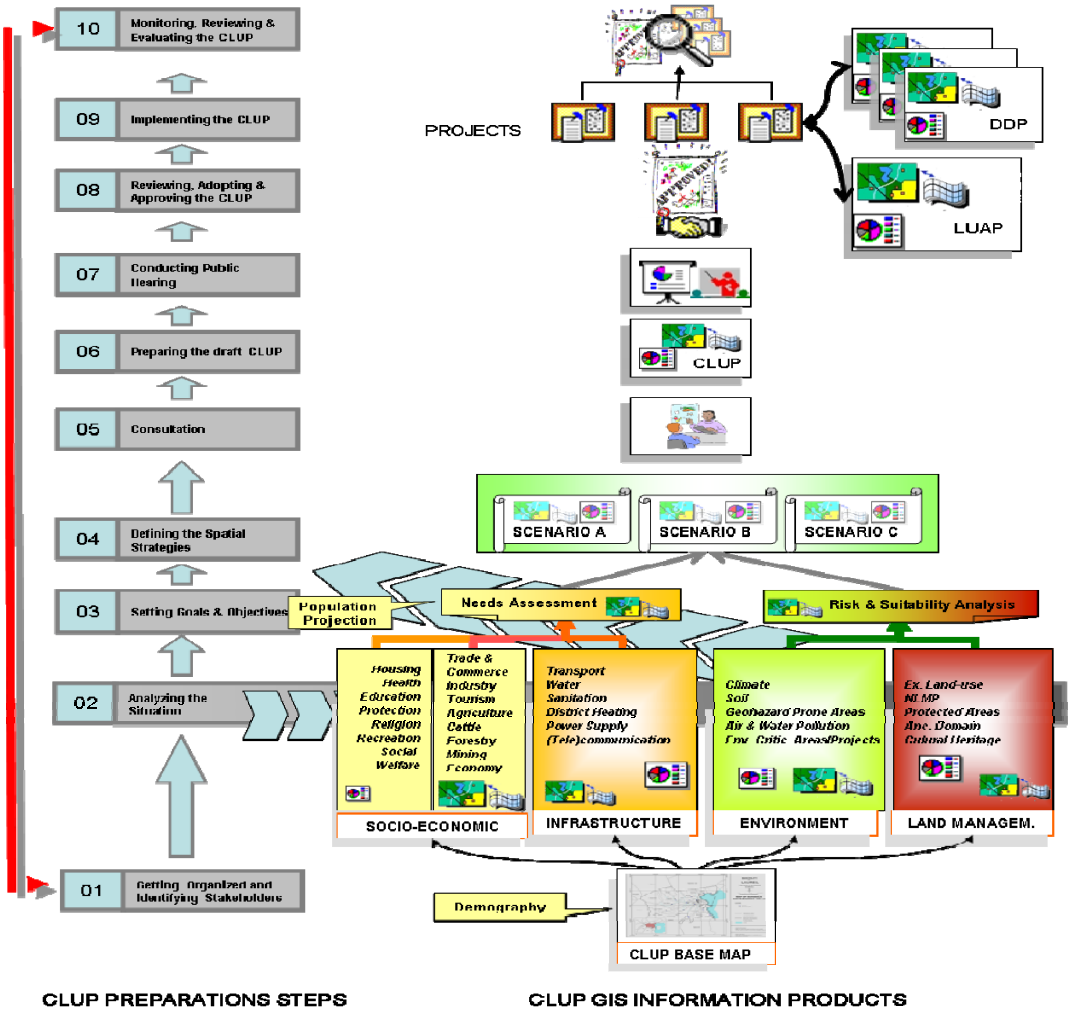
Information are sourced from Department of Land Affairs, Geodesy and Cartography, Land Administration Department of Capital, SIDA, and Swedesurvey.

Acronyms:

CLUP	Comprehensive Land use planning
LUP	Land use planning
GIS	Geographic information system
LA	Land administration

2. Methodologies of this case study /New modeling for improvement of land use planning/

Applying the information with high level of accuracy that base on GIS, plan to implement the major policy of improving land use planning in Ulaanbaatar, future land use and land administration have been made and divided to be implemented within following steps. (Figure 1).



\ISO 1.05 Relationship of the GIS Cookbook to CLUP Guidebook\.

Figure 1. Structure of the methodology

The main appearance form of methodology consists from 10 steps, 2 types of analyzes and 4 types of information.

Step 1. Getting organized stakeholders
Step 2. 2 types of analyzes on main 4 information.
Step 3. Setting goals and objectives
Step 4. Establishing and evaluating options
Step 5. Consultation
Step 6. Preparing the draft
Step 7. Conducting public hearing
Step 8. Approval
Step 9. Implementation
Step 10. Monitoring

From this methodology /thesis/, two kinds of analyze will be thoroughly explained. (Figure 2).

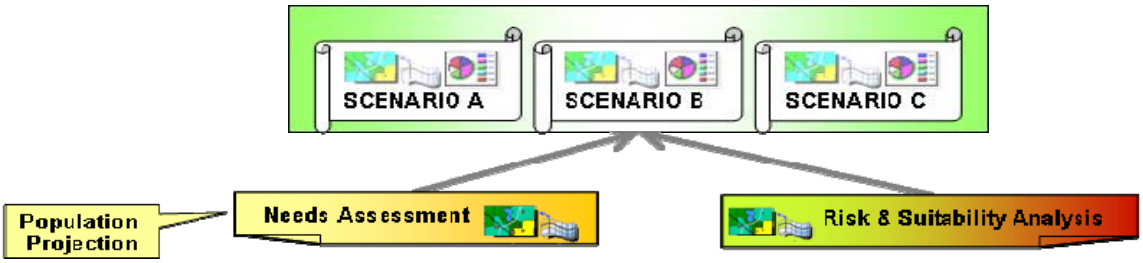


Figure 2. Types of analyzes

(Analyze 1) Needs assessment

Needs assessment is mainly useful analyze for ArcGIS program, it describes commerce serving area of needs for regional territory. It will be appeared below as an example. (Figure 3).

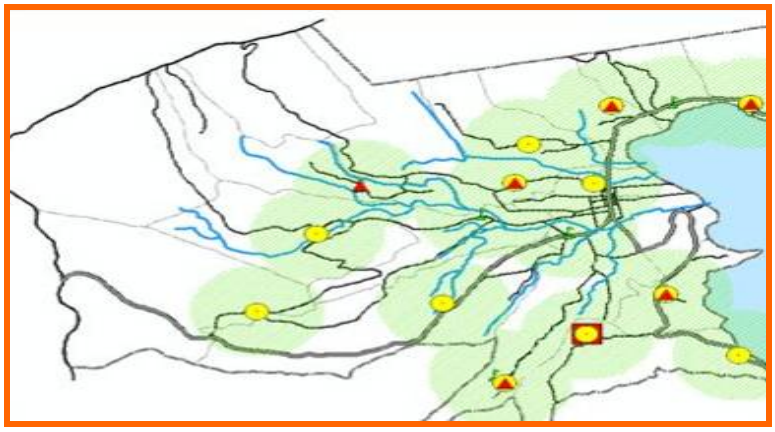


Figure 3. School positioning that has to be repaired.

Triangular red color on this map is the school positioning that has to be repaired and green contour line is the commerce serving area.

(Analyze 2) Risk and Suitability analysis

This analyze describes average value of suitable and unsuitable positions, creates follow the meaning point from many kinds of thematic maps. The modeling of suitability analyses will be appeared below. (Figure 4).

Figure 4. The modeling of suitability analyses.

There are 10 needed steps in order to implement this framework /case study/ and step numbers of 2, 4, 5, 7 are the predominate levels. (Table 1).

Table 1. Steps for implementing framework

Step1 Analyzing on dominate information, approval of the draft	**Step2** Standardized and realized information \Metadata of the ESRI and ISO standard\	**Step3** Setting criterions in accordance with needs and characteristics of the activity	**Step4** Conducting public hearing, evaluation and control of the criterions \experts and specialists\	**Step5** Formulation GIS Modeling, establishing other models
Step 10 Monitoring, evaluating on implementing process Monitoring, Reviewing & Evaluating the CLUP	Step9 Setting results into the materials and other source of information \database,WEB page, printing\	Step8 Classifying, zoning and setting limitation the researches	Step7 \Analyzing the model's\	Step6 Setting goals and objectives

By implementing this program with 10 steps, as a result, GIS storage will be created for decision supporting system that based on geographic information system. From this program with 10 steps, step numbers of 1,2,5 will be thoroughly explained below.

A) Analyzing the dominate information, approval of draft /final version/

This step is going to describe the ways of activities and information transferring in order to conduct the activities how to implement this program. In order to implement the planned activities, public hearing with specialists and experts should be conducted. (Figure 5).

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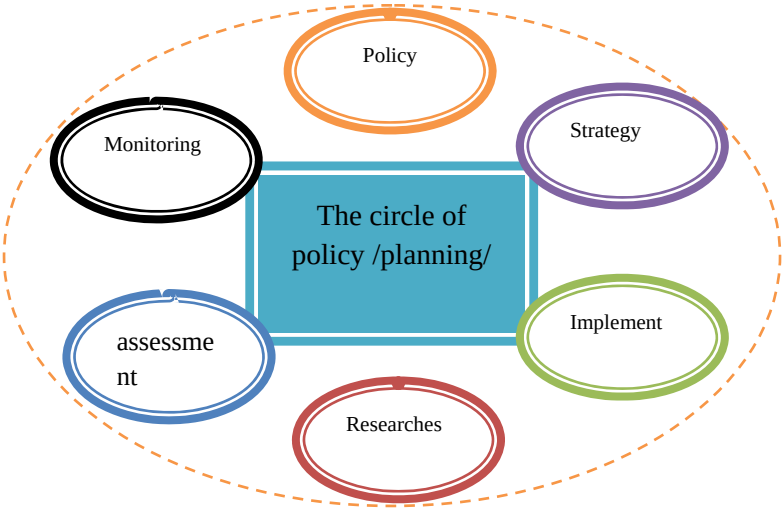

Figure 5. The form of Program

Transferring information and general modeling consists from 4 basic information. These are:

1. Socio and economic information
2. Infrastructure
3. Environment
4. Using land

B) To create the criterions what is compatible for specific features of activity and needs

In this part of activity, what criterions has to be implemented, using these information? What results will be set from implementing the criterions on these information? These are the most important activities.

C) Creating "GIS Modeling" and formulate other modeling.

The part where the mathematic modeling and GIS modeling are being established and formulated is the major system of decision supporting system, and taking into account the criterions of making the GIS modeling, \in this thesis\ it will be easily established using all types of relevant information. Models that base on relevant information and criterions are most likely to effectively serve the decision makers and the users of the modeling. (Figures 6, 7, 8).

Figure 6. Formulating criterions and the methodology for creating modeling

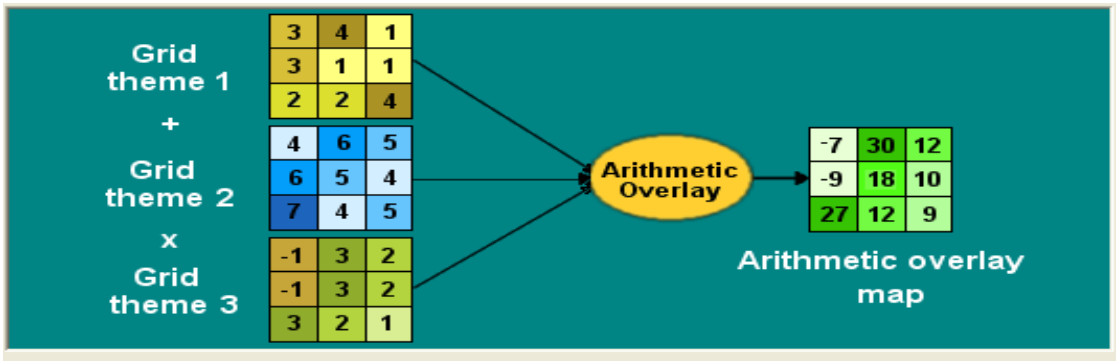

Figure 7. The methodology to unifying criterions

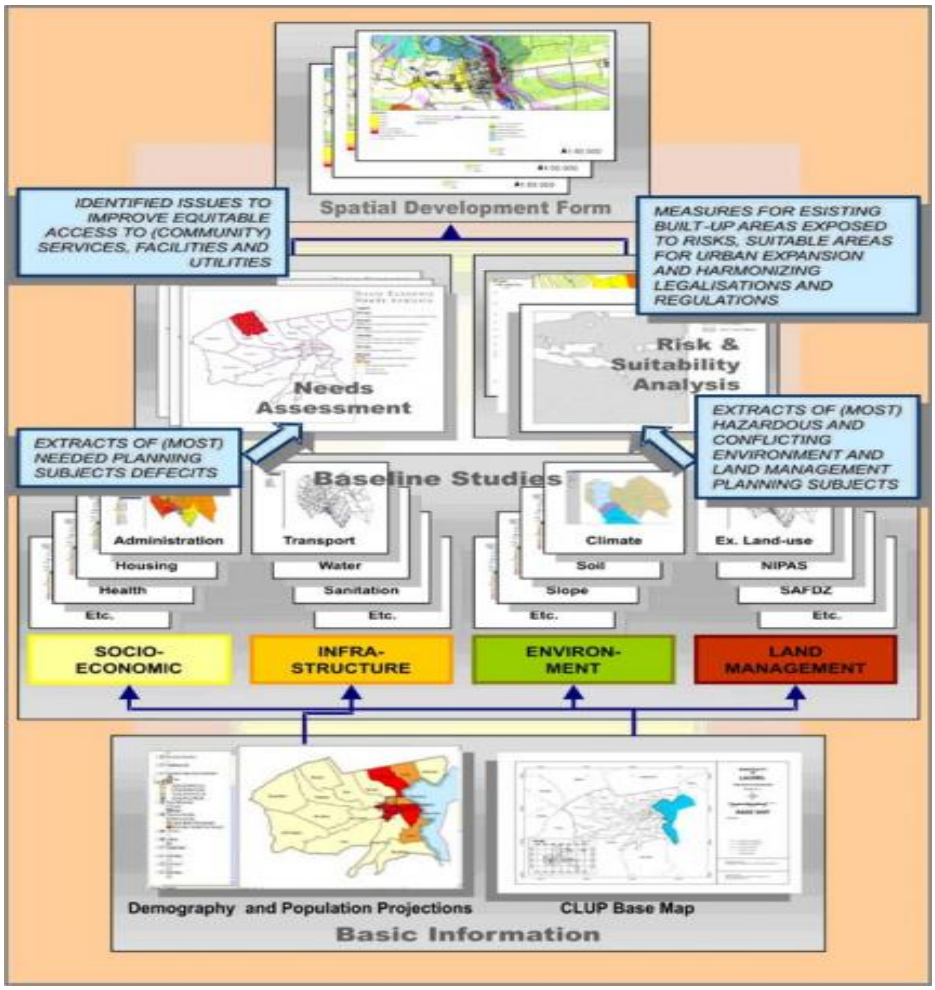

Figure 8. Decision supporting system.

2.1. Results

1. Monitoring system based on Geographic information database will be established.
2. Mathematic models based on Geographic information database will be consisted of.
3. Professional bases on high technology to support for decision makers will be established.

2.2 Inserting basic information that will be used for Decision Supporting System into International meta data standard

Today many organizations in Mongolia, depending on their capacity and ability, are using various geographic information and data in different levels. Constituting geographic information is a process that requires reasonable time and money.

Therefore, cooperating and sharing geographic information have various advantageous traits such as saving the expenses, remove unnecessary job vacant, making the information transparent, improving the quality of the data, maintaining appropriate technical conditions for transferring and sharing information and etc. In order to create favorable information gaining environment for users, organizations that handle geographic information and certain professionals need to discuss the issue first of all. Afterwards, National Standard for meta data needs to be processed and following this standard information fund shall be established through constituting geographic meta data.

In order to follow the world standard and freely transfer geographic information in an international environment, the process of reforming meta data standard of GIS in Mongolia is basing on researches of international meta data standard of GIS (ISO 19115). Therefore the meta data standard have been processed adapting into certain conditions of Mongolia.

2.3. A Need To Shift Into United Structure of Geographical Co-ordinates

From 1990s GPS measuring and mapping technology was introduced to Geodesy and Topography sector of Mongolia and further ordinary users all over the world started using this technology. Air and auto transportation, sea shipment, tourism, sport competition, environment, telecom, energy sector, agriculture, and mining sector all started using GPS technology and within this reason a need to coincide the previous topographic mappings with GPS measuring was urged. Furthermore, satellite pictures being used in making topographic mapping technology has helped Geodesy, Topographic Mapping sector to develop enormously. Nowadays, normal Internet users are able to access satellite pictures from Google, Landsat, Spot and etc.

All the pictures taken by the satellites are same co-ordinates as GPS co-ordinates and this influenced in common usage of GPS technology and now information fund and mappings have been created in the coordinating structure and being used worldwide. Different structures of coordinating – satellite pictures, satellite technology and GIS systems have been used in making cadastre mapping, however this limits transferring information between organizations and leads to confusion demands the topographic mapping to shift into united structure of geographical coordinating.

2.4. Used projection

Geographic Coordinate System: GCS_ITRF_1988
Angular Unit: Degree (0,017453292519943299)
Prime Meridian: Greenwich (0,000000000000000000)
Datum: D_ITRF_1988
Spheroid: GRS_1980
Semimajor Axis: 6378137,000000000000000000
Semiminor Axis: 6356752,314140356100000000
Inverse Flattening: 298,257222101000020000

2**.5. Meta data**

In order to use the information fully, it is crucial to draft requirements and limits of data and forces that constitute the data well. Meta data makes it less complicated for data producers to draft complete package of that data, and thoroughly explain the data. Further it gives certain limits and things to be cautious while using the data to users and provide them with the opportunity to use the metadata within their necessary purposes and assess it.

Geographical metadata is used not only by its producers but various other users, in other words, metadata can be produced by certain person or organization but other non authorized persons are able to use the information. There is a need to draft the metadata in a way that certain users who do not have basic knowledge of topography understand it and use it effectively. For geographical metadata producers and users the more the data size and range the better chance of drafting the data in an advanced way, giving more precise information about the data, further producing, saving, renewing ,and reusing the data. And overall it improves the management of these operations.

The purpose of this standard is to create content and structure of elements that is used in drafting and explaining geographical numeric data. This standard will help system investigator, developer of GIS and other users to understand and effectively use general requirements and main principles in using the standard. This standard will determine the metadata elements, graphically show the relations of set of data, and define professional terms that are used and adjust them. By following the standard, data producers will benefit:

1. Data producers will know how to draft data with precision by using necessary geographical data indicators.
2. Possibility of organizing and improving the data management of geographical data.
3. For users, it gives the opportunity to easily obtain and use the information by knowing the general information and necessary specifications.
4. It will be possible to discover, and repeatedly use the data. Users will have wide opportunities to locate, obtain, assess, buy, and use the geographical information.
5. Users will also be able to determine whether the necessary information exists and if it does where to obtain it.

International standard will be used toward common objective of information gaining and it determines the meta data thoroughly. Metadata that is related to geographical data and geographical data

serving area are clearly written in the ISO 19100 international standard.

2.6. Realized and standardized information

Geographic information will be unified into international standard and Meta data from. These are:

1. Quick Look, Table Index and Table Coding
2. Metadata for Basic Information
3. Metadata for Socio-economic
4. Metadata for Infrastructures
5. Metadata for Environment
6. Metadata Land Management

Metadata for Basic Information

1. Boundary \Urban boundary information\
2. Relief
3. RS data\ Remote Sensing\

Metadata for Socio-economic

1. Housing
2. Health
3. Education
4. Protection
5. Religion
6. Recreation
7. Social Welfare
8. Commerce
9. Industry
10. Tourism
11. Agriculture
12. Forestry

Metadata for Infrastructures

1. Transport
2. Water
3. Sanitation
4. Power Supply
5. Communication
6. Mining

Metadata for Environment

1. Slope
2. Landslide
3. Soil Type
4. Flood
5. Water
6. Ground Water

Metadata Land Management

1. Existing General Land and Water Use
2. Proposed General Land and Water
3. Zoning
4. Land Classification
5. Strategic Agriculture and Fisheries Development Zones (SAFDZ)
6. Building Permit from (the date the CLUP was Approved) onwards
7. National Integrated Protected Areas System (NIPAS)
8. Non-National Integrated Protected Areas System (Non-NIPAS),
9. Cultural Heritage

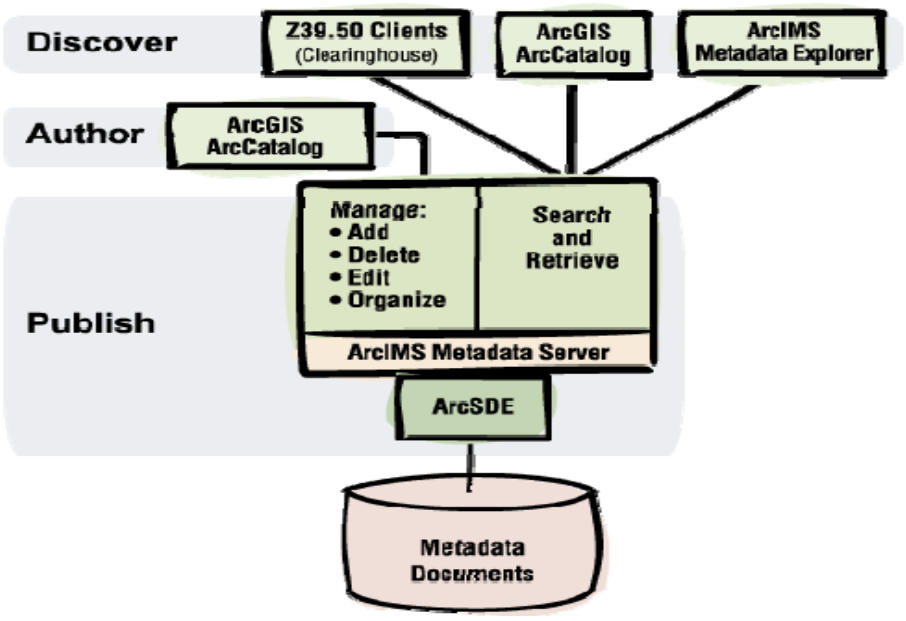

Figure 9. Scheme of information standard

In order to unify above all information, Arccatalog and metadata explorer systems have to be used.

3. Urban land use planning, land use form

3.1. Condition of urbanization.

Ulaanbaatar city occupies 16151 hectare, out of this urban land also occupies 4.95 percent.

Comparing Commercial zoning and field structure below. /percentage/

1.Commercial zoning-33,2
2.Social infrastructure zoning- 5,2
3. Industrial infrastructure zoning-10
4. Production and office zoning-13,7
5. Protected area-2,7
6. Non operational and damaged area 28,8
7. Other 4,2

3.2. Evaluating the situation of urbanization

Master plan of Ulaanbaatar city, case study for construction of Ulaanbaatar city.

3.3. Land use planning of 2009

This chapter includes model draft of 2009 land use planning of Ulaanbaatar City. By using this model it is possible for Land Administration Office to solely make the land use planning of 2010 and 2011 without computer programmers' help.

By using this new drafting model, following results have been made. Regions to be newly developed are colored in blue, brown background shows the areas that are in use now. Brown is deducted from the newly developing region and these regions that are near the necessary infrastructure have been located using the ArcGIS program and it is monitored by architect and land planning officials. Out of the results planning of businesses, service, and public organizations are shown below /Figure 10, 11/.

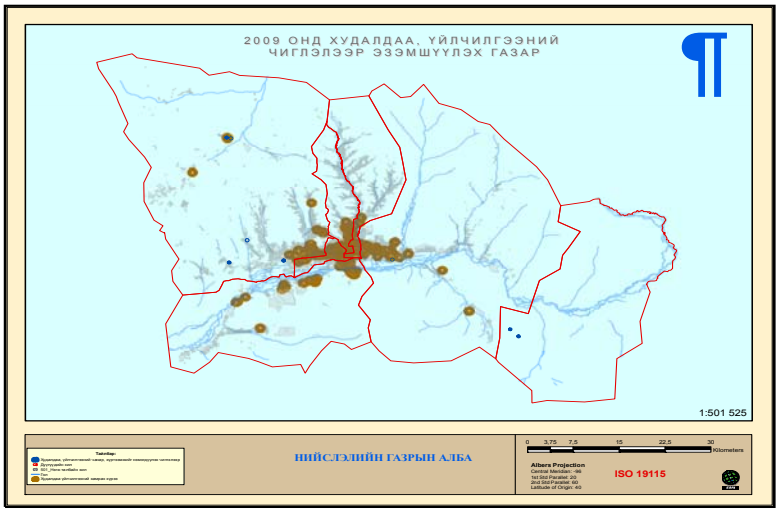

Figure 10. Land position to possess for just commerce

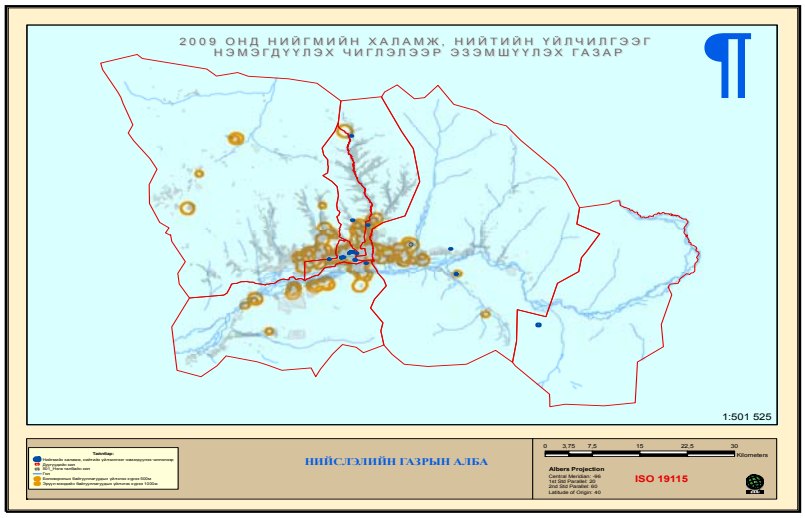

Figure 11. Land position to possess for just public service

4. Conclusions

Regarding the social and economic conditions, summing up today's condition of the capital and capital development process and land use planning process are following:

1. Looking at the analyses and assessments that were made on public supply, infrastructure, businesses and services, education and other sectors, suburb areas and some of the regions in the central capital are not used in any purpose. In terms of danger level, central parts of the city buildings are locating in the areas where petrol station dangerous area locates. Health service stands in relatively high standard comparing to other services. It is well possible to develop those suburban areas and register the locations to include in the capital land use planning.
2. In today's highly developed information and technology society, basing on the satellite information that constitute GIS, will help decision makers determine the land use planning and it is mentioned in summaries of 2009 land use planning of the capital. Therefore, it is considered that when processing Master plan of land use, and capital building plans, it is important to assess the social and economic condition of the area and apply it to the planning process.

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References

[1] Lanress Co.,Ltd 'Master plan on Capital Land Use planning" 1999.
[2] Kjorneberg.C "GIS Cookbook" .Sweden. 2007.
[3] Kjorneberg.C "Comprehensive land use plan" Sweden. 2007.
[4] Buyandelger.M "An issue of improment in Land evaluation" master degree, AUoM, 2004
[5] Department of land affairs, construction, geodesy and cartography "Introduction for rtransfering into co-ordinates of national geodesy and unified reference system" 2007
[6] Dugersuren.L "The history of Ulaanbaatar city" UB, 1956
[7] Dugersuren.L "Ulaanbaatar city from 1921 to 1940" UB, 1963
[8] Land use planning. FAO, 1995.
[9] The Capital city Governor's office "early, present and future of Ulaanbaatar city" UB, 1999
[10] Narantsatsralt.J "An issue for land management in the socio and economic new condition"
[11] Maidar.D "Three maps of Mongolian urban land"
[12] Maidar.D "Mongolian construction and architecture"