

EXPLOITING SENTINELS FOR SUPPORTING URBAN PLANNING LEVELS IN RUSSIA

SEN4RUS Newsletter

March 2017

IN THIS ISSUE

Editorial

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SEN4RUS (Exploiting Sentinels for supporting urban planning applications at city and regional levels in Russia) is one of the projects that were funded from the ERA.Net-RUS Plus Joint Call on Innovation. It is a joint effort of seven Organizations from six different countries, aiming to introduce novel ideas on exploitation on Earth Observation (EO) in urban planning activities in Russian cities.

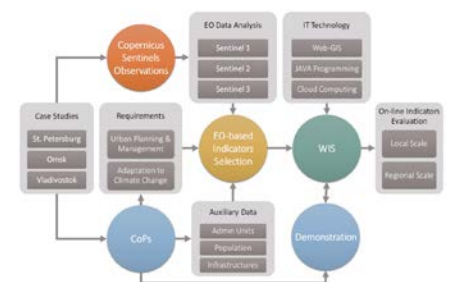
Cities are complex systems showing a diverse spatial structuring of surface cover and morphology. There are enormous opportunities and challenges to shape the built environment and for urban planning to play an important role in climate change mitigation and adaptation at city level. However, the challenges cities are facing cannot be solved at the local level alone. Better policy integration, involving closer partnership and coordination at local scale (neighbourhood), as well as at regional scale (city, region) are needed.

Currently, in Russian cities, most of this information is collected by means of statistics, surveys and mapping or digitizing from aerial imagery. However, in consideration of statistical information these approaches often show a

comparably coarse spatial and temporal resolution while surveying and mapping is time consuming and cost-intensive - properties which significantly restrict periodic updates.

Although methods exist for monitoring land cover changes using EO data, synergistic methods for exploitation of different Sentinels Sensors' observations for mapping and monitoring the urban environment are still under development. A major challenge is the exploitation of the Copernicus Sentinel satellites' synergistic observations to support routine urban planning activities, as well as urban planning activities related to climate change mitigation and adaptation, resulting in improved thermal comfort, as well as in improved energy efficiency. SEN4RUS was launched in the end of 2016 to meet this challenge.

This Newsletter initiates an open dialogue between SEN4RUS partners and potential users from the planning community; and informs about activities, progress and achievements of the project. The Newsletters will be published every 8 months and will be open to articles, news and opinions.



The SEN4RUS Approach

A detailed description of the SEN4RUS approach is presented. A flowchart is included to indicate the different Work Packages interactions, as well as the role of the end users in the three SEN4RUS case studies: St. Petersburg, Omsk and Vladivostok.

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The SEN4RUS Kick-off Meeting

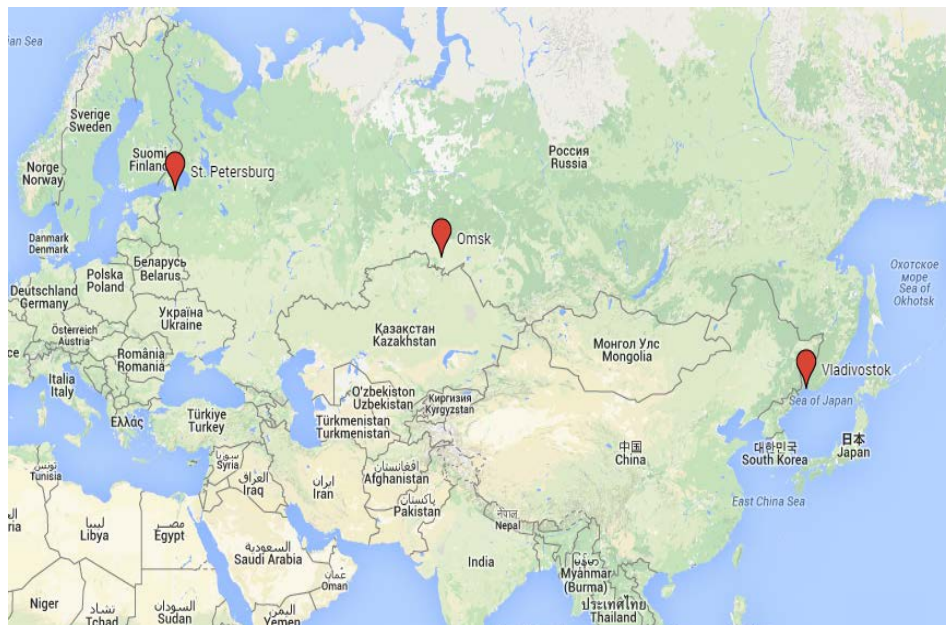
The SEN4RUS Kick-off Meeting was organized in Heraklion, Crete on October 25, 2016. A short description is included.

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Project Overview

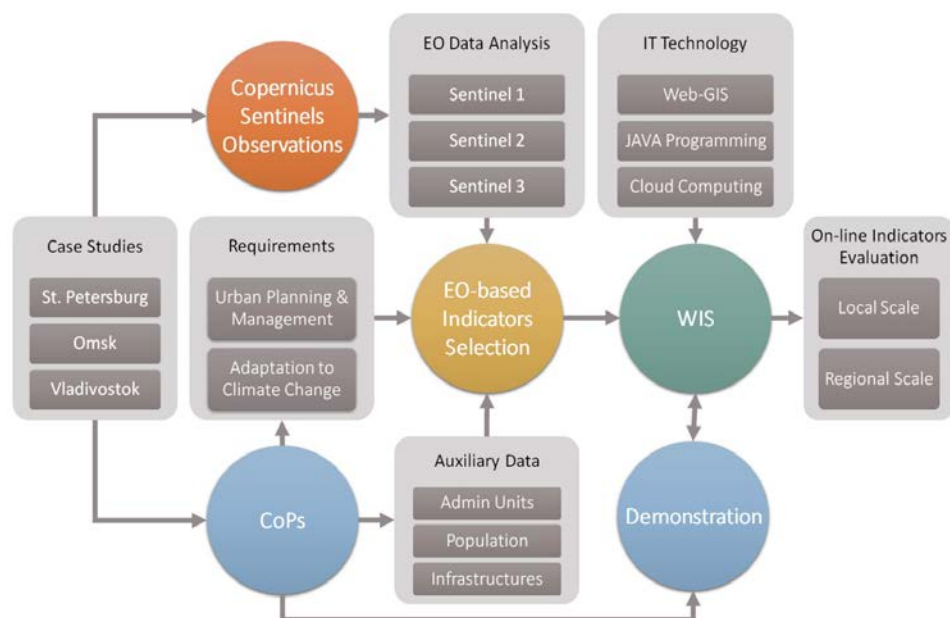
Despite the promise of new and fast-developing EO, a gap exists between the research-focused results offered by the urban EO community and the application of these data and products by the governments of urban regions. To this aim, the EO community often notes the lack of communication of new knowledge and its implications to users, such as urban planners, architects and engineers. Increasing attention has been recently focused on bridging this critical gap. The ERA.Net-RUS project GEOURBAN developed a set of EO-based indicators for urban planning and a software prototype for their evaluation, focused on the local city level. However, planning in peri-urban and rural areas is particularly important for Russia, given its huge territory and its high number of large cities and scattered settlements.

For this reason, the SEN4RUS project aims to specifically take into account the requirements of urban planning in Russia to develop indicators that effectively exploit the information content provided by Copernicus Sentinels mass data streams in support of urban planning at local and regional scales. Three Russian cities with different urban planning perspectives, located at different parts of the huge Russian territory, have been selected as SEN4RUS application areas: St. Petersburg, Omsk and Vladivostok. With the given spatial resolution and revisiting times in combination with the open and free data policy, the potential of Copernicus Sentinels to support a wide range of environmental, regional and urban planning applications is particularly high and SEN4RUS will contribute to their effective and efficient exploitation in Russia. SEN4RUS is meant to further extend and improve previous studies by developing and validating a novel Web-based Information System (WIS) adapted to and optimized for exploiting Sentinel data in the Russian urban planning and management domain. More specifically, the objectives of the SEN4RUS are:



- › Bridge the gap between European EO scientists and Russian urban planners, by addressing issues of needs and the potential of Copernicus Sentinels data for diverse stakeholders dealing with urban planning.
- › Analyse the relevant to EO urban planning requirements in Russia, by setting-up a Community of Practice (CoP) at selected case studies.
- › Identify the new potential arising from Sentinels and derived geo-information products and services to support urban planning at city and regional scales.
- › Adapt the techniques for deriving those indicators that have been evaluated as more relevant by past projects to the processing and analysis of Sentinel imagery.
- › Develop new methodologies, based on Sentinels synergies, to be implemented for fusion of multisource data in the framework of the project.
- › Extend the set of indicators to new application areas such as energy (sustainable energy, energy efficiency) and urban climate.
- › Develop a WIS by optimizing and expanding the functionality and performance of the GEOURBAN prototype to optimally meeting the specific user requirements.
- › Exploit the recent developments in cloud computing, to make the WIS able to support the on-line analysis of time series of high spatial resolution data.
- › Demonstrate the WIS in the framework of an umbrella CoP event.
- › Illustrate the planning-related and socio-economic benefits of using of Sentinels data on a routine basis in urban planning decisions in Russia.

The SEN4RUS Approach



The overall SEN4RUS approach is shown above. SEN4RUS explores the potential of EO to support urban planning and management by providing guidelines towards sustainability objectives at micro, local and regional scales, as well as towards climate change adaptation. These guidelines will be the result of the combination of several EO-based indicators using the web-based information system that will be developed. The web-based character of this tool makes it easily transferable from city to city and the indicators can be evaluated if EO data are available.

To develop a method that will be welcomed by local stakeholders, it is important to involve them in the project from the beginning. The project uses a Community of Practice (CoP) approach, which means that in each case study city, local stakeholders and scientists of the SEN4RUS project will meet on a regular basis in order to learn from each other. The CoP will identify and provide insight into aspects which are important for the future users of the SEN4RUS products. It also provides network contacts for collecting auxiliary datasets for each case study, if needed. One of the main purposes of the CoP is to acknowledge the different stakeholders' perceptions into the indicator development.

The WIS to be developed in the framework of SEN4RUS will be capable of on-line evaluation of the EO-based indicators to be selected, supporting in this way sustainable urban planning. The web-based character of this tool makes it easily transferable from city to city, whereas the long term operation of the Copernicus Sentinels series guarantees the future supply of satellite observations, providing the means for the development and realization of the SEN4RUS method. The Sentinels data is the main input for SEN4RUS indicators. Well-known EO analysis methods will be used to calculate products from raw data. It should be noted that the development of new EO data processing tools is not among the main objectives of SEN4RUS, but rather state of the art methods will be implemented. However, new algorithms will be developed if necessary. The SEN4RUS indicators will be the means to exploit Sentinels observations in addressing the following main issues related to urban planning and management: urban surface structure; urban surface type; urban sprawl; urban environmental quality; vulnerability to hazards; socio-economics; adaptation to climate change; and urban metabolism.

The SEN4RUS WIS will be developed in an iterative procedure. The user requirements will be translated to EO-based indicators and the users will set the specifications for the WIS design. The consortium will release several versions of the WIS during its development exercise. Since it will be a web-based tool, the end-users will be able to evaluate it online and provide direct feedback to the consortium. The SEN4RUS WIS will be a fully dynamic system exploiting all internet capabilities and the "Open Layers" availability (openlayers.org). The user will just need a web-browser and internet connection to access it. The Graphical User Interface (GUI) of the WIS will include: a) control bar with layers, search function, contacts and indicators; b) tool bar with several functionalities to be developed (i.e. for navigation, distance measuring, maps saving etc.); c) map display area; and d) status bar. One of the main capabilities of the WIS will be the indicator evaluation module, which will allow the end-user to evaluate each Sentinels-derived indicator within user-defined specific areas (polygons). The WIS will also exploit web-services, for accumulating different types of data for supporting the decision making in urban planning and management. Cloud storage and computing capabilities will be investigated for use with the SEN4RUS WIS. Services like the Google Earth Engine (earthengine.google.org), or the Amazon Elastic Compute Cloud (aws.amazon.com/ec2/) can be used for large EO data storage and for computationally demanding algorithms implementation.

SEN4RUS is expected to enhance the scientific and operational exploitation of the existing and emergent European space infrastructure, by stimulating the emergence of novel ideas on how urban planning related indicators can be evaluated from space observations, focusing on the estimation of the spatiotemporal patterns of parameters related to urban structure and urban environmental quality.

The SEN4RUS Kick-off Meeting

The SEN4RUS kick-off meeting held in Heraklion on October 25, 2016, with the participation of representatives from all project partners. This meeting defined the work plan for the first semester of the project. A Management Board meeting was also held to guarantee the smooth progress of the project actives and to resolve any technical or administrative problems. The operation of the web-server of the project from the very beginning supported the communication and the data exchange among the partners.

Furthermore, the SEN4RUS web-site is operational and accessible at: <http://www.sen4rus.eu>



Events

SEN4RUS is present in several conferences and events. Follow us on your preferred social network (*ResearchGate, Twitter, Google+, LinkedIn*) to get instant updates on events related to SEN4RUS.

Past	Mapping Urban Areas from Space Conference MUAS 2015 4-5 November 2015, Frascati, Italy. 4 th International Conference on Countermeasures to Urban Heat Island 30 May - 1 June 2016, Singapore GEO-XIII Plenary and Exhibition 7 -10 November 2016, St. Petersburg, Russian Federation	Past
Upcoming	European Geosciences Union General Assembly 2018 8 - 13 April 2018 Vienna, Austria 10 th International Conference on Urban Climate (ICUC10) August 2018 New York, United States SPIE Remote Sensing 2018 10 - 13 September 2018 Berlin, Germany	Upcoming

All publications are available through the project's web-site: <http://www.sen4rus.eu>

SEN4RUS

sen4rus.eu

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