

Recognizing the Existing Potentials of Iran in Identification of Natural Resources for Ecological Studies with a Land Use Planning Approach

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Key words: key words, theme, etc.

SUMMARY

While Spatial information is a prerequisite for sustainable development, the lack of such information is quite tangible in some parts of the world.

By providing spatial information which is an important tool for decision making in land use planning National Mapping Agencies provide an effective mean to monitor environment of the globe and so their role in sustainability of development in planning is quite unique and essential.

In this paper, it is tried to study the role and level of accessibility to accurate information of the land or in fact the identification card of the land ie. topographic maps , aerial photos , satellite images and Geographic Information Systems (GIS) in national level so as to identify the resources for ecological studies with a land use planning approach and to reveal the existing potentials of the country .

In the introduction, first the environmental conditions of Iran is considered and explained and then the process of implementing the projects with and without land use planning approach is presented and then a model of general approaches in land use planning is designed and presented.

In continue, the methods of resource identification including interpretation of topographic maps, aerial photographs and satellite images and automatic interpretation by using computer and the existing potentials of Iran in this field are introduced.

Finally the proper models for data gathering and analysis and planning in a national level by using GIS with a land use planning approach and Environmental Impact Assessment (EIA) methods for sustainable development are presented.

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1. INTRODUCTION

At the beginning of the third millennium, excess land use and involvement of human beings in environment have imposed a great pressure on the environment so that it is quite noticeable that from the scientific & technical viewpoint, especially in Asian and African countries, development should be made through a proper land use plan and with minimum destruction of the environment.

As the infrastructures of the notion of land use planning and as the means for proper decision making, the role of organizations and institutions involved with production of spatial information is quite clear. Through misuse of the land and incorrect management and because of long duration of revive and rebuild of land, the world is faced with a great crisis of decrease in natural resources in addition to increase in population and pollution crises.

At the present era that human activities unprecedently have involved all economic subdivisions, there is no doubt that application of a kind of wisdom in development is quite essential. This wisdom results in planning. A planning which considers development actually through overall conservation of environment and through prevention from ecological destruction and which considers and involves the refining and renovation of the environment in its assessments.

Recognizing the available potentials of the country leading to identification of resources will help us to compile and arrange successful scientific programs. Ref. to appendix 1.

2. THE STATE OF THE ENVIRONMENT

At the end of 1970s, people appeared the most destructive behavior facing with environment. The gulf war imposed a lot of destructive effects on the environment of our country. When the oil wells of Kuwait was targeted by Iraqi forces, huge thick clouds covered about 500000 km² of the sky of Iran, causing acid rain from the north to the east of the country. Gulf war caused health problems for about 12 million people of Iran, destructed 5 million hectares of agricultural lands, 8 million hectares of forests and 8.5 million hectares of pastures and vanished numerous fauna and flora species vanished.

On the other hand; in recent years floods, pollution in large cities, extinction of a vast part of forests, uncontrolled growth of cities, desertification are all examples of disturbance in the state of the environment.

The process of destruction in different dimensions has many reasons, but we can find the major one in unreasonable use of the land.

World statistics show that the number of cities with more than 8 million population has increased from 2 cities to 28 cities, water consumption has been increased from 1300 billion m³ to 4200 billion m³, gas production has been increased from 5 billion tons per year to 25 billion tones and the extent of rain forests has had 30% decrease. The metal resources such as Nickel, Copper, Zinc, Plumb will be respectively ended up after 55,36,25,21 years and each minute 5.6 hectares of forests of the world are destroyed.

3. LAND USE PLANNING AND SUSTAINABILITY IN DEVELOPMENT:

Land is a limited and vulnerable resource but if its capacities to be utilized constantly and not entirely, it can be eternal and renewable and to find solution for this, it needs more carefulness and attention to the past, present and future of the subject. Inattentive use of the land together with incorrect management or improper and unwise application of the land by human have also increased the problem.

Today we know that we should preserve the nature and use the potentials of the land reasonably. The land use must be in accordance with the potentialities of the land and we should arrange and meet our social and economic requirements according to it. This conception became the introduction to land use planning and by this the economic basis of the expansionist concept which knew the economy separated from nature converted to the economy of sustainable environment which knows the whole economy as a comprehensive and inseparable subdivision of the nature.

Land use planning considers the constant profitability of the land according to qualitative and quantitative potentialities of the land for the use of human beings and prevents squandering of the resources and misuse of the environment. In figure 1 and 2, the process of preparation and compilation of projects with and without considering the land use planning procedures are illustrated.

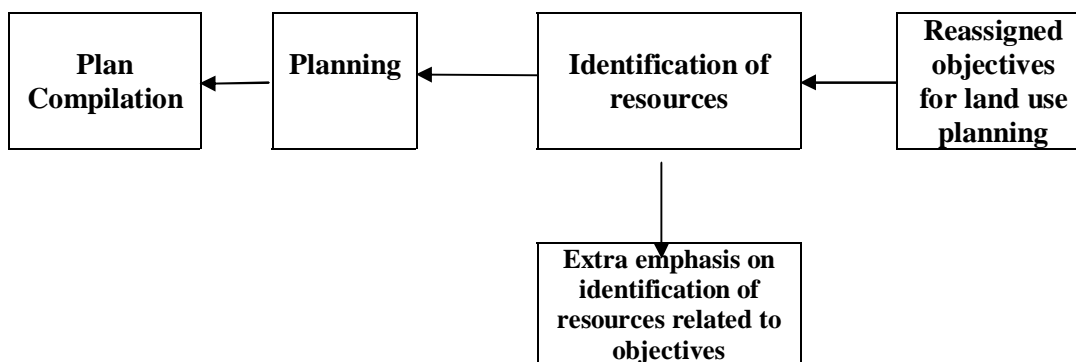


Figure 1: Process of Plan Compilation Without Land Use Planning Approach

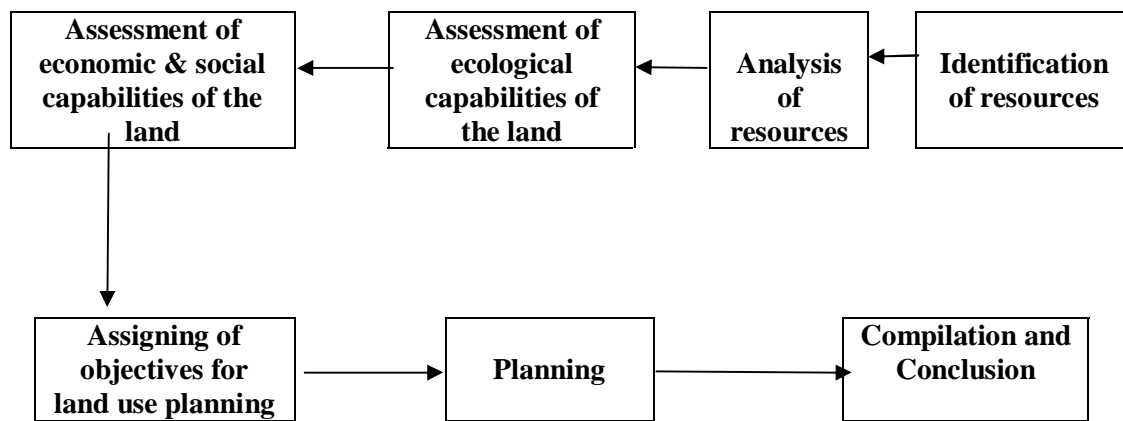


Figure 2: Process of Plan Compilation With Land Use Planning Approach

4. IDENTIFICATION OF RESOURCES AND AVAILABLE POTENTIALS

4.1 Methods of Resource Identification

4.1.1 Statistics and sampling

4.1.2 Conversion of the aerial photos, satellite images and topographic maps

4.1.3 Automatic conversion of aerial photos and satellite images and Data of Remote Sensing

4.1.4 Geographic Information Systems (GIS)

It is considerable that the evolutionary process of resource identification is so that each step is a prerequisite to the next step. From environmental planning point of view, resource identification is the first step in national planning and assessment or land use planning. Although there are different methods for it in different countries of the world but there is no doubt that arranging comprehensive scientific plans according to the land potentialities and their accordance with the overall social and economic requirements of the society is based on a proper and accurate identification of the resources.

Essentially, the resources can be divided into two parts: Fixed resources and unfixed resources. The natural or ecological resources can be divided to physical and biological resources. Physical resources include land, climate, stones, land form and soil and the biological resources include fauna and flora. From sustainability point of view, ecological resources can be divided into fixed and unfixed groups.

Fixed resources are those which are fixed in their matrix (*such as stone, soil, land form, plant and etc.*); change in such resources is slow if not to be under the influence of severe natural or human forces and unfixed resources are those which are not permanent and change in such natural and human resources is very quick (*such as land, climate, water resources, animals*).

To identify the climate of Iran, methods such as statistics, sampling and analysis are used. Along with recent technological developments remote sensing data and analysis of satellite data are widely applied through out the world.

To identify the stones and geomorphology, the method of interpretation of satellite images or aerial photos together with field works are used and to identify the probability of soil erosion, aerial photos and satellite images are used.

5. THE MAJOR AVAILABLE POTENTIALS OF THE COUNTRY

Essentially, the environmental assessment needs accurate quantitative data from the quality of the land and so methods of aerial photography and data preparation from inaccessible areas and resources and their potentials by using aerial photos and space activities by using remote sensing data and GIS are of great importance and value.

5.1 Aerial Photos and Method of Preparation (Aerial Photography)

In comprehensive studies and planning of the country; if we are to collect accurate and correct information from the understudied area and if the consumed time and expense is of great priority, using photogrammetry method and aerial photography techniques are suggested especially if photographs be merged with data resulted from field operations.

The methods of study and the obtained results depends on the subject and aim of the project. Using aerial photos in many cases such as possibility of three dimensional vision, conversion, possibility of measurement, coverage of all regions especially arduous areas such as elevations is very ideal and applicable.

5.2 Aerial Photography and its Facilities in the Country

At present, National Cartographic Center is responsible for preparation of aerial photos and base maps of the country and NCC is equipped with a very capable photography fleet.

Aerial photography department of NCC includes offices such as: flight, photography, aerial triangulation, photogrammetric computations, graphical editing, three dimensional controlling of graphical files and digital image processing. With a great experienced experts and advanced equipment, NCC performs different and diverse photography missions.

The capable fleet of NCC consists of 1 Falcon Jet aircraft and 4 Dorniers which fly over the country for aerial photography missions. These aircraft with flight board of 6.5 hours and flight elevation between 500 to 42000 feet make photography from every region and at every scale possible. This fleet is ready to provide aerial photos from every region of the country.

The photography office with its 40 years continuous activity , in addition to providing base photos at the scale of 1:40000 with geometrical specifications and high resolution from all of the country and photos at the scale of 1:1000 from all of the cities, has the capability to take oblique color and black & white photos from religious and historical

and cultural places , industrial sites and their surrounding areas in different time periods, different projects after or before a project and economical centers and cities. This office is also capable to develop and print photos and black and white diapositives is 25×25 cm² dimensions and to develop aerial color and black & white photos in 100×100 cm² dimensions.

6. GEOGRAPHIC INFORMATION SYSTEMS (GIS)

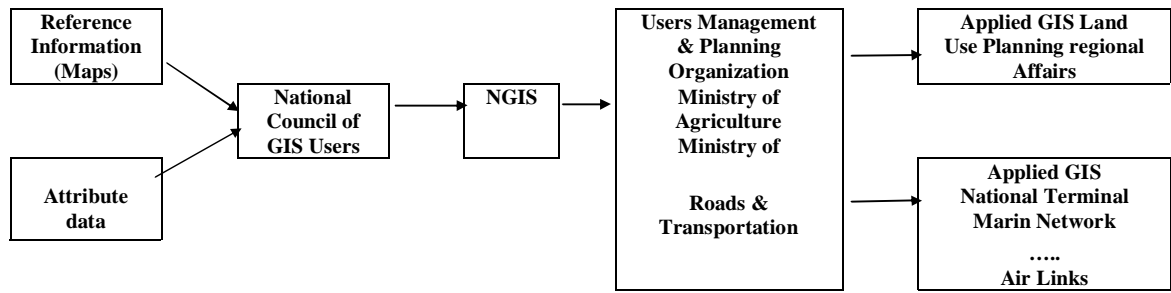
When interpretation of aerial photos or satellite images for the whole country is performed, ie maps of resources in digital format and tables related to data bases are stored and available, such kind of vast information can be arranged and classified according to geographical location and all resource data can be handled in different regions. If such data are provided with such huge volume, it can even be possible to do the assessments on resource maps and directly store the potentials of each region according to geographical location in data bases in the form of maps and tables.

Parallel to this, geographic information systems should be vastly applied in different applications. In national level, the task of organizing and establishment of National Geographic Data Base in order to utilize the potentials of a Geographic Information System is under taken by National Cartographic Center (NCC). From national planning point of view and land use planning approach, National Geographic Information Systems is a proper data base for planners and decision makers.

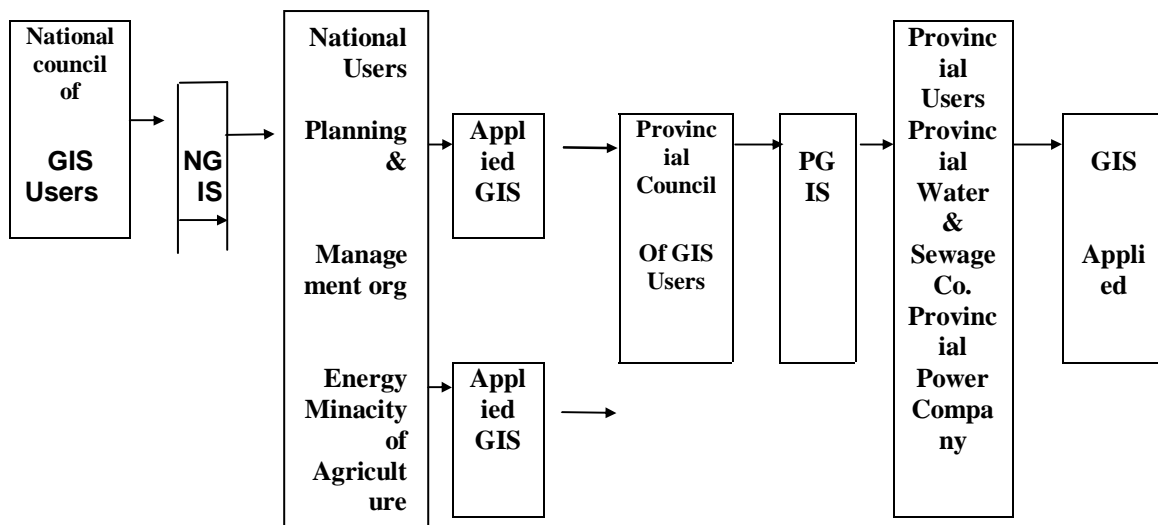
6.1 Department of Geographic Information Systems in National Cartographic Center (NCC)

The expertise, experience and proper hardware and software facilities and the capabilities and potentials of Geographic Information Systems Department of NCC are very important and applicable in planning for sustainable development of the country. At present GIS Department of NCC is one of the main members of board of directors of the Permanent Committee on GIS in Asia and the Pacific Region and an active member of workgroup II of this committee also and the delegate of our country is one of the six active of Asia and the Pacific region in GIS. Among the main tasks of GIS department the establishment of National Topographic Data Base (NTDB) at 1:250000 and linkage of attribute data to graphical elements and digital cartographic processing can be mentioned.

National Cartographic Center, in the way to promote its objectives and tasks in order to make policies, plan and coordinate the activities in the field of GIS in the country and in order to establish National Geographic Information Systems (NGIS), has established National Council of GIS Users in national & provincial levels. Models number 1 and 2 introduce the role of NCC in organizing GIS in national and provincial levels.



Model 1: Model of NGIS & Users in Iran



Model 2: Model of NGIS & PGIS in Iran

7. SPACE ACTIVITIES FOR SUSTAINABLE DEVELOPMENT AND IRAN SPACE AGENCY

We are all aware of the vital role of space technology in monitoring and assessment and identification of potential natural resources on a global and regional scale for sustainable development. Space technology is an indispensable tool in the proper recognition and exploitation of natural resources.

The optimization of resource exploitation and environmental conservation is one of the major problems encountered by many countries whose economy and society are undergoing rapid development.

Considering the high cost of space technology and its complex and sophisticated nature, most third world countries are faced with serious constraints.

Further it is also a fact that the way through which nations approach the issue of the peaceful uses of space technology depends upon their economical and political situation.

With the use of space applications, one can meet the challenges of improving people's lives and conserving natural resources in a world with a growing population that places an increasing strain on all ecosystems and natural resources.

Advances in space technology would help us respond to the increasing demand for education, food, water, shelter, sanitation, energy, health services and economic security in the field of sustainable development.

Earth observation from space has provided mankind and its decision makers with new global perspectives of its environment. Protection of the environment will certainly be one of the great challenges in the 21st century.

Successful planning and management of natural resources and environment are the basic requirement for sustainable development. The effective survey of dynamic changes is necessary for this purpose where key technologies are remote and GIS.

Remote sensing data gathered from airborne and space borne sensor systems are one of the starting points to preparing tools for gaining a better understanding of the complex interactions between the atmosphere, oceans, ice regions and land surfaces on one hand and the population with its various activities on the other hand.

Today we are engaged in practically all aspects of modern geographical data handling by integrating remote sensing with GIS, DEM, Computer Graphics, as well as basic research such as image processing, simulation and modeling techniques. Our main research and application activities are being carried through the following grounds:

- Disaster monitoring such as draught and flooding
- Land cover mapping
- Radar remote sensing
- Environmental assessment
- Urban studies
- DTM
- Map revision
- Map production using high resolution satellite data
- Radio frequency planning using 3 dimensional geographic data bases
- Mobile networking design
- Research studies in concern with low resolution satellite data including MODIS as well as NOAA

8. CONCLUSIONS

After finishing the task of resource identification for land use planning, ecological data of the land are inverted into the form of different maps for resources such as water, climate, land form, geology, fauna and flora and etc.

Essentially, the most important and probably the most difficult task in assessment of environmental potentials is the analysis and data gathering and according to different views on this, the analysis and data gathering is the process of map making or illustrating the distribution of a resource in a region, area or catchment in a simple or complex collection of national resource parameters. The application of Geographic Information Systems (GIS) tools and facilities for land use planning is a main trend in future plans the country.

Figures No 1 and No 2 compare the planning with and without “land use planning approach”. In a comprehensive and national view, the presented models (No: 1 and 2) specify how it is possible to exploit the gathered data in a National Geographic Information System(NGIS).

Essentially, the land use planning in management and planning of the country, is a universal and comprehensive approach in compilation of development programs and coordinating the future trends for the studied elements.

Improve in model 1 should be made through and according to gathered data of the land in NGIS by using proper models for assessment needed for determination of national potentials of each region and be applied according to the economic, social and cultural needs of different regions of the country.

In main approaches in land use planning, not only the maps and available data in NGIS should be referred to as the base and structure of planning but also the other approaches in land use planning should also be based on the potentialities of each region.

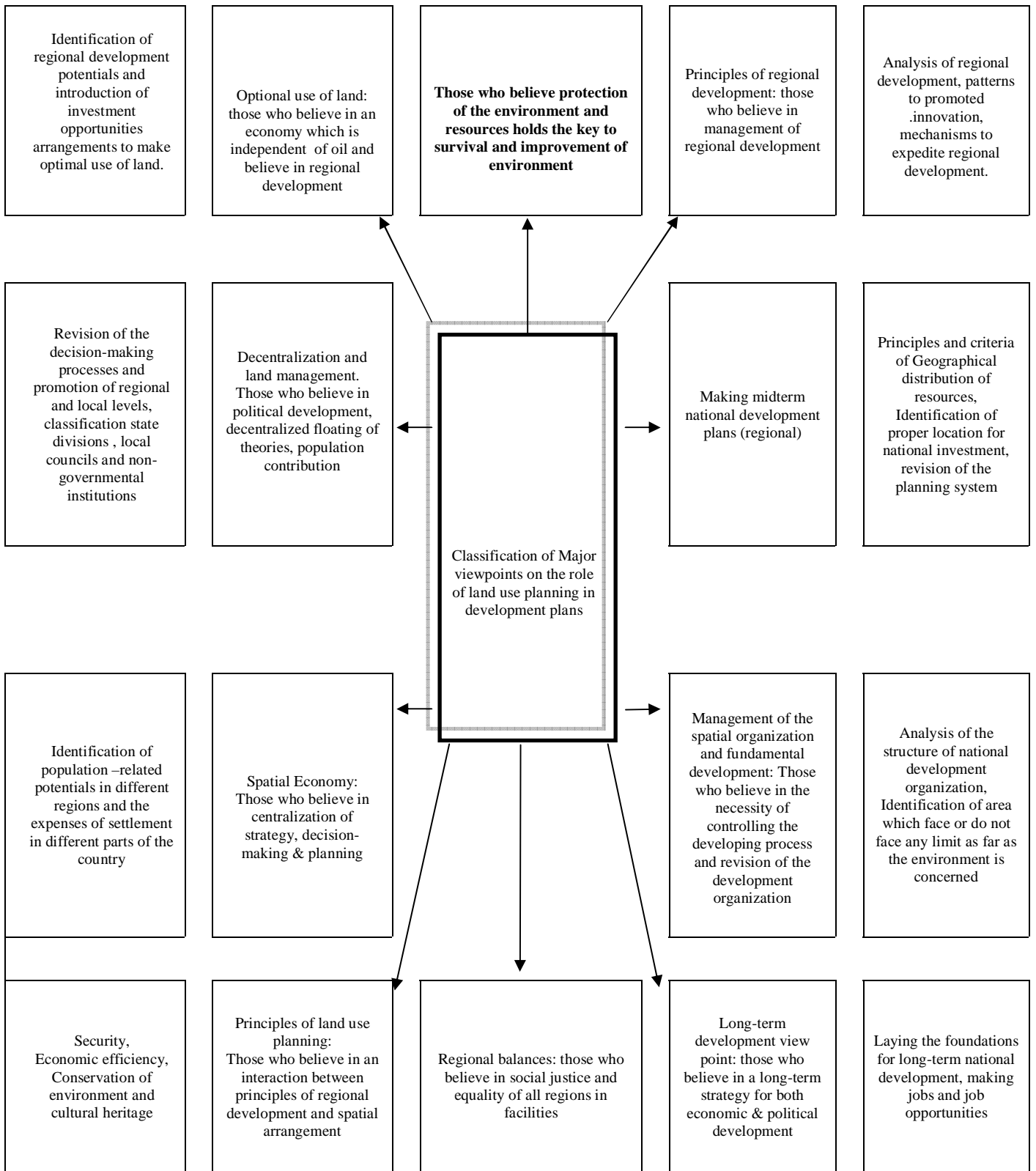
Finally, the proposed model for application of GIS and Remote Sensing in development programs with sustainable development approach is presented in model 3.

In this model, from the resource identification phase to implementation of a project in each region and the role of GIS and Remote Sensing and Geo-reference information with land use planning approach and EIA methods for sustainable development are presented in Model 3 (appendix 2).

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Appendix 1



Major Interpretations of land Use Planning

Appendix 2

