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Urban Planning Principals of Sustainable Neo-Industrial Territory Development

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Abstract. Global trends in the innovative technologies' development are systematically entering our lives, introducing sociological and economic changes in the society. As a result of the introduction of innovative technologies, human life inevitably changes, and cities must respond to these changes in order to ensure the sustainable development of cities and society. The general goal of research is identifying the urban-planning principles for the sustainable development of settlement systems and cities, taking into account the neo-industrial scenario of the economic and political development. The research contains the analysis urban development strategies, description of the notion of neo-industrialization, disclosure of the concept of sustainable development, general principles and graphic models of urban development, sustainable development, neo-industrial development and neo-industrial sustainable urban development.

1. Introduction

Neo-industrial revolution, which had been started with the invention of microprocessor, makes whole society change drastically. Job forms modify and jobs distribution shifts.

Human activity qualitatively changes during the neo-industrialization: human devotes more time to learning and inventing automated machines. In turn the automated machines replace human in technical operations of manufacturing industry.

The more automated machines are improved, the more time human devotes to science and creation. Research area absorbs more and more people and science outgrows into the primary industrial force. The market economy is turning into knowledge-based economy.

The neo-industrial evolution of society will inevitably affect life and development of the city. So urban-planning strategies must consider factors of neo-industrial social conversions [1,11].

The general goal of research is identifying the urban-planning principles for the sustainable development of settlement systems and cities, considering the neo-industrial scenario of the economic and political development. Forming new urban planning principles of neo-industrial sustainable development will help to reveal the potential and form urban development strategy.

The principals will allow to form the criteria to estimate existing strategies relevance and to reveal the potential of neo-industrial territory development.

2. Methodology

Object of the article: urban planning principals of sustainable neo-industrial territory development.



Research methods (figure 1): Analysis of a complex notion allows to reveal several simple notions, that the complex notion consists of. Learning experience and a content analysis allows to reveal specific features: goals, priorities and principles. Generalization and synthesis of revealed principals allows to form new principles classify them.

Research methodology is illustrated as the methodology model (Figure 1).

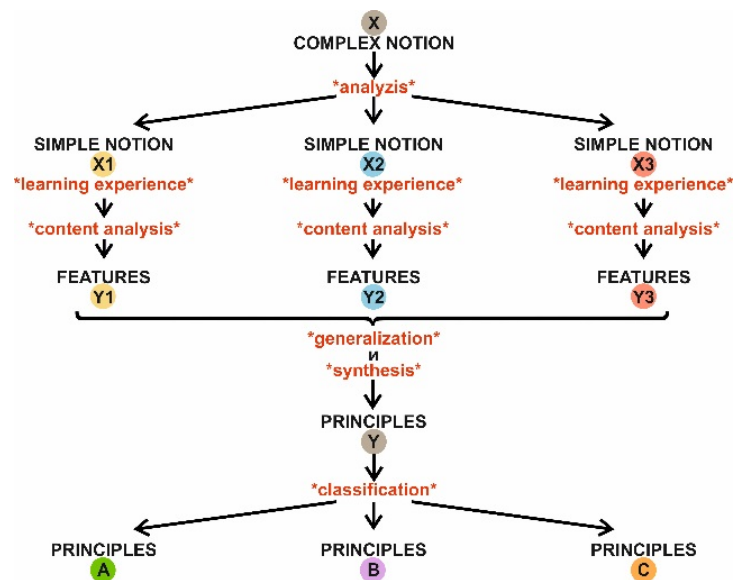


Figure 1. Methodology model.

The methodology model is a sample for the research model process. The research model (Figure 2) illustrates the process of the research

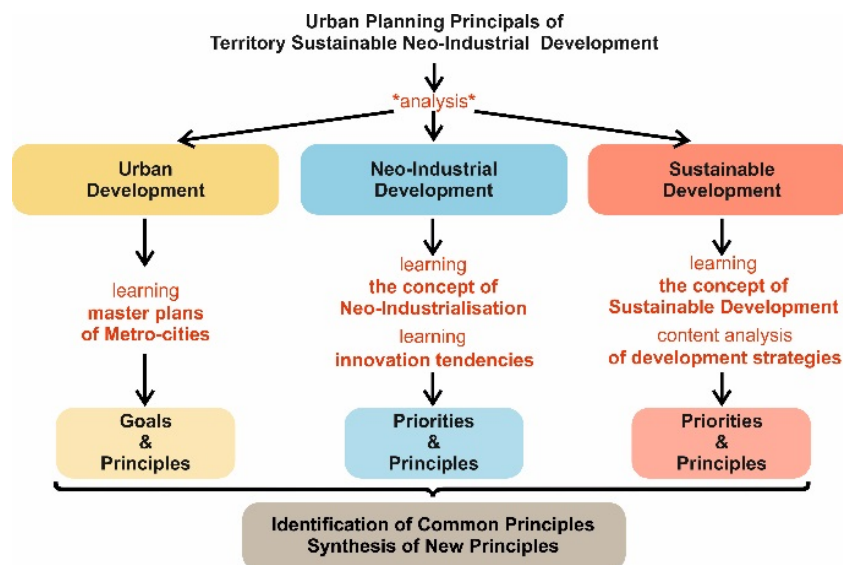


Figure 2. Research model.

3. Argumentation

The object of the research is a complex notion, that consists of simple notions: urban development, neo-industrial development and sustainable development. To define urban planning principals of sustainable neo-industrial territory development it is necessary to analyze urban development strategies, describe the notion of neo-industrialization, disclose the concept of sustainable development and to define general principles and graphic models of urban development, sustainable development, neo-industrial development.

3.1 Concept of sustainable urban development.

The concept of sustainable urban development is defined in the Un-Habitat “New agenda” [3].

New Urban agenda: making cities inclusive, safe, resilient and sustainable.

Description of the priorities of sustainable urban development according to the Un-Habitat “New agenda” is provided below [3]. The model of sustainable urban development is illustrated in Figure 3.

- Governance Structures: The NUA is anchored in participatory urban policies that mainstream sustainable urban and territorial development as part of integrated development strategies and plans, supported by institutional and regulatory frameworks linked to transparent and accountable finance mechanisms.
- Social Inclusion: Development must protect the planet and enable all inhabitants, whether living in formal or informal settlements, to lead decent, dignified, and rewarding lives, and to achieve their full human potential.
- Spatial Development: Balanced territorial development that accounts for different scales of cities and human settlements, strengthens their role in food security and nutrition systems, puts housing at the centre, builds infrastructure and services, facilitates trade, and connects farmers and fishers across value chains and markets
- Urban Prosperity: Inclusive and sustainable economic growth, with full and productive employment and decent work for all, is a key element of sustainable urban development where can people live healthy, productive, prosperous, and fulfilling lives.
- Environmentally Sustainable: Unsustainable consumption and production patterns, loss of biodiversity, pressure on ecosystems, pollution, natural and man-made disasters, and climate change and its related risks, undermine efforts to end poverty and to achieve sustainable development.



Figure 3. Model of sustainable urban development.

To define principles of urban development the review and content analysis of metro-cities spatial development strategies was held (Table 1).

Table 1. The result of content analysis.

No	Strategy title	Planning horizon	Scope of planning	Goals and principles defined in the strategy
1	Landesenwickungs-plan Berlin- Brandenburg [4,5]	2008 - 2018	- spatial; - economical; - social; - transport; - ecological.	· creation of complex system of central areas; · development opportunity equality; · spatial interconnection of population growth and infrastructure development; · natural landscape protection; · transport infrastructure development according to pendulum migrations and international traffic flows; · restriction of building development on spare territories; · containment of the extensive development of small cities; · formation of a holistic ecological framework of the region.
2	Metro Vancouver 2040 Regional Growth Strategy [4,6]	2013 - 2040	- spatial; - economical; - social; - transport; - ecological.	· dense urban environment; · sustainable economics; · environment protection; · formation of integral areas; · sustainable transport system; · concentration of urban growth within the selected areas; · decentralization; · combination of densely populated urban areas and extensive natural landscapes; · prevalence of port logistics, industry and agriculture; · ethnic and cultural diversity as a recognition basis.
3	Copenhagen Finger Plan 2013 [4,7]	2013 - 2032	- spatial; - economical; - social; - transport; - ecological.	· maintaining competitiveness at the global level · dense of urbanized areas · limitation of new construction areas · priority of public transport and cycling · preservation of the natural landscape · maintaining the quality of the urban environment
4	The London Plan: Spatial Development Strategy for Greater London [4,8]	2014 - 2050	- economical; - social; - transport; - ecological.	· successful solvation of the problems of economic growth and population; · increasing competitiveness in the international arena; · variety; · development and accessibility of areas;

No	Strategy title	Planning horizon	Scope of planning	Goals and principles defined in the strategy
				· establishing leadership for environmental improvement; · a city in which everyone has easy, safe and quick access to jobs and services.
5	Plan Melbourne: Metropolitan Planning Strategy [4,9]	2011 - 2031	- spatial; - economical; - social; - transport; - ecological.	· high quality of life with increasing population; · limiting the growth of built-up area; · natural landscape protection; · promoting state growth and development; · efficient integration of the transport system.
6	CMAP, Go to 2040: Comprehensive Regional Plan (Chicago) [4,10]	2010 - 2040	- spatial; - economical; - social; - transport; - ecological; - financial.	· investment in the development of built-up areas; · maximum functional variety; · transit-oriented development; · informational clarity; · investments in public transport and the development of a multimodal transport system; · realistic plans and their binding to budget financing indicators; · region development as a center of the global economy and attraction of qualified personnel/

Defined goals and principles were generalized and, as a result, the key urban-planning principles were formed and illustrated as a model in Figure 4.

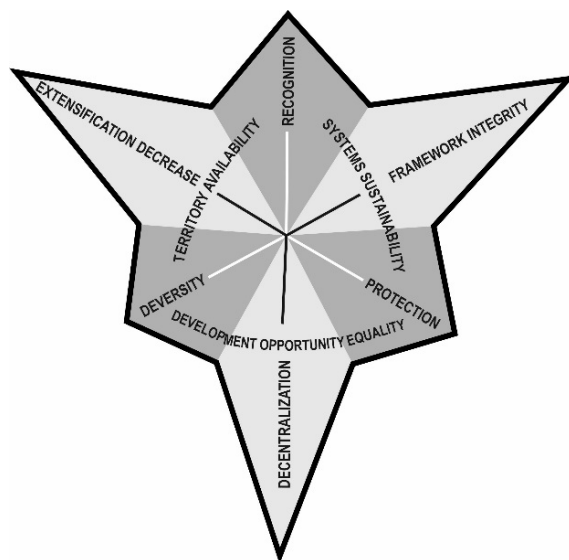


Figure 4. The model of urban development.

- Decentralisation;
- Development opportunity equality;
- Protection (of history and landscapes);
- Advance and maintenance cityscape quality;
- Extensification decrease, compact city;
- Framework integrity;
- Systems sustainability;
- Deversity;
- Area recognition;
- Territory availability.

3.2. Concept of Neo-Industrial development

To form the most relevant principles of territory development, the content analysis of innovation worldwide tendencies, that could affect the city development, was held: automatization, robotization, remote access, vertical farms, alternative energy.

The result of content analysis is introduced in Table 2.

Table 2. Content analysis of innovation worldwide tendencies.

No	Ten- dency	Loca- tion	Description	Result
1	Automa- -tization	China 2017	Despite low labor price, the head of Changying Precision Technology Company in Dongguan, China, replaced 90% of labors with robots and automated systems [12].	- 250% production increase; - 80% defects reduce; - proceeds increase; - unemployment increase; - social protests emerge.
2	Robo- tization	Japan 2017	In 2015, ad agency McCann Japan's creative planner Shun Matsuzaka set himself a task he called the "creative genome project": he wanted to create the world's first AI creative director, capable of directing a TV commercial. The client was asked to fill out a form with all the elements they wanted to appear in the ad. The AI robot then scrambled the database for ideas (humans were required to actually produce the final creative). The two spots would then be thrown to a nationwide poll, where consumers could vote for which ad they preferred [13].	- 54% of public vote for the human created ad; - the most of executives chose the AI ad; - ad agency can use AI algorithms to create ads; - it appears, that not only labor can be replaced by robots, but also some of creative professions.
3	Robo- tization	USA 2017	BlackRock laid out an ambitious plan to consolidate a large number of actively managed mutual funds with peers that rely more on algorithms and models to pick stocks. As part of the restructuring, seven of BlackRock's 53 stock pickers are expected to step down from their funds. Several of the money managers will stay on as advisers. At least 36 employees connected to the funds are leaving the firm [14,16].	16% of total revenue represents machine-driven passive investing
4	Robo- tization	Germany 2017	In their study, researchers of the School of Business and Economics have shown that algorithms based on artificial intelligence are able to make profitable investment decisions [15].	Profitability decreased and even became negative at times. This decline was driven by the rising influence of artificial intelligence in modern trading - enabled by increasing computing power as well as by the popularization of machine learning.

No	Ten- dency	Loca- tion	Description	Result
5	Remote access	USA 2017	Automattic, the company behind the popular WordPress blogging website, is making the unusual decision to get rid of its San Francisco office. Its employees in the Bay Area will simply work full time from their homes, coffee shops, or wherever else they choose. Of the company's roughly 550+ employees, only about 30 of them live in the Bay Area. The rest of them are scattered across more than 50 countries [17].	Its employees in the Bay Area will simply work full time from their homes, coffee shops, or wherever else they choose. It gives employees a generous stipend to set up their home offices, meetings are held online, everything can be done via chat rooms, and the company pays for teams to travel anywhere in the world for when in-person time is needed
6	Remote access	Russia 2016	Russian company Beeline started the project called "BeeFree". According to the concept of the project 50-70% of employees will work remotely 1-5 days a week, that means all employees, except for those who work with special equipment [18].	- overhead decrease is expected.
7	Vertical farms	China 2017	The complex of vertical farms is now building in Shanghai. It allows to grow 350 times more production and consume 100 times less water than fields or greenhouses.	- agricultural territories reduce; - water consumption is reduced.
8	Vertical farms	USA 2017	Aerofarms in New Jersey (area 14 164 sq. m) produces more than 900 tons of plants a year. It is comparable to a simple farm with 140 000 sq. m area.	- agricultural territories reduce; - water consumption is reduced.
9	Vertical farms	France 2017	Vertical farm in the centre of Paris allows to produce 7 tons of berries a year, having area only 24 sq. m.	- agricultural territories reduce; - water consumption is reduced.
1 2	Alter energy	Germany 2017	Today in Germany 55% of consumed energy is produced by NPP. By 2022 it is expected to reduce consumption of NPP energy to 0%, going over to wind-generated energy.	In 2016 during lingering calm, the energy was provided to Germany from Switzerland.

As a result, the priorities can be defined and should be considered. Defined priorities and learning the notion of "neo-industrialization" [1,2] gives us an opportunity to define principles of neo-industrial development.

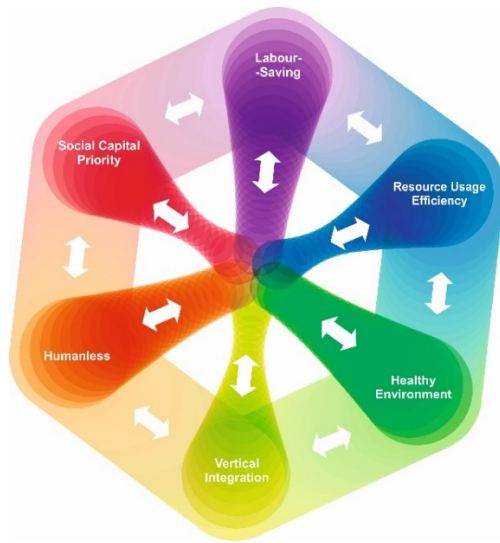


Figure 5. The model of neo-industrial development.

- Labour-saving;
- Vertical integration;
- Humanless;
- Resource usage efficiency;
- Healthy environment;
- Priority of social fund (capital).

4. Urban planning principals of sustainable neo-industrial territory development

As a result of generalization of different concepts principles, the general principles are revealed. Principles that cannot be generalized are synthesized as specific principles.

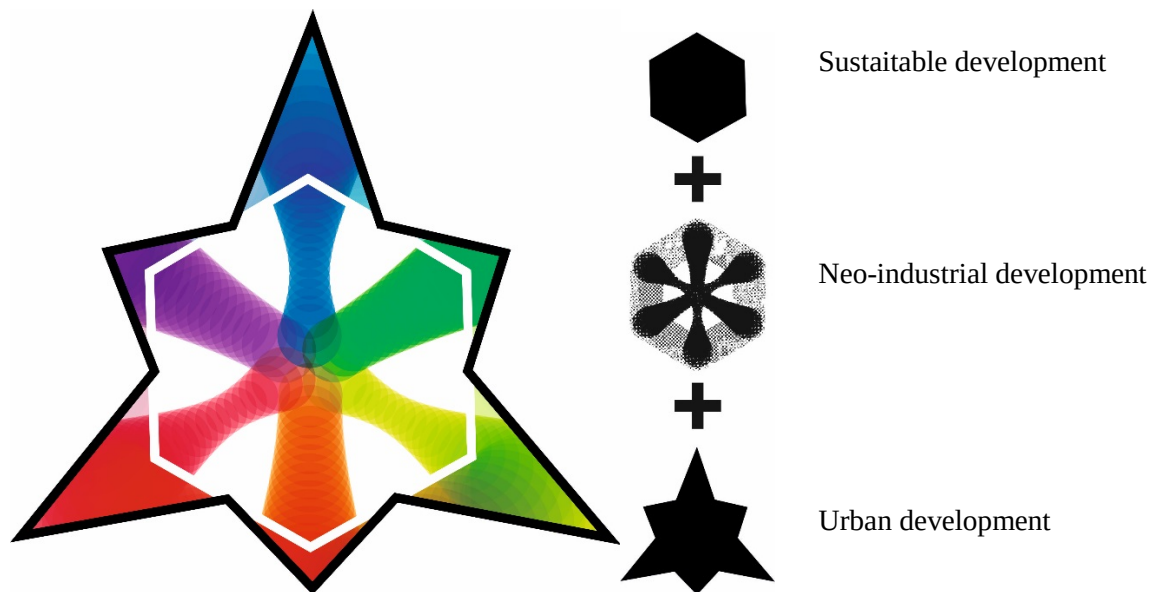


Figure 6. Model-symbol of Neo-industrial sustainable urban development.

Balanced complex development: Every element and every structure need to be developed. Development of one element must not threat the other elements development.

Priority of social fund: The innovation or the process can be integrated if it will not lead to social fund costs.

Areal independence and outlaying availability: People are free to choose place of residence and place of employment. Territorial availability of all places of employment and residential area. Integration of remote access concept in residential area development. Different areas can be connected with several different infrastructures.

Robotization as means of ecological and social security: it is necessary to define spectrum of processes that can be atomized with no threat for society and environment

Structural and processual territory integration: Maximum of safe processes must be integrated into the city contexture considering protection of existing structure and structure development. Integration can be reached by using innovative technologies.

Territorial clusters principle: Territorial clusters as basis for infrastructure, city and agglomeration development

Density and decompression balance: Urbanization and deurbanization balance, compact city concept, localization of anthropogenic affection, priority of intensive development.

Balanced vertical and horizontal integration: Scenarios of city development can be based on the concept of vertical integration of a company. If there is a strong company-developer, that is based in a city, the government must support the vertical integration of the company, and the company must develop city infrastructure by horizontal integration.

Diversity: Diversity of residential types, of spaces, of transport, of connections etc.

Hierarchy of functional connectors: Different areas can be connected in different ways: transport, energy, information etc. Every element of a system must have a general connection and accessory connections.

Originality: Originality and identity – the most important aspects when the concept of the area development is defined.

Joint innovation development: It is important that neighbored territory elements develop together, trying to consider interests of each other.

Resource usage efficiency: Efficiency usage of territory, people, financial, energetic, environment etc

Healthy robotization: Robotization is applied to reach people and environment security. Application of robots must be under control of government and must consider interests of citizens.

Decentralized hierarchy: Appointing several centers of development and defining several levels of city elements.

Framework adaptability: Any system must be based on existing elements. Liquidation of existing elements is allowable only if the element threatens environment, people or the whole system.

Forming new urban planning principles of neo-industrial sustainable development will help to reveal the potential and form urban development strategy.

The principals will allow to form the criteria to estimate existing strategies relevance and to reveal the potential of neo-industrial territory development.

The principles, defined in this research need to be tested on different territory levels: agglomeration, city, district.

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