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Land Ownership and Land Use Development

The Integration of Past, Present, and Future in Spatial Planning and Land Management Policies

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Evaluation of Land Use for Justification of a Decision-Making Process

A study on experiences and tools in the implementation of spatial development plans

Abstract

The issues regarding the rational use of land resources and effective monitoring of land-related activities are urgent and rather challenging in many parts of the world. It is argued in the article that by choosing a sound scientific approach and applying both selected methods and criteria, it is possible to explain the processes of land use from point of view of efficiency in the widest possible form. The author suggests that a systematic evaluation of land use by applying the efficiency domain within appropriate methodological framework permits not only decisions to be justified in land use management, but also to improve the spatial planning process. A systematic, logical and comparative analysis of the existing approaches and tools for the justification of a decision-making process in relation to the implementation of spatial development plans is used for the research.

Key words: land use; evaluation techniques; efficiency domain; decision-making

1. Introduction

The way land is managed may have a profound effect on economic growth, social security, and environmental protection. Basically, "land use" is concerned with the usage of the beneficial features of a land. Managing the use of land is an essential part of land administration systems and represents the process that has to provide sustainable development (Williamson et al. 2010). Accordingly, "modern land administration theory" prescribes the "land use" as one of the four land administration functions. Although effective land use management should promote sustainability in land developments, often it is not clear what effects will follow when readjusting land infrastructure, designing new urban areas, distributing hazardous and polluting facilities, and developing appropriate engineering infrastructure.

Experience on the evaluation of land use (ELU) largely indicates a sector approach, which focuses on research within specific projects in both rural and urban areas. The evaluation experience in rural areas is to be associated with solutions of land consolidation projects, providing processes of real estate development together with improvements in engineering infrastructure. By contrast, in the urbanised environment mainly promotes the formation of compact and multifunctional urban developments whilst contributing to the spatial and

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architectonic perception of the construction to carry out an analysis of urban and spatial structure. In many locations the evaluation is carried out by using GIS technologies, multi-criteria analysis, solving optimization tasks, and creating land use models.

ELU is often associated with decision-making in the optimization of economic activities and the best possible management of land areas. However, initiating some positive effects, e.g. land improvements and increased land use intensity, does not necessarily mean that the best possible outcome will be gained. Examples of such actions may include agricultural land management through investments in the improvement of engineering infrastructure, and additional land acquisition in circumstances where there is uncertainty in the sales of agricultural products. This displays the variability of the land use intensity and its impact on land use results. It is argued that funds invested in land consolidation projects in rural areas cannot be repaid because of the narrowing of the market of agricultural products and migration of population to cities and towns (Dixon-Gough 2006:174–175). Therefore, more topical research on the rural-urban relationship and land readjustment projects in urbanised areas, in particular – peri-urban areas, became more pertinent.

Recent research by the author suggests specifically that in terms of efficiency the land use process has not been comprehensively evaluated and the evaluation experience relatively small (Auziņš 2013). In most cases, the evaluation is focused on development projects and related to the application of socio-economic indicators in a cost-benefit analysis. The assessment experience of land use reflects a systemic approach, primarily through the input-output and cost-benefit analysis methods. Thus, the effects gained and the socio-economic nature of resources used to obtain them is indicated. The system is built and the evaluation made by using the efficiency domain that takes place where it is topical and urgent. For example, in China such an approach was made because of a governmental initiative to carry on with an 'accelerated urbanisation' programme.

The aim of the study is to explore and discuss the experiences and tools in ELU for supporting decision-making in land use management. Therefore, the implementation of spatial development plans has been researched through analysing the planning-implementation relationship and ELU techniques. In addition, an appropriate methodological framework is proposed that would allow justifying decisions for better and more efficient land use.

This study presents knowledge about: the land use management within the framework of the socio-economic, environmental and institutional aspects; the experiences and tools of both the spatial planning and the implementation of spatial development plans; the practices and applications of various evaluation techniques based on the review of scientific literature; and the necessity to employ a methodological approach for more efficient use of land-related resources. The scientific research methods mainly used in this study include the logical-constructive, the monographic, the analysis and synthesis, and the historical approach method.

2. Land use planning-implementation relationship

2.1 Spatial planning systems and practices in Europe

European Commission (1997) described the spatial planning systems (SPS) as control systems, which vary considerably in terms of scope, maturity and completeness, and the distance between expressed objectives and outcomes. SPS also varies in terms of the locus of power – e.g., centralization versus decentralization – and the relative roles of the public and private sector – e.g., the planning-led versus market-led approach. More generally, SPS are influenced by the cultural and administrative development of the country or jurisdiction, the same way as for cadastral systems (Williamson et al. 2010). Approaches to spatial planning vary considerably throughout the world, reflecting historical and cultural developments as well as geographical and economic conditions (Williamson et al. 2010:176–177). Across Europe, four major traditions of spatial planning have been identified (European Commission 1997).

Recently conducted comparative studies on SPS and practices in Europe show considerable changes facing some European countries since 1990s – the continuity and decay in Danish system; recent developments in Finnish system; the end of an era in Dutch system; the institutional inertia and new challenges in German system; drifting away from the 'regional economic' approach in France; the modernization in Italian system; the evolutionary changes of planning in Greece; serving a by-pass capitalism in Flanders; the evolving planning guidelines in UK; changes in the planning system of the Czech Republic; institutional change and new challenges in Turkish systems; European influence and dominant market forces in Polish system (Reimer et al. 2014). The impact of administrative-territorial reform influenced the spatial planning practice since 2009 and SPS has been significantly changed since 2012 in the Republic of Latvia.

Following the identified traditions of spatial planning, one can conclude that most of European countries, including countries of Baltic See Region (BSR), employ a 'comprehensive integrated' planning approach. Comparable information about the SPS of the BSR countries is available on the website (Commin 2007), which gives the definition of 'land use planning':

> *"Land use planning is a branch of public policy which encompasses various disciplines seeking to order and regulate the use of land in an efficient way. It means the scientific, aesthetic and orderly disposition of land, resources, facilities and services with a view to securing the physical, economic, social and environmental efficiency, health and well-being of urban and rural communities. The systematic assessment of land and water potential, alternative patterns of land use and other physical, social and economic conditions, for the purpose of selecting and adopting land-use options which are most beneficial to land users without degrading the resources or the environment, together with the selection of measures most likely to encourage such land uses. Land use planning may be at international, national, district (project, catchment) or local (village) levels. It includes participation by land users, planners and decision-makers and covers educational, legal, fiscal and financial measures."*

From the above definition it is obvious that the process of land use planning is an integrated part of local spatial planning and is concerned with an *efficiency domain*. Assessing the SPS in Latvia and Norway, it was found that local planning contains two levels of statutory (legally binding) plans as in most regulatory planning systems: an overall (comprehensive) plan and a detailed plan (Kule and Røsnes 2010; 2011). However, the Latvian system includes more specific statements, covering descriptions of existing land uses, preconditions for development, development objectives and directions, existing planning policies, land use and building regulations with zoning for future uses, and public participation. At the end of year 2011 the new Spatial Development Planning Law was adopted by the Parliament of the Republic of Latvia (Spatial Development Planning Law 2011). The Law introduces a local plan as an additional planning document in hierarchy between both comprehensive and detailed plans. On the one hand, such legislative change may lead to more flexible planning system, but, on the other hand, it may cause to more complex interpretation of regulatory norms in the cases of changes in functional zoning, and so, in land use.

Any changes either in the Law, regulations or land use patterns itself do not cause the changes in the appropriate territory. Even if the priorities of the territory are set and clear, the following questions should be addressed to the land management entities: What direct and indirect effects have been analysed during the planning process? What are the objectives for improvements in land structure and site developments? Which territories are appropriate for specific projects, for example, land consolidation projects in rural areas or developments of urban infrastructure in neighbourhoods? How previously set priorities and objectives are to be implemented in the territory? Does the implementation of plans follow the methodological framework? Does the land use and site development comply with the provisions of land use and building regulations? Are the effects from application of the regulations monitored systematically? These and similar issues are directly related to the land use management measures in practice.

2.2 Why does evaluation of land use make sense?

Studying various topical researches of recent years, it can be concluded that the issues on ELU become increasingly important to support the sustainable usage of land-related resources. It is argued that the success of a land consolidation project is directly related to the detailed examination of the project territory and at the preparatory stage it is very important to have as much actual GIS data and documentation as possible (Paškarnis et al. 2013). Accordingly, it is expected that after a successful implementation of the project, the value of the land will rise and it will attract investment, which will in turn lead to further rise in value and improvements of local environment. However, it also indicates the necessity to gather comparable data about effects and potential outcome from implementation of the project in the territory. For the purpose to evaluate the rationality of land use and its monitoring as well as to analyse the results of the implemented measures of land use policy, specific indicators revealing underlying changes in the qualitative and quantitative content should be used (Auziņš et al. 2014). An irrational use of either agricultural or building land is examined as a consequence from applying the techniques of land use planning in the

Republic of Slovenia, because of focusing in particular on the physical balancing of land surfaces for a specific type of land use, and do not considering the economic aspect in preparing the foundations for land use decision-making in the process of spatial planning (Šubic Kovač 2013). Accordingly, it is argued that a sustainable development largely depends on defining of the land development potential, using appropriate methodological framework.

Land use objectives (patterns) spatially characterise the functional use of the territory. Thereby, they are effectuated by land use planning and implementation system (measures) in a country. In Baltic countries like in more advanced European spatial planning practices, the land use planning follows the 'bottom-up' approach and points to the responsibilities of local governmental level – municipalities (Auziņš et al. 2014), which basically represents a decentralised SPS. The areas of various land use patterns can be identified according to the functional zoning designed by the land use plan of specific territory. Figure 1 shows the process through which the land use pattern may be changed. Thus, a land use pattern may be changed in the result of land use planning and implementing desired developments in the territory.

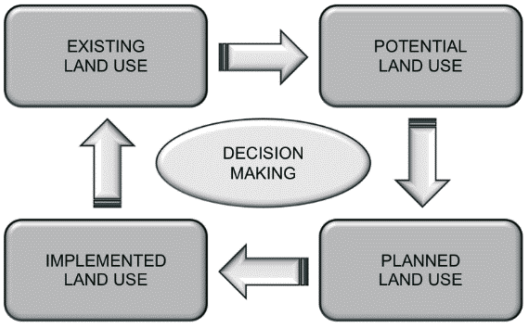

Figure 1: Changes in a land use pattern (Source: Auziņš 2013).

Potential land use (pattern) follows the assessments on feasibilities and necessity to change the existing land use while the area of changed land use is determined through implementation of land use plan. The collection of specific indicator sets for the assessment of land use dynamics indicates to the application of land use modelling methods and GIS technologies. For instance, spatial decision support systems are designed to deal with complex spatial allocation problems for balancing interests and solving land use conflicts. Therefore, generic conceptual framework has been proposed to support land use planning in the region of Flanders with focus on soil protection (De Meyer et al. 2013). Programme-based planning of natural resources is an evolving planning frame for solving complex land use, environmental and forest management problems within hierarchically administrated funding and decision-making schemes. It acknowledges that an effective planning process requires the combined consideration of environmental, technological, economic and socio-political factors. The approach is based on a list of key criteria for the phases of a *collaborative planning process*: (1) problem identification, (2) problem modelling and (3) problem solving (Vacik et al. 2014).

3. Practices and applications of evaluation techniques

Based on literature review

Alongside the definition of land use principles, the making conditions for the best possible land use and its sustainability should be determined by national land policy. Accordingly, the implementation processes of land policy are related to the development of national economy sectors and the evaluation of land use efficiency – applicable approaches, methods, evaluation criteria and indicators based on sustainable development principles.

Actual information plays meaningful role when starting the assessment of possible land use solutions in particular areas. Thus, the information has to show the impact of various factors, such as worksite increasing, decreasing of land units, formation of more compact structures of land units, improvement of accessibility, on profitability in agricultural and forestry sectors (Backman 2002). Systems approach for evaluation and analysis of land use potential has been proposed in China (Zou and Li 2008). Thus, systemic analysis provides the land managers with a possibility to oversee the utilisation of land resources if considering the outcome of versatile usage of these resources. For the purpose to assess the relationship of both the land consolidation and rural housing, an indicator system and a mathematical model allow the efficiency determination of land consolidation process (Gao et al. 2011). An optimal allocation of land resources from the usefulness and effectiveness point of view in a region resulted when the technique for order of preference by similarity to ideal solution has been applied and integrated with other methods (Li et al. 2013). Performed territorial assessment and solved optimisation tasks resulted to the substantiation of most suitable allocation of land use patterns (Taromi 2011). A collaborative analysis shows the territorial changes of farm holdings and suggests in addition to quantitative indicators of differentiated agricultural land use zones apply also qualitative indicators in order to better identify most suitable possibilities of land use (Atkoceviciene et al. 2011).

When analysing the methods for evaluation of investment projects in several European countries, it has been concluded that there do not exist standardised and unified methods to evaluate the infrastructure characterising urban systems (Griškevičiūte-Gečiene 2010). Cost-benefit method still widely is used for evaluation of project solutions co-financed by EU, thus capitalising economic benefits and costs. However, the methods of multi-criteria analysis are becoming more employed if assessing the funding possibilities and alternative solutions for development of sustainable infrastructure (Lazauskas et al. 2015). Explored ELU practices in urban environment indicate to feasibility analysis and assessment of alternatives, the process of land use planning, specific solutions of either the construction design or territorial improvement as well as to processes of elaboration and implementation of detailed plans, making specific territorial investigations. A particular model for evaluation of urban sustainability has been proposed (Yigitcanlar and Dur 2010). This model can be seen as a remarkable instrument of land use planning within urban area, because it provides integrated assessment of urban environment.

During the last decade the interest of researchers increased significantly towards applications of modelling tools with the aim to study changes of land use and land cover. By employing

various approaches and techniques, including cellular automata approach integrated modelling, agent-based models, the complex tasks can be solved and systems simplified (Sohl and Claggett 2013; Matthews et al. 2007). The application of land use modelling techniques mainly involves: cellular automata, statistical analysis, Markov chains, artificial neural networks, economic models and agent-based models (Celio et al. 2014). Some recent researches emphasise on necessity to develop and apply the models, which reflect integrated approach. Accordingly, the methods of analytical modelling are applied together with participatory modelling (Hewitt et al. 2014) as well as Bayesian networks are used in order to integrate both quantitative and qualitative data resulting to improvement and implementation of more efficient land use planning and policy instruments (Celio et al. 2014). Modelling the urban dynamics and using particular specification lead to convincing arguments in favour of integrated modelling and imitation (Lektauers 2010). These instruments would promote better justification of a decision-making in land use management.

Some analysis of land use changes showed the results of empirical research and thus the calculated loss of ecosystem services value caused by these changes when observing the time series from 1980 to 2010 (Chen et al. 2014). Recently some review of methods, data, and models to assess changes in the value of ecosystem services from land degradation and restoration has been done. It was stressed a need for further development of the integrated approaches and methods. The developed models should be addressed by adding the 'human factor', for instance, in participatory decision-making and scenario testing (Turner et al. 2015).

4. A methodological approach for more efficient use of land-related resources

Efficiency domain, objectives for evaluation, evaluation criteria and indicator system

By choosing scientific sound approach and applying of both selected methods and indicator system, it is possible to explain the processes of land use from point of view of efficiency in the widest possible form (Auziņš 2013; Auzins et al. 2013). However, it has been researched that the indicators in the estimates are used in accordance with the purpose and context of the relevant study, observing the different functional goals of land management entities (stakeholders) and the need to support the decisions on the respective land management level – national, municipal and land users' level. It is argued by the author's recent research that the application of 'efficiency domain' for an assessment of land use effects points to the approach when the *rationality assessment* of sustainable usage of land resources may replace the *directional assessment* of territorial development (Auziņš 2013).

The *variability* of the influencing factors of the land use outcomes indicates the significance of the 'efficiency domain' in studies on land management, given potential land use objectives and outcomes as well as the resources necessary to achieve them. The evaluation outcomes may cause to changes in functional land use, or in more detail – in land use patterns (Auzins et al. 2013). Several scientifically sound solutions and the results of the performed analysis by the author show that the *coincident influence* of socio-economic, environmental and

institutional factors and the linkages between them enable the determination of criteria and development of an indicator system specific to the ELU (see Figure 2).

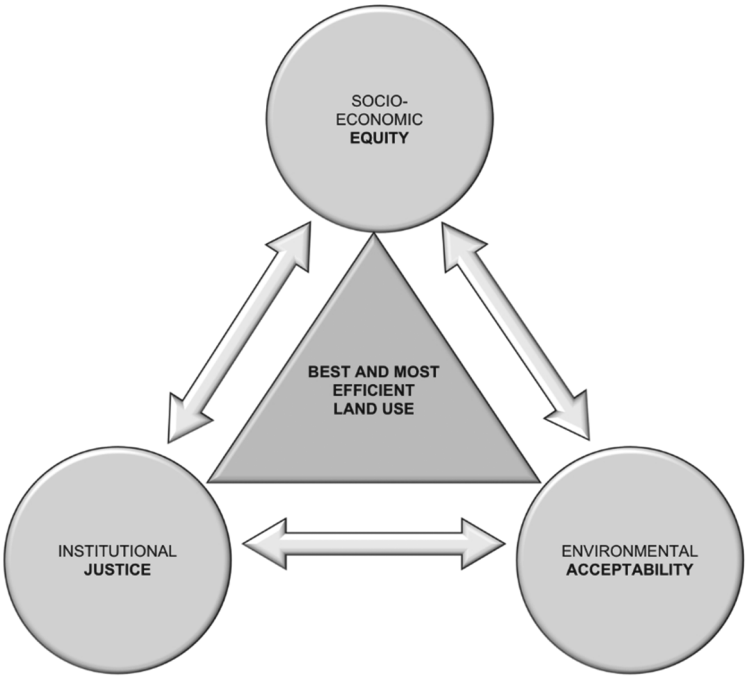

Figure 2: Objectives for evaluation of land use (Source: Auzins et al. 2013).

Linkages are the relationships between set objectives and can be identified to promote a balance in the development of these objectives to increase welfare gains for local communities. Here "equity" represents the internal linkage between economic growth and social security, e.g. if assessing the criteria of "investments into public infrastructure per capita" at municipal land management level or "labour productivity" at land users' land management level, "acceptability" represents the internal linkage between ecological live ability and environmental quality, e.g. if assessing the criteria of "land use diversity" and "ecological viability" at either municipal or land users' land management level, and "justice" represents the internal linkage between administrative management and the regulatory framework, e.g. if assessing the criteria of "administrative capacity" and "regulatory framework" at municipal land management level. External linkages are identified in addition to the internal ones according to the study context. For instance, "resource productivity" represents the linkage between socio-economic and environmental objectives, "land use monitoring" represents the linkage between institutional and environmental objectives, and "participation in decision-making" represents the linkage between the socio-economic and institutional objectives. External linkages are dependent to a great extent on the evolution of objectives and changes in society. Therefore, their features may be considered changing, specifiable and attributable to the context of the study (Auzins et al. 2013).

The application of the indicator system makes it possible to evaluate the regularities that determine and affect land use, to support the decisions for the best possible and more efficient land use as well as to provide prospective development directions and the required resources in the respective area. The "best and most efficient land use" conceptually refers to the land use activities resulting in the greatest benefit to society (Auziņš et al. 2014). Accordingly, the land use planning and the implementation of spatial development plans should be provided and the sustainable management of land use promoted.

5. Conclusions

Spatial planning is a continuous process. However, the plans are elaborated and accepted taking into consideration the perspective of its likely implementation. In Latvia this period of time is set for 12 years. Evidently, during this period of time, the changes and adjustments according to the needs of the society normally be implemented. In the scientific literature more attention is paid to the evaluation and optimisation of land use as well as to conflict resolution by using a variety of techniques for project assessment in land consolidation areas, evaluation of land use potential, scenario analysis, a decision support, etc. Accordingly, for ELU widely GIS, multi-criteria analysis, land use optimisation and various modelling methods have been used. Developed and practically implemented models provide land use planning-implementation relationship, mainly employing GIS technologies. Integrated approaches, if combining quantitative and qualitative criteria and indicators, create more objective base for decisions as well as integrated methods show more convincing research outcomes and thus serve for better justification of decisions in land use management. Comparable and actual data and thematic maps, including land use-related information are needed to assess the land use changes when considering long enough dynamic time series. Data availability needs to be improved properly to the purpose of the evaluation. The research outcome of Latvia's case indicates this as main issue to be solved before to carry out the empirical studies on how the spatial planning documents have been improved following ELU. If introducing the ELU system, the spatial-environmental, socio-economic, and institutional effects can be analysed by identifying changes in dynamic data sets of outcome indicators as well as the decision-making to optimise business operations and to improve the management of land units can be provided. These changes, optimisations, and improvements by analysing the impact indicators may lead towards effectiveness measures – qualitative changes in the socio-economic and environmental situation. A methodological framework for ELU prescribes the conditions, integrated methods, models, classifications, an indicator system and sequential evaluation procedures. This framework should be designed as a support system in decision-making and used for systematic monitoring of land use that will lead to sustainable land use management.

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