Tamar Papachashvili
Master of Geography, Specialist of Geographic Information Systems,
PhD of Engineering Geodesy,
Visiting Professor of Georgian Technical University, Georgia,
t.papachashvili@gmail.com

THE ROLE OF INFORMATION TECHNOLOGIES IN THE LAND MANAGEMENT

Summary. *The work deals with IT role in the land management. Aspects of land management are presented, where IT, especially geographic information technologies are able to play a crucial role. Territorial organization of land usage in the light of each parcel of land (land arrangement, planning, zoning etc.): engineering assurance of land usage, establishment of land status (property, rights, duties, usage, restrictions, risks; also, natural and economic analysis of land in the light of land usage, establishing economic and ecological technologies etc. The article analyses of supporting spatial decisions systems: on the land Information Systems. This work also deals with discussion of contemporary means of obtaining geographic information such as Esri, Google Maps, Google Street view, Imagery & Remote Sensing.*

Key words*: Land Management, Land Information System, GIS.*

Introduction:

Crucial innovative changes in the sphere of technologies make society face new challenges. Changes handle all the spheres of human life, knowledge economy formation that is based on huge innovative information (Papachashvili, 2014, Papachashvili, 2016.) Holding, and managing information make various sectors face new ways on different level of management. These challenges handle territorial management as well.

Land is fundamental resource. Economic stability of a country and society welfare are based on its effective management and optimal usage. Any country faces necessity of land effective management.

Land management includes property, land and natural resources perfect management, envisaging restrictions, responsibilities and risks. Land management is implemented complexly. In the period of accomplishing management functions, it is necessary to consider land main features (location, borders, area, value, property) and surrounding terms (environment, economy, emergency situations) as well.

Land research and registration, formation of relevant data should be background of land management. Without perfect information data it is impossible to organize and use land rationally. This issue relates to obtaining effective spatial decisions on the level of a municipality, a country and internationally. Obtaining and using information about land should be a subject of interest of private and public entities. Different technological opportunities make it possible to describe land surface, its usage and spread information about its commercial data effectively and successfully.

Even though successful steps are made to reflect fixed objects in unified data base, contemporary technologies are not relevantly used in land management. In many countries of the whole world, in municipalities, there is no information about land coverage, researchers indicate that the problem of not using technologies relates to institutional failure. Qualified personnel are concentrated in huge cities and unavailability of relevant policy of land are connected with it as well (Williamson, 2000).

According to above mentioned, **this work aims at displaying** the preference role of information technologies in the land management.

The emphasis of issue research:

Land management is a process, due to it land resources are managed effectively and smartly. It includes all activities connected with land, as a resource management. If we glimpse at traditional definition of land management (for example, 90s of the xx century) nothing has been changed. Although obtaining and working out information improved and reflected on the management process.

Land management is the process of managing the use and development of land resources. With great pace of growth in world societies in last decades managing and administering them is getting more and more complicated, increasing needs such as emergency management, environment protection, economic decision making and so on. Land administration systems (LAS) are about addressing these problems by providing a basic infrastructure for implementing land related policies and land management strategies to ensure social equity. Economic growth and environmental protection (Ansoff and Sullivan, 1993).

"The Land Management Paradigm" unifies 4 administrative functions: Land tenure, Land value, Land use, Land development. Authors indicate that land management activity can be defined by three components: Land policy, information assurance of land, functions of land management that is aimed at sustainable development (GIS, Cadaster and Sustainable Development, 2010).

The right policy of land management should be aimed at sustainable development. The issue is complex and relevant measures should be taken. This includes expansion of society consciousness and expansion of state policy in various directions. (Gagnidze, Papachashvili, Papachashvili, 2018).

According to economic conditions and social terms of a country methods and functions of land management differ, although the main component remains unchangeable. For complex thinking up an issue, we tend to researchers, who presented land management paradigm in a systemized way (Enemark et al., 2005) (Fig. 1).

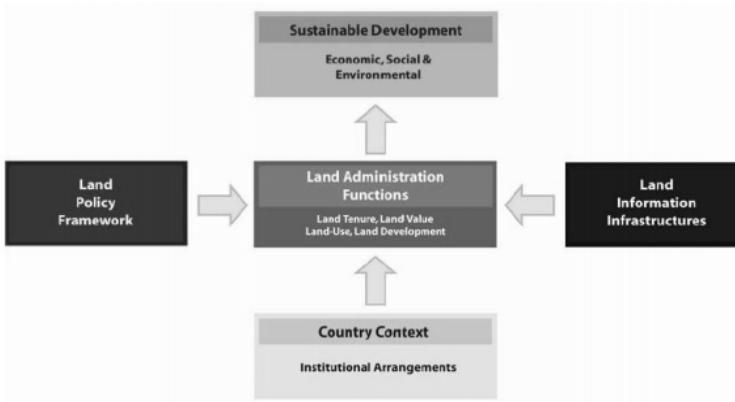

Figure 1. The Land Management Paradigm

The important fact in this paradigm is that main functions, act and develop not as a separate unit, but unity. Cadaster systems in the country should assure sustainable development assurance. Free access of spatial data for all interested bodies, plays an important role in this process. This covers the whole society.

The object of land management is an object of a real world, the land fund, land plots, road networks and premises etc. Management object is organizational issue of land usage, according to state and society interests planning of land usage and different ways of it are presented. Some directions can be selected, territorial organization of land usage in the light of separated plots such as land arrangement, planning, zoning, etc.; engineering assurance of land usage procedure, establishing status of land, rights, duties, benefits, restrictions, risks; natural and economic analysis of land as well; introduction of economic and ecologic technologies in the point view of land usage, etc.

Accelerating of scientific technical development in the contemporary management systems made sharp changes in methods. Despite the fact, that land management is depended on peculiarities of countries and regions, depends on numerous factors. Using IT for effective management, created wide opportunities for effective management. It depends on the level of these technologies and other circumstances as well, that are above mentioned.

It is of a crucial importance to form spatial data infrastructure to meet international standards. Free access of geographical data and opportunity of easy expression of information via contemporary IT, is very easy and takes little time.

Currently, spatial information technologies development creates novel views in management of territory. In researches of spatial decisions supporting systems different aspects are indicated. Scientific works emphasize systems of supporting pure spatial decision and progressive development of pure technical characteristics and following this development opportunity expansion. On different level of management. Some researchers indicate existence of vague limit between geographic information systems and spatial decision supporting systems. For example, „the simplest perspective on the definition of SDSS is that a GIS is implicitly a DSS, as a GIS can be used to support decision-making. This type of informal definition is also used in other fields; Keen (1986) identified a trend for the use of any computer system, by people who make decisions, to be defined as a DSS. Many GIS based systems are described as being DSS on the basis that the GIS assisted in the collection or organization of data used by the decision-maker“(Keenan, 2003).

The same author, later emphasizes technical details, (Keenan, 2003). Other Scientists emphasize practical importance of contemporary technologies different aspects of territorial management in the process of decision making (Malczewski, 2004; Rayed, 2012; Halbich&Vostrovský, 2011).

In the contemporary world Google Maps became as every day vital part. Via these maps, it is possible to connect one place with another. For example, in Georgia, Public Registry is regional administrator of Google Maps, Geographic data have been accumulating since 2014, for detailed and accurate description of Georgia. Data of Tbilisi, premises, road networks, addresses, railway main lines, mountains, rivers, etc. are placed.

Long before, Google, company Esri-Environmental Systems Research Institute was set up. Environmental systems research institute that was bases for creation of Google Earth-ი, Google Maps

and Google Street view. Esri laid foundations to Google and surrendered leadership in the map world. It itself allocated in different sectors (business, government etc.) Google is beneficial for searching routes and understanding different locations, but working out spatial information, managing, showing, problem noticing clearly, obtaining fast and perfect information, easy sharing opportunity, reflecting of operating and forecasting realities are advantages of Esri, which is carried out on the base of software system (GIS)

GIS software allows to describe, process and manage information of objects on the land surface, as well as their expression, creation the different format data by using of specific tools of mapping. Also, the opportunity for creation and management of sets of the personal data bases and the multiuser database objects is given by GIS.

Some scientists use the term „Land Information Systems“ (LIS). A Land Information System is a specialized application of GIS technology that is concerned with issues of land ownership, land planning and land management. Such systems usually rely on large-scale maps and store information about land ownership and land use. More formally an LIS can be defined as ‘a system for capturing, storing, checking, integrating, manipulating, analyzing and displaying data about land and its use, ownership, development, etc. (Wyatt & Martin, 2003).

Wyatt P. and Martin R. indicated that Cadastral LIS maintain information on property ownership, use and value and are common throughout the countries of Europe, with the exception of Britain. In Sweden, for example, the on-line Land Data Bank System integrates the Land Taxation Register, Census Register, Housing Statistics and local authority information systems. Applications include planning, natural resources management, banking and real estate brokerage. It is important to clarify that the core technology underpinning LIS is essentially the same as that of the more generic GIS and given the list of candidate data types for a LIS described above there would appear to be little difference between the two (Wyatt & Martin, 2003).

Remote sensing has long been used for land use management due to the multiple possibilities offered by airborne or spaceborne imagery: land description and measurement (including in 3D), change detection, control of land use legality. Recent developments have led to a higher quality and an easier access to this information and to a lower cost per land surface unit (Polidori, 2011). Remote sensing provides the basic data to undertake inventory of land, as well as the temporal information required to monitor sustainable land management practices (Woodcock, 1983). Remote Sensing and GIS

techniques can be applied effective measure to generate data and information for sustainable development (Elias, 2009).

The Global Positioning System (GPS) is the modern way of collecting the geographical data. The GPS system determines the location and is used for navigation and planning of the various services.

All the above listed opportunities allow the effective implementation of land management issues in a short period of time.

Conclusions:

Management of land resources is a complex process. It is important to consider the basic features of land (location, boundaries, area, value, property) and environmental conditions (environment, economy, emergency situations) while performing land management functions.

The most important prerequisite for the land management is the formation of an appropriate database.

It is impossible to use rational organization and use of land without comprehensive information base. The issue is related to the adoption of efficient spatial decisions on the municipality, country and international level.

Development of spatial information technology creates new visions in the territorial management. Following the technological development, using of tools of modern information technologies improves and makes land management effective. Differences in effectiveness among countries are mostly depended on the relevant institutional development and qualified personnel.

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