

Space Technology Advances Application in Town Planning

Nargiz A. Babayeva¹, Rayxa B. Amenzade² and Rustam B. Rustamov^{3,*}

¹Encotec Company, Baku, Azerbaijan

²Institute Architecture and Art of the Azerbaijan, National Academy of Sciences, Azerbaijan

³Laboratory of Modern Method of Applied Electrodynamics, Institute of Physics, Azerbaijan National Academy of Science, Baku, Azerbaijan

Abstract: This paper is dedicated space technology advances use architectural design in town planning for selected area of Gobustan district, Azerbaijan. It describes conceptual approach of the process of use space technology in initial stages of design process. This paper briefly observes an option of remote sensing platform for data collection with further geographical information system (GIS) technology applications.

The decision oriented on the importance of linking remote sensing systems with GIS. The use of GIS is contained in application such as image classification, calibration and environmental modeling.

There is clearly great complimentary between remote sensing and GIS. Existing remote sensing method and GIS technology are operating and functioning independently. It is necessary to mention that by linking the technology, concepts and theories of remote sensing into GIS, information systems considerable richer and more sophisticated can be created for use in substantive applications.

The fact is that application indicated technology for collection necessary data during execution and decision making of engineering solutions. An advantage of use of space technology is an excellent instrument of merging and integration accessed data into geographical coordination stimulated of easily those definition and importance in all the stage of engineering executions.

Keywords: Space Technology, Town Planning, Remote Sensing, Space Image Processing.

INTRODUCTION

There is no doubt that town planning is highly complicated in engineering point of view. It demands consideration number of requirements and standards within the whole stages of execution. The success and efficiency of town planning depends of collection and management of the data with further processing. For this purpose remote sensing technologies offer that they can efficiently and objectively quantify the physical characteristics and growth of cities [1-4]. There are following aims and main tasks required in developments:

- (i) city area selection;
- (ii) vertical layout;
- (iii) underground utilities;
- (iv) landscaping;
- (v) social facilities;
- (vi) natural and artificial reservoirs improvement;

(vii) urban areas lighting;

(viii) health improvement.

It is obvious that natural condition and factors are also important in town planning. It has to be considered natural factors in selection of areas of settlement for town planning. The main natural factors have been reflected below:

- (i) relief of selected territory has to meet the requirements of site development, urban transport and drainage system achieving by gravity approach;
- (ii) territory should not be selected on the waterlogged or water flooded areas;
- (iii) soil resistance has to meet of intended type of site development;
- (iv) residential areas should be located in the windward side against of the air pollution sources and upstream in case of the river presence against of industrial facilities provoking pollution of the water reservoir;
- (v) territory needed to be maintained with the best, satisfied sources of water supply and suitable areas for sewage system;

*Address correspondence to this author at the Laboratory of Modern Method of Applied Electrodynamics, Institute of Physics, Azerbaijan National Academy of Science, Baku, Azerbaijan; Tel: (+994 50) 366 89 49; Fax: (+994 12) 538 16 01; E-mail: r_rustamov@hotmail.com

- (vi) territory should be considered for a further expansion;
- (vii) territory needed to be maintained an external highways and railways or to be allowed of those facilitation with a low cast expenses in case of absence;
- (ix) settlement territory should not be content of minerals having industrial value.

Other important territory selection circumstances in town planning:

- (i) climatic condition of selected area/for full climate characteristics are:
 - monthly average temperature;
 - relative air humidity;
- (ii) land cover/land use of the area;
- (iii) engineering - geological conditions.

How systematically to use and manage the data collected for town planning with further construction? It is highly important subject in any stages of engineering activities.

It has been selected Gobustan area of Azerbaijan for town planning. Fir study of the areas was used stereo topographical survey (Figure 1).

This method is the method of development of the original topographical map based on processing of the photographical images of the area by means of stereo topographic or photogrammetric. The method as a result of stereo topographical survey makes possible an interpretation of aerospace images, conducts stereoscopy acting of relief and develop of original maps.

The aim of the stereo topographical survey is the stereoscopy vision that is ability of human eyes to sense the three-dimensional space [3]. The three-dimensional model understands as decreased spatial optical model of the area which defining in case of crossing of aero or space images generating of stereoscopy pairs. Processing aero or space images (relief survey and horizontal application) is implementing using stereo photogrammetric facilities.

1. REMOTE SENSING METHODS AND GIS TECHNOLOGY IN TOWN PLANNING

Remote sensing can provide an important source of data for town planning mainly as an excellent



Figure 1: Stereo topographical Survey.

instrument on land use/land cover mapping and environmental monitoring. This technology makes available to collect required information for a huge of features of town planning. Town planning land cover/use mapping has received an increasing interests from town planners and specialists involved for indicated implementations.

Planning is a widely accepted way to handle complex problems of town planning for further decision-making by appropriate state authorities [5]. The modern technology of remote sensing which includes both aerial as well as satellite based systems allow us to collect physical data rather easily with speed and on repetitive basis and together with GIS helps to analyze the data spatially, offering possibilities of generating various options (modeling). Thereby it allows optimization of the whole planning process. These information systems also offer interpretation of physical data with other socio-economic data and thereby providing an important linkage in the total planning

process and making it more effective and meaningful. Therefore it is essential to know intensively about the characteristics and capabilities of these remote sensing data products available to the urban and regional planners.

2. APPROACHES OF REMOTE SENSING AND GIS APPLICATION IN TOWN PLANNING

Application of Remote Sensing technology may lead to innovation in the planning process in various ways:

- (i) Digitization of planning base maps and various layout plans has facilitated updating of base maps wherever changes have taken place in terms of land development etc. Digital maps provide flexibility as digital maps are scale free. Superimposition of any two digital maps which are on two different scales is feasible. This capability of digital maps facilitates insertion of fresh survey or modified maps into existing base maps. Similarly superimposition of revenue maps on base maps with reasonable accuracy is of great advantage compared to manually done jobs;
- (ii) Remote Sensing techniques are extremely useful for change detection analysis and selection of sites for specific facilities, such as hospital, restaurants, solid waste disposal and industry. An attempt has been made here to demonstrate the potentials of remote sensing techniques in base mapping, land use and land cover mapping, urban change detection and mapping, urban infrastructure and utilities mapping, urban population estimation, management etc.

3. CONCEPTUAL APPROACH OF SPACE TECHNOLOGY USE IN TOWN PLANNING

It is important to investigate areas undertaken for a new town planning where necessary to meet all a main requirements of engineering facilities development, social, natural and human aspects. It has been studied conceptually of the areas embraced territory of Azerbaijan and offered a way of a new town planning in case of necessity of execution such implementation.

Figure 2 space images used for selected area processed and integrated into the stereo topographic data. Figure 3 reflects view of area selected for a new town planning. In this regard space images have been processed with content of foregoing mentioned stages

demanded to be considered in a new town planning execution process.



Figure 2: Top view of the selected area.

For this reason the area has sectioned into six zones: residential, down town, and areas of green, school, kindergarten and parking.

The use data collected by means of RS methods with further GIS technology application opens opportunity for suitable convenient location all engineering and social features which are highly important aspect of the successful town planning execution. The legend shows the main features of the city necessary for satisfaction of life needs. In the other hand application of space technology outcomes makes available easily integration of city engineering and communication systems to the existing in outside of the city maintaining services.

One of the important issues is the data related to the evaluation model of the selected area for the town planning. Space image data processing with orientation of Digital Evaluation Model (DEM) is the way of effective understanding and management of location industrial and required other important technological options of town planning process (Figure 4). It is an excellent advantage for human safety aspects with forecasting of any possible natural disaster impacts as a whole and minimization its consequences.



Figure 3: Town planning integrated into the space image/topo map.

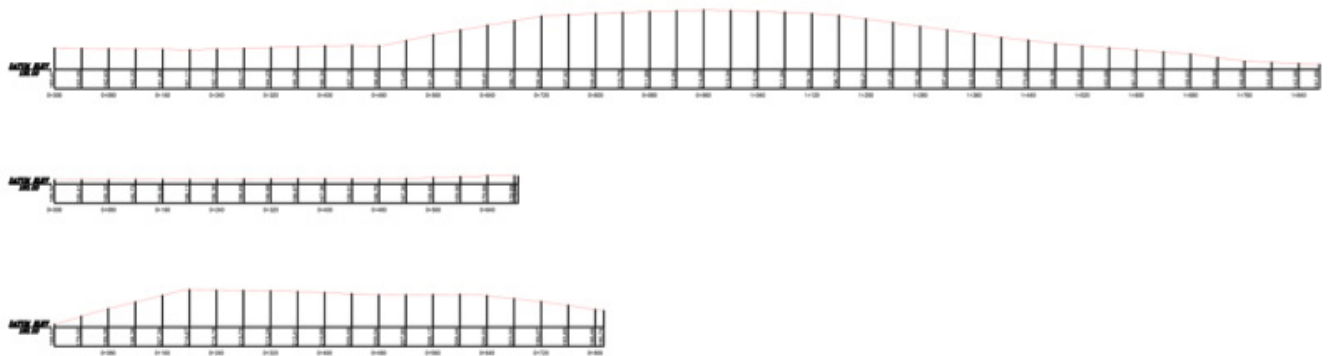


Figure 4: Selected area elevation data for town planning.

The cost of project is one of the important issues in any engineering options. A suitability of selection most effective way of implementation is a valuable segment of the implementation. This data plays a significant role successfully manage of the process of water supply, design and construction town sewerage system and other communication elements in town planning which is influencing project management condition.

CONCLUSION

There is no doubt that purposeful approach of engineering execution comes from successful achieved data collection related all areas of developments. There is several methods can be used for this target achievement. The modern technology applications particularly space technology advances with RS and GIS technology use become a good instrument in

challenge of expected outcomes of town planning. It relates a wide aspect of town planning as a good choice of starting stage of town planning as well as detailed management of the issues as a whole embraced full stages of execution.

The paper demonstrates conceptual approach of application space technology in town planning process. The use of space technology advances in engineering particularly in town planning makes available a suitable interface and interact into the all process of engineering activities. It influences the main platforms of project lines starting from tender package development up to project execution phases reflecting management of cost, time and other resources participating in the process.

REFERENCE

- [1] Elizabeth AW, Nelson D, Rahman A, Stefanov WL, Roy SS. Expert system classification of urban land use/cover for Delhi. India Int J Remote Sens 2008; 29(15): 4405-27. <http://dx.doi.org/10.1080/01431160801905497>
- [2] Keys E, Elizabeth AW, Redman C. The spatial structure of land use from 1970-2000 in the Phoenix, Arizona metropolitan area. Professional Geographer 2007; 59(1): 131-47. <http://dx.doi.org/10.1111/j.1467-9272.2007.00596.x>
- [3] Myint SW, Wang L. Multi-criteria Decision Approach for Land Use Land Cover Change Using Markov Chain Analysis and Cellular Automata Approach. Can J Remote Sens 2006; 32(6): 390-404. <http://dx.doi.org/10.5589/m06-032>
- [4] Myint SW, Jain J, Lukinbeal C, Lara-Valencia F. Simulating urban growth on the U.S.-Mexico border: Nogales, Arizona and Nogales, Sonora. Can J Remote Sens 2010; 36(3): 166-84. <http://dx.doi.org/10.5589/m10-038>
- [5] Rai PK, Kumra VK. Role of Geoinformatics In Urban Planning, Department of Geography, B.H.U., Varanasi-221005, Journal of Scientific Research 2011; 55: 11-24. Banaras Hindu University, Varanasi ISSN: 0447-9483.

Received on 15-05-2014

Accepted on 03-06-2014

Published on 17-09-2014

DOI: <http://dx.doi.org/10.12974/2311-8741.2014.02.01.2>

© 2014 Babayeva *et al.*; Licensee Savvy Science Publisher.

This is an open access article licensed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>) which permits unrestricted, non-commercial use, distribution and reproduction in any medium, provided the work is properly cited.