

RIGA TECHNICAL UNIVERSITY
Faculty of Engineering Economics and Management
Institute of Civil Engineering and Real Estate Economics

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Doctoral Student of the Study Programme
“Management Science and Economics”

**ASSESSMENT OF SUSTAINABLE DEVELOPMENT
OF REAL ESTATE MARKET: CASE OF LATVIA**

Summary of the Doctoral Thesis

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DOCTORAL THESIS PROPOSED TO RIGA TECHNICAL UNIVERSITY FOR THE PROMOTION TO THE SCIENTIFIC DEGREE OF DOCTOR OF ECONOMIC SCIENCES

To be granted the scientific degree of Doctor of Economic Sciences, the present Doctoral Thesis has been submitted for the defence at the open meeting of RTU Promotion Council "P-09" on December 7, 2018 at the Faculty of Engineering Economics and Management of Riga Technical University, 6 Kalnciema Street, Room 209.

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DECLARATION OF ACADEMIC INTEGRITY

I hereby declare that the Doctoral Thesis submitted for the review to Riga Technical University for the promotion to the scientific degree of Doctor of Economic Sciences is my own. I confirm that this Doctoral Thesis had not been submitted to any other university for the promotion to a scientific degree.

Linda Kauškale (signature)

Date:

The Doctoral Thesis has been written in English. It consists of Introduction; 3 chapters; Conclusion; 55 figures; 39 tables; 21 appendices; the total number of pages is 143, not including appendices. The Bibliography contains 389 titles.

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INTRODUCTION

Topicality of the Research

Sustainable development is directly and indirectly influenced by a variety of European Union regulations, such as the Europe 2020 Strategy, the Energy Strategy 2050, and globally important regulations such as Brundtland report ("Our Common Future") drawn up by the World Commission on Environment and Development organised by the United Nations in 1987, the UN Universal Declaration of Human Rights (1948), the Montreal Protocol on Substances that Deplete Ozon Layer (1987), Kyoto Protocol to the United Nations Framework Convention on Climate Change (1998), the Rio Declaration on Environment and Development (1992), which influenced the UN Framework Convention on Biological Diversity, Lisbon Strategy (2000), the Johannesburg Declaration on Sustainable Development (2002), and for Latvia special importance lies in the Sustainable Development Strategy of Latvia until 2030, Latvia's Stability Programme for 2017–2020, Long-Term Economic Strategy of Latvia, Long-Term Energy Strategy of Latvia 2030, Latvian Green Energy Strategy 2050, Long-Term strategy for building renovation 2014–2020 in Latvia, Latvian Energy Efficiency Law (2016), Environmental Protection Law of the Republic of Latvia (2006), Construction Law (2014), several European Commission documents and other related laws and documents that are important globally, and for Latvia, in particular.

These documents and regulations focus on the need for sustainable development and integration of sustainable development into a number of areas, including the real estate market regulation, real estate operations (L68) and construction industry (mainly construction of buildings – environmental aspects), determine the need for assessment of these aspects, as well as of the economic problems in general, and the real estate market development problems have a great influence on the development of the society, while all these aspects have a considerable impact on the private sector as well. Development of sustainability concept regarding the real estate market and the necessity of assessment of sustainable development of the real estate market were identified from all the above-mentioned documents and regulations, of which the Sustainable Development Strategy of Latvia until 2030 and Latvia's Stability Programme for 2017–2020 are of special importance for Latvia. There is the necessity for stability-oriented activities, highlighted also by the European Central Bank (2017) in monetary policy development, which is significantly affecting the real estate market development.

Decisions on the construction of green buildings are also affected by the construction costs (economic aspect), affordability of green buildings (social aspect) and environmental development in general (environmental aspect). Green buildings have a great potential for investments and can contribute to the

sustainable long-term national development. Reduction of the greenhouse gas emissions is one of the most important environmental priorities on the global scale, and the development of the sustainable real estate market can also contribute to the reduction of greenhouse gas emissions. Investment trends in the country and in a particular region play a crucial role in the creation of sustainable environment in the city, territory planning and land use. The topicality of the research is also determined by the fact that characteristics of real estate market are different not only in different countries, but also within one country.

In order to strengthen economic stability of Latvia, it is useful to promote the sustainable development of real estate market, which also determines the topicality of the Thesis. The research results have also identified the problems of sustainable development of the Latvian real estate market that could be improved. All of the above-mentioned aspects show a necessity for the development of methodological solution for sustainable development of real estate market in order to develop possible improvement opportunities for the situation. The research extends the current activities implemented by entrepreneurs and other market participants and integrated into models and algorithms. The necessity for *sustainable* development of the real estate market resulted from analysis of Latvia's Stability Programme 2017–2030 and Sustainable Development Strategy of Latvia until 2030; however, as it is described in the Thesis, there are differences between *sustainable development* and *stable (stability-oriented) development*.

The Hypothesis of the Research

Methodological solution of the assessment of sustainable development of the real estate market provides opportunities to reveal problems of sustainable development of the real estate market in the country and to develop improvement solutions for sustainable development of the real estate market.

The object of the research is the real estate market.

The subject of the research is assessment of sustainable development of the real estate market in Latvia.

The aim of the Thesis is to develop the methodological solution for the assessment of sustainable development of the real estate market in Latvia.

Tasks of the Thesis

1. To approve the necessity for the assessment of sustainable development of the real estate market and to develop the concept of sustainable development of the real estate market.
2. To analyse the dimensions of sustainable development of the real estate market.
3. To identify the problems of sustainable development of the real estate market, including the definition of motivating and contractionary factors

affecting sustainable development of the real estate market at the company, industry and national levels.

4. To analyse the regulation of environmental development and to make the assessment of the development of sustainable and green buildings in Latvia, by conducting a survey.
5. To develop an integration system for the stability-oriented processes in the real estate market and for the real estate transaction entities, by analysing the theoretical and practical aspects of sustainable development of the real estate market and its regulation.
6. To develop the methodological solution for an integrated, multi-level and multi-factor assessment of sustainable development of the real estate market in Latvia.

Thesis Statements

1. Social, economic and environmental aspects are crucial for sustainable development of the real estate market, and affect the overall development of the country.
2. The development of the real estate market is affected by economic, social and environmental problems, which are manifested at different economic and management levels.
3. There is a variety of areas of possible assessment and analysis of the real estate market
4. The lack of information and of financial resources are the main problems of the development of sustainable and green buildings in Latvia.
5. The methodological solution for assessing the sustainable development of the real estate market allows identifying deficiencies in the development of the real estate market and developing recommendations for improving the sustainable development of the real estate market in public and private sectors.

Theoretical and Methodological Foundation of the Research

Generally accepted methods of analysis of scientific literature, articles, fundamental scientific research and combination of qualitative and quantitative research methods, including empirical research methods, such as analysis, synthesis, induction, deduction, historical, triangulation and comparative analysis methods, analysis of documents and regulations, online survey, expert evaluation method during the conducted expert interviews, factor pair comparison method, combination of focus group and nominal group methods, statistical data analysis, historical, logically constructive and other methods have been used in the research,. As green building covers a variety of aspects that influence operations in the real estate market, construction, environmental development

and energy industries, and involves a number of different market participants, the research adopted an interdisciplinary approach. Integrated approach of applying mixed research methods has provided an opportunity of in-depth analysis of the research question, emphasized the novelty of the research and played a crucial role in the development of methodological solution for the assessment of sustainable development of the real estate market and for the development of recommendations for sustainable development of the real estate market. More detailed description of methods is provided in certain chapters of the Thesis.

The Thesis also contains a detailed analysis of the scientific literature, research articles and international experience on the research problem. The research primarily focuses on Latvia, but the experience of the Baltic States, Germany, the United Kingdom, the United States, Australia, Japan and other countries has also been analysed.

The Doctoral Thesis is based on theoretical and methodological foundation of economics and management science theories of foreign and Latvian researchers such as Actiņa, G., Asaul, A. N., Auziņš, A., Burns, A. F., Carlowitz, H. C., Chan, E. H. W., Christersson, M., Deaton, A., Didenko, K., Ding, G. K. C., Fisher, I., Friedman, M., Galbraith, J. K., Gan, X., Geipele, I., Geipele, S., Ghunaim, M., Giddens, A., Grizāns, J., Hines, M. A., Juglar, C., Junnila, S., Kaklauskas, A., Keynes, J. M., Kitchin, J., Kondratieff, N. D., Kuei, C.H., Löwe, A., Malthus, T., Mayring, P., Minsky, H. P., Mises, L., Mitchell, W.C., Pareto, V., Počs, R., Quinn, R. E., Rogmans, T., Ruddock, L., Ruddock, S., Sadler, J. P., Smith, A., Šaparauskas, J., Šenfelde, M., Štaube, T., Tirole, J., Vanags, J., Veblen, T., Zavadskas, E. K., and others.

Literary analysis is based on the studies of Hawker, R. J., McKillop, A., Jacobs, S., Mayring, P., Van de Ven, A. H., Delbecq, A. L., Gallagher, M., Hares, T., Spencer, J., Bradshaw, C., Webb, I., Linton, J., Erzah, L., and other scientists. The methodology for questionnaire development and focus group and nominal group management is based on the studies by Ruddock, K., Ruddock, S., Sharan, B. M., Rutherforda M. W., Brauers, W. K., Lepkova, N., and other scientists. The mathematical (and methodological) basis of the index development is based on the studies of Pollesch, N., Dale, V., Gan, X., Fernandez, I. C., Guo, J., Wilson, M., Zhao, Y., Zhou, B., Wu, J., Rogmans, T., Ghunaim, M., Šenfelde, M., Judrupa, I., and other scientists, as well as on Eurostat and CSB methodological materials. Both IBM SPSS Statistics Data Processing Version 25.0 and Excel 2016 have been used to compile the results of the research.

The informative base of the research includes scientific literature and articles, its overview, the EU regulations and directives, reports and forecasts of the European Commission and of European Central Bank, statistical databases, reports of different organisations, government and municipalities, European Statistical Database Eurostat, World Bank, Organisation for Economic Co-operation and Development (OECD), World Economic Forum reports and data, Central Statistical Bureau of Latvia, United Nations (UN), UN Global Compact, UNEP (United Nations Environmental Programme), United Nations Economic Commission for Europe (UNECE), RICS (Royal Institution of Chartered Surveyors)

documents, BRE Global Ltd., Bream Europe Commercial, US. Green Building Council (USGBC), German Sustainable Building Council (DGNB), Latvian Sustainable Construction Council, World Building Council for Sustainable Development (WBCSD), McKinsey & Company, Economic Sciences Prize Committee of the Royal Swedish Academy of Sciences, Committee for the Prize in Economic Sciences in Memory of Alfred Nobel, Ministry of Finance of the Republic of Latvia, Latvian Herald and other resources. The results of the research have been analysed by the author.

Literature review includes high impact articles related to the research question and international experience. The process of literature analysis is shown in Appendix 1. The summary of methodological solution is presented in Chapter 3 of the Thesis.

Research Limitations

The research focuses on the analysis of sustainable development of the real estate market, with particular focus on environmental, economic and social aspects that is also a research limitation. Other factors, such as global factors, are affecting factors. Additional statistical analysis is provided in the Appendices (especially, in Appendix 19 of the Doctoral Thesis).

The Thesis is more focused on the real estate as the object of transactions, rather than on the housing maintenance procedures. The analysis and evaluation of green building in Latvia should take place for the period from 2013, when the first green building certification in Latvia was performed. Expert survey on sustainable and green building development in Latvia was made in 2016, when the scientific background for the result analysis appeared. Experts with professional experience were attracted for giving the expert evaluation on research question.

As the concept of sustainable development of the real estate market is of environmental, economic and social importance, the author has specified the importance of sustainable (and green) buildings in sustainable development of the real estate market with the main focus on environmental dimension of sustainable development of the real estate market; results of the research are presented in Chapter 2 of the Thesis. In Chapter 2 of the Thesis, the author conducts the analysis of green buildings; however, a city planning aspect is not assessed that is also a research limitation. The aspects of implementation of sustainability concept in organisations that are of importance particularly to real estate transaction entities were included in the research.

Lack of statistical information on some indicators can be observed (Eurostat, Central Statistical Bureau of Latvia) for certain periods, for example, the real estate price index has been available since 2006. The registration of new buildings in the

Land Register, registered real estate purchase and lease contracts and the average net wage in Latvia have been reviewed over the period from 1995 to 2016. Several indicators such as construction confidence indicator and share of the construction sector in gross domestic product have been considered since 2004. Some indicators have only been available since 2010, such as the housing stock in statistical regions at the end of the year.

Novelty of the Thesis

Scientific novelty of the Thesis.

1. Theoretical guidelines for sustainable development of the real estate market, models for their functioning visualisation have been developed by performing the assessment by levels, as well as the *dimensions of sustainable development of the real estate market* have been identified and analysed; systematisation of definitions related to the research topic was done. *The system of information analysis of cycles and its interrelation with other processes of sustainable development of the real estate market* have been developed.
2. *The holistic approach with a triangulation method for determining the problems of sustainable development of the real estate market* has been implemented. The motivating and contractionary factors affecting the sustainable development of the real estate market at several levels of economy and management have been identified, as well as the interrelation of the development of the real estate market with economic development has been analysed.
3. *The assessment of factors influencing the development of sustainable and green buildings has been made in Latvia* for the first time.
4. *The implementation system for the sustainable transaction processes in the real estate market and for real estate transaction entities* have been developed; as well as the supportive decision-making model for sector regulation in the public and private sectors has been elaborated.
5. *The methodological solution for the assessment of sustainable development of the real estate market* has been developed by assessing the sustainable real estate market in Latvia. *The sustainable development index of the real estate market* has been developed.

The scientific significance of the research lies in the methodological solution for sustainable development of the real estate market that provides the opportunity to identify the problematic issues in the real estate market development in the state and to develop the recommendations for improving the situation at different levels. The conducted research provides an opportunity to compare the experience of different countries, which helps find solutions for sustainable development of the real estate market.

The Approbation and Practical Use of Research Results

The most important results of the Thesis have been reported in 19 conferences. The results of the Thesis have been approbated in 25 scientific publications, and in the working groups with participation of the industry experts and scientists.

The methodological solution of sustainable development of the real estate market is closely related to the need for a complex analytical assessment and can improve the results of the performance of private sector (real estate transaction entities), the overall development of national economy, the environment, planning of the activities of the market participants and real estate market regulation in general. The holistic real estate market analysis and the assessment of its development provide an opportunity to compare experience of different countries and to find effective solutions for the sustainable development of the real estate market. Scientific and practical solutions and recommendations can help the market participants plan their activities, which, in turn, can improve the overall performance of the industry in the longer term.

Scientific and practical solutions and recommendations will enable the industry companies to plan their activities better, which, in turn, can improve the overall performance of the industry in the longer term by promoting sustainable development of the real estate market.

The author's research results have been approbated in Latvia and abroad at the following events:

- in focus groups at RTU Institute of Civil Engineering and Real Estate Economics, by using focus group and expert survey methods, by organising the meeting on 30 June 2016 and 11 August 2016;
- in an interview with the Director of DGNB System Dr. ing. Stephan Anders on 31 October 2016 at DGNB, Stuttgart, Germany; the aim of the interview was to discuss the topical issues related to green building concept, green building certification and green building development trends, including the case of Germany;
- during the lectures of the study courses "Real Estate Economics" and "Real Estate Market in National Economy" in RTU Faculty of Engineering Economics and Management, Faculty of Civil Engineering, and also to the students of ERASMUS international exchange programme;
- in the scientific practical forum "Housing Management Practice, Possibilities for Renovation of Apartment Buildings", in the 16th international construction, repair and interior exhibition "House. Apartment 2017 BT1", International Exhibition Hall, Riga, 19–22 October 2017.

Scientific Publications

The results of the research are reflected in 25 scientific articles, that are indexed in international databases, such as Scopus, ISI WoS, EBSCO.

1. Tupenaite, L., Kaklauskas, A., Lill, I., Geipele, I., Naimaviciene, J., Kanapeckiene, L., Kauskale, L. Sustainability Assessment of the New Residential Projects in the Baltic States: A Multiple Criteria Approach. *Sustainability*, 2018, vol. 10, no. 5, pp. 1–21. e-ISSN 2071-1050. doi:10.3390/su10051387. Scopus
2. Kauškale, L., Geipele, I., Zeltiņš, N., Vanags, J. Sustainable Construction Industry Development and Green Buildings: A Case of Latvia. *Latvian Journal of Physics and Technical Sciences*, 2018, vol. 55, no. 1. doi: <https://doi.org/10.2478/lpts-2018-0005>. Scopus, ISI WoS.
3. Binovska, I., Kauškale, L., Vanags, J. The Comparative Analysis of Real Estate Market Development Tendencies in Baltic States. *Baltic Journal of Real Estate Economics and Construction Management*, 2018, vol. 6, 2018, pp. 6–23. doi: 10.1515/bjreecm-2018-0001. EBSCO.
4. Lemos, A., Kauškale, L. Factors Influencing Green Roof Development in Recife, Brazil. *Baltic Journal of Real Estate Economics and Construction Management*, vol. 5, 2017, pp. 146–159. e-ISSN 2255-9671. doi:10.1515/bjreecm-2017-0011. EBSCO.
5. Mishra, A., Kauškale, L. Comparative Analysis of Sustainable Real Estate Market Development in Two Northern Capitals: Case of Riga, Latvia and Stockholm, Sweden. *Baltic Journal of Real Estate Economics and Construction Management*, vol. 5, 2017, pp. 186–200. e-ISSN 2255-9671. doi:10.1515/bjreecm-2017-0014. EBSCO.
6. Geipele, S., Geipele, I., Kauškale, L., Zeltiņš, N., Štaube, T., Pudzis, E. The Development of Nanotechnologies and Advanced Materials Industry in Science and Entrepreneurship: Scientific Indicators. A Case Study of Latvia (Part Three). *Latvian Journal of Physics and Technical Sciences*, 2017, vol. 54, no. 5, pp. 3–13. ISSN 0868-8257. doi:10.1515/lpts-2017-0029. Scopus, ISI WoS.
7. Kauškale, L., Geipele, I., Vanags, J., Lepkova, N. Environmental Aspects of the Construction Industry Development in Latvia. *Baltic Journal of Real Estate Economics and Construction Management*, 2017, vol. 5, iss. 1, pp. 209–225. e-ISSN 2255-9671. doi:10.1515/bjreecm-2017-0016. EBSCO.
8. Kauškale, L., Geipele, I., Zeltiņš, N., Lecis, I. Environmental and Energy Aspects of Construction Industry and Green Buildings. *Latvian Journal of Physics and Technical Sciences*, 2017, vol. 54, no. 2, pp. 24–33. ISSN 0868-8257. doi:10.1515/lpts-2017-0010. Scopus, ISI WoS.
9. Kauškale, L., Geipele, I. Integrated Approach of Real Estate Market Analysis in Sustainable Development Context for Decision Making. *Procedia Engineering*, 2017, vol. 172, pp. 505–512. ISSN 1877-7058. doi:10.1016/j.proeng.2017.02.059. Scopus, ISI WoS.
10. Kauškale, L., Geipele, I., Zeltiņš, N., Lecis, I. Energy Aspects of Green Buildings – International Experience. *Latvian Journal of Physics and Technical Sciences*, 2016, no.6, pp. 21–28. ISSN 0868-8257. doi:10.1515/lpts-2016-0040 Scopus, ISI WOS.
11. Kauškale, L., Riemenschneider, F. The Environmental and Economic Substantiation for Investments in Green Buildings. *Baltic Journal of Real*

- Estate Economics and Construction Management*, vol. 4, 2016, pp. 126–144, doi:10.1515/bjreecm-2016-0010 November 2016. EBSCO.
12. Kauškale, L., Geipele, I. Economic and Social Sustainability of Real Estate Market and Problems of Economic Development – A Historical Overview. *Baltic Journal of Real Estate Economics and Construction Management*, vol. 3, pp. 6–31, ISSN 2255-9671. doi:10.1515/bjreecm-2016-0002. EBSCO
 13. Komisarov, V., Kauškale, L., Lepkova, N. Commercial Property Development Positively Influencing Factors: Case of Lithuania. In: *57th International Riga Technical University Scientific Conference on Economics and Entrepreneurship (SCEE'2016): Proceedings, Latvia, Riga, 14–16 October, 2016*. Riga: Riga Technical University, 2016, pp. 204–205. ISBN 978-9934-10-860-0. ISSN 2256-0866. EBSCO
 14. Kauškale, L., Geipele, I. Economic Problems of Real Estate Market and Its Influence on the Development of Business Environment. In: *Proceedings of the 2016 International Conference "Economic Science for Rural Development". No. 43, Latvia, Jelgava, 21–22 April, 2016*. Jelgava: 2016, pp. 39–48. ISBN 978-9984-48-225-5. ISSN 1691-3078. ISI WoS
 15. Kauškale, L., Geipele, I. Real Estate Investment Management and Macroeconomic Sustainability: Case of Latvia and International Experience. In: *Proceedings of the Sixth International Conference on Industrial Engineering and Operations Management, Malaysia, Kuala Lumpur, 8–10 March 2016*. Kuala Lumpur: 2016, pp. 932–939. ISBN 978-0-9855497-4-9. ISSN 2169-8767. Scopus. Code 135628.
 16. Kauškale, L., Geipele, I. Influence of Economic and Real Estate Market Fluctuations on Real Estate Entrepreneurship in Latvia. In: *Proceedings of the Sixth International Conference on Industrial Engineering and Operations Management, Malaysia, Kuala Lumpur, 8–10 March 2016*. Kuala Lumpur: 2016, pp. 851–862. ISBN 978-0-9855497-4-9. ISSN 2169-8767. Scopus. Code 135628.
 17. Štaube, T., Leemeijer, B., Geipele, S., Kauškale, L., Geipele, I., Jansen, J. Economic and Financial Rationale for Age-Friendly Housing. *Journal of Financial Management of Property and Construction*, 2016, vol. 21, iss. 2, pp. 99–121. ISSN 1366-4387. doi:10.1108/JFMPC-05-2015-0015 Scopus, ISI WoS.
 18. Kauškale, L., Geipele, I. Construction Management – Challenges, Influencing Factors and Importance of Investment Climate. In: *Proceedings of 5th International Conference on Industrial Engineering and Operations Management, United Arab Emirates, Dubai, 3–5 March 2015*. Dubai: IEOM Society, 2015, pp. 522–531. ISBN 978-0-9855497-2-5. ISSN 2169-8767. doi:10.1109/IEOM.2015.7093803 IEEE, Scopus, ISI WoS
 19. Kauškale, L., Geipele, I. Urban Entrepreneurship Development Trends in Real Estate Market in Latvia. In: *5th Central European Conference in Regional Science: International Conference Proceedings, Slovakia, Košice, 5–8 October 2014*. Košice: Technical University of Košice, 2015, pp. 358–369. ISBN 978-80-553-2015-1. ISI WoS, WoS:000379207200036

20. Kauškale, L., Geipele, I. The Real Estate Market Development Impact on Life Quality - Main Aspects, Tendencies and Important Regulations. In: *Proceedings of the 8th International Scientific Conference "Rural Environment. Education. Personality" (REEP-2015), Latvia, Jelgava, 15-16 May 2015*. Jelgava: Latvia University of Agriculture, 2015, pp. 213-221. ISBN 978-9984-48-178-4. ISSN 2255-8071. ISI WoS. WOS:000380577000024
21. Kauškale, L., Geipele, I. Foreign Direct Real Estate Investments in Latvia in the Context of the Development of the National Economy. In: *Economic Science for Rural Development, No. 37: 16th International Scientific Conference "Economic Science for Rural Development", Latvia, Jelgava, 23-24 April 2015*. Jelgava: Latvia University of Agriculture, 2015, pp. 241-250. ISBN 978-9984-48-180-7. ISSN 1694-3078. e-ISSN 2255-9930. ISI WoS, WOS:000360011300024
22. Kauškale, L., Geipele, I. Land Use Analysis in Latvia in the Context of Sustainable Development. *Baltic Journal of Real Estate Economics and Construction Management*, vol. 3, 2015, pp. 14-25. ISSN 2255-6904. e-ISSN 2255-9671. doi:10.1515/bjreecm-2015-0003. EBSCO
23. Kauškale, L., Geipele, I. Particular Aspects of Entrepreneurship in Real Estate Market in Latvia. *Baltic Journal of Real Estate Economics and Construction Management*, vol. 2, 2014, pp. 30-35. ISSN 2255-9604. e-ISSN 2255-6971. doi:10.7250/bjreecm.2014.005. EBSCO
24. Geipele, I., Kauškale, L., Lepkova, N., Liias, R. Interaction of Socio-Economic Factors and Real Estate Market in the Context of Sustainable Urban Development. In: *9th International Conference on Environmental Engineering (ICEE-2014): Selected Papers, Lithuania, Vilnius, 22-24 May 2014*. Vilnius: Vilnius Gediminas Technical University Press Technika, 2014, pp. 1-8. ISBN 978-609-457-640-9. e-ISSN 978-609-457-690-4. e-ISSN 2029-7092. doi:10.3846/enviro.2014.117. Scopus, ISI WoS.
25. Geipele, I., Kauškale, L. The Influence of Real Estate Market Cycle on the Development in Latvia. *Procedia Engineering*, 2013, vol. 57, pp. 327-333. ISSN 1877-7058. doi:10.1016/j.proeng.2013.04.044. Scopus, ISI WoS.

Participation in the Projects

1. Interreg Coast4us project of Central Baltic sub-programme, P2 – Sustainable use of common resources. Sustainably planned and managed marine and coastal areas. Position: Expert on land use and resource planning. Period: 2018-2020.
2. Erasmus + Mobility project at DGNB (Deutsche Gesellschaft für nachhaltiges Bauens/ German Sustainable Building Council), Stuttgart, Germany. 21-24 February 2017.
3. Deutsche Bundesstiftung Umwelt MOE-Austauschstipendiumprogramm, für Nachwuchswissenschaftler (Regierungspraktikanten) – German Environmental Foundation Exchange scholarship program for young scientists

(government practicants), Germany. Thema “Ökologische und wirtschaftliche Begründung für Investitionen im Bereich des ökologischen Bauens” (topic of project: The Ecological and Environmental Substantiation for Investments in Green Buildings). Contract No. AZ 30016/628. Period: from 20 August 2016 – 19 February 2017.

4. European Social Fund project “Support for the Implementation of Doctoral Studies at Riga Technical University”. Academic year 2014/2015. Project 2009/0144/1DP/1.1.2.1.2/09/IPIA/VIAA/005.

Participation in Scientific Conferences

The results of the Thesis have been presented in 19 international conferences (Germany, Latvia, Lithuania, Malaysia, Singapore, and the United Arab Emirates).

1. The 58th International Conference “Scientific Conference on Economics and Entrepreneurship” (SCEE ‘2017) of Riga Technical University. Latvia, Riga, 13–14 October 2017. Report: Environmental Aspects of the Construction Industry Development in Latvia.
2. The 11th International Conference on Engineering, Science and Technology. 13–14 March 2017, Dubai, UAE. Report: An Interconnection between Environmental Problems and Sustainable Real Estate Market Development.
3. The 19th International Conference on Business, Economics, Management and Behavioural Sciences. 11–12 March 2017, Dubai, UAE. Report: The Real Estate Market Sustainability Concept and Its Implementation in Management of Real Estate Companies.
4. Scientific practical forum “Housing Management Practice, Possibilities for Renovation of Apartment Buildings”, in the 16th international construction, repair and interior exhibition “House. Apartment 2017 BT1”, International Exhibition Hall, Riga, 19–22 October 2017. Report: Green Buildings and its Certification – Experience of Germany and Latvia.
5. 40. MOE-Statusseminar der Deutschen Bundesstiftung Umwelt vom 28.11.2016 bis zum 01.12.2016, Oesede, Deutschland. Report: Ecological and Economic Substantiation for Investments in Green Buildings (*Ökologische und wirtschaftliche Begründung für die Investitionen in ökologisches Bauen*).
6. The 57th International Conference “Scientific Conference on Economics and Entrepreneurship” (SCEE ‘2016) of Riga Technical University. Latvia, Riga, 29–30 September 2016. Reports:
 - Commercial Property Development Positively Influencing Factors: A Case of Lithuania;
 - Economic and Social Sustainability of Real Estate Market and Problems of Economic Development – A Historical Overview.
7. FIABCI Baltic Real Estate Development Forum, 26–27 September 2016, Riga, Latvia, Radisson Blu Hotel Latvia. Report: Influence of Attraction of Foreign

- Companies by Governmental Investment Agencies of the Baltic States to the Real Estate Market.
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 9. The 17th International Conference “Economic Science for Rural Development”. Latvia, Jelgava, 21–22 April 2016. Report: Economic Problems of Real Estate Market and Its Influence on the Development of Business Environment.
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 - Influence of Economic and Real Estate Market Fluctuations on Real Estate Entrepreneurship in Latvia *Section Chair at Section: Production Planning and Management*.
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 14. The 16th International Scientific Conference “Economic Science for Rural Development”, Latvia, Jelgava, 23–24 April 2015. Jelgava. Report: Foreign Direct Real Estate Investments in Latvia in the Context of the Development of the National Economy.
 15. The 56th International Conference “Scientific Conference on Economics and Entrepreneurship” (SCEE ‘2015) of Riga Technical University. Latvia, Riga, 14–17 October 2015. Report: Land Use Analysis in Latvia in the Context of Sustainable Development.
 16. The 9th International Conference on Environmental Engineering (ICEE-2014): Selected Papers, Lithuania, Vilnius, 22–24 May 2014. Report: Interaction of Socio-Economic Factors and Real Estate Market in the Context of Sustainable Urban Development.
 17. The 55th International Scientific Conference on Economics and Entrepreneurship (SCEE’2014), Latvia, Riga, 14–17 October 2014. Report: Particular Aspects of Entrepreneurship in Real Estate Market in Latvia.

18. The 11th International Conference on Modern Building Materials, Structures and Techniques (MBMST 2013), 16–17 May 2013, Lithuania. Section: Facility and Real Estate Management. Report: The Influence of Real Estate Market Cycle on the Development in Latvia.
19. International Conference “Today’s Management Challenges in the Field of Investment, Construction and Environmental Management”, Moscow, 11–12 April 2013, Plekhanov Russian University of Economics. Report: Impact of the Economic Development Cycle on the Property Market in Latvia (Влияние экономического цикла развития на рынок недвижимости в Латвии).

The Volume and Content of the Doctoral Thesis

The Doctoral Thesis is an independent scientific research written in the English language. The total volume of the Doctoral Thesis is 143 pages, not including appendices. The Doctoral Thesis consists of Introduction, 3 chapters, Conclusions and Recommendations, Bibliography and 21 appendices. The Thesis contains 39 tables, 55 figures, and 7 formulas. During the elaboration of the Doctoral Thesis 389 information sources that listed in the Bibliography have been used.

Chapter 1 describes the sustainable development concept in real estate market, distinguishes dimensions of sustainable development of real estate market, with the main focus on economic, social and environmental aspects of sustainable development of real estate market, and its problematic issues. On the basis of literature survey, scientific and practical aspects of the factors, regulations and policies affecting the sustainable development of real estate market are analysed in the chapter.

Chapter 2 describes the sustainable development of real estate market and green building development in Latvia. The chapter provides an analysis of sustainable development of real estate market in Latvia, issues regarding environmental preservation, its legal aspects, development of green and sustainable buildings, the assessment of its affecting factors in Latvia, environmental development aspects and development analysis of real estate market in Latvia. The system for sustainable processes for real estate transaction entities has also been developed.

Chapter 3 provides the developed methodological solution for the assessment of sustainable real estate market development that comprises an integrated and interdisciplinary approach of the real estate market analysis in the context of sustainable development of real estate market, and includes its assessment for sustainable development of the real estate market in Latvia. The integrated sustainable development of real estate market implies the developed informative, organisational and methodological aspects for its assessment.

In **Conclusions**, the research results are summarised and the recommendations for public and private entities and other market participants are developed. The developed methodological solution provides an opportunity to make assessment in many countries, compare different national experiences and find solutions for sustainable development of the real estate market.

The Doctoral Thesis has been supported by the European Social Fund within the project “Support for the Implementation of Doctoral Studies at Riga Technical University”.

GLOSSARY OF ABBREVIATIONS

BRE – Building Research Establishment

BREEAM – British Research Establishment Environmental Assessment Method

CERES - Coalition for Environmentally Responsible Economies

CSB - Central Statistical Bureau of Latvia

DGNB - German Sustainable Building Council (Deutsche Gesellschaft für Nachhaltiges Bauen)

ESG criteria – economic, social and governance criteria

Et al. – and others (et alia)

FIABCI – International Real Estate Federation (French: Fédération Internationale des Administrateurs de Biens Conseils et Agents Immobiliers)

GDP – gross domestic product

GFI - Global Financial Integrity

IBM – International Business Machines Corporation

IIGCC – Institutional Investors Group on Climate Change

INCR – Network on Climate Risk

ISO - International Organization for Standardisation

JSC - Joint-Stock Company

KfW - German Development Bank (German: Kreditanstalt Für Wiederaufbau)

LANĪDA – Latvian Association of Real Estate Transactions (Latvian: Latvijas nekustamo īpašumu darījumu asociācija)

Ltd. – limited company

M / Mln – million

n.d. – no date

OECD – Organisation for Economic Co-operation and Development

RICS – Royal Institution of Chartered Surveyors

SDIREM - sustainable development index of the real estate market

SJSC - State Joint-Stock Company

SPSS – Statistical Package for Social Sciences

Thsd – thousand

UN – United Nations

UNECE – United Nations Economic Commission for Europe

UNEP – United Nations Environmental Programme

USGBC – US. Green Building Council

WBCSD – World Building Council for Sustainable Development

THE MAIN SCIENTIFIC RESULTS OF THE RESEARCH

1. SUSTAINABILITY ASPECTS IN REAL ESTATE MARKET

The sustainability aspects are particularly important in the real estate market. Sustainable development of real estate market includes the analysis of definitions related to real estate market and sustainable development. Real estate market can be defined as follows: “A set of existing and potential real estate market participants and entities that operate in a specific socio-economic and legal political system, performing reciprocal real estate transactions at an agreed price at a specified time and within the territory of a particular country” (Geipele, 2015, p. 29). Real estate market definitions were also analysed by Kauškale and Geipele (2013), and Kauškale and Geipele (2017).

Based on the developed *sustainability concept of the real estate market by levels* that includes economic, social and environmental sustainability of real estate market (developed by the author), the interrelation between sustainability of the real estate object, real estate market and macroeconomic sustainability (developed by the author, as cited in Kauškale and Geipele (2017), the model of interrelation among the real estate unit, real estate market and macroeconomic sustainability has been developed (Fig. 1.1). This interrelation is important for understanding the necessity of sustainable development of the real estate market. Real estate market is formed of many real estate units and each unit affects its system aggregate sustainability.

“The term *“Macroeconomic Stability”* describes the national economy that has minimized vulnerability to external shocks, which in turn increases its prospects for sustainable growth” (Reut Group, n.d.). Macroeconomic Sustainability is a long-term sustainable development of all sectors of national economy, which is reflected in stable macroeconomic and monetary development indicators and growth rates (developed by the author, as cited in Kauškale and Riemenschneider (2016). The author has developed definitions related to sustainable development of the real estate market, which are as follows.

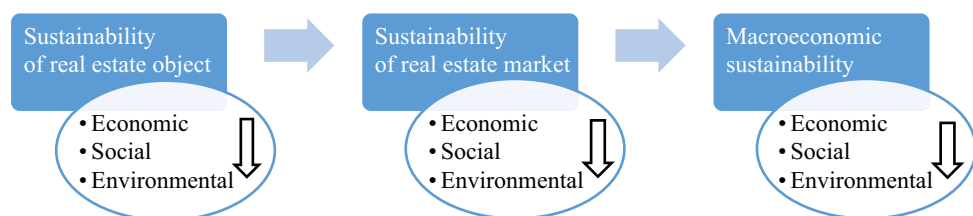


Fig. 1.1. Interrelation of sustainability of real estate unit, real estate market and macroeconomic sustainability (source: developed by the author, as cited in Kauškale and Geipele, 2017).

Sustainable Development of Real Estate Market (1) includes economic, social, environmental, political, technological and legal aspects of real estate market development, long-term national and real estate market development policies, conservation and preservation of environment, housing affordability issues and development, which contribute to the quality of social life through the entire real estate market cycle (developed by the author).

Sustainable Development of Real Estate Market (2) is a stable and balanced development of real estate market that can provide meeting of the present needs of real estate market participants without compromising the ability of future generations to meet their own needs, realised by all market participants at all levels (developed by the author, based on sustainable development definition from Brudtlands report (UN, 1987)).

All the above-mentioned models and schematic representations are related to the concept of sustainable development of real estate market.

Factors, Regulations and Policies that Influence Sustainable Development of the Real Estate Market in Latvia

Dimensions and number of influencing factors in the countries can vary from particular case and methodology. For example, ESG (economic, social, governmental) factors (CERES, IIGCC, INCR, PRI, UNEP Finance Initiative, RICS, 2016) are particularly important for real estate investments. The interactive model of interrelation of government policies, macroeconomic development and the development of real estate market is shown in Fig. 1.2. These issues are analysed in the Thesis as well.

Sustainability regulations and the main market participants in Latvia by levels are shown in Table 1.1.

The author offers a model of motivating and contractionary factors affecting sustainable development of the real estate market by levels, which is shown in Table 1.2.

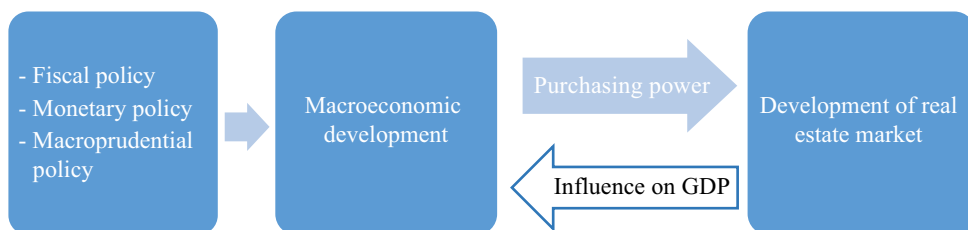


Fig. 1.2. Interactive model of interrelation among government policies, macroeconomic development and real estate market (source: developed by the author, as cited in Kauškale, Geipele, 2016, b).

Table 1.1

The Regulations Affecting Sustainable Development of the Real Estate Market and the Key Market Participants by Levels in Latvia
(source: developed by the author, as cited in Kauškalē et al., 2017, a)

Level	Market participants	Laws, regulations and documents that influence sustainable development of the real estate market
International level	State government, international organisations and unions, the European Parliament, the European Environmental Bureau, international real estate organisations, e.g. FIABCI	2030, 2050 Regulations regarding sustainable development, Directives; The Rio Declaration on Environment and Development; UNEP, Principles of Sustainable Development, 2002; Lisbon Strategy; EUROPE 2020 strategy; Commission strategy aimed at achieving a new sustainable and greener economy; Energy Roadmap 2050; The Ten Principles of the UN Global Compact (Human Rights, Labour, Environment, Anti-Corruption, etc.); Directive 2014/24/EU and Directive 2014/25/EU and other documents and regulations
National level	Government, Parliament, governmental institutions in Latvia: Saeima (Land Register, Privatisation Agency, SJSC State Real Estate, JSC Latvia's State Forests, state government, privatisation agencies	Regulations, directives, laws: Immigration Law of the Republic of Latvia (2003); National Development Plan of Latvia for 2014–2020; National Industrial Policy Guidelines for 2014–2020; Latvian Stability Programme for 2017–2020; Latvian long-term Energy Strategy 2030, laws and regulations related to taxation and real estate taxes in particular, etc.
Industry	Organisations such as LANĪDA, municipalities and municipal real estate units; Latvian House Manager Guild; Latvian House Manager and Maintenance Provider Association; Latvian Association of Property Appraisers	Unions, competition law and other industry regulations: Public Procurement Law of Latvia (2016) and Green Public Procurement regulations and aspects; Construction Law of Latvia (2014); Competition Law of Latvia (2002); Regulations of the Cabinet of Ministers, quality standards and other regulations and documents

Table 1.1 (continued)

Level	Market participants	Laws, regulations and documents that influence sustainable development of the real estate market
Company	Owners, managers, employees, builders, investors, developers, brokers, banks, bank subsidiaries, acquisition officers, analysts, portfolio managers, asset managers, property managers, financial and accounting managers, administrators, procurists, environmental consultants, architects, surveyors, planning and zoning specialists, brokers, investment specialists, lawyers in the field of real estate, notaries*	Corporate social responsibility aspects; Integration of ESG criteria in the analysis; Construction Law (2014); Environmental Protection Law (2006); ISO standards (e.g., ISO 14001 Environmental; Management System Certification (2015) and other documents and regulations
Households	Real estate buyers and sellers	Activities on the real estate market; Buying/selling/renting real estate; Housing maintenance
Individuals	Behaviour of real estate buyers and sellers	Individual decision-making areas; Buying/selling/renting real estate analysis and activities; Housing maintenance

* According to S. Peca (2009).

Table 1.2

The Model of Motivating and Contractionary Factors Affecting Sustainable Development of the Real Estate Market by Levels
(source: developed by the author)

Level	Motivating factors	Contractionary factors
National	<p>Increase in economic activity. Changes in development of promoting laws. Globalization. Changes in demography – rapid growth of people living in urban areas. Policy support – importance of funding and government support. Pressure to innovate – open innovation, increased competition, innovation spiral, and other. Tax policy. Increase in housing affordability. International opportunities</p>	<p>Inflation risk; Interest rate risk; Legislative risk; Environmental risk; Lack of consistent and long-term policy frameworks (national and sub-national), including regulations and incentive schemes; Ineffective national tax system; Government decisions are not focused on the development; Absence of a real long-term economic development plan; Monetary policy is oriented to the exchange rate rather than to price stability; Economic cycles (recession, crisis); High tax burden, tax rates, policy instability; Threat of the loss of foreign market and currency fluctuations</p>
Industry	<p>High operating yield, average profitability of the industry (economic factor), financial opportunities of the enterprise. Increase in economic activity, economic factors characterising economic recovery, increase in the number of buyers, increase in investment volume, etc. Infrastructure, demographic factors, increase in demand. Emergence of new technologies</p>	<p>Slowdown in market rise, lack of adequate financing models; High level of competition in a sector or insufficient competition (lack of competition), which does not stimulate the development of industry; incompetence of employees; advertising restrictions; industry development risks – monopoly for any market participant; Small market, too closed or too open market; Lack of local raw materials for construction industry; greater exposure to raw material price fluctuations; Dependence on the changes in the global economy; Decrease in demand / purchasing capacity, real estate cycles</p>

Table 1.2 (continued)

Level	Motivating factors	Contractionary factors
Enterprise	<p>Financial consideration, enterprise reputation, benefits for employees– higher salary opportunities, good working conditions, growth opportunities, interesting work, etc., implementation of motivating theories (Herzberg and other motivation theories); internal drivers – strategic management priority, employee involvement, costing, health and safety, marketing issues, profit opportunities; external drivers – legislation and regulations, market pressure, public pressure. Globalization for owners of the enterprises: organisation maintenance, capital raising, dividends, high salaries, development of the company. For developers: opportunities for selling real estate units to the local and foreign clients, brand awareness, increase in market share, by reducing the market share of other competitors, revenues from real estate rent. For banks: there is interest in an increase in the number of customers, in obtaining the credit amount (from real estate sellers who sold the real estate to foreign customers and paid back credits to the bank %). Revenues from advertisements. Development of different types of marketing communications. Local community, real estate market development (minus – housing availability). Opportunities for selling real estate. Money is partially remaining in the country, which is contributing to the national development. National, state organisations. Largest taxpayers. Taxes increase expenses for the acquisition of real estate</p>	<p>Selective risk; Increase in the impact of buyers and suppliers; Business risk; Financial risk (liquidity risk, management risk); Lack of awareness and leadership particularly related to challenges in making the business case; Workforce capacity and the need for proper skills and collaboration along the value chain to implement the right solutions; Difficult start; Limited capital and competition for resources; Shortage of actionable information tailored to grocery stores; Failure to consider all benefits over project life; Lack of specific integrated design methods adapted to grocery store retrofits; Need for reliable data to support business case; Incorrect assessment of demand – low production volume and too high costs; Insufficient production capacity and efficiency compared to foreign competitors; Absence of the enterprise strategy; Price adjustment efforts in the EU; Variable overall price level, selective risk; Inadequately educated workforce (legal complexities); Acquisition risks, entitlement risks, site risks; Market full lease-up risks; Operating risks, sale risks, timing risks; Growth of power of influence of buyers and suppliers</p>

Note: Factors are developed based on Peterson, Gamill, (2010); WBCSD Publication Library, Energy Efficiency in Buildings 2.0 (n.d.); WBCSD Publication Library, Energy Efficiency in Buildings. Action Plan (2015); Baccarne, Mechant, Schuurman (2014); Hines (2001); Peiser, Frei (2005); Lapigin, Y. N., Lapigin D. (2009); Wofford, Claurette (1992).

Sustainable development strategies vary by countries. The Swedish Strategy for Sustainable Development: Economic, Social and Environmental 2003 developed by the Swedish Ministry of the Environment has common directions to those in the report “Sustainable Development Strategy of Riga until 2030”, “Development Plan of Riga 2014–2020” and “Development Programme of Riga”, which were developed in 2014 (Mishra, Kauškale, 2017). German practice provides good examples of sustainable development of the real estate market that may be implemented in Latvia, especially in the areas of legislation and financing programmes related to the construction industry, for instance, KwF programme, as was identified by Kauškale and Riemenschneider (2016).

Dimensions of Sustainable Development of Real Estate Market

As the economic, environmental and social factors are the guidelines for the implementation of sustainable development, these issues are under great consideration in all sectors of the economy.

The cyclical development and external factors affect the activities within the industry. “One of the priorities of the Europe 2020 strategy is the sustainable and inclusive economic development, so special attention should be paid to its improvement and resolution of the related problems” (European Commission, 2014). Negative aspects of fluctuations can be expressed in economic slumps and recessions. At the same time, the demand for commodity depends on its own price, on the price level of all other commodities, and on total expenditure, so the household’s demand for each commodity is changing in response to the changes in price level and total expenditures, but the uncertainty and liquidity constraints are in individual consumption (Deaton, 1991; The Committee for the Prize in Economic Sciences in Memory of Alfred Nobel, 2015). All the mentioned aspects show a high level of importance of the question under research. According to Hyman P. Minsky (1992), the key determinant of behaviour remains the level of profits, in spite the fact that complexity of financial relations is greater nowadays in comparison with previous times.

Cyclical development affects also the development of society. All changes in society and economic development result in the fluctuations and changes within real estate and business cycle. The author has developed *The system of information analysis of cycles and its interrelation with other processes of sustainable development of the real estate market* (shown in Table 1.3), which is essential for the overall evaluation of the situation and analysis of information.

Here the author concludes that the analysis of the development of real estate market is inseparable from the analysis of the development of society and analysis of macroeconomic tendencies.

Environmental issues are crucial for sustainable development of the real estate market, and for its evaluation. Principles of sustainable construction are also of high importance for sustainable development of the real estate market. For

Table 1.3

The System of Information Analysis of Cycles and its Interrelation with other Processes of Sustainable Development of Real Estate Market
(source: developed by the author, based on Kauškale, Geipele (2016, b))

Social development (including Forrester, Toffler cycles)	Global processes	State development plan: Fiscal policy, Monetary policy, Macroprudential Policy	Economic development analysis (including the development of the financial markets)
PESTEL factor analysis (all levels – international, national, regional, urban)			
Analysis of long waves (Kondratieff, 1922), (Schumpeter, 1939) and others	<p>The Kondratieff wave or long technological cycle and its characteristics (Kondratieff, Stolper, 1935; Koltashov, 2010):</p> <ul style="list-style-type: none"> • cycle duration ranged from 48 to 55 years, both of them involved 2 stages – <i>upstream and downstream</i>; upstream waves are characterised by fast industrial growth and frequent technological leaps; • upstream periods are characterised by fast economic growth, downstream cycles are characterised by the slowdown in growth rates, depression of national economy, price lowering; • interest rate on the capital decreases, wages become lower, economic development becomes unstable, the recession is getting longer, but growth periods are shorter; • downstream period implies less wars and revolutions. <p>Long cycles are caused by innovations (Schumpeter, 1939)</p>		
Infrastructural cycles (Kuznets, 1930)	<p>Infrastructural investment cycle (Kuznets, 1930). Kuznets' cycles – economic cycles with the characteristic period of 15–20 (some believe 20–25) years. These cycles are also closely associated with the renewal of the buildings and places of residence. Kuznets associated these waves with the demographic processes, the flow of immigrants and emigrants; therefore, these cycles are also known as demographic cycles (Kuznets, 1930). Hypothesis was put forward that these cycles could be viewed as Kondratiev's third harmonics (Korotayev, Tsirel, 2010). American scientist M. Abramovics described the fluctuations over the period of 20 years as the "multiplicative – accelerative outline chain", which "generates" 20 years of fluctuations: income → immigration → construction of buildings → total demand → income (GDP growth stimulates the population growth, it leads to the increase in investing, including the construction of buildings (Akaev, 2010)</p>		

Social development (including Forrester, Toffler cycles)	Global processes	State development plan: Fiscal policy, Monetary policy, Macprudential Policy	Economic development analysis (including the development of the financial markets)
PESTEL factor analysis (all levels – international, national, regional, urban)			
Business cycle (Juglar,1872)	Juglar fixed-investment cycle (Juglar, 1862): <ul style="list-style-type: none"> its duration is 7–11 years, which on average is 9 years. This interval was observed in the global GDP amounts during the last 30 years of the 20th century, while the minimum growth rates were observed during the crisis years: 1973, 1982, 1991; Juglar cycles are short-term economic cycles, which are based on the changes in money circulation. The fluctuations in the investment volumes in fixed capital were observed during the cycle and Juglar particularly stressed the changes in credit volumes; the depth of Juglar crisis depends on Kondratiev’s wave phase. Juglar cycles are also characterised by delays in information movement, and information delays are greater than for Kitchin’s cycle, so the cycles are longer. Juglar considered the crisis phase a factor for the recovery of the economy, price reduction and liquidation of those companies, which were formed to artificially meet the increased demand 		
Kitchin (1923)	The length of Kitchin inventory cycle is from 3 to 5 years. Kitchin’s short economic cycles were explained by the world gold stock fluctuations, but nowadays these explanations are supplemented. The reason is the time delay in the information movement, which affects the company decisions (Kitchin, 1923)		
Other cycles	Liquidity cycles (CrossBorder Capital Ltd., 2012), project life-cycles and other cycles		

example, sustainable construction in the UK (Cabinet Office and Infrastructure and Projects Authority of UK, 2016) is defined as follows: “Sustainable Construction is a Government initiated policy imperative to improve the social, economic and environmental performance of the UK construction industry” (Roy Stewart, n.d., retrieved 2017). *Sustainable construction* is also “... a process of creating a building that is applicable for the set purposes and is environmentally friendly, while high efficiency of resource usage is ensured in its operation and management” (Kibert, 2008, as cited in Vanags, Butāne, 2013).

On the basis of Building Research Establishment Environmental Assessment Method (BREEAM), Leadership in Energy and Environmental Design (LEED), and Deutsche Gesellschaft für Nachhaltiges Bauen (DGNB – German Sustainable Building Council) methodologies of green building evaluation standards (BRE Global Ltd., 2009; DGNB System, 2014; USGBC, 2016), the author summarises

that the **Green Building** is a concept that includes management, waste, health and wellbeing, pollution, energy, atmosphere, land use and ecology, transport, materials and resources, water and its efficiency, innovation, location and transportation, indoor environmental quality and other components, as well as environmental, economic, technical processes and site quality, and promotes development of sustainable cities and planning systems. Here the author highlights that in the research the terms “sustainable building” and “green building” have close meaning.

As it has been investigated, there are a variety of problems and factors that affect the development of the real estate market and create the need for the development of methodological solution for the assessment of sustainable development of the real estate market, which is considered and developed within the framework of the Thesis.

2. ASSESSMENT OF FACTORS INFLUENCING REAL ESTATE MARKET AND THE SUSTAINABLE DEVELOPMENT OF BUILDINGS

In order to conduct the empirical research on environmental aspects of sustainable development of the real estate market in Latvia, the survey has been developed. The results and methodology have been approbated in the study by Kauškale et al. (2018).

The aim of the survey is to define the incentives and disincentives affecting the green building development, its socio-economic importance and other issues related to the analysis.

Research methodology comprised quantitative research, online survey method (WAPI – web assisted personal interviews at Web panel). Questionnaires were anonymous. Descriptive statistics included summary tables, standard deviation, standard error, confidence interval, summary tables and charts, and other elements. The author has used Excel and IBM SPSS statistics programme for the statistical data analysis in social sciences (version 25.0). The research on 100 biggest companies is implementated in practice in different countries, for example by Ruddock L., Kheir A., Ruddock, S. (2014). The following selection criteria have been chosen to achieve the aim of the survey. First of all, enterprises dealing with development of certified green buildings in Latvia have been selected. By 13 July 2018, there were 5328 construction companies in Latvia, 7645 construction specialists, and there were 191 experts in the register of independent experts in the field of energy efficiency of buildings (Economic Ministry of the Republic of Latvia, 2018). However, the number of certified green buildings in Latvia in 2017 is less than 20 in all sectors of real estate market. In

Table 2.1

Information about the Survey (source: developed by the author)

Parameter	Description
Type of survey	Questionnaire
Description of experts	Experts operating in the areas of real estate operations and construction
The level of competence of the respondents	Owner, top-level manager, middle-level manager, supervisory-level manager
Selection of respondents (Sample)	100
Responses	18
Reaction coefficient Response rate	18 %
Period of questionnaire	From 1 August 2016 to 1 November 2016 (2016M8,M9,M10)

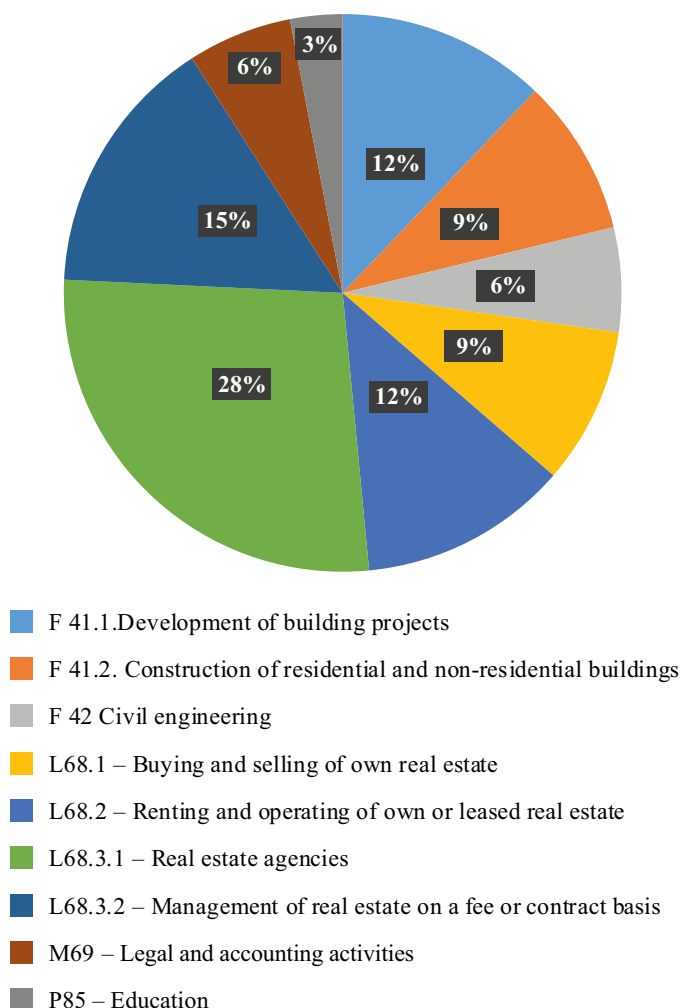


Fig. 2.1. Structure of the respondents (source: developed by the author).

2016–2017, the number of certified green buildings in Latvia was less than 10 in all sectors of real estate market.

Summarised information about the survey is shown in Table 2.1.

Multiple answers have been possible to some questions of the survey. Structure of the respondents is shown in Fig. 2.1.

55.56 % of respondents have Bachelor's degree or higher professional education, 33.33 % have Master's degree, while 11.11 % have secondary or vocational education. 44 % of respondents have more than 10 years of professional experience.

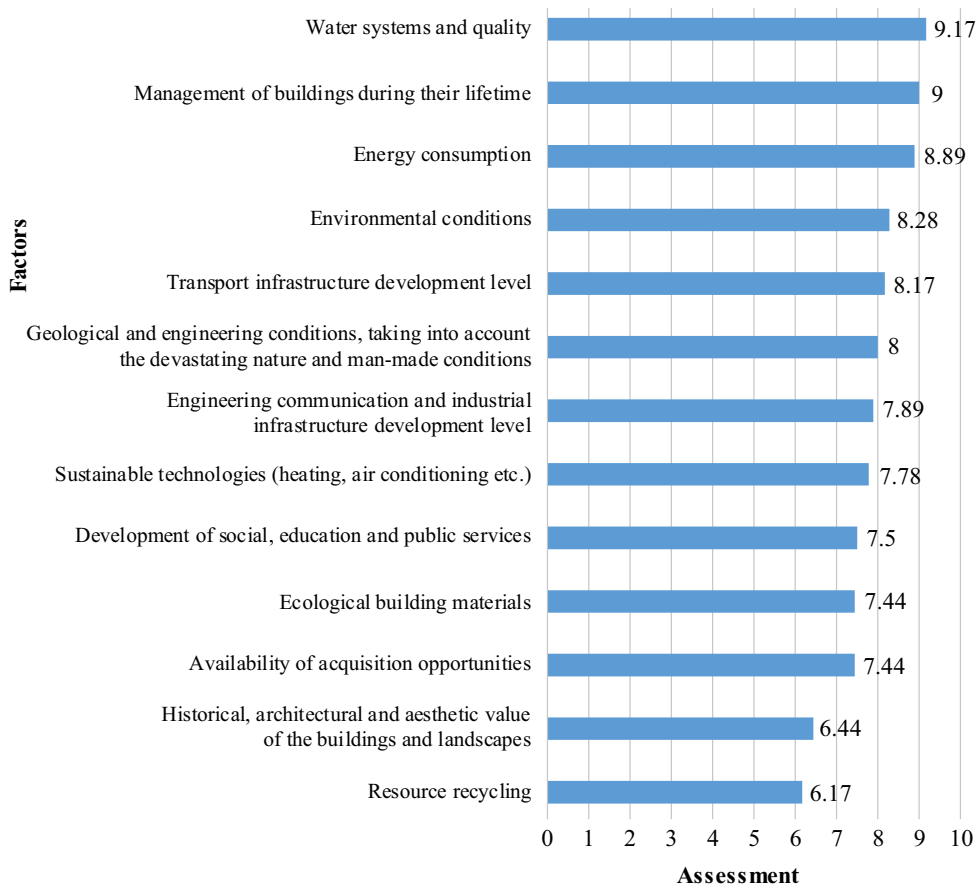


Fig. 2.2. Significance of each environmental factor for the construction of environmentally friendly and sustainable real estate unit and its further operation (1 – not important, 10 – very important) (source: developed and calculated by the author).

The first question is related to the significance of each environmental factor for the construction of the environmentally friendly and sustainable real estate unit and its further operation (see Fig. 2.2).

There is no separate impact of the environmental factors of construction sector on the sustainable development of the country, but the whole complex has the impact on the environment. Additional factor mentioned by respondents was the availability of parking places, factor significance – 8.

Answers to the question “How do you evaluate the following factors influencing the green building housing affordability?” are shown in Table 2.2 (1 – not developed, negative evaluation; 10 – well-developed, positive evaluation).

The average answer to the question “How important are ecological aspects of civil construction?” was 7.11 points from 10 (0 – not important; 10 – very

Table 2.2

Green Building Affordability (source: developed by the author)

Factor	Average	St.dev.	St.err.	Median
1. Green building unit price level	5.06	1.92	0.1132	5.5
2. Mortgage loan (financing) accessibility for green building unit financing	6.00	2.38	0.1398	5,0
3. Inhabitant's income	4.56	2.62	0.1540	4,0

Table 2.3

Promoting and Restrictive Factors of Investments in Green Building (source: developed by the author, on the basis of Kauš kale et al., 2018)

Promoting/motivating factors	Restrictive/obstructive factors
<ul style="list-style-type: none"> • Access to financing, regulations, mortgage rates (7.94) • Available purchase price of the resources (7.83) • Good overall economic situation in the country, economic upturn, contributing to an increase in demand (7.83) • Good financial health opportunities, free assets (7.78) • Favourable industry development trends (7.78) • Successful investment attraction programmes (7.67) • Green construction promotion national development policy (7.39) • Competition in the industry, and hence the need for the construction of the competitive real estate object (7.28) • Good Ease of Doing Business ranking* (7.11) • Change in thinking paradigm of buyers, focus on sustainability (6.94) • Market pressure to find innovative opportunities (6) 	<ul style="list-style-type: none"> • Lack of long-term policies in the field of green construction (8.17) • Increase in the prices of resources (8) • Lack of credit financing opportunities (7.78) • Limited financial opportunities, lack of free funds (7.78) • Increase in object selling price, which would reduce the potential number of buyers (7.67) • Lack of professional skills and professional employees (7.61) • Lack of experience in green building projects (7.5) • Lack of motivation (7.33) • Lack of information (7.22) • Economic recession, crisis, contributing to a reduction in demand (7.11) • Difficulties to start operation (7.06) • Lack of management experience (7) • Underdeveloped business environment (6.67) • Low Ease of Doing Business ranking (6.56) • Competition in the industry (6.44)

* Ease of Doing Business ranking (index) is a World Bank developed and calculated index that ranks 183 countries according to ease of doing business in a particular country.

important). According to the results of the conducted research, the replies of the respondents to the question regarding the impact of favourable conditions for mortgages for green construction accessibility on decision-making in favour of green building are as follows: 61 % of respondents answered “Yes”, 22 % answered “Partially”, and 17 % of respondents answered “No”. Promoting and restrictive factors of green building investments are shown in Table 2.3.

The evaluation of the adequacy of knowledge for the successful green building and sustainable construction entrepreneurship in particular areas has shown the following results (see Fig. 2.3) (1 – no adequate skills; 10 – good knowledge).

Preventive measures that are taken by the companies for the reduction of cyclical development risks according to the survey results, which have been analysed in detail in the previous Subchapter, have been taken by the analysed companies for the reduction of cyclical development risks (see Fig. 2.4).

Problems can appear at all stages of building life cycle – construction intention, building design and project development, construction works, building operation phase, building renovation/reconstruction phase and phase of wrecking of the building according to the provided procedure. PESTEL factors that affect the

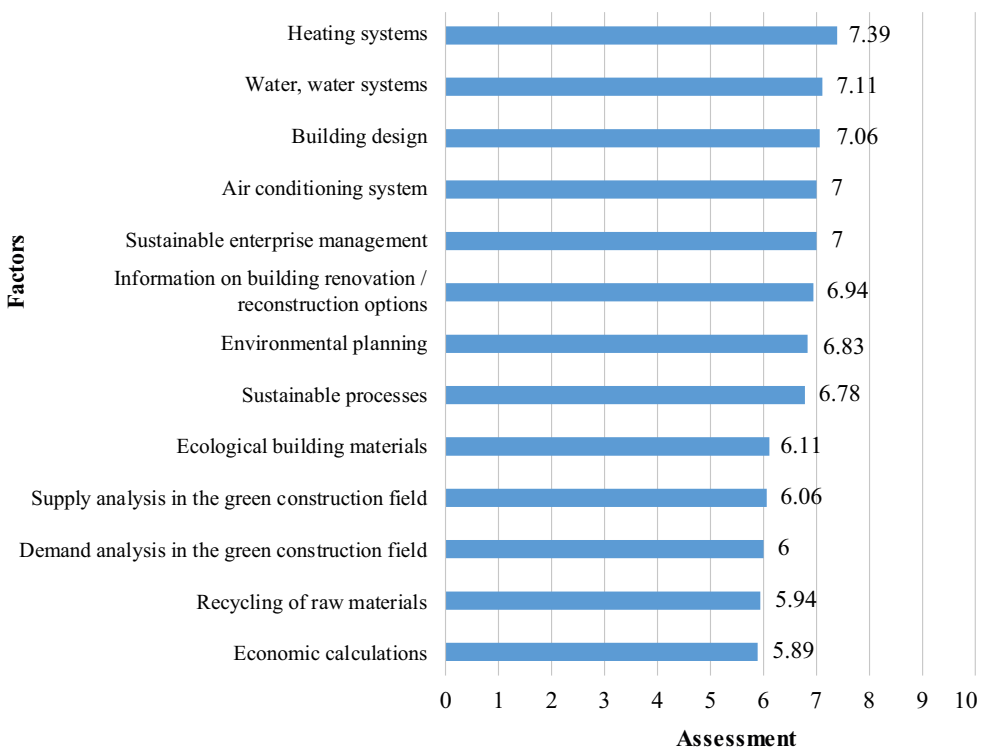


Fig. 2.3. The evaluation of the adequacy of knowledge for the successful green building and sustainable construction entrepreneurship in particular areas (1 – no adequate skills; 10 – a lot of knowledge) (source: developed by the author).

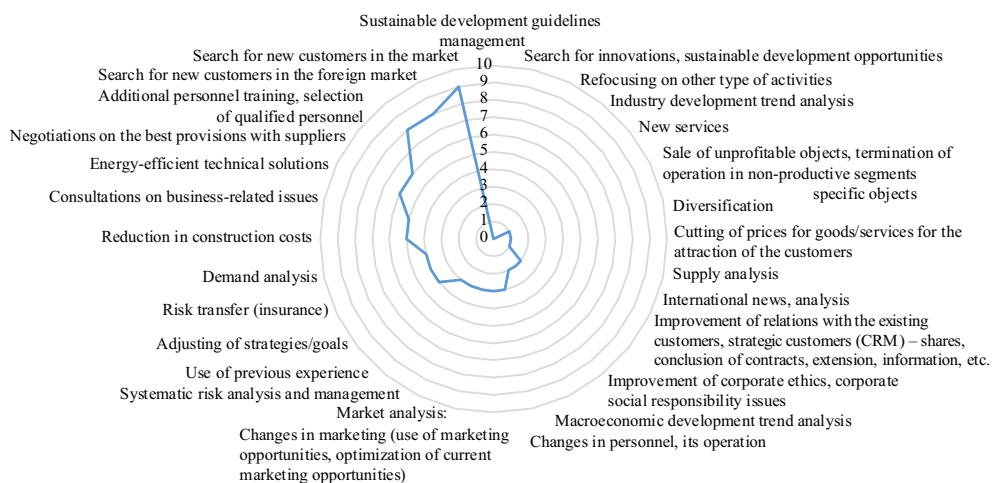


Fig. 2.4. Which preventive measures are taken by your company for the reduction of cyclical development risks? (multiple answers possible; 0 – not done, 10 – often done) (source: developed by the author).

sustainability of the construction unit at each stage of the building life cycle are shown in Table 2.4.

There are many problems to be resolved for the sustainable development of the national economy and real estate market. The construction companies in practice, as well as other companies operating in the real estate market, are facing a number

Table 2.4

Evaluation of PESTEL Factors in Terms of the Effect on Sustainability of the Construction Unit at Each Stage of the Building Life Cycle
(1 – no impact, 10 – significant impact) (source: developed by the author)

		Construction intentions	Construction design and project development	Cons-truction works	Building operation	Building renovation/reconstruction	Wrecking of the building according to the provided procedure
Evaluation of factors (1–10)	Political	6.94	7.39	6.83	6.78	6.67	6.94
	Economic	7.72	7.17	7.44	7.67	7.67	7.33
	Social	6.39	6.56	6.61	7.22	6.94	7.17
	Tehnological	7.22	6.94	7.5	7.61	7.83	7.17
	Environmental	7.33	6.56	6.89	7.28	6.50	6.94
	Legal	7.44	7.44	7.78	7.28	7.56	7.33

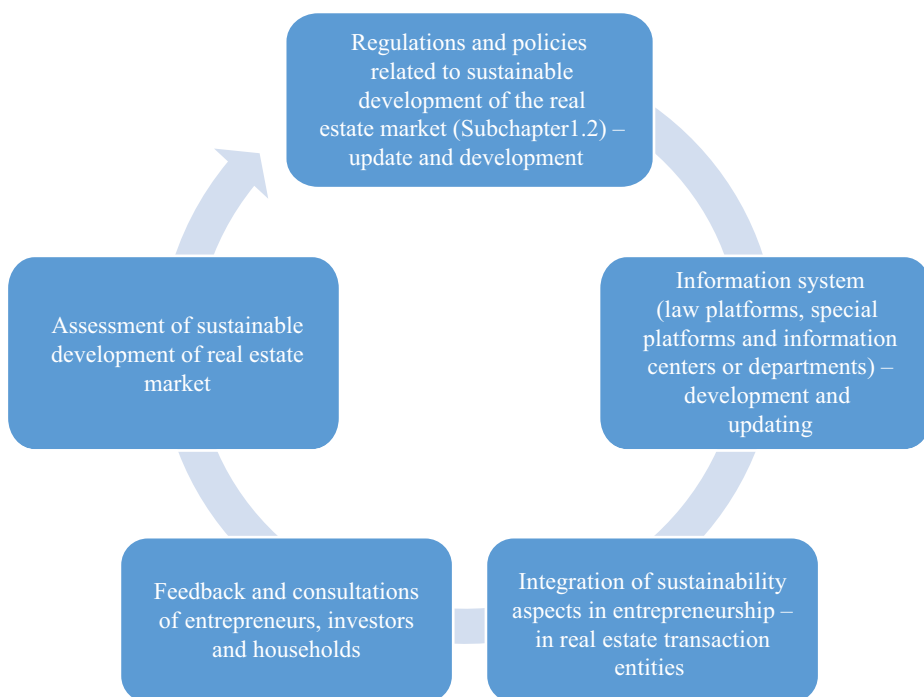


Fig. 2.5. The implementation system for sustainable transaction processes in real estate market (source: developed by the author).

of challenges – both in internal and in external environments. Certain risks exist at the stage of investment decision-making and construction process – both at the determination of the economic viability of the project and at the determination of the best conditions for the project practical implementation. The implementation system for the sustainable transaction processes in real estate market is shown in Fig. 2.5.

The implementation system of sustainable transaction processes for real estate transaction entities is shown in Fig. 2.6.

Adaptation to the company and situation can be performed after cyclical analysis and other external factor analysis, as well as by exploring the company's



Fig. 2.6. The implementation system of sustainable transaction processes for real estate transaction entities (source: developed by the author).

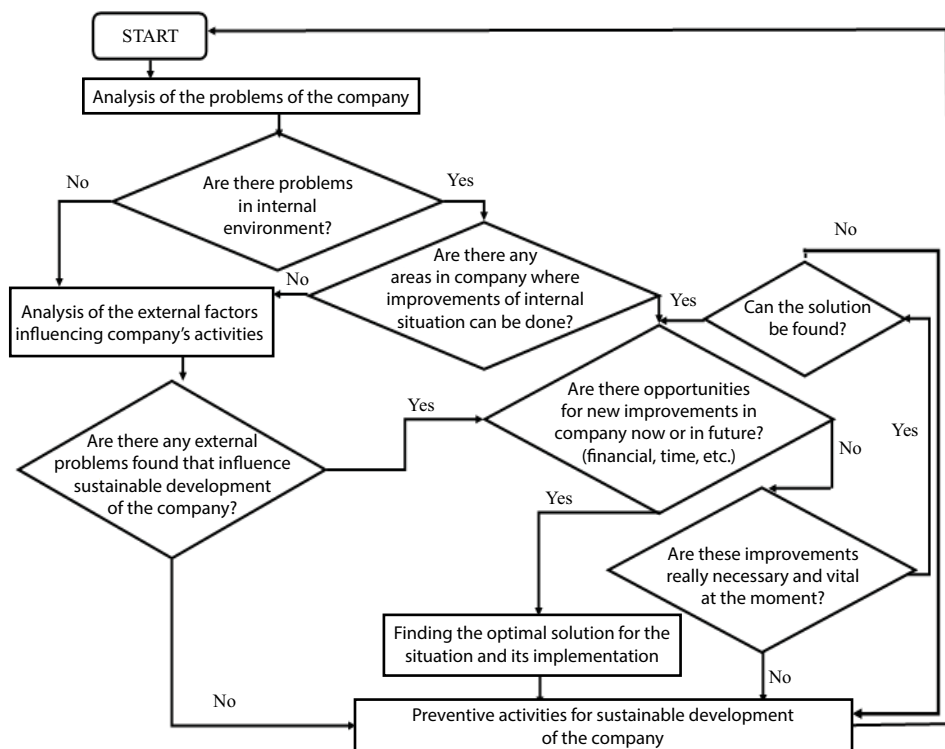


Fig. 2.7. Systematic problem analysis algorithm for integration of sustainability aspects for the real estate transaction entities (source: developed by the author).

internal factors. The integration of the preventive activities is implemented further for the successful implementation of sustainability aspects in the real estate transaction entities. The integration of sustainability aspects to the real estate companies becomes crucial and vital for sustainable development in general. The systematic problem (quarterly) analysis algorithm for integration of sustainability aspects for the real estate transaction entities is shown in Fig. 2.7.

Interrelation between economic and environmental aspects is also important. Interrelation between socio-economic and environmental aspects of sustainable development of the real estate market at different levels is shown in Table 2.5.

There are many positive environmental aspects of green buildings. The construction units have a long life-cycle, the implementation of sustainability concept in this area is especially important.

Table 2.5

**Interrelation between Socio-Economic and Environmental Aspects
of Sustainable Development of the Real Estate Market at Different Levels
(source: developed by the author)**

Level	Influencing PESTEL factors		
	Crucial aspects affecting socio-economic development	Crucial aspects affecting environmental development	Possible benefits and aims that could be achieved at all levels
International	<ul style="list-style-type: none"> • Economic openness level (dependence on other countries / globalization) • Economic cycles • Financial markets and its development • Liquidity cycles and other characteristics 	<p>Impact assessment on the environment and society globally:</p> <ul style="list-style-type: none"> • conservation of resources • nature conservation • planning of settlements • greenhouse gas emissions • water quality • materials (consumption, availability, chemicals and waste) 	<p>Economic substantiation (Kauškale, Riemenschneider, 2016):</p> <ul style="list-style-type: none"> • cost improvements in maintenance period • cost improvements in facility management process • competitive advantage for customers and marketing opportunities • qualitative projects require renovation/reconstruction activities later • better conditions for financing in particular cases (support from EU funds and / government / special programmes in banks, for example, KfW Group programmes in Germany (KfW 2016a, KfW 2016b)) • higher rent/lease prices and other reasons
Macroeconomic	<ul style="list-style-type: none"> • Fiscal policy • Monetary policy • Macroprudential policy • Economic cycles • Purchasing power • Company purchasing power • Other 	<ul style="list-style-type: none"> • Energy policies • Government policies in green building area • Investment policies • Environmental conditions • Geographical location • Geological and engineering conditions, taking into account the devastating nature and man-made conditions in the country 	
Regional	<ul style="list-style-type: none"> • Regional development policies • Social sphere, infrastructure, land, regional economic development • Infrastructure • Population, regional development factors 	<ul style="list-style-type: none"> • Energy efficiency achievement • Availability of acquisition opportunities • Transport infrastructure development level • Engineering communication and industrial infrastructure development level • Development of social, education and public services • Investment: climate/investment, environment affecting investments in green buildings 	

Table 2.5 (continued)

Level	Influencing PESTEL factors		
	Crucial aspects affecting socioeconomic development	Crucial aspects affecting environmental development	Possible benefits and aims that could be achieved at all levels
Industry*	<ul style="list-style-type: none"> • Real estate price level • Mortgage loan offer • Real estate cycles • Real estate supply • Real estate demand • and other 	<ul style="list-style-type: none"> • Ecological building materials • Resource recycling • Sustainable technologies • Energy consumption • Water systems and quality • Air conditioning systems, etc. 	Ecological substantiation (Kauškale, Riemenschneider, 2016): <ul style="list-style-type: none"> • More efficient use of materials and resources, implementation of energy efficiency measures • Higher quality of life, health and environmental aspects • Reduction of CO₂ emissions • Implementation of responsible sustainable investment strategy; • Participation in development of sustainable environment and sustainable cities and other reasons
Enterprise	<ul style="list-style-type: none"> • Company's strategy; • Personnel management; • and other internal factors 	<ul style="list-style-type: none"> • Construction of the environmentally friendly and sustainable real estate units; • Their further operation during life cycle 	
Household	<ul style="list-style-type: none"> • Subjective factors; • Behaviour of households; • Size of households and other criteria 	<ul style="list-style-type: none"> • Consumption of energy; • Consumption of water resources; • Waste sorting, recycling; • Lifestyle of household 	
Individual	<ul style="list-style-type: none"> • Behavioural factors • Psychological, cultural factors, education, and other factors 	<ul style="list-style-type: none"> • Consumption of energy; • Consumption of water resources; • Waste sorting, recycling; • Lifestyle 	

* Industrial level includes Construction (F43) and Real Estate Operations (L68).

3. METHODOLOGICAL SOLUTION OF THE ASSESSMENT OF SUSTAINABLE DEVELOPMENT OF REAL ESTATE MARKET

The proposed methodological solution is mainly focused on the assessment of the overall development of the real estate market, not on sustainability criteria of the real estate unit. The IBM SPSS Statistics version 25.0.0 and Excel are used for statistical data analysis. Criteria may be applied according to an individual case. It consists of PESTEL factor evaluation and the evaluation of their weights (Kauškale, Geipele, 2017), represented in Equation 3.1 and Equation 3.2, respectively.

$$SDIREM = f(P; E; S; T; E; L) \longrightarrow 1 \text{ (max)}, \quad (3.1)$$

$$SDIREM = W_p P + W_e E + W_s S + W_t T + W_e E + W_l L \longrightarrow 1 \text{ (max)}, \quad (3.2)$$

where *SDIREM* – real estate market development index;

$W_p; W_e; W_s; W_t; W_e; W_l$ are PESTEL factor weight coefficients min = 0 (no influence); max = 1 (high influence); upon condition $W_p + W_e + W_s + W_t + W_e + W_l = 1$.

Indicator should strive to “1”, which can positively influence not just the development of the real estate market in a particular country, but also show better results of sustainable development of the real estate market. *SDIREM* can be calculated quarterly or yearly, and the development of index can be compared with the indicator of stratum *j* over a period $SDIREM_j$, comparing with price index in stratum *j* over a period *T*. Factor evaluation is min = 0 (low level of development); and max = 10 (high level of development). Factor base is 10. PESTEL (political, economic, social, technological, ecological and legal) factor evaluation is shown in Equation 3.3.

$$Factor(P; E; S; T; E; L) = \sum \frac{Factor \ evaluation}{Factor \ base}. \quad (3.3)$$

Factor and weights assessment is performed using the expert evaluation methods. Decision-making models for the public and private sectors are developed by the author and shown in Figs. 3.1, a and 3.1, b, respectively. In Fig. 3.1, b, the business sector includes real estate companies, real estate investors, building entrepreneurs, developers and the representatives of other business sectors.

The model has been approbated in the study by Kauškale and Geipele (2017), and in the focus group. The developed model has some analogy with McKinsey's General Electric Matrix (McKinsey & Company, 2008); however, this model has been developed for decision-making for private and public sector within the real estate market and construction industry. For the assessment of sustainable development of real estate market in Latvia, a qualitative research technique has been implemented and survey developed.

The aim of the survey is to identify the main problems of the real estate market, the factors affecting its development and other issues related to sustainable development of the real estate market. The survey is focused on the real estate market experts who are operating in the economic sector of transactions in the real estate market, and on the experts in the field of science, whose research and scope

a

Real estate market growth rates per year*, %	high	Imbalanced development hindering activities with fiscal, monetary and macroprudential policy	Recession preventive activities, real estate market cooling measures	Real estate market regulations, recession preventive activities		
	middle	Real estate market problem identification and resolution	Detailed market analysis, trend identification	Real estate market regulations,procyclical activities		
	low	Urgent real estate market revitalization activities, crisis management	Real estate market growth generating activities	Government investments in infrastructure and public object construction		
		low	3.34	middle	6.67	high
		SDIREM (sustainable development index of the real estate market)				

b

Real estate market growth rates per year*, %	high	Another investment regions and options are selected in order to sell real estate	Investments to particular sectors for the provision of the preventive activities for possible recession	Preventive activities for possible recession in order to keep positions		
	middle	Investments to particular real estate sectors, search for new markets	Detailed market analysis, focus on acquisition of profits	To use real estate and to use real estate efficiently or to rent real estate		
	low	Not to invest, to leave the market	Market analysis for growth perspectives	To invest, as prices are low		
		low	3.34	middle	6.67	high
		SDIREM (sustainable development index of the real estate market)				

* Low real estate market growth rates also include negative real estate market growth rates.

Fig. 3.1. Decision-making model for the public sector (a); Decision-making model for the private sector (b) (source: Kauškale, Geipele, 2017).

of activities are associated with real estate for more than 10 years, 28 % of the experts are representatives of the academic area (current employment activities).

Research methodology. The research was performed using the qualitative and quantitative approach. Data collection has been performed using PAPI (Paper and Pencil Interviews) and focus group interview. *Having performed a complex scientific and practical analysis, a focus group interview has been developed and the feedback of the experts received. The direct interview method has been used. Focus group method has been chosen for the acquisition of research results, and the focus has been put on highly professional and educated experts in the question under research.*

The data collection has been performed using the survey method – expert evaluation, and approbation has been implemented within the focus group meeting. The focus group has been moderated by the author of the Thesis. Data processing included validation, sorting, summarisation, aggregation, analysis, reporting. Focus group discussions included the following:

- development of guidelines for organisation of focus group;
- management of focus group;
- analysis of results.

The questions of survey included quantitative and qualitative aspects.

Sampling. The survey focuses on the managers and employees of the enterprises who are operating in the economic sector “Real Estate Operations” (L68) and “Construction” (F41), such as managers and employees of real estate agencies, managers of the real estate sector on a fee or contract basis, managers of building projects, construction of residential and non-residential buildings, civil engineering, renting and operating of own or leased real estate, buying and selling of own real estate and delegated from real estate, construction, finance, environmental and academic sectors (interdisciplinary).

The following areas of experience were included:

- L68 – Real estate activities;
- L68.1 – Buying and selling of own real estate;
- L68.2 – Renting and operating of own or leased real estate;
- L68.3 – Real estate activities on a fee or contract basis;
- L68.3.1 – Real estate agencies;
- L68.3.2 – Management of real estate on a fee or contract basis.

Academic area – 23 %.

The survey also included the following areas: Construction of Buildings (F41), Construction of Residential and Non-residential Buildings (41.1) and Development of Construction Projects (41.2), Financial and Insurance Activities. Information about the survey is provided in Table 3.1.

Problematic areas of national economy, real estate market and construction industry have been summarised in Table 3.2. Three main problems are ranked by relevance order, evaluated by the frequency of the answers of the respondents.

The motivating and contractionary factors for sustainable development of the real estate market by levels have been identified. Three main factors selected by the experts are shown in Table 3.3.

Table 3.1

Information about the Focus Group and the Survey
(source: developed by the author)

Criterion	Description
Type	Focus group discussion and expert interviews
Date	30 June 2016 11 August 2016
Period of questionnaire	2016 M6, M7, M8
Description of experts and their qualification	The survey focuses on the real estate market experts who are operating in the economic sector "Real Estate Operations" and "Construction", and on the experts in the field of science, whose research and scope of activities are associated with real estate – a group of especially knowledgeable experts representing real estate, construction, finance, environmental and academic sectors (interdisciplinary)
Focus group	19 experts
Survey unit	Experts
Professional experience of experts	10 years and more
Number of respondents – participants of the survey (nominal group)	17

Table 3.2

Three Main Problems of Sustainable Development of the National Economy, Real Estate Market and Construction Industry, Mentioned by the Experts (source: developed by the author)

Problematic areas of the development of the national economy	Problematic areas of the development of the real estate market	Problematic areas of the development of the construction industry
<ul style="list-style-type: none"> • Tax system and social system. Necessity for equal income distribution and for effective use of resources. • Regional policy. • Impact of international factors 	<ul style="list-style-type: none"> • Cyclical development nature of the real estate market – imbalance. Necessity to achieve sustainable development. • Sensitivity of the real estate market and its participants to external factors and economic development. • Real estate market overheat 	<ul style="list-style-type: none"> • Significant impact of external factors – impact of the economic development and real estate market. • Investment returns. • Availability of financing

Table 3.3

Three Main Motivating and Contractionary Factors for Sustainable Development of the Real Estate Market by Expert Evaluation
(source: developed by the author)

	Motivating factors	Contractionary factors
Enterprise	Financial consideration Strategic management priority Changes in personnel	Failure to consider all benefits over project life Legal complexities Financial risks
Industry	High operating yield Increase in the number of buyers Increase in investment volumes	Lack of adequate financing models Small market Decrease in demand / purchasing capacity
Macroeconomic	Increase in economic activity Tax policy Increase in housing affordability	Lack of consistent and long-term policy frameworks Tax system and tax burden Policy instability and changes in legislation

The assessed PESTEL subfactors, which are the most important for sustainable development of the real estate market, are shown in Table 3.4.

However, as analysed in the previous chapters, taking into account the international practices, environmental factors can have a great impact on the development of the real estate market. Growth and yield indicators of the real estate market are also changing during cyclical development. As mentioned by Löwe (1928) and other scientists (see Subchapter 1.3.1), every cycle is individual and it is required to analyse the situation in the whole system. Real estate market participants are affected by a variety of external factors and risks. The assessment of the impact of factors by levels and evaluation of the current situation (the case of Latvia) are provided in Table 3.5.

By using Equations 3.1, 3.2 and 3.3, the real estate market development index is 0.587 (58.7 %) according to the results of calculations using the pair comparison method. At present, the market growth rates can be considered average, but in some sectors – high. Such development trends and the increase in profit are also related to the indicators of macroeconomic development. It has been mentioned in the replies that there is a lack of information about tax relieves and other relieves provided by green construction, about the ecological construction materials, fundraising opportunities, lack of general knowledge, advertising and striving for the purest life.

Table 3.4

**Important Subfactors of Development of the Real Estate Market and their
Evaluation by Experts (Assessment: 0 – no affect, 10 – maximum effect)
(source: developed by the author)**

Factor	Subcriteria	Average	Median	St. dev.
Political	Political stability; regulation of real estate industry; internal political problems; international relationships; level of corruption	8.35	8	1.03
Economic	GDP in volume, % change; GDP per capita; private final consumption in volume, %; investments in volume, %; international trade balance, mln euro; current account – total, mln euro; inflation, %; unemployment, by age groups, by industry, by gender etc., %; labour cost index, %; employment, %; industrial producer prices, %; industrial production, %; construction production, %; government finance – government deficit/surplus, %; general government gross debt, %; economic sentiment indicator, <i>index</i> ; 3 months interest rate, %; long term government bond yields, %; euro-dollar exchange rate, \$; number of enhanced mortgages; investments in construction; real estate investments; deposit rates; level of profit inside industry; number of registered real estate purchase agreements; mortgage interest rates; purchasing power parities; average salaries; wage level within the branch; material prices; labour costs; price of resources; real estate price level; house price index; real estate rent prices; number of registered rents; real estate taxes; tax burden; real estate vacancy rates for various types of property; new construction volumes; new issued building permits etc.	9.03	9	0.88
Social	The demographic situation in the country – number of inhabitants; population density; net migration; birth balance; average family/household size; age level; income by age and gender; level of education; structure of employment; national culture and traditions; unemployment rate in the country; employee turnover of the sector; housing affordability; Gini coefficient; S80/S80 quintiles; housing affordability; population density, which is particularly important in central business districts and high-rise residential neighbourhoods; educational characteristics; skill levels, and employment categories, which are particularly important in industrial or high-technology districts; age levels, which are particularly important in residential neighbourhoods; household size; employment levels and types of employment (temporary, seasonal, or chronic); extent of crime	7.79	8	1.27

Table 3.4 (continued)

Factor	Subcriteria	Average	Median	St. dev.
Technological	Construction technology and equipment development; new construction materials and resources on the market; customer relationship management; computer technology development, etc.	6.18	6	1.58
Environmental	Citizens ability and desire to buy eco-home or demand for eco homes; sustainability of the construction of units; impact of the construction of units on the environment; number of buildings with green buildings certification; CO ₂ emissions; environmental taxes in general and by economic activity; resource productivity; energy efficiency; environmental protection expenditures; health and wellbeing; indoor environmental quality; land use; innovation; materials; resources; energy affordability; pollution; renewable technologies; transport; ecology waste; water; green building certification indicators; climate change and other indicators in the construction industry and overall in the country	5.88	5	2.00
Legal	Valid legislation and decision-making speed; international law; European directives; changes in the legislation related to construction and real estate market; legal aspects of zoning and land use; legal aspects of construction; entrepreneurship; environmental regulations; special assessments and other factors	7.82	8	3.38

Table 3.5

Assessment of the Impact of Factors and Current Situation by Levels, Q2 and Q3 in 2017 (the case of Latvia) (source: developed and calculated by the author, based on the respondents' answers)

Level	Influence on real estate market (strong/average/low) Points from 0 (min) to 100 (max)	Current influence (positive/neutral/negative) Points from 0 (min) to 100 (max)
International	Strong (93.75) Average (6.25) Low (0.00)	Positive (7.14) Neutral (28.57) Negative (64.29)
Macroeconomic, state level	Strong (89.61) Average (9.74) Low (0.65)	Positive (7.14) Neutral (42.86) Negative (50.00)

Table 3.5 (continued)

Level	Influence on real estate market (strong/average/low) Points from 0 (min) to 100 (max)	Current influence (positive/neutral/negative) Points from 0 (min) to 100 (max)
Regional	Strong (56.25) Average (37.50) Low (6.25)	Positive (14.29) Neutral (35.71) Negative (50.00)
Industry	Strong (93.33) Average (6.67) Low (0.00)	Positive (23.08) Neutral (69.23) Negative (7.69)
Enterprise	Strong (29.41) Average (47.06) Low (23.53)	Individual case for each enterprise
Household	Strong (56.25) Average (31.25) Low (12.50)	Individual case for each household
Individual	Strong (37.50) Average (43.75) Low (18.75)	Individual case for each individual

Methodological Solution and Integration System of the Assessment of Sustainable Development of the Real Estate Market

Real estate development is a continuous process, so the new trends, which will take place in the real estate market and the economy, are very significant. The organisational aspects of the development of methodological solution along with all steps and their logical sequence are shown in Fig. 3.2.

Assessment process of the real estate market development includes the indicator groups that are mentioned in Fig. 3.3.

Integrated real estate assessment should be applied at all levels and for all sectors of the real estate market (see Fig. 3.4).

The regional level includes the statistical regions of the Republic of Latvia. Local level includes municipalities. Classification of the regions is done according to the European NUTS classification (Eurostat, 2018). Multi-criteria analysis includes the holistic approach in the analysis of indicators mentioned in the research. Information analysis and sustainability principle implementation process in the real estate market is shown in Fig. 3.5.

Assessment of sustainable development of the real estate market includes information analysis at each level of the research. The process of assessment of sustainable development of the real estate market is shown in Fig. 3.6.

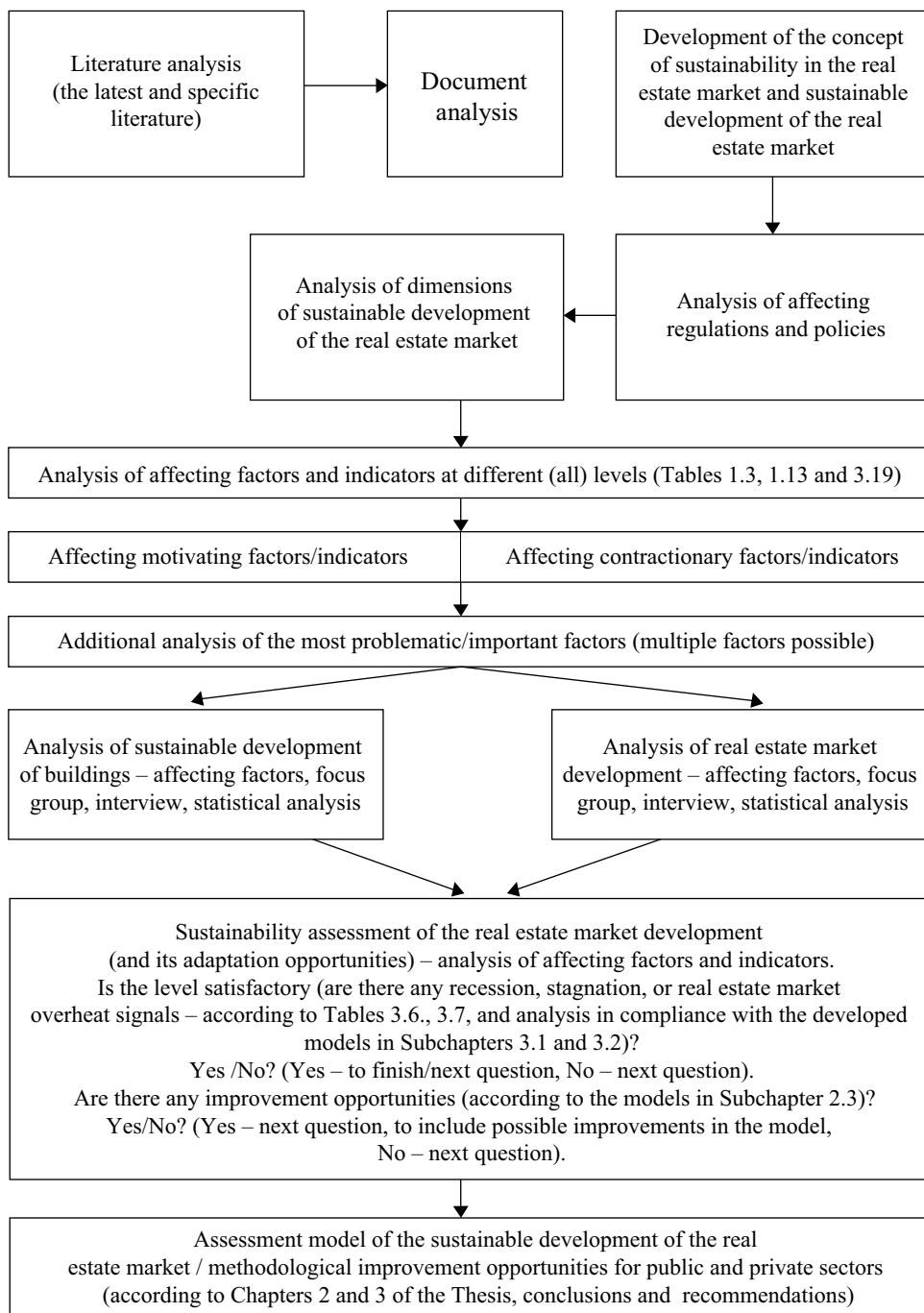


Fig. 3.2. Methodological Solution for the Assessment of Sustainable Development of the Real Estate Market (source: developed by the author).

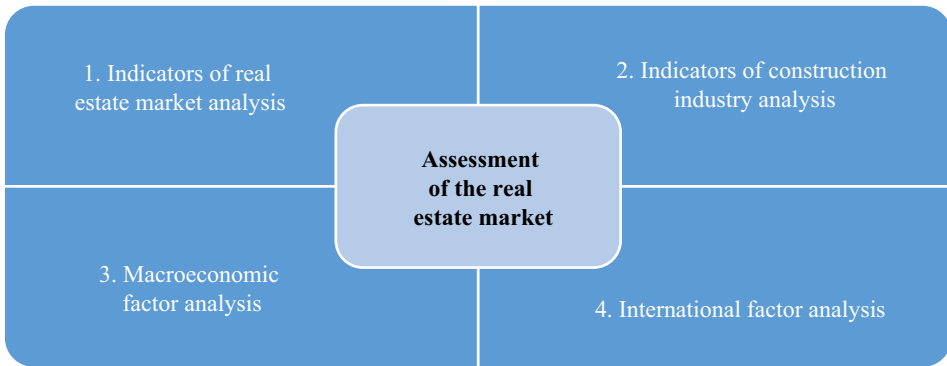


Fig. 3.3. Assessment process of the real estate market (source: developed by the author).

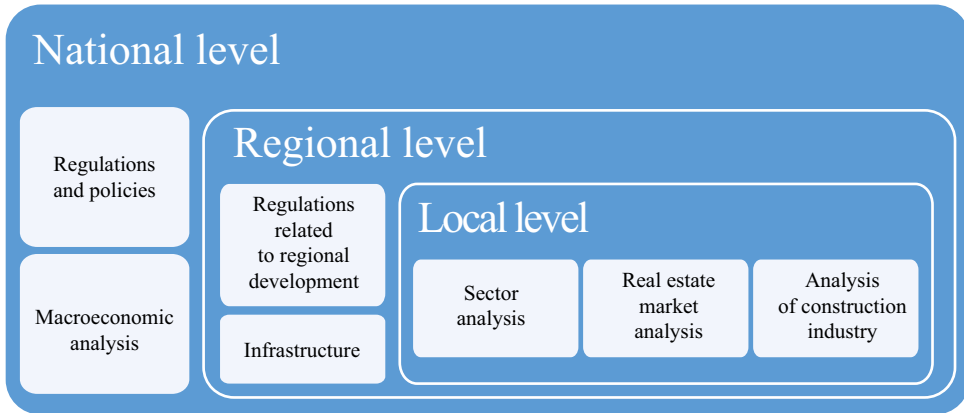


Fig. 3.4. The integration system of the assessment analysis of sustainable development of the real estate market for the planning activities (source: developed by the author).

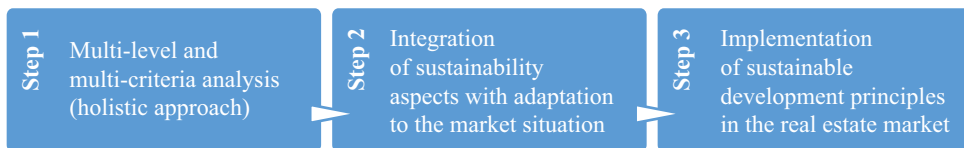


Fig. 3.5. Information analysis and sustainability principle implementation in the real estate market (source: developed by the author).

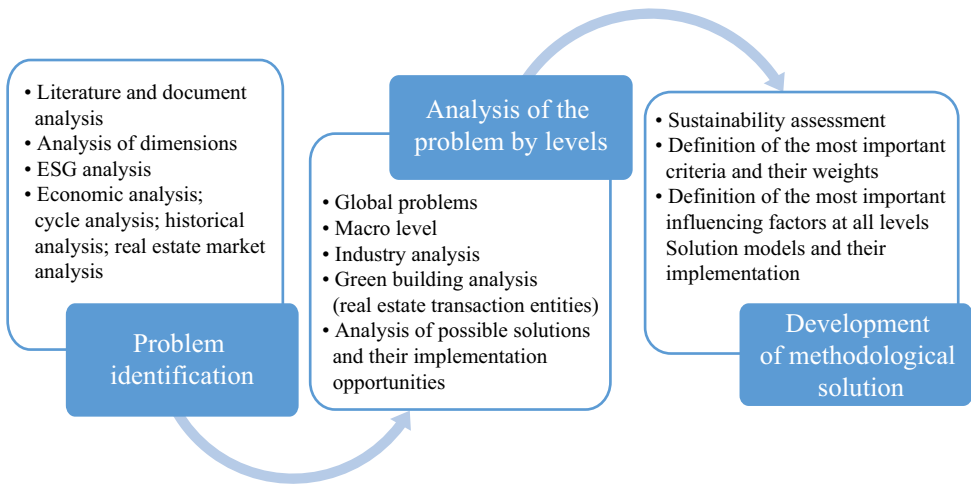


Fig. 3.6. Process of assessment of sustainable development of the real estate market (source: developed by the author).

Market analysis opportunities for the market participants in order to promote sustainable development of the real estate market have been described in Subchapters 1.1–1.4, 2.1, 2.2, 3.1–3.4 of the Thesis.

CONCLUSIONS AND RECOMMENDATIONS

Relevance of the research is determined by the fact that the development of the real estate market is changing during the time. The following **conclusions** can be drawn.

1. Sustainable development of the real estate market is of very high economic, social and environmental importance. At the same time, economic, social and environmental aspects are interrelated and conflicting.
2. The analysis of the problems of sustainable development of national economy, real estate market and construction industry has demonstrated that the analysis and solution opportunities can be implemented in different sectors and at different levels. Each analysis shows different and more exact results for each specific area.
3. Sustainable development of the real estate market is affected by a variety of factors, regulations and policies, such as 2030, 2050 Regulations regarding sustainable development, directives, the Rio Declaration on Environment and Development, UNEP, Principles of Sustainable Development 2002, Lisbon Strategy, EUROPE 2020 strategy, National Development Plan of Latvia for 2014–2020, Latvian Sustainable Development Strategy for 2030, Latvian Stability Programme for 2017–2020, Latvian Long-Term Energy Strategy 2030 and other programmes and regulations.
4. The role of the public sector is reflected in the regulation of socio-economic processes, interaction of the economy and real estate market development, as well as in the main challenges and directions of Latvia's Sustainable Development Strategy 2030. These challenges are important due to the correlation of some macro-economic and real estate market development indicators in terms of sustainable development.
5. The cycle of the real estate market phases determines various indicators that are significant for the real estate transaction entities. The approbation of the methodological solution of sustainable development of the real estate market has demonstrated that the lack of information is observed. A complex approach to the analysis of the development of real estate market can positively affect the awareness of the private sector and decision-making of participants of the real estate market.
6. The analysis of social dimension of the real estate market development has revealed high relevance of social aspects in sustainable development of the real estate market. The increase of quality of life could positively affect sustainable development of the real estate market.
7. The importance of environmental aspects in construction is growing during the time. Sustainable and green buildings are an important component of the environmental dimension of sustainable development of the real estate market and play a high social and economic role. Development of the construction and real estate market has a direct impact on the environment in a variety of

aspects; today it is particularly important to resolve the related issues and problems by means of an integrated approach – not only ecological, economic and social issues, but also the technological, political and legal aspects, for which expert interviews and focus group methods are of high importance. It is also very important not just for the preservation of the environment, but also for the private sector and society in general.

8. Research results have demonstrated both the advantages and the need for the green building construction activities, but at the same time they show difficulties related to these activities, as the large amount of information, knowledge, practical experience and financial resources is required in the beginning.
9. The results of the research show positive sustainable and green building development trends in Latvia; however, the number of green buildings in Latvia is lower in comparison with global experience. The results of the research show that compliance with the environmental requirements in construction is a necessity for market participants and industry development, and sustainable and green buildings are a future need as well, so the gradual transition to green building and sustainable construction is necessary.
10. The methodological solution of the assessment of sustainable development of the real estate market includes a multi-level and complex information analysis approach and integration of political, economic, social, technological, environmental, legal, and other aspects of sustainable development into analysis. In the course of the research, the real estate market and the factors affecting sustainability have been analysed in an integrated way, and the proposals for the improvement of the real estate investment decision-making have been developed.
11. The results of the assessment of sustainable development of the real estate market in Latvia have demonstrated the necessity of improvements and improvement opportunities. The real estate market development indicator and information models can be used by market participants for the analysis of the market. Economic issues of the problem and cyclical nature of the real estate market development play a crucial role. The investors should analyse the problems at various levels, taking into account the external factors, which affect both the decision-making and the sustainable development in general. Optimal balance should be found for the society, private and public sectors.
12. The results of the research and the developed models can be used in many countries, with adaptation of influencing factors, factor weights and indicators to particular cases, taking into account the available information. The scientific and practical recommendations can contribute to more efficient planning of the activities in the sector, which, in turn, will improve the overall performance of the industry in the longer term.

Hypothesis of the Thesis has been proven during the research. According to the conducted research, the following main **recommendations** are proposed.

To the public sector

1. As the economic and environmental aspects can be conflicting, it is recommended to implement activities promoting sustainable and green building construction in practice, for instance, in government support programmes.
2. It is recommended to develop the informative system of sustainable development of the real estate market with open access for the private sector, taking into account the lack of information on sustainable construction and green building for the market participants.
3. It is recommended to find the optimal balance of integration of green building criteria in the legislation of construction process without limitation of construction industry development (financial aspect).
4. It is recommended to enhance cooperation with stakeholders in order to provide an opportunity to create more valuable and resilient building stock that will ensure benefits by means of government policies and investment programmes. It is recommended for all market participants to analyse in detail and follow the changes in the socio-economic sphere and real estate demand in order to achieve sustainable development of the real estate market.
5. It is recommended to introduce a separate subchapter to the Latvia's Stability Programme related to sustainable development of the real estate market. It is recommended to promote the concept of sustainability at all levels.
6. It is recommended to implement sustainable development principles into the development of the real estate market in the longer term. To reduce information asymmetry that results in fluctuations and supply and demand shocks, and to minimise the risk of overheating of the real estate market, or its recession, the government or the appointed competent establishment should devote special attention to raising the awareness of the society and regulation of the real estate market, mainly by means of effective fiscal and monetary policy in order to ensure the balanced development.

To the private sector

7. For real estate transaction entities, and especially construction companies, it is recommended to move forward to sustainable and green building development, integrate sustainable development aspects in the industry and in each building in particular.
8. At the beginning of the construction, it is recommended to carry out a separate analysis of the external factors that affect the object and its operational environment, and special attention should be devoted to the analysis of the macroeconomic situation and cyclic development of the real estate market. It is also recommended to devote attention to the analysis of behaviour of the

buyers, including the irrational nature of the buyers' decision-making, which can be a future research area.

9. It is recommended to regularly follow the fluctuations in the real estate market, as well as analyse the development of the international real estate market as a complex approach and use the gained knowledge in planning entrepreneurial activities.

To the Central Statistical Bureau of Latvia in cooperation with the State Unified Computerized Land Register of Latvia

10. It is recommended to summarise and publish the statistical information (for instance, average price per square meter, total price and its changes for particular sectors) for different sectors of the real estate market – residential, office, retail, industrial and other sectors.

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