

Megacities 2050

Citation for published version (APA):

Vasenev, V. I., Cheng, Z., Stoorvogel, J., Dovletyarova, E. A., Hajiaghayeva, R. A., & Plyushchikov, V. G. (2018). Megacities 2050: From urbanization risks towards sustainable urban development. In *Megacities 2050: Environmental Consequences of Urbanization. Proceedings of the VI International Conference on Landscape Architecture to Support City Sustainable Development* Springer. https://doi.org/10.1007/978-3-319-70557-6_1

DOI:

[10.1007/978-3-319-70557-6_1](https://doi.org/10.1007/978-3-319-70557-6_1)

Document status and date:

Published: 01/01/2018

Document Version:

Publisher's PDF, also known as Version of record

Document license:

Taverne

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

<https://www.ou.nl/taverne-agreement>

Take down policy

If you believe that this document breaches copyright please contact us at:

pure-support@ou.nl

providing details and we will investigate your claim.

Downloaded from <https://research.ou.nl/> on date: 07 Nov. 2024

Open Universiteit
www.ou.nl



MEGACITIES 2050: From Urbanization Risks Towards Sustainable Urban Development

V.I. Vasenev^{1,3(✉)}, Z. Cheng², J.J. Stoorvogel³, E.A. Dovletyarova¹,
R.A. Hajiaghayeva¹, and V.G. Plyushchikov¹

¹ Department of Landscape Design and Sustainable Ecosystems,
Agrarian-Technological Institute, RUDN University, Moscow, Russia
vasenyov@mail.ru

² Department of Earth and Environmental Sciences,
Brooklyn College of the City University of New York, Brooklyn, (NY), USA

³ Soil Geography and Landscape Group, Wageningen University, Wageningen,
The Netherlands

Abstract. Urbanization is a long-term global trend, responsible for substantial environmental changes. At the same time, urban ecosystems are vulnerable and their adaptation to the ever-changing environment is necessary to sustain essential functionality and important ecosystem services. Sustainable urban development demands the integration of innovative green technologies and nature-based solutions in urban management, which is only possible through a collaboration and participation of all stakeholders including scientists, landscape designers, civil engineers, policy makers, and all citizens.

Keywords: Urban ecosystems · Megapolis · Monitoring · Environmental management · Green infrastructure · Urban soils · Ecosystem services

Globally, urban areas grow rapidly with more than two thirds of the world population expected to live in cities by 2050 [1, 11]. Urbanization influences the environment and may contribute to e.g., climate change, soil degradation and biodiversity reduction. At the same time, urban ecosystems are very sensitive to global changes, and their adaptation is necessary to sustain essential functionality and important ecosystem services [5].

Historically, urbanization was mainly studied as a potential environmental threat, resulting in soil, water, atmospheric and forest degradation and biodiversity loss. The unfavorable ecological state of urban environments was documented by the beginning of the 21st century [3, 8]. An established urban ecosystem strongly differs from a natural or agricultural ecosystem. Urban ecosystems are characterized by the human modified and often artificial landscapes with considerable anthropogenic disturbances (e.g., environmental pollution, soil sealing, waste disposal). Cities generally consume much more energy than they generally provide, resulting in the emissions of heat, (airborne and waterborne) contaminants and greenhouse gases. With the continued increase of global urban population, novel concepts like ‘sustainable cities’ have emerged. The concept of urban sustainability resulted in the design of model or ideal cities, for example, ‘emission free’ cities [6] and ‘climate adapted’ cities [7] which view

urban areas as source of unique natural and urban-specific resources, rather than an environmental threat.

The international conference *Megacities 2050* aimed to find solutions for environmental problems of modern megapolises and to maximize the capacity of urban ecosystems to support specific ('natural') functions and services. The conference proceedings introduce urban ecosystems, considering their spatial variability, temporal dynamics, environmental risks and potentials to provide important functions and ecosystem services. The volume includes 18 papers, describing different components of urban ecosystems (e.g., air, soil, vegetation and biota) and covering different aspects of environmental monitoring, assessment and management in megacities.

The general concept of megacities as diverse and complex ecosystems is presented in the first paper "Urbanization of Biosphere: from Mega- to Ecopolises". The subsequent papers are organized into four different thematic sections: (i) air quality and greenhouse gases (GHGs) emission (papers 2 and 3), (ii) urban soils at multiple-scales (papers 4 to 9); (iii) urban forests and green infrastructure (papers 10 to 13); and (iv) advanced technologies in monitoring, modeling, designing and management of urban ecosystems (papers 14 to 18).

Maintaining air quality, carbon sequestration and mitigating global warming and climate changes by reduced GHGs emissions are key services provided by urban ecosystems. The supply of these services for the cases of Naples (Italy) and Moscow (Russia) is discussed by the papers in Section 1. Urban soils are key for regulating healthy urban ecosystems. Ecosystem services and functions provided by urban soils impact the environment, and human health and wellbeing [4]. Urban soils that form conditions and features differ principally from natural and agricultural soils, but their functions and services remain poorly quantified [9]. Recently, there has been increased attention and interest in understanding the capacity of urban soils to support specific functions and services [5, 7, 10]. Currently, urban soils face a paradox where on one hand it is of the highest value for property development, and on the other hand being almost totally ignored with regard to the ecosystem services they can provide [4]. Different aspects of monitoring and assessment of urban soils at multiple scales from local and city level (Rostov in Russia and New York in USA) to regional and global scales are discussed in Section 2. Similar problems (e.g., contamination with heavy metals) were presented for urban soils located at different climates and vegetation zones (e.g., Yamal in arctics, Bashkortostan in steppes and New York in the humid continental/temperate), providing a unique opportunity for comparative assessments. Section 3 focuses on green infrastructure as the main tool to integrate nature-based solutions into urban design and management. Finally, Section 4 promotes a range of technologies to monitor and manage urban ecosystems, including biotesting, decision-support systems and ecological engineering.

The conference received feedback from a broad and multi-disciplinary audience, including the scientific community, municipal services, the environmental protection agency and other stakeholders working in urban management and greenery. Such a multi-disciplinary discussion is an essential step towards sustainable urban development, because implementation of innovative technologies and nature-based solutions relies on a collaboration of all interested stakeholders for the purpose of smart urban management.

Acknowledgments. The RFBR project NK 15-34-70003 and Jean Monnet Project EDEMS supported the conference and the research.

References

1. FAO: Climate-Smart Agriculture. Sourcebook, E- (2013). ISBN 978-92-5-107721-4
2. Gómez-Baggethun, E., Barton, D.N.: Classifying and valuing ecosystem services for urban planning. *Ecol. Econ.* **86**, 235–245 (2013)
3. McKinney, M.L.: Urbanization as a major cause of biotic homogenization. *Bio. Conserv.* **127**, 247–260 (2006)
4. Morel, J.L., Chenu, C., Lorenz, K.: Ecosystem services provided by soils of urban, industrial, traffic, mining, and military areas (SUITMAs). *J. Soil Sed.* **15**, 1659–1666 (2015)
5. Pickett, S.T.A., Cadenasso, M.L., Grove, J.M., Boone, C.G., Groffman, P.M., Irwin, E., Kaushal, S.S., Marshall, V., McGrath, B.P., Nilon, C.H., Pouyat, R.V., Szlavecz, K., Troy, A., Warren, P.: Urban ecological systems: scientific foundations and a decade of progress. *J. Environ. Manag.* **92**, 331–362 (2011)
6. Pickett, S.T.A., Cadenasso, M.L., Grove, J.M., Groffman, P.M., Band, L.E., Boone, C.G., Burch, W.R., Grimmond, C.S.B., Hom, J., Jenkins, J.C., Law, N.L., Nilon, C.H., Pouyat, R. V., Szlavecz, K., Warren, P.S., Wilson, M.A.: Beyond urban legends: an emerging framework of urban ecology, as illustrated by the Baltimore Ecosystem Study. *Bioscience* **58**, 139–150 (2008)
7. Raciti, S.M., Groffman, P.M., Jenkins, J.C., Pouyat, R.V., Fahey, T.J., Pickett, S.T.A., Cadenasso, M.L.: Accumulation of carbon and nitrogen in residential soils with different land-use histories. *Ecosystems* **14**, 287–297 (2011)
8. Stroganova, M.N., Myagkova, A.D., Prokofieva, T.V.: The role of soils in urban ecosystems. *Eurasian Soil Sci.* **30**, 82–86 (1997)
9. Vasenev, V.I., Ananyeva, N.D., Makarov, O.A.: Specific features of the ecological functioning of urban soils in Moscow and Moscow oblast. *Eurasian Soil Sci.* **45**, 194–205 (2012)
10. Vasenev, V.I., Stoorvogel, J.J., Vasenev, I.I.: Urban soil organic C and its spatial heterogeneity in comparison with natural and agricultural areas in the Moscow region. *CATENA* **107**, 96–102 (2013)
11. United Nations.: World Urbanization prospects: the 2007 revision. United Nations Department of Economic and Social Affairs, Population Division. New York, USA (2008). <http://www.un.org/esa/population/unpop.htm>