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Mindaugas STANIŪNAS

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Scientific Supervisor

Prof Dr Marija BURINSKIENĖ (Vilnius Gediminas Technical University, Technological Sciences, Civil Engineering – 02T).

The dissertation is being defended at the Council of Scientific Field of Civil Engineering at Vilnius Gediminas Technical University:

Chairman

Prof Dr Habil Artūras KAKLAUSKAS (Vilnius Gediminas Technical University, Technological Sciences, Civil Engineering – 02T).

Members:

Assoc Prof Dr Jurgita ANTUCHEVIČIENĖ (Vilnius Gediminas Technical University, Technological Sciences, Civil Engineering – 02T),

Dr Raimundas BLIŪDŽIUS (Kaunas University of Technology, Technological Sciences, Civil Engineering – 02T),

Prof Dr Habil Jurgis Kazimieras STANIŠKIS (Kaunas University of Technology, Technological Sciences, Environmental Engineering – 04T),

Prof Dr Habil Leonas USTINOVIČIUS (Vilnius Gediminas Technical University, Technological Sciences, Civil Engineering – 02T).

Opponents:

Prof Dr Dalė DZEMYDIENĖ (Mykolas Romeris University, Technological Sciences, Informatics Engineering – 02T),

Dr Zenonas TURSKIS (Vilnius Gediminas Technical University, Technological Sciences, Civil Engineering – 02T).

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Address: Saulėtekio al. 11, LT-10223 Vilnius, Lithuania.

Tel.: +370 5 274 4952, +370 5 274 4956; fax +370 5 270 0112;

e-mail: doktor@vgtu.lt

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Mindaugas STANIŪNAS

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Mokslinis vadovas

prof. dr. Marija BURINSKIENĖ (Vilniaus Gedimino technikos universitetas, technologijos mokslai, statybos inžinerija – 02T).

Disertacija ginama Vilniaus Gedimino technikos universiteto Statybos inžinerijos mokslo krypties taryboje:

Pirmininkas

prof. habil. dr. Artūras KAKLAUSKAS (Vilniaus Gedimino technikos universitetas, technologijos mokslai, statybos inžinerija – 02T).

Nariai:

doc. dr. Jurgita ANTUCHEVIČIENĖ (Vilniaus Gedimino technikos universitetas, technologijos mokslai, statybos inžinerija – 02T),

dr. Raimondas BLIŪDŽIUS (Kauno technologijos universitetas, technologijos mokslai, statybos inžinerija – 02T),

prof. habil. dr. Jurgis Kazimieras STANIŠKIS (Kauno technologijos universitetas, technologijos mokslai, aplinkos inžinerija – 04T),

prof. habil. dr. Leonas USTINOVIČIUS (Vilniaus Gedimino technikos universitetas, technologijos mokslai, statybos inžinerija – 02T).

Oponentai:

prof. dr. Dalė DZEMYDIENĖ (Mykolo Romerio universitetas, technologijos mokslai, informatikos inžinerija – 07T),

dr. Zenonas TURSKIS (Vilniaus Gedimino technikos universitetas, technologijos mokslai, statybos inžinerija – 02T).

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Adresas: Saulėtekio al. 11, LT-10223 Vilnius, Lietuva.

Tel.: (8 5) 274 4952, (8 5) 274 4956; faksas (8 5) 270 0112;

el. paštas doktor@vgtu.lt

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Introduction

Topicality of the problem

Industrial revolution started at the end of the 18th century had already encompassed all the main European countries in the 19th century. Steam energy, factory system formation, new transport networks, standardisation and urbanisation became an integral part of human life. Urbanisation process is so entrenched that even after a century it is still under progress: a city is conventionally perceived as an equivalent to residential and work-related places almost in the whole civilised world. Concurrently, urbanisation became inextricably entwined with such phenomena as an immense consumption of energy and natural resources, air and water pollution, noise, waste, and the like.

One of the main means of regulating urban management has to do with urban comprehensive plans on the basis of which urban development is implemented. The impact assessment of territorial planning document solutions is confirmed by laws; it is well known that urban development impacts the environment; there is, however, no unequivocal system helping assess quantitatively the indispensable ecological aspects and the very indicators have not been defined. Trying to assess the impact of development on ecology of city, the problem related to both assessment of the structure and selection of parameters is being solved. Using the legal basis of territorial planning as the main point of departure, it is foreseen in the dissertation to provide solutions to the questions related to the structure of ecology of city as well as to quantitative assessment of its components.

Object of the work is the ecology of city being understood as a part of general (not social) ecology, which operates and is being operated in the urban environment. In the dissertation the possibilities and peculiarities of selecting the main components of city ecology, forming and quantitatively assessing the principal structure are investigated. The ecological parameters, 1) which are fundamental / indispensable, i. e. those whose replacement is related to essential changes, and 2) can be applied in preparing urban comprehensive plans, are analysed.

Boundaries of the work

In the scientific work a complete model of ecology of city is presented, which is, within the scope of general ecology, conceived as a combination of two parts. Assessing the impact trend, the following parts in the work are: 1) external ecology of city and 2) inner ecology of city. Taking into consideration the fact that urban impact on the world's ecological processes has

been little investigated, the work focuses on comprehensive construction of external ecology of city, while inner ecology of city is only partially analysed, to the extent it is needed to fully understand the model itself. The work also oriented towards preparation of Lithuanian urban comprehensive plans.

Aim of the the work is to improve the quality of urban comprehensive plans, encompassing the assessment of ecology of city.

Tasks of the work

1. To analyse scientific literature, the essential principles of legal mechanisms, related to the territorial planning, of the European Union as well as the Lithuanian basis of legal acts regulating the ecological aspect of territorial planning.
2. To create the list of quantitative parameters used during planning by referring to the legal acts regulating the Lithuanian territorial planning.
3. To put forward a general structure of ecology of city and essential parameters of its description.
4. To establish a quantitative system of assessing the external ecology of city that can be used in the process of planning and to present practical examples of assessment.

Methodology of the research

The main focus, with reference to which the research has been intended, is to assess the possibility of applying quantitative parameters of ecology description in preparing urban comprehensive plans. At present the mostly applied practice – descriptive, qualitative assessment; however, in this way one obtains ambiguous, objectively incomparable results. Furthermore, the results obtained mainly depend on the specialists preparing plans. Paying attention to the above-mentioned drawbacks and to the fact that urban planning is a legal procedure, one shall deal with two basic questions of the research:

1. to investigate whether the concept of ecology of city is properly defined, both scientifically and legally, i. e. whether there exist quantitative parameters of ecology of city?
2. whether it is possible to apply the existent parameters of ecology of city in preparing comprehensive plans, i. e. whether adaptation of quantitative indicators is indispensable to the practice of planning?

Three methods of the research work have been applied: theoretical analysis, generalisation and probation. During the theoretical analysis an overview of the present-day scientific literature and legal sources has been conducted; during generalisation a critical assessment of the afore-mentioned

information has been implemented, seeking to ascertain validity of information, i. e. its credibility and feasibility. The examples of probation of the provided solutions have been presented at the end of the research work.

In organising the work, 1) an overview of scientific literature, the analysis of 2) legal documents and 3) statistical data as well as 4) locality (control) investigations have been implemented. The primary source of these data is electronic databases which are selected due to versatility of information presented in them, its fast updating and abundance. Legal documents have been read on official Internet sites of the European Union, the Lithuanian Republic Seimas, the Government and the Ministry of Environment. Statistical data have been collected from the LR Department of Statistics or Eurostat Internet sites.

Scientific novelty

From the theoretical point of view, the conception of ecological assessment is not new: this thought has many times been elaborated by both separate specialists and state and international organisations. The result of such situation is a variety of different models, indicators, and the like; therefore, one more assessment method would be theoretically new, but would virtually soon disappear in no longer processed plethora of parameters. Seeking to avoid it, the work focuses on a different methodological approach and tries to generalise and clarify the collected data. The findings of the research paper are an explicit logical structure, a principal framework based on available data. Filtration of data available and critical evaluation are closely entwined with novelty of the scientific work which is oriented not towards quantitative dissemination and propagation of information, but, conversely, towards a qualitative structure.

1. On the grounds of scientific and legal information, the major problems of city ecology assessment as well as those with which one is to cope with in preparing urban comprehensive plans have been determined.
2. The general model of ecology of city has been constituted. Assessing the impact trend, the model has been created from both external and inner ecology of city.
3. The calculation model allowing one to assess the external ecology of city during preparation of urban comprehensive plans has been put forward. The model itself is based on quantitative indicators.

Practical value

The concept of ecology of city being worked out in writing the dissertation and especially a quantitative system of assessing the external ecology of city can be applied in practice while preparing urban comprehensive plans. This is a means allowing planners in the aspect of external city ecology to

mathematically assess the impact of a comprehensive plan and / or compare different variants of urban development. The calculations established do not require additional primary information nor is it used simply in working out the documents of territorial planning. According to the author of the dissertation, there is no such model practically functioning in Lithuania. The research work is valuable at national level as 1) a self-study means 2) as well as due to a clearer impact of Lithuanian towns on the world's ecological processes. Although the model focuses on Lithuanian towns, the theoretical framework, however, was worked out with reference to the EU documents concerning planning and ecology; therefore, one can modify the model and try to apply it in the territories of other EU member states.

Defended statements

1. The ecology of city, according to the impact trend, is two-sided: external and inner. Processes of external ecology are equal to towns, i. e. global ecological processes that have the essential impact beyond administrative boundaries, whereas processes of inner ecology can be various as these are local processes that have the essential impact within a city.
2. The ecological processes being only on the verge of exposure limits are significant in urban planning. Urban planning is a legal procedure, so external ecological critical boundaries shall be equalised at most and juridically confirmed.
3. In Lithuania, the beginning of the reference of critical boundaries shall be treated as the beginning of planning procedures for an affective integration of ecology of city into preparation of urban comprehensive plans as well as for the progress assessment.

Scope of the scientific work

The scientific work consists of the introduction, three chapters, conclusions, list of literature and list of author's scientific publications on the topics of the dissertation. The total scope of the dissertation is 136 pages, 20 figures and 30 tables. 187 references were used writing the work.

1. Ecology of city and planning: scientific and juridical approach

First chapter discusses the primary and essential (in the juridical state) aspect of planning – reveals the juridical part of planning. The result of urban planning is a legally valid planning document influencing all the objects connected to city life; in a sense that any urban comprehensive plan could be

defined as a document related to the massive impact of the urban environment. In 2004 Lithuania became an EU Member State, the Lithuanian legal basis was, respectively, changed; these modifications had influenced the policy of urban planning. Pursuing to uncover the present-day situation of planning in Lithuania in a broader context, European integration has been taken into consideration in the research work and part of the Chapter has been devoted to elucidating the principal EU legal structure. Other part of the Chapter focuses on discussion of the LR legal acts, referring to the aspect of practicality presented in the aim of the research work. It has been analysed whether the EU position is reflected in the LR urban planning policy, how elaborately the planning is regulated, in what way city ecology is defined in legal acts and in what situation specialists find themselves. The last part of the Chapter is dedicated to selecting and grouping numerical parameters from the LR territorial planning documents regulating urban planning.

The EU has more than one instrument of legal administration which is intended for important and general issues at the level of the whole EU; however, the EU participation in governmental processes within countries is a greatly restricted case of the EU fundamental documents and intervention from the "top" – it is more an exception than an every-day performed action. One of the strictest means, realised in practice, of a direct impact on a community is regulations although more "flexible" and "milder" directives are much more often used. A primary and desirable trend of the EU urban planning policy can be sustainable development; however, urban management has not adequately been concretised yet and there is not united European policy in terms of cities, as well. The EU influence over municipal government is often indirect and actualised through special programmes and projects, yet viable activities of local government, which was and still is the main player in forming a city, are mostly encouraged.

During the analysis of the LR planning legal documents one can observe a strong narrative of sustainable development. The provision of sustainable development is stated both explicitly and implicitly, i.e. at least one integral part of sustainable development is often confirmed in legal acts, for instance, environmental protection or careful use of natural resources, and the like; therefore, while evaluating an overall view and not going deep into details, the LR planning documents correspond to the EU desirable trend in terms of sustainable development. The problems become obvious when one has thoroughly analysed what local government has done to make ecology of city (an integral part of sustainable development, examined in the dissertation) assume a concrete trend and indicators, whether a coherent system of assessment has been constituted, whether the existent database allows setting

urban planning towards ecological development, and the like. A more comprehensive analysis of the LR planning documents have revealed three significant moments: 1) the concept / aim of sustainable development is imperatively recurred in legal acts; 2) in the documents regulating urban planning it is appealed to the stream-lined, equivocal phrases of political type; 3) there is generally no clarification of the term ecology of city and / or its integral parts, structure in legal acts. The inevitable consequences of such situation are: fragmentation, speculation, a conflict of interest, and real incomparability between plans.

Indefiniteness of the legal basis of planning and a lot of freedom to act has been noticed during the analysis; however, certain numerical indicators have been found in legal acts and occur in urban comprehensive plans. Indicators are not particularly connected with the concept of sustainable development and are mostly treated as a particular statistical summary (e. g. the number of population) that also performs a certain restraint function; however, in this case not a constraint (wanted to be found) in the name of ecological aims but the restriction of physical parameters of future constructions (e. g. a maximum height in meters) is taken into consideration. The indicators have been compiled from the basic legal acts of planning and divided into three suggested groups: 1) Group I includes the indicators, already having a numerical value; 2) Group II encompasses the indicators which are likely to assume a numerical value after additional actions; 3) Group III embraces the (integrated) indicators that have been obtained by combining certain indicators of I and II groups.

Overall, eleven indicators have been obtained: four from Group I, five from Group II and two from Group III. The absence of a precise and explicitly confirmed concept of ecology of city lays the foundations for further scientific work, i. e. for creating the concept of ecology of city, while the selected groups of indicators could be applied in a new model. The use of all or part of indicators could be acceptable from the practical point of view: to apply these indicators in planning is a common matter, the indicators have been collected from the legal acts available; therefore, when having the indicators integrated into the city ecology structure being under creation, it (the structure) would become more intuitive.

2. Model of the ecology of city: structure and boundaries

The major task of the second chapter is to create the structure of ecology of city with reference to four aspects: 1) the ecology of city shall be defined by specific spheres of activity, which 2) could assume a quantitative expression; moreover, 3) the ecology of city shall be conceived in a broader context,

and 4) the structure put forward shall be managed by (feasible) instruments provided for in urban comprehensive plans. Due to the stated relationship of the research work with general ecology, the aspects are of great importance in assessing the very notion of city ecology and completeness of the proposed model. General ecology as a scientific branch investigates much more domains than proposed in the model, so one might have an impression that the model itself is not complete, focused only on major issues which are sometimes even associated with a man's impact on climate change and / or environmental protection. In the dissertation the specialists' criticism of traditional understanding of ecology has been widely discussed, which is connected to (not) attributing people to certain spheres of activity and especially urgent in the urban environment and topical for the research work. Metaphorically speaking, one can compare environmental protection and ecology with an official's and a servant's positions: the assessment will differ greatly in essence, depending on which part people and their activities are to be attributed to, in other words, the results will determine whether it is to be evaluated from the top or from the bottom. In the event of "from the top" when people are perceived as being above, close to nature, isolated, city ecology would approach the principles of assessing the environmental protection: one would happen to assess how and what was changed in nature by human activities. On this understanding there emerges an artificial ridge (being intentionally created) between object and subject, between the main agent determining the system performance and the system itself. Such division could be possible if people themselves were not affected by direct and / or resonant natural phenomena; however, it is obviously not so. Pursuing integrated perception, it is proposed in the research work to assess the phenomena, taking place in towns due to urban processes, alongside with people by regarding them as equal components of the system (non-hierarchal position).

Selecting the basic components of ecology of city, at the beginning of the second chapter the distinction between sustainable development (as a combination) and ecology (as a separate component) is accentuated. Sustainable development is a constant process the results of which fall behind schedule; it can be consistently corrected, whereas ecological processes can be corrected, but in the certain established range of possibilities. There exists the "ceiling" of nature, technically speaking, exposure limits, when going beyond them, simple natural processes change and changes become irreversible. The position stated in the dissertation is that ecology of city is constructed on two levels: external and inner, depending on the impact trend. The processes being influential on a world scale are attributed to external (or global) ecology of city, while the processes being significant in a particular place – inner (or local)

ecology of city. In evaluating multipurposeness of a comprehensive plan and limited possibilities, having become such due to this, of comprehensive plans, the notion of ecology of city in the research paper has expediently been narrowed to the basic domains; the domains wherein a negative, yet minor impact is exerted on the environment (and people) are disposed.

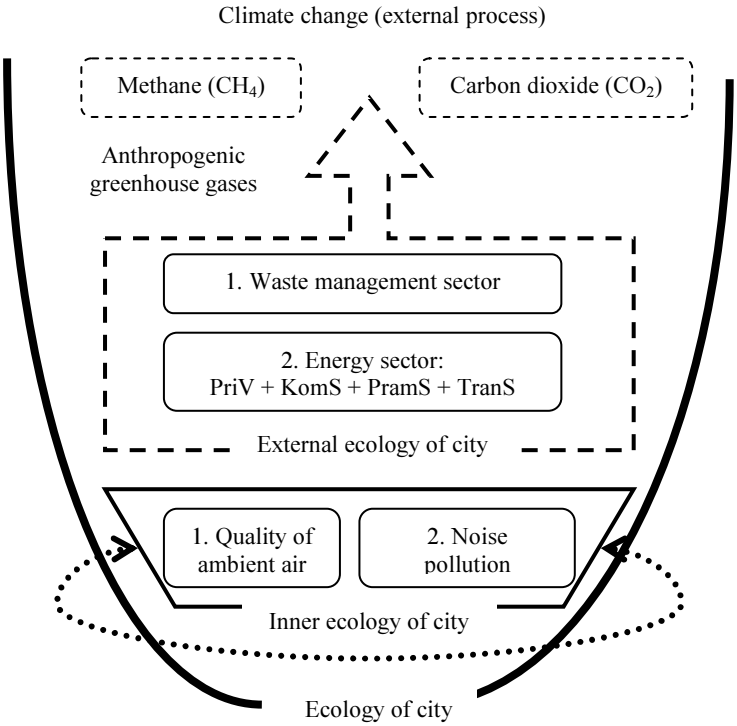


Fig. 1. The structure of the ecology of city. Notes: PriV – individual energy users, KomS – commercial sector, PramS – industry, TranS – transport

Functioning in fundamental spheres is indispensable to all the activities analysed and worked out in comprehensive plans. In the proposed structure of ecology of city one has selected only those ecological parameters which are close to exposure limits and require immediate correction. According to the world's statistics, publications of international organisations and work groups,

it is proposed to understand external (global) ecology of city as climate change, in the concrete case, as greenhouse gas emissions control in 1) waste management and 2) energy sectors. Inner (local) ecology of city should be understood as 1) quality of ambient air and 2) management of noise pollution (Fig. 1).

The end of the second chapter is devoted to the establishment of exposure limits of external ecology of city. Exposure limits have been determined with reference to international agreements of legal obligation; when modifying them one has to refer to the particularities of urban planning. The estimated period which has been proposed is related to validity of comprehensive plan solutions, i. e. embracing a period of ten years, and four possible variants of cutting emissions from 8 % up to 30 % have been foreseen. Practical means of implementation and possible results achieved are presented in the third chapter.

3. Practical application of the model of external ecology of city

The third chapter is dedicated to integrating external ecology of city into urban planning, emphasising the practical aspect: integration of 1) waste management and 2) energy sectors into the practice of planning has been elaborated; moreover, the proposed re-planning model has been inspected with specific town districts. Referring to the possibilities of urban comprehensive plans, the emissions of municipal waste in the waste management sector and that of house heating preferences in the energy sector have been analysed. The emissions of both sectors are linked to quantitative values used in planning as well as to the aims of reducing emissions, discussed in the second chapter. The findings of the proposed formulae have demonstrated that both sectors of municipal waste and energy can be involved in the practice of planning and, what is important to the scientific work itself, to assess them quantitatively by means of comprehensive plans.

Regulating the emissions in the event of municipal waste, full compensation of ecological damage (emissions) is possible when reserving the territories for green plantations in comprehensive plans. The calculated emissions per capita, which are to be established during the validity of comprehension plan solutions, constitute approximately 20 tons of CO_2 equivalent and the area of 200 m^2 of green plantations is needed to compensate these emissions. In the event of bigger cities, it is proposed to provide the area of compensation beyond the boundaries of municipal administration, cooperating with municipalities and regulating the accounting at national level. Incineration (a waste treatment process) has been put forward, not only seeking to compensate the damage, but also considering the potential benefit of

municipal waste. The energy produced during the combustion could be used for the heating of buildings. In preparing urban comprehensive plans, the place for incinerating the municipal waste should be planned within the limits of municipal administration, not bigger than 5–10 km from the main users of energy.

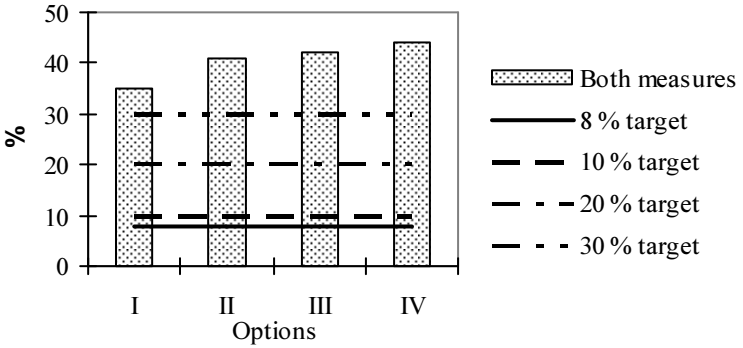


Fig. 2. Reduction of emissions

Addressing the energy-related question of emissions, it has been determined that the most important problem in Lithuania deals with the present dwelling stock (of Soviet times). Having regard to depopulation and migration, old apartment buildings will further generate the biggest amount of emissions due to the heating: 69 % of blocks of flats were built within a period of thirty years which lasted from 1961 up to 1991. In this part of the chapter two measures have been analysed: 1) the "smooth" one that is associated with modernisation of existing buildings, and 2) the "hard" one that is undertaken when projecting the district re-planning. Both measures have been examined, trying to achieve the underlined technical indicators; the major focus is, however, placed on assessment of socioeconomic status. This is one of the reasons why it is thought that solutions are feasible not only on a theoretical / scientific level, but also in practice. The first measure ("smooth") is replacement of doors and windows in blocks of flats; it will cut emissions from 27–36 %; therefore, almost all the examined variants would meet the strictest aim (reduction of 30 %). The second ("hard") measure has to do with partial re-planning of existing residential districts; it will directly cut emissions 8 % more, and alongside with the first means, emissions would decrease from 35–44 %. When applied simultaneously, both measures would produce better results than it has been expected and exceed the underlined tasks (Fig. 2). The

second measure is significant not only due to direct reduction of emissions, but also due to the social aspect as well as to the expected implicit results. The proposed method allows achieving a smaller amount of emissions, yet, at the same time, sprawl of cities is being restrained; while using the built-up area, the existent urban areas are being improved and living conditions reaching the EU standards are being created. The emission being indirectly reduced by the second measure is thought to be bigger than directly calculated savings.

Multi-criteria assessment of the existent condition and proposed reconstructions shows that the existent condition is the best in the examined district of Klaipėda, while the worst one – in Vilnius; however, the reconstructions proposed in the present scientific work can change the existing condition (Fig. 3). Klaipėda district in both cases stands on top due to quite simple reasons: the smallest number of population, vast green areas and the biggest space between buildings. The values of the indicators of Kaunas and Vilnius districts differ less; in Kaunas district, differently from Vilnius, part of buildings is nine-storey buildings which are not re-planned according to the proposed model, while in Vilnius much fewer residents remain in old buildings; moreover, the indicators related to intensity and density of occupied areas as well as annual emissions are better in Vilnius. Differences are not essential, yet a general sum determined the growth of Vilnius district.

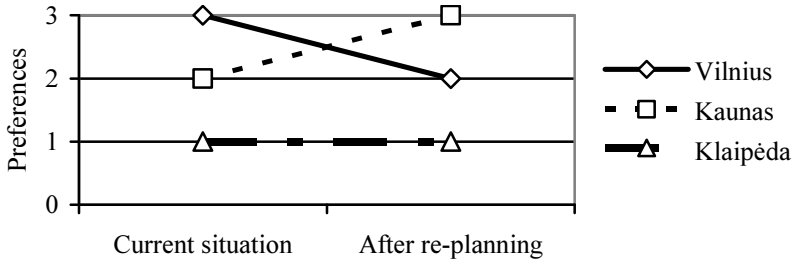


Fig. 3. Preferences before and after partial re-planning

All the technical tasks raised in this chapter have been achieved; however, the social aspect plays a significant role in urban planning. The emissions of municipal waste of a person living in a city are three times bigger than the emissions of the same person which are created due to the old non-effective heating in a block of flats of the Soviet times. In other words, the damage of waste equals to the heating of three statistical apartment buildings throughout the whole heating season. The proposed measures allow one to technically

manage and "cut" emissions, yet the results would be much better if it were possible to change the mentality of people by stimulating their consciousness, i.e. harmonising technical means with social ones.

General conclusions

1. Urban planning is a legal procedure, yet the EU has not prepared the urban management legal means shared by European countries and full responsibility falls on local government. The LR legal acts concerning urban planning and assessment of ecology of city meet the EU provisions, but they lack in clarification: the solutions of ecological problems in cities are required; however, it has not been determined what ecology of city is, which indicators would define it, what values one has to pursue, and the like.
2. Having regard to the foreign experience, the model of ecology of city has been put forward, depending on the impact trend; it comprises two parts: 1) external ecology of city and 2) inner ecology of city. External ecology of city is climate change (warming), connected with greenhouse gas emissions of urban 1) waste and 2) energy sectors; 1) the quality of ambient air and 2) noise pollution constitute the inner ecology of city.
3. Referring to international agreements and the EU policy, definite quantitative objectives for the proposed external ecology of city have been determined: to reduce emissions to 8 %, 10 %, 20 % or 30 % from the time of initiating preparation of a comprehensive plan. The calculations have been created to effectively integrate the external ecology of city into comprehensive plans; these calculations are based on the indicator constantly used in the practice of urban planning: the population.
4. It has been estimated that during the period of validity of urban comprehensive plans the statistical person will throw away such quantity of municipal waste the damage of which equals to 19,9 tons of CO_2 equivalent. To compensate the damage done to ecology one needs the area of 200 m^2 of green plantations.
5. When applying the proposed decisions (partial modernisation of both buildings and districts) in the energy sector, it is possible to reduce ecological damage. Applying the proposed decisions to chosen Lithuanian cities' districts, it has been calculated that it is feasible to reduce emissions more than 30 %, i. e. the most ambitious aim has been pursued.

List of published works on the topic of the dissertation in the reviewed scientific periodical publications

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In the other editions

Staniūnas, M.; Burinskienė, M. 2011. Assessment of greenhouse gases attributable to the waste management sector in urban planning, in *8th International Conference "Environmental Engineering"*: selected papers, vol. 3. Ed. by D. Čygas, K. D. Froehner. May 19–20, 2011, Vilnius, Lithuania. Vilnius: Technika, 986–992. ISBN 978-9955-28-826-8. (Conference Proceedings Citation Index).

Staniūnas, M.; Burinskienė, M. 2011. Assessment of greenhouse gases attributable to the waste management sector in urban planning, in *8th International Conference "Environmental Engineering"*, ed. by D. Čygas, K. D. Froehner. May 19–20, 2011, Vilnius, Lithuania CD. Vilnius: Technika, 986–992. ISBN 978-9955-28-831-2.

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About the author

Mindaugas Staniūnas was born on 2nd September, 1983, Panevėžys. In 2005, he acquired the Bachelor's degree in Architecture, and in 2007 – the Master's degree in Architecture at Vilnius Gediminas Technical University, Faculty of Architecture. In 2004, he set up a design firm wherein he has been working since its establishment. From 2009–2013, he has been a PhD student at

Vilnius Gediminas Technical University. In 2012, he underwent his internship at KTH Royal Institute of Technology in Stockholm (Sweden). During doctorate studies he participated in two international projects; therefore, group meetings in Estonia, Russia, Sweden, and Ukraine influenced the material of the dissertation. At present, he is working as an assistant at Vilnius Gediminas Technical University, Department of Urban Engineering.

EKOLOGIJOS ASPEKTO VERTINIMAS MIESTŲ BENDRUOSIUOSE PLANUOSE

Mokslo problemos aktualumas

Šiuolaikiniame pasaulyje labiau nei bet kada anksčiau miestai yra siejami su verslo vystymo galimybėmis, paslaugų teikimu, patraukliomis darbo ir gyvenamosiomis vietomis, tačiau tuo pat metu didėja susirūpinimas dėl miestų zonų aplinkos būklės. Iš esmės miestuose susiduriama su panašiomis ekologinėmis problemomis, tokiomis kaip oro ir vandens tarša, padidėjęs triukšmo lygis ar šiltnamio efektą sukeliančių dujų emisijos.

Viena iš pagrindinių miestų vystymąsi reguliuojančių priemonių – miestų bendrieji planai, kuriais remiantis vykdoma miestų plėtra. Teritorijų planavimo dokumentų sprendinių poveikio vertinimas yra įtvirtintas įstatymais, tačiau nors ir yra žinoma, kad miestų plėtra daro įtaką gamtai, nėra aiškios sistemos, leidžiančios kiekybiškai įvertinti kertinius ekologinius aspektus, be to, ir patys rodikliai nėra apibrėžti. Skirtingų specialistų individualiai siūlomos naujos vertinimo struktūros, viena vertus, parodo, kad tinkamos struktūros vis dar nėra, tačiau, kita vertus, pateikia (dažniausiai) perteklinės ir neesminės informacijos, kuri paslepia svarbiausius rodiklius.

Lietuvoje savivaldybės pagrindines miesto teritorijos valdymo gaires užtikrina dalyvaudamos rengiant miestų bendruosius planus, todėl disertacijoje analizuojamas vienas aktualiausių šiandienos miesto ekologijos klausimų – kaip ir kokios ekologinės problemos gali (turi) būti sprendžiamos rengiant miestų bendruosiuos planus? Šio klausimo sprendimas aktualus tiek mokslo krypčiai ir specialistams, tiek valstybei vietiniu, nacionaliniu ir tarptautiniu lygmenimis.

Tyrimo objektas

Tyrimo objektas – miesto ekologija, ją suvokiant kaip bendrosios (ne socialinės) ekologijos dalį, veikiančią ir veikiamą miestų aplinkoje. Darbe analizuojami miesto ekologijos pagrindinių komponentų atrinkimo, principinės struktūros formavimo ir kiekybinio įvertinimo galimybės bei ypatumai. Nagrinėjami tik tie ekologiniai parametrai, kurie yra kertiniai, t. y. tie, kurių

keitimas susijęs su esminiais pokyčiais, ir tie, kurie gali būti panaudoti rengiant miestų bendruosius planus.

Darbo ribos

Darbe pristatomas visapusiškas miesto ekologijos modelis, kurį bendrosios ekologijos apimtyje siūloma suvokti kaip dviejų dalių junginį. Dalys, vertinant pagal poveikio kryptį, darbe vadinamos išorine miesto ekologija ir vidine miesto ekologija. Įvertinus, kad miestų įtaka pasauliniams ekologiniams procesams yra mažai tyrinėta, darbas orientuotas į išsamų išorinės miesto ekologijos konstravimą, o vidinė miesto ekologija aptariama tik iš dalies, tiek, kiek reikia konstruojamo modelio suvokimui. Darbas skirtas Lietuvos miestų bendrųjų planų tobulinimo aktualijoms atskleisti.

Darbo tikslas – pagerinti miestų bendrųjų planų rengimo kokybę, įtraukiant miesto ekologijos aspekto vertinimą.

Darbo uždaviniai

1. Atlikti mokslinės literatūros, Europos Sąjungos teisinio reglamentavimo, susijusio su miestų planavimu, pagrindinių veikimo principų ir Lietuvos įstatyminės bazės, reglamentuojančios miestų planavimo ekologinį aspektą, analizę.
2. Remiantis Lietuvos teritorijų planavimą reglamentuojančiais įstatymais, sudaryti kiekybinių rodiklių, naudojamų planavimo metu, klasifikuotą sąrašą.
3. Pasiūlyti bendrąją miesto ekologijos struktūrą ir ją apibūdinančius esminius parametrus.
4. Sukurti kiekybinę išorinės miesto ekologijos vertinimo sistemą, kurią galima naudoti planavimo proceso metu, ir pateikti vertinimo praktinių pavyzdžių.

Tyrimų metodika

Pagrindinė idėja, kuria remiantis buvo sumanytas tyrimas, įvertinti ekologiją apibūdinančių kiekybinių parametrų taikymo galimybę, rengiant miestų bendruosius planus. Dabartiniu metu dažniausiai taikoma praktika – aprašomasis, kokybinis vertinimas, todėl gaunami nesistemingi, daugiaprasmiai, tarpusavyje objektyviai nepalyginami rezultatai. Be to, gauti rezultatai labai priklauso nuo planą rengusių specialistų. Atsižvelgiant į minėtus trūkumus ir faktą, kad miestų planavimas – teisinė procedūra, esminiai du tyrimo klausimai yra šie:

1. ar miesto ekologijos sąvoka yra tinkamai apibrėžta moksliškai arba juridiškai, t. y. ar egzistuoja kiekybiniai miesto ekologijos parametrai?
2. ar esamus miesto ekologijos parametrus galima taikyti, rengiant bendruosius planus, t. y. ar reikalingas rodiklių pritaikymas praktiniam naudojimui?

Darbe naudoti trys tyrimo metodai: teorinė analizė, apibendrinimas ir testavimas. Teorinės analizės metu atlikta šiuolaikinės mokslinės literatūros ir teisinių šaltinių apžvalga, apibendrinimo metu – minėtos informacijos kritinis vertinimas, siekiant nustatyti informacijos validumą, t. y. patikimumą ir tinkamumą praktinėje veikloje. Papildomai atsižvelgta į statistinius duomenis. Darbo pabaigoje pateikti pasiūlytų sprendimų testavimo pavyzdžiai (kontroliniai skaičiavimai).

Pagrindinis visų duomenų šaltinis – elektroninės (interaktyvios) duomenų bazės, kurios pasirinktos dėl jose pateikiamos informacijos įvairiapusiškumo, spartaus atnaujinimo ir gausos. Teisiniai dokumentai skaityti oficialiose Europos Sąjungos, Lietuvos Respublikos Seimo, Vyriausybės ir Aplinkos ministerijos internetinėse svetainėse. Statistiniai duomenys paimti iš LR Statistikos departamento arba Eurostat internetinių svetainių / leidinių.

Mokslinis naujumas

Teoriniu požiūriu ekologinio vertinimo koncepcija nėra nauja: XX a. pab. – XXI a. šią mintį plėtoja tiek pavieniai specialistai, tiek valstybinės ir tarptautinės organizacijos. Tokios situacijos rezultatas – daugybė skirtingų modelių, įvairių rodiklių, indikatorių ir pan., todėl dar vienas vertinimo metodas būtų teoriškai naujas, tačiau faktiškai labai greitai pranyktų ir taip nebeapdorojamoje parametrų masėje. Siekiant to išvengti, darbe vadovautasi kitokiu metodologiniu požiūriu: stengtasi apibendrinti ir išgryninti esamus agreguotus duomenis. Darbo rezultatas – aiški loginė struktūra, principinis karkasas, paremtas jau turimais duomenimis. Esamų duomenų filtravimas ir kritinis vertinimas neatsiejamai susijęs su darbo moksliniu naujumu, darbas orientuotas ne į kiekybinį informacijos plėtimą, dauginimą, bet priešingai – į kokybinę struktūrą.

1. Remiantis moksline ir teisine informacija, nustatyta, kokios yra pagrindinės miesto ekologijos vertinimo problemos, su kuriomis susiduriama rengiant miestų bendruosius planus.
2. Sudarytas bendras miesto ekologijos modelis. Modelis, vertinant pagal poveikio kryptį, susideda iš išorinės ir vidinės miesto ekologijos.
3. Pasiūlytas skaičiavimo metodas, leidžiantis išorinę miesto ekologiją įvertinti rengiant miestų bendruosius planus. Modelis paremtas kiekybiniais rodikliais, t. y. gaunamas objektyvus rezultatas.

Praktinė vertė

Disertacijos metu parengta miesto ekologijos samprata ir ypač kiekybinė išorinės miesto ekologijos vertinimo sistema gali būti praktiškai taikomos rengiant miestų bendruosius planus. Tai yra priemonė, leidžianti planuotojams matematiškai išorinės miesto ekologijos aspektu įvertinti bendrojo plano poveikį ir / arba palyginti skirtingus miestų plėtros variantus, kurios dėka tampa įmanomas objektyvus sprendimų pasirinkimas. Sukurtas skaičiavimo modelis nereikalauja papildomos pradinės informacijos, užtenka tos, kuri įprastai naudojama rengiant teritorijų planavimo dokumentus. Autoriaus žiniomis, kito tokio praktiškai funkcionuojančio modelio Lietuvoje nėra. Darbas yra naudingas vertinant ir visos valstybės lygmeniu kaip šios srities savianalizės priemonė bei dėl aiškesnės Lietuvos miestų įtakos pasauliniams ekologiniams procesams atskleidimo. Pasiūlytas modelis tinkamas Lietuvos miestams, tačiau teorinė bazė buvo parengta remiantis Eropos Sąjungos dokumentais, susijusiais su planavimu ir ekologija, todėl modelį galima keisti ir taikyti kitų ES šalių narių teritorijose.

Ginamieji teiginiai

1. Miestų ekologija pagal poveikio kryptį yra dvipusė: išorinė ir vidinė. Išorinės ekologijos procesai visiems miestams vienodi – tai yra globalūs ekologiniai procesai, darantys esminę įtaką už miesto ribų; o vidinės – gali būti įvairesni, nes tai yra lokalūs procesai, darantys esminę įtaką miesto viduje.
2. Planuojant miestus svarbūs tik ties kritinėmis vertėmis atsiduriantys miesto ekologijos procesai. Miestų planavimas – teisinė procedūra, todėl išorinės ekologijos kritinės ribos turi būti maksimaliai suvienodintos ir įtvirtintos juridiškai.
3. Lietuvoje efektyviam miesto ekologijos aspekto integravimui į miestų bendrųjų planų rengimą ir progreso įvertinimui, kritinių ribų atskaitos pradžia turi būti laikoma planavimo procedūrų pradžia.

Darbo apimtis

Darbą sudaro įvadas, trys skyriai ir išvados. Bendra disertacijos apimtis 136 puslapiai. Darbe yra 30 lentelių ir 20 paveikslų. Literatūros sąraše 187 darbe naudotos literatūros punktai.

Pirmas skyrius skirtas pradiniam ir esminiam (teisinėje valstybėje) planavimo aspektui aptarti – juridinės planavimo pusės atskleidimui. Analizuojant literatūrą, buvo pastebėtas vieningos europinės politikos miestų atžvilgiu nebuvimas, lietuviškos teritorijų planavimo teisinės bazės neapibrėžtumas ir didelis planavimo veiksmų laisvumas. Iš LR teisės aktų

galima atrinkti / išvesti tam tikrus kiekybinius parametrus (iš viso darbe gauta vienuolika rodiklių), tačiau įstatymuose nėra nustatytos rodiklių siektinosios vertės ir kaip tas vertes praktikoje specialistai galėtų realizuoti.

Antrame skyriuje pasiūlytas miesto ekologijos modelis, kuris būtų tinkamas (suprantamas) planavimo specialistams ir leistų valdyti pagrindines miestų ekologijos problemas. Modelis orientuotas į kiekybinį vertinimą ir, atsižvelgiant į poveikio kryptį, yra sudarytas iš dviejų pagrindinių dalių: išorinės ir vidinės miesto ekologijos. Įvertinus, kad miestų įtaka pasauliniams ekologiniams procesams yra mažai tyrinėta, detalesnei analizei buvo pasirinkta būtent išorinė miesto ekologija. Remiantis tarptautiniais teisiškai įpareigojančiais susitarimais, nustatytos ribinės vertės: emisijų mažinimas nuo 8 % iki 30 %.

Trečias skyrius skirtas išorinės miesto ekologijos įtraukimo galimybėms į miestų planavimą atskleisti: analizuotas atliekų tvarkymo ir energetikos sektorių integravimas į planavimo praktiką. Minėtų sektorių emisijos susietos su planavime naudojamais kiekybiniais parametrais ir disertacijoje nustatytais emisijų mažinimo tikslais. Apskaičiuota, kad miestų bendrųjų planų galiojimo laikotarpiu statistinis gyventojas išmes tokį komunalinių atliekų kiekį, kurio ekologinės žalos kompensavimui reikalinga 200 m^2 želdynų teritorija. Energetikos sektoriuje, pritaikius siūlomus sprendimus – dalinį pastatų ir dalinį mikrorajonų modernizavimą – ekologinę žalą galima sumažinti daugiau kaip 30 %. Pasirinkus konkrečius skirtingų miestų rajonus, pasiūlytas modelis patikrintas empiriškai.

Pasiūlytu modeliu tikslinama miesto ekologijos struktūra ir komponentai, sudaromos prielaidos kiekybinį vertinimą įtraukti į planavimo praktiką.

Bendrosios išvados

1. Miestų planavimas – teisinė procedūra, tačiau ES dar nėra parengusi bendraeuropinių teisinių miestų valdymo priemonių, todėl visa atsakomybė tenka vietos valdžiai. LR teisės aktai, susiję su miestų planavimu ir ekologijos aspekto vertinimu, atitinka pagrindines ES nuostatas, tačiau juose trūksta aiškumo: reikalaujama ekologinių problemų miestuose sprendimų, tačiau nėra nustatyta, kas yra pmiesto ekologija, kokie rodikliai ją apibrėžtų, kokios būtų siektinosios vertės ir pan.
2. Remiantis užsienio patirtimi, darbe pasiūlytas miesto ekologijos modelis, sudarytas iš dviejų dalių, priklausančių nuo poveikio krypties: išorinės ir vidinės miesto ekologijos. Išorinė miesto ekologija – klimato kaita (atšilimas), sietina su miesto atliekų ir energetikos

sektorių šiltnamio dujų emisija, vidinę miesto ekologiją sudaro oro kokybė ir triukšminė tarša.

3. Remiantis tarptautiniais susitarimais ir ES politika, darbe buvo nustatyti konkretūs kiekybiniai tikslai išorinės miesto ekologijos būklės gerinimui: sumažinti emisiją 8, 10, 20 arba 30 procentų, skaičiuojant nuo bendrojo plano rengimo pradžios metų. Efektyviam išorinės miesto ekologijos integravimui į bendrųjų planų rengimą buvo sukurtas skaičiavimo modelis, paremtas nuolatos miestų planavimo praktikoje naudojamu rodikliu – gyventojų skaičiumi.
4. Apskaičiuota, kad miestų bendrųjų planų galiojimo laikotarpiu statistinis gyventojas išmes tokį komunalinių atliekų kiekį, kurio žala lygi vidutiniškai 19,9 tonos CO_2 ekvivalento. Nustatyta, kad minėtos ekologinės žalos kompensavimui būtų reikalinga 200 m^2 želdynų teritorija.
5. Energetikos sektoriuje ekologinę žalą galima sumažinti pritaikius darbe siūlomus sprendimus – dalinį pastatų ir dalinį rajonų modernizavimą. Taikant pasiūlytas priemones pasirinktiems Lietuvos miestų mikrorajonams, apskaičiuota, kad emisiją galima sumažinti daugiau kaip 30 %, t. y. buvo pasiektas pats ambicingiausias nustatytas emisijų mažinimo tikslas.

Trumpos žinios apie autorių

Mindaugas Staniūnas gimė 1983 m. rugsėjo 2 d. Panevėžyje. 2005 m. įgijo architektūros bakalauro ir 2007 m. architektūros magistro laipsnį Vilniaus Gedimino technikos universiteto Architektūros fakultete. 2004 m. įsteigė projektavimo įmonę, kurioje dirba nuo įkūrimo. 2009–2013 m. – Vilniaus Gedimino technikos universiteto doktorantas. 2012 m. stažavosi Karališkajame technikos universitete Stokholme (Švedijoje). Doktorantūros studijų metu dalyvavo dviejuose tarptautiniuose projektuose, todėl disertacijos medžiagai įtaką darė darbo grupių susitikimai Estijoje, Rusijoje, Švedijoje ir Ukrainoje. Šiuo metu dirba asistentu Vilniaus Gedimino technikos universiteto Miestų statybos katedroje.

Mindaugas STANIŪNAS

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leidykla „Technika“,
Saulėtekio al. 11, 10223 Vilnius,
http://leidykla.vgtu.lt
Leidinys atspausdintas ant 100 % perdirbto popieriaus
Spausdino UAB „Ciklonas“
J. Jasinskio g. 15, 01111 Vilnius