URBIS

Urban Land Recycling Information Services for Sustainable Cities

Project Final Report

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Project Final Report

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URBIS
Urban Land Recycling Information Services for Sustainable Cities

ICTPSP
ICT POLICY SUPPORT PROGRAMME

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Project Overview

European urban and regional planning on all levels is increasingly being challenged by economic globalisation and this will continue to intensify over the coming decades. Traditional European cities have developed into regional agglomerations, but planning methods and the associated management tools have not progressed and these are still applied within a 'traditional' model of land use planning and non-integrated environmental management. In addition, poorly integrated and unsystematic approaches in land use policies with limited linkage to environmental quality further impact on the environment and quality of life problems seen in many European cites. It might increase land-related conflicts in densely urbanised regions and in turn seriously threaten the social cohesion and competitiveness of all European cities and regions, including those in the New Member States. Thus, integrated and participatory urban governance and planning of the cities and regions of Europe is universally identified as crucial to the economic recovery and sustainable development of Europe. Technological innovation aims to support the rapid development of ICT enabled intelligence, tools and methodologies defining new opportunities for smart city governance.

In this context, the ICT PSP **URBIS project** has focused on development of innovative methodologies, services, tools and associated business strategies ('URBIS Solutions') to support **integrated solutions for the urban growth challenges related to urban (re-)development**. URBIS has aimed to explore the opportunities of **European Open Data flows from Copernicus programme** for a multilevel, harmonized and comparable information base for urban sustainable development governance and planning, their horizontal and vertical coordination and stakeholder engagement on city, regional and European/global level.

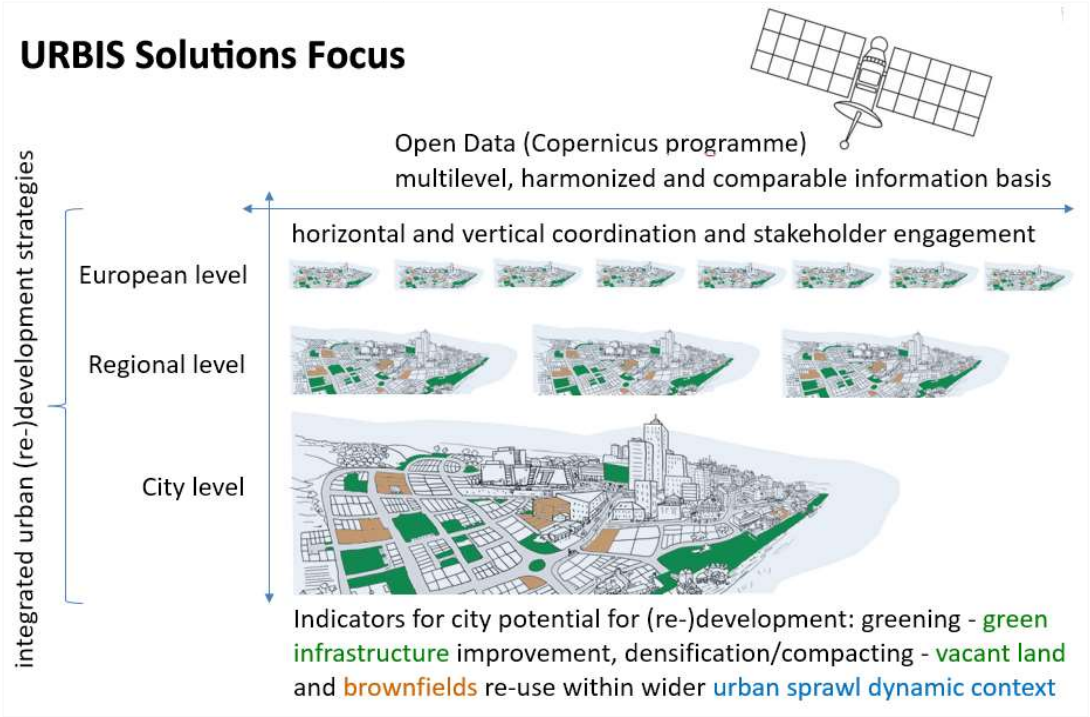


Figure 1 URBIS Solutions focus

In particular, the URBIS project has reflected growing national, European and nowadays also global (e.g. UN SDGs) concerns about land, being a finite and shrinking natural resource, and related land take and land degradation reduction commitments. In this respect the URBIS services aimed to provide, within a broader coalition of smart city governance projects, contribution into current general development stream towards more effective integrated urban development strategies, by deployment of specific ICT tools and methodologies sourced by Copernicus data flows. Central to such integrated re-development policy is accurate intelligence on land cover / land use spatial-temporal development in particular area and its potential for further (re-)development - physical availability of potential development areas (PDAs - vacant and underused land), including supply of previously developed "brownfield" land. These are key information for land-use decision making, maximizing the net socio-economic benefits from land-use without degrading natural capital. This intelligence concerning the context, availability, supply and development of previously developed land, provides the basis for the URBIS solutions for enhanced land use management and land use transformation in urban environment.

The URBIS project, together with other smart city governance research projects, funded under ICT PSP, Horizon 2020, JPI Urban Europe and other sources, aims to unlock these urban governance potentials and at the same time define new business models for the delivery of common governance solutions, replicated and upscaled to numerous cities of Europe.

Objectives

General objective of the URBIS project was to develop, implement and validate in real environment innovative information services related to urban vacant land, based on open geospatial data available from Copernicus programme for European Large Urban Zone's (LUZs).

In more detail, the specific project objectives can be summarized as follows:

- Objective 1: To assess the potential reuse strategies of vacant urban land based on its past uses and characteristics and through wide involvement of end-user organisations, to establish common ground for the development of URBIS services.
- Objective 2: To develop a methodology for an inventory and typology of European vacant urban land based on Copenicus Urban Atlas and HRL IMD layers and the analysis of multi-temporal imagery to determine potential constraints to re-development.
- Objective 3: To develop, implement and validate interoperable services on a number of representative LUZs across Europe under operational conditions in collaboration with key European stakeholders/practitioners. Thus, to support European spatial urban planning in general and land use planners and land (re-) development agencies in particular reflecting the needs of both strategic and operational users in this field (regional & local authorities, urban development agencies, national & EC level institutions)
- Objective 4: To contribute into further development of Copernicus Land services by practical testing of utility of existing standard dataflows, identifying gaps and proposing value-adding business chains for a sustainable operational URBIS information services.

Project history

A live network of committed partners

Project consortium was formed by effective and complementary mix of research organisations/universities, private companies already involved in Copernicus services development and provision and urban planners/practitioners (see URBIS Consortium at a Glance below). During the three years of the project, all Consortium partners were involved in an extended and valuable exchange of ideas, knowledge and expertise, which contributed to the achievement of all planned results and deadlines, and finally led to the implementation of the URBIS Solutions. As URBIS was concerned with the development of innovative technologies, methodologies and associated strategies to support the definition and implementation of sustainable planning and governance strategies in cities and city-regions, the project has been designed with direct support of urban planning experts from 3 pilot sites - Moravian-Silesian Region (CZ), Greater Region of Amiens (FR) and City of Osnabrück (DE), providing immediate feedback on service design, implementation and utility. Considering service upscaling throughout Europe, consequently the range of stakeholders, those individuals and organisations with an interest or stake in the issue of sustainable cities were gradually expanded. In order to structure this engagement process with a diversity of stakeholders, strategically important dimensions of the dialogue via URBIS Stakeholder Board activities have been emphasised, focusing on communication at European, regional and city levels. Furthermore engagement has been structured over time according to the stages of project delivery culminating in the months 12, 24 and 36 with dedicated Brussels workshops/stakeholder meetings.

During the first period the URBIS project has focused on consolidation of user requirements (**D2.1**), more deep insight into the state-of-the-art in the land management domain, relevant activities and their technical approaches (**D3.1**) as well as the first service contents drafting (**D3.2**, **D4.1**). Based on the user feedback from pilot stes, clear need to consider vacant land more broadly then in the original proposal (considered predominantly as brownfield areas) was identified. As consequence, not only strictly vacant land was investigated, but all areas with some physical potential for development or re-development in general. According to the definitions applied during first period (**D2.3 - Vacant land typology**), the areas of URBIS interest so called called “potential development areas” (PDA) included vacant land and under-used land (including brownfields). As side effect of this move, the final URBIS services can also well serve to implementation of policy strategies around city green areas, green infrastructure and open spaces in general. During the first period, the URBIS Stakeholder Board has been also established, which was further extended throughout the project and used as important communication channel between project partners on one side and a wide group of end users and the general public within a number of communities (e.g. scientific, technical, government and industry) as well as it formed dialogues with other related projects.

Based on these achievements, **the second period** of the URBIS project was dedicated to the first set of baseline und update data services development, workflow implementation and testing, namely for ‘Green Layer’, ‘Grey Layer’ and ‘Urban Land Use Dynamics‘ services (**D4.2**, **D4.3**). In addition,

thematic services focused on first selected use cases has been developed supported by the URBIS web exploration platform. Overall, the URBIS services were developed as tightly linked to the Copernicus Urban Atlas service (as additional PDA development layers) with clear aim to support operational decision-making at the city level concerning the allocation of development sites in relation to policy objectives concerning compact cities, densification and the management of urban sprawl as well as city transformation and re-naturing. Simultaneously these services were design t osupport also the EU level requirement for comparable (city by city benchmarking) monitoring information concerning the availability and potential for recycling of PDA across the cities of Europe in support of policy objectives concerning minimization of land degradation (e.g. zero-net land take). Finally, the user feedback has been collected from the URBIS test sites users as well as the wide range of other stakeholders on the first version of the URBIS services and sustainability issues has started to be consolidated including business options and exploitation roadmap - the project business (**D6.5**) and exploitation (**D6.6**) plan drafts.

In the third, final period of the URBIS project, based on the stakeholders feedback from period two, the service offer has been updated and re-branded into so-called URBIS Solutions, where the original URBIS baseline and thematic services were grouped and adapted for specific use cases supporting selected regional/city administrations activities. The final version of the URBIS services release is described in deliverables **D4.4** (Updated spatial database of relevant processed data for each case studies), **D4.5** (Functional prototype V2 and INSPIRE compliance) documents. Technical details for methodologies used to derive URBIS services are described in **D3.4** (Best practice guide for vacant land inventory). The URBIS service portfolio is now ready for spatial roll-out, change detection as well as implementation of more thematic information services. These are reflected in deliverables **D5.5** (Final report on the information service implementation in each pilot site) and **D5.6** (Best practice guide to implement URBIS service for decision makers). Based on consolidated URBIS Solutions, the business strategy has been developed for further exploitation activities within and beyond the project duration. In this context, the last period was notable for further extension of stakeholder engagement beyond strategic European level, well developed during previous periods, towards more operational regional/local level users governed by partnership with EuroCities, CEMR or JPI Urban Europe as well as cooperation with a wide coalition of smart city governance project partners. Beside, engagement with other potential users within sustainable development support domain, mainly with International Financial Institutions (IFIs), has intensified as well as coordination with the Copernicus Land Local activities. Namely, opportunities have been explored to link the URBIS Solutions to ongoing activities toward Sustainable Development Goals (SDGs) implementation and related indicators development both at national and global level.

Finally, it should be noted that all activities carried out during the URBIS project was formally structured around six Work Packages (see also figure 2):

WP1 - Project management

WP2 - User requirements and land use potentials

WP3 - Data assessment and inventory & typology of vacant sites

WP4 - Service developments and interoperability

WP5 - Pilot studies design, implementation and validation

WP6 - Dissemination, training and exploitation

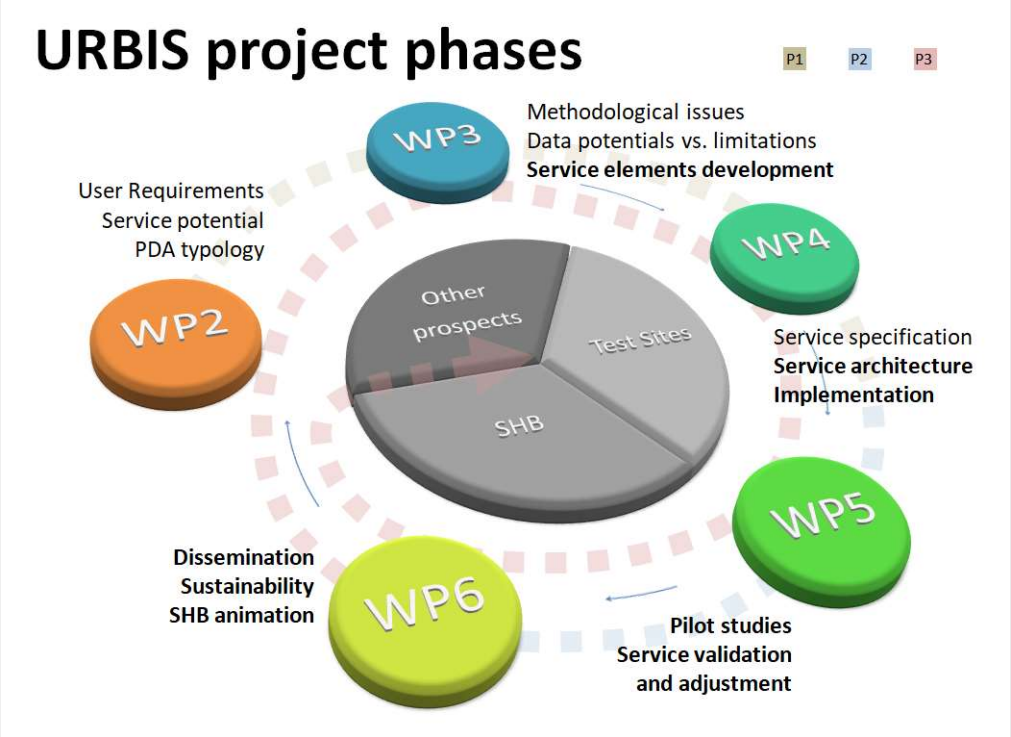


Figure 2 URBIS project Work Packages and phases

A network actively communicating with the external world

The URBIS dissemination and communication activities were considered and structured as part of strategic framework of stakeholders engagement to support central project aims to develop and deliver effective tools supporting urban governance and decision making and, in parallel, to build the ground for later business exploitation. An effective implementation of the dissemination plan was therefore seen as essential for the success of the overall project and commercial exploitation of URBIS services. The URBIS dissemination strategy supported an integrated and coordinated effort of multiple agencies at different levels of governance from local to EU, reinforcing the engagement of all stakeholders in a coalition of participatory and integrated urban governance. URBIS dissemination engaged with city managers in this transformational governance, exploiting "open" European data including Copernicus data, and deploying the latest analytical methods to meet a wide range of user requirements for assessment, evaluation and communication tools. URBIS dissemination engagement supported integrated assessments of city-wide land use development potential, and seeked to discover common solutions that can be applied to all cities, whilst simultaneously contextualising development assessments according to the ambient demand and supply for development in relation to plan objectives.

Overall, the project partners have very successfully promoted the URBIS project aims and results in numerous technical and thematical venues, as is apparent by the range, degree and effectiveness of dissemination activities. This engagement extended beyond the Earth Observation research and

spatial data-based application and services communities, to engage with city planners in their day-to-day work. The stakeholder engagement and exploitation workshops have provided a particular focus for dissemination and engagements activities with a broadly representative and active group of stakeholders that have offered clear and valuable feedback and guidance to project development activities. The stakeholder group, from the beginning strong at the European level, was further extended to include city and regional actors e.g. EuroCities, JPI Urban Europe, CEMR, and engagement continues as specified in the URBIS promotion and operational plans, supporting the longer-term sustainability of the URBIS Solutions. Effective engagement has also been secured with a wider community of potential users within the ESA projects framework, as well as raising the awareness of global urban development players e.g. large IFI organizations including the World Bank.

During the last period the project outputs has been presented on number of important stakeholder meetings, workshops and conferences. The most important ones include:

- Conference presentations at JPI Urban Conference in April 2016 in Amsterdam,
- Conference presentation and URBIS workshop at CEMR Congress in April 2016 in Nicosia,
- Conference presentation at ESA Living Planet Symposium in May 2016 in Prague,
- Conference presentation at IEEE International Geoscience and Remote Sensing Symposium (IGARSS 2016) in July 2016 in Beijing,
- Stakeholder Workshop with JPI-Urban Europe and CEMR in October 2016 in Brussels,
- Conference presentation at Joint Urban Remote Sensing Event (JURSE 2017) in March 2017 in Dubai and
- Stakeholder Workshop on Exploitation in coordination with JPI Urban Europe and CEMR in March 2017 in Brussels.

All dissemination activities are summarized in deliverables **D6.7** (Report from the third stakeholder board workshop) and **D6.10** (Final report on dissemination activities).

A clear exploitation strategy

Main objectives of the project has been achieved and the URBIS Solutions (described below) are now ready to serve to specific user needs and further evolve based on feedback from technicians, thematic users and policy stakeholders involved. The Consortium meeting held in 02/2017 in Osnabruck, was dedicated to finalization of businness and exploitation plans and to discussion about further business opportunities for the selected URBIS Solutions as well as further consortia plans to support their development and marketing beyond the project lifetime. Intensive exchange finally resulted in strategic documents **D6.8** (Exploitation plan of URBIS project's results) and **D6.9** (Business plan for URBIS information service provision). As there is a partner concensus in place and the plan how to proceed with the URBIS offer beyond project duration (i.e. based on freemium, premium and consultancy service model), it provides a good potential for the results exploitation in future.

As indicated above a core objective of the URBIS dissemination strategy was to engage with a diversity of pan-European expertise in discussions on the future potentials for the development of smart city governance, and ICT investments in the drive towards enhanced integrated urban planning and more participatory forms of governance. Accordingly, new project connections were also identified to be pursued in future research and innovation collaborations, and new understandings were generated between stakeholder groups with distinctly differing comprehensions of the task in hand and the best ways forward. It is also became clear as a result of this dissemination engagement that the URBIS longer-term sustainability objectives must be part of a process of ongoing engagement.

One pointer for future ongoing engagement concerns the understanding that clustering of projects sharing common research and innovation objectives is essential. Typically research communities are fragmented according to specifics such as funding source which define separated research communities, for example the space, societal challenge and ICT communities are separated by different calls, even though common interest in smart sustainable cities is totally evident.

A second pointer for future engagement concerns the widely differing conceptual worlds that different stakeholder groups inhabit which form major barriers, similar to those of the fragmented research and innovation activity. The future architecture of smart city governance must be built on an effective and representative ecosystem of skills including all user communities and ICT expertise.

A third pointer for future engagement is the realisation that despite the barriers identified above structured engagement and dialogue, as promoted in the Brussels stakeholder workshops, does generate effective outcomes - new understanding and progress towards the integration objective. Awareness of the potentials for conceptual and practical misunderstanding permits the establishment of effective communication frameworks structuring dissemination and exploitation engagements. An appropriate framework of engagement allows the inhibitors of separation to be overcome and effective dialogue promoting positive progress towards a more integrated and participatory participatory urban governance to be realised.

In this respect the final URBIS workshop provided a forum for general discussion of the drivers and potential barriers to the upscaling of smart city governance initiatives from demonstration and pilots to large-scale implementation, to elaborate critical factors and framework conditions for replication, and thereby to contribute to JPI Urban Europe and the EIP SCC initiative for “upscaling and replication”.

Project outcomes

As mentioned, based on the stakeholders feedback on final technical development results, initial URBIS services has been updated and re-branded into portfolio of the URBIS Solutions, where the URBIS services were packed reflecting specific use cases in support of selected regional/city administrations activities. Based on these URBIS Solutions, the business strategy has been developed for further exploitation activities within and beyond the project duration.

URBIS Solutions

URBIS Solutions aim to assist in responding effectively to the societal challenges of our time, in transforming our cities and city-regions. However, the interconnectedness of socio-economic and environmental challenges in the urban context create complex conditions for urban management, and barriers to the delivery of a more sustainable urban development.

URBIS Solutions address these complexities supporting an integrated and coordinated effort of multiple agencies at different levels of governance from local to EU, reinforcing the engagement of all stakeholders in a coalition of participatory and integrated urban governance.

URBIS Solutions offer, for example, integrated assessments of city-wide land use development potential, targeting brownfield sites, specifying green infrastructure as a strategic structuring

principle for urban development, and contextualising development assessments according to the ambient demand and supply for development in relation to plan objectives.

URBIS Solutions have been developed specifically to support city managers in this transformational governance, exploiting "open" European data including Copernicus data, and deploying the latest analytical methods to meet a wide range of user requirements for assessment, evaluation and communication tools including:

- **Information and intelligence** - delivering evidence-based policy making, decision-making and implementation associated with the planning process;
- **Impact assessment and evaluation** - specifying territorially defined assessment of socio-economic and environmental impacts - typically in assessment of alternative site development options - linking URBIS Solutions to other information/intelligence sources;
- **Stakeholder and inter-agency communication** - fostering communication with urban stakeholders including the local community, as well as between urban and regional development agencies at the local level, and between levels of government from local to EU.

URBIS Solutions consist of 3 core elements:

- **URBIS Land Resource Management Services**
  - Green infrastructure planning and connectivity (Re-Naturing the City)
  - Urban sprawl dynamics analysis
  - Land development potential assessment

- **URBIS Thematic Services**
  - Urban Renewal Cost Estimation
  - Flood Risk Assessment
  - Solar and Biomass Energy Potentials

- **URBIS Integration Tool**
  URBIS Integration Tool service offers interactive web-based user communication platform supporting visualization, assessment, evaluation, and benchmarking, etc.

URBIS Solutions - Green Infrastructure planning and connectivity

Context

Nature-based solutions to societal challenges are inspired and supported by nature as living solutions. They are adaptable, multi-purpose and resource efficient, and provide simultaneously environmental, social and economic benefits including:

- improving city resilience contributing to both climate change adaptation and mitigation;
- restoring urban biodiversity, ecosystems and their services;
- enhancing human health, air and water quality, reducing noise;
- raising quality of life, well-being and social cohesion.

Challenges / needs

Green infrastructure planning objectives are set in the strategic planning framework that extends across the administrative boundaries from city centre to hinterland at the local level. Green infrastructure planning requirement, are fully supported by URBIS solutions, and focused on the connectivity of the network of green infrastructures, and the definition of green routeways linking city centre to countryside. URBIS solutions (See Figure) identify gaps in the network to be filled to ensure connectivity essential to meet the requirements of the policy. Gaps in the network can only filled at the local level, where neighbourhood planning is critical to the realisation of city-wide planning objectives. Overall URBIS solutions support policy development, project implementation, as well as awareness raising.

Solutions

URBIS Solutions for Green Infrastructure planning and connectivity (Re-Naturing the City) are based on URBIS Green and Open Space Layer dataset and include following elements (Figures 3 and 4 below):

- **Production of datasets** - ***URBIS Green and Open Space Layer and change*** **-** in 5m spatial resolution, derived from Copernicus satellite imagery and other data sources) describing amount, spatial distribution and other characteristics of green and open space in the city-region and their development in time (2006 – 2012);
- **Delivery of indicators** - specifying existing state and identifying development of green and open space (2006 - 2012) in the city-region, calculated for analytical units at various scales **(**1km grid; neighborhood, city-wide and functional urban area);
- **Support of interactive thematic analysis** - focusing on green and open space e.g. provides site relevant information for context analysis, benchmarking of analytical units to identify green area deficiencies, via the ***URBIS Integration Tool.***

Figure 3 URBIS Solutions - Green Infrastructure Re-Naturing the City

Figure 4 URBIS Solutions - Green Infrastructure Re-Naturing the City – detail view

URBIS Solutions - Urban Sprawl Dynamics Analysis

Context

Urban sprawl defined as 'unplanned incremental urban development, characterised by a low density mix of land uses on the urban fringe' (EEA, 2006) has different impacts depending upon the type of land use involved (residential, industrial, commercial, etc.) and what land is being consumed (agriculture, forest, etc.). Agricultural land is generally the dominant land-use in peri-urban areas, and this land use suffers of rapid changes. Urban sprawl and the uncontrolled expansion of built development and infrastructures of transport around cities:

- generates high rates of land-take and soil sealing;
- poses a major threat jeopardizing the sustainable use of soils, in particular the highly fertile soils;
- promotes loss of ecosystem services due to disrupted natural cycles;
- creates other harmful effects including increase in the urban heat island effect, decrease of infiltration and acceleration of run-off, etc.

Challenges / needs

Compact cities form critical elements in strategic policy frameworks to counteract urban sprawl. URBIS solutions support public authorities in resisting pressure by market actors generating urban sprawl, reinforcing governance-based planning interventions resisting supporting compact cities. URBIS urban sprawl dynamics intelligence identifies the rate of urban sprawl in peri-urban and the urban hinterland, and supports critical analysis regarding loss of agricultural soils, as well as the health of ecosystems and habitats. URBIS solutions help to guide strategic priority setting and decision-making at local and regional levels. Overall URBIS solutions support policy development, project implementation, as well as awareness raising.

Solutions

URBIS Solutions – Urban Sprawl Dynamics are based on URBIS Enhanced Imperviousness Layer, Land Cover Map and include following elements (Figures 5 and 6 below):

- **Production of datasets** - ***URBIS Enhanced Imperviousness Layer, Land Cover Map and change*** - in 5m spatial resolution, derived from Copernicus satellite imagery and other data sources, describing amount, spatial distribution and other characteristics of urban area in the city-region and their development in time (2006 – 2012);
- **Delivery of indicators** - specifying existing state and identifying development of urban areas (2006 - 2012) in the city-region, calculated for analytical units at various scales **(**1km grid; neighborhood, city-wide and functional urban area); to define the nature of sprawl and support development of potential land use solutions;
- **Support of interactive thematic analysis** - focusing on urban land and urban sprawl in the local and regional context via the ***URBIS Integration Tool*** to meet the requirements and varied objectives of a wide range stakeholders.

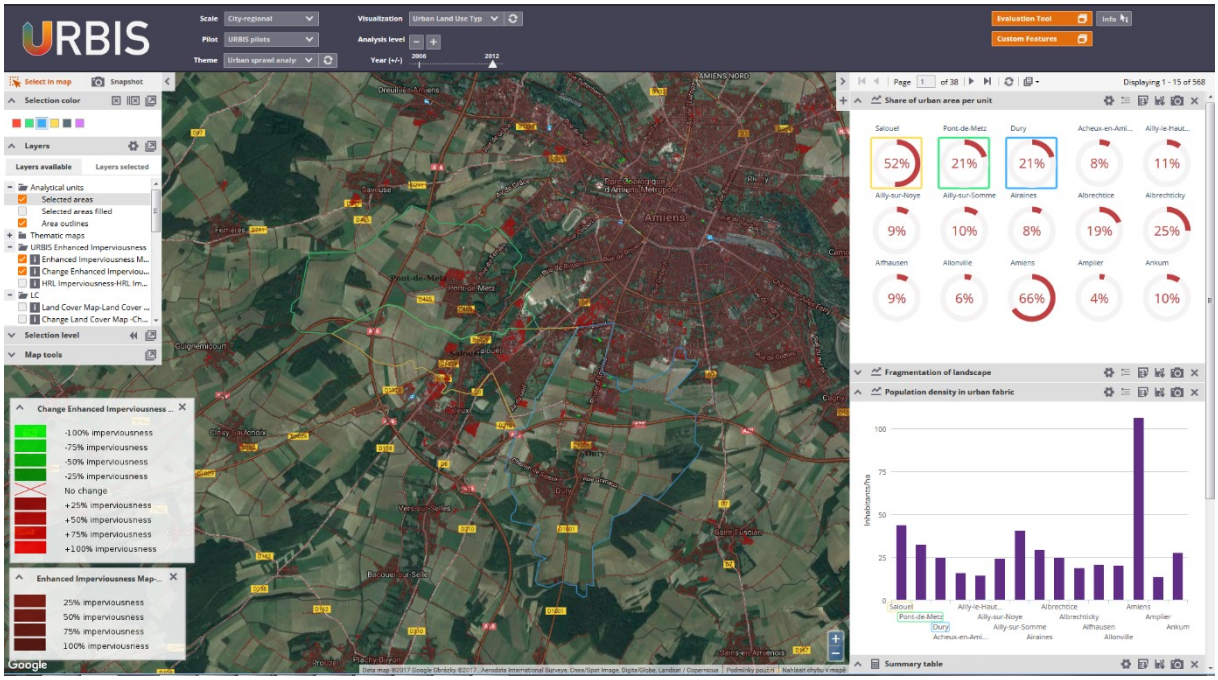


Figure 5 URBIS Solutions - Urban Sprawl Dynamics - amount, spatial distribution and other characteristics of the city-region and their development over time (2006 – 2012)

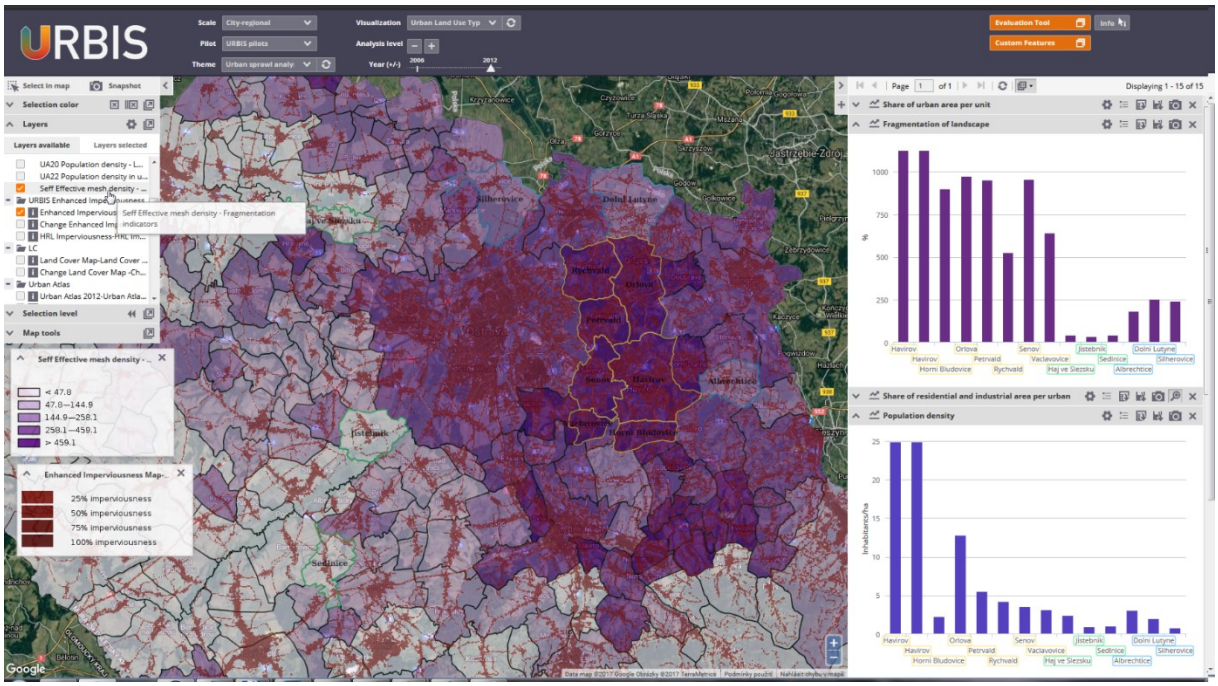


Figure 6 URBIS Solutions - Urban Sprawl Dynamics - analytical units at various scales - 1km grid; neighborhood, city-wide and functional urban area; to define the nature of sprawl and support development of potential land use solutions

URBIS Solutions - Land Development Potential

Context

Potential development sites can include for, example, brownfields sites as well as other vacant and underused areas within the existing urban environment. The re-use of these sites supports sustainable land use management objectives, including the minimization of land consumption and de-sealing initiatives, as well as an opportunity to rethink city planning and improve urban design:

- providing new green open space;
- developing new housing opportunity including social housing;
- creating mixed use developments in the heart of the city.

Challenges / needs

URBIS Land Development Potential assessments complement the URBIS sprawl dynamic assessment in the city regional context by providing detailed assessment within existing urban areas. URBIS solutions identify and classify sites according to their development potential, and suitability to accommodate a wide range of new urban uses. URBIS Land Development Potential assessments provide a first estimate of the type, scale and distribution of sites available for urban redevelopment. These assessments offer local stakeholders and authorities an improved overview of inner city development potentials, as a basis for further investigation and site development. Overall URBIS solutions support policy development, project implementation, as well as awareness raising.

Solutions

URBIS Solutions – Land Development Potential is based on URBIS Grey Layer and change and URBIS Green and Open Space Layer and include following elements (Figure 7 below):

- **Production of dataset** - ***URBIS Grey Layer and change*** - of potential development areas (brownfields) in the city-region and their development in time (2006 – 2012) to identify brownfield site potential via URBIS Grey Layer assessment;
- **Production of dataset** - ***URBIS Green and Open Space Layer*** assessment - identifies non-brownfield potential development sites in the urban envelope;
- **Delivery of indicators** - specifying characteristics of each site (derived from Copernicus satellite imagery and other open-source data sources); enabling to define sites according to range of criteria e.g. large vacant sites, with no green potential, well connected to urban fabric;
- **Support of interactive thematic analysis** - focusing potential development sites e.g. based on site specific information, via the ***URBIS Integration Tool and Evaluation Tool.***

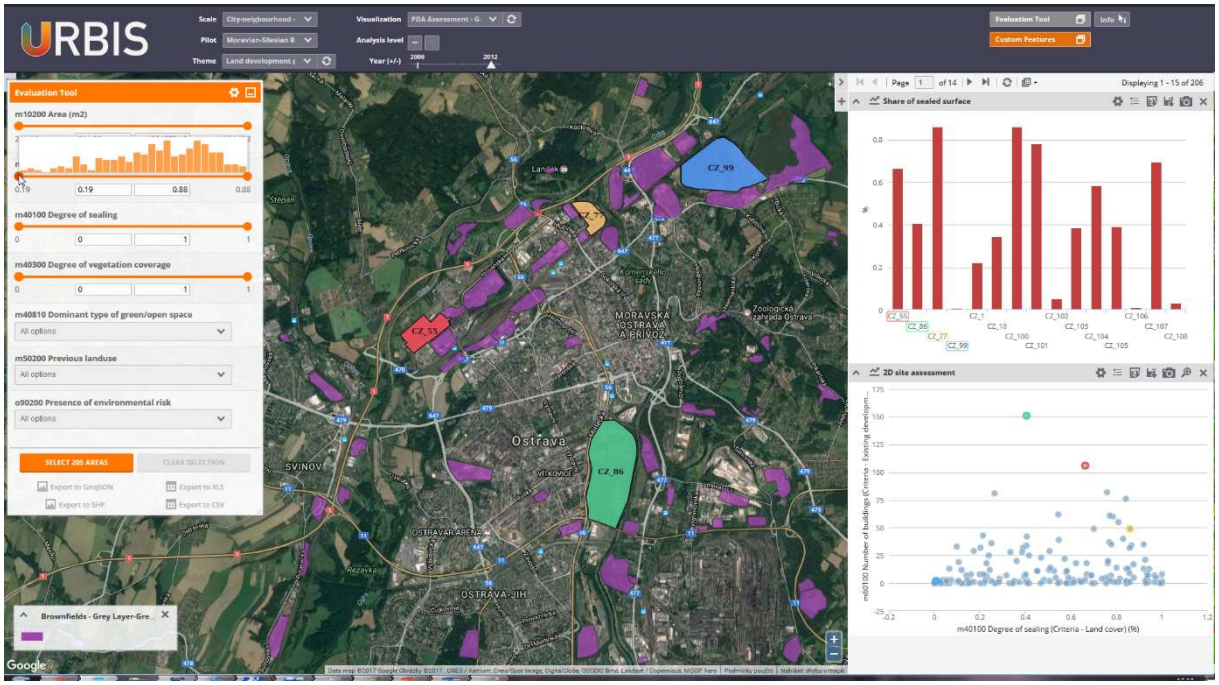


Figure 7 URBIS Solutions - Land Development Potential - specifying characteristics of each site (derived from Copernicus satellite imagery and other open-source data sources

URBIS Solutions - Urban Renewal Cost Estimation

Context

The creation of new urban uses, supports a range of policy objectives including the development of more compact cities, delivered by mixed use developments, connected by green infrastructures in the heart of the city. This regeneration, transformation, and restructuring of cities often requires the demolition of buildings and infrastructures. Demolition occurs for a number of reasons, including abandonment of the use of the structure, unsatisfactory location, deteriorating building material quality, lack of interest from property owners to invest.

Challenges / needs

URBIS Urban Renewal Cost Estimation permits full understanding and evaluation of the benefits of the renewal process, and supports full assessment of the costs of demolition activity to be presented to decision-makers including:

- municipalities and city planners in the generation of demolition and site redevelopment scenarios;
- finance and investment managers in the prioritization of demolition sites in a portfolio management system to guide longer term strategic planning and investment;
- land owners and development agencies in the evaluation of alternative development strategies for the city.

Solutions

URBIS Solutions – Urban Renewal Cost Estimation is based on URBIS Grey Layer and include following elements (Figure 8 below):

- **Production of dataset** - ***URBIS Grey Layer*** - of potential development areas to identify brownfield sites in the city-region;
- **Delivery of basic indicators** – specifying characteristics of each site relevant for estimation of the demolition/renewal cost, including degree of sealing, area/volume of buildings, previous land use e.g. industrial/residential;
- **Delivery of advanced/specific indicators** - estimating demolition/renewal costs based on area of sealed surface, volume of buildings, area of buildings, and current land use (residential/industrial);
- **Support of integration of local specific datasets or knowledge** (average demolition costs for the city/region);
- **Support of interactive thematic analysis** - focusing on assessment/benchmarking of site potential for renewal via the ***URBIS Integration Tool and Evaluation Tool.***

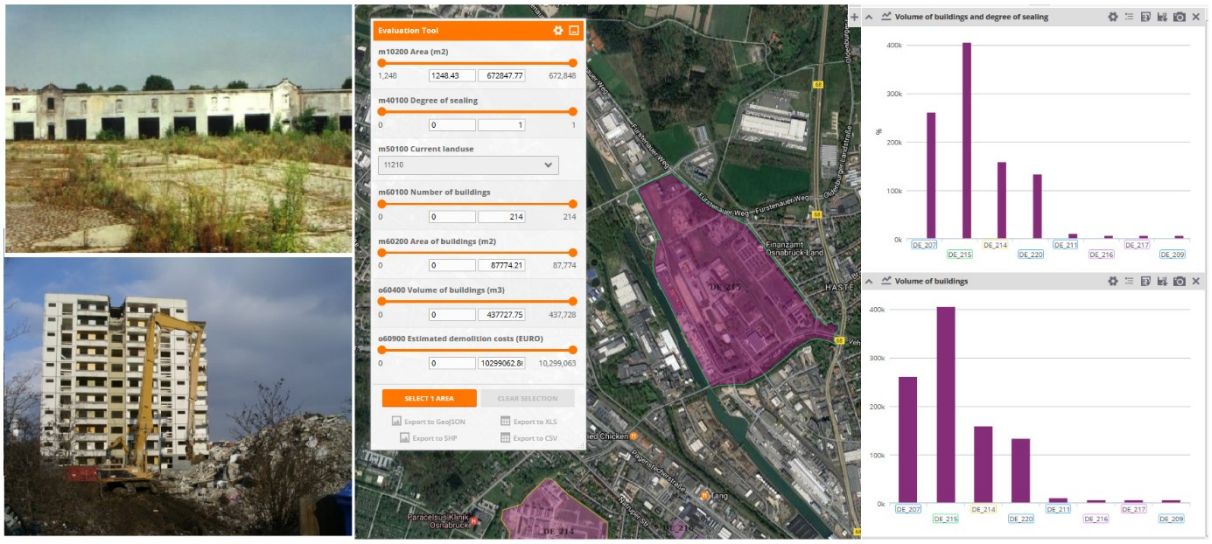


Figure 8 URBIS Solutions - Urban Renewal Cost Estimation

URBIS Solutions - Flood Risk Assessment

Context

Sustainable city planning requires hazards to be mitigated where they can be anticipated, and specifically urban structures must be managed to avoid the consequences of climate change including protection against flooding, and avoidance of development in flood risk zones. At the same time the development of green infrastructures inside and around cities, offers opportunity to deploy more resource-efficient nature based solutions, so instead of building dykes against flood events, exploitation of flood areas can be secured. Comprehension of flood risk and assessment of it's impact is therefore an essential element in decision making for the future development of the city.

Challenges / needs

URBIS Flood Risk Assessment service provides vital flood risk zone information:

- specified in relation to potential development zones;
- identifying the suitability for development and providing improved ecological services;
- permitting the optimal planning of potential development areas;
- supporting the delivery of nature based solutions.

Solutions

URBIS Solutions – Flood Risk Assessment is based on URBIS Grey Layer and URBIS Grey Layer and include following elements (Figure 9 below):

- **Production of dataset** - ***URBIS Grey Layer*** - of potential development areas (brownfields) in the city-region based on location of sites inside/outside flood zones;
- **Production of dataset** - ***URBIS Green and Open Space Layer*** – to identify non-brownfield potential development sites or green sites with potential for natural water retention within the urban envelope;
- **Delivery of advanced/specific indicators** – specifying characteristics of each site relevant for estimation of its risk of flood, based on its location in respect of flood zones defined in the city-region and other site characteristics;
- **Support of integration of local specific datasets or knowledge** – concerning local information about environmental risk zones);
- **Support of interactive thematic analysis** - focusing on assessment of flood risk for potential development sites in the city/region via the ***URBIS Integration Tool and Evaluation Tool.***

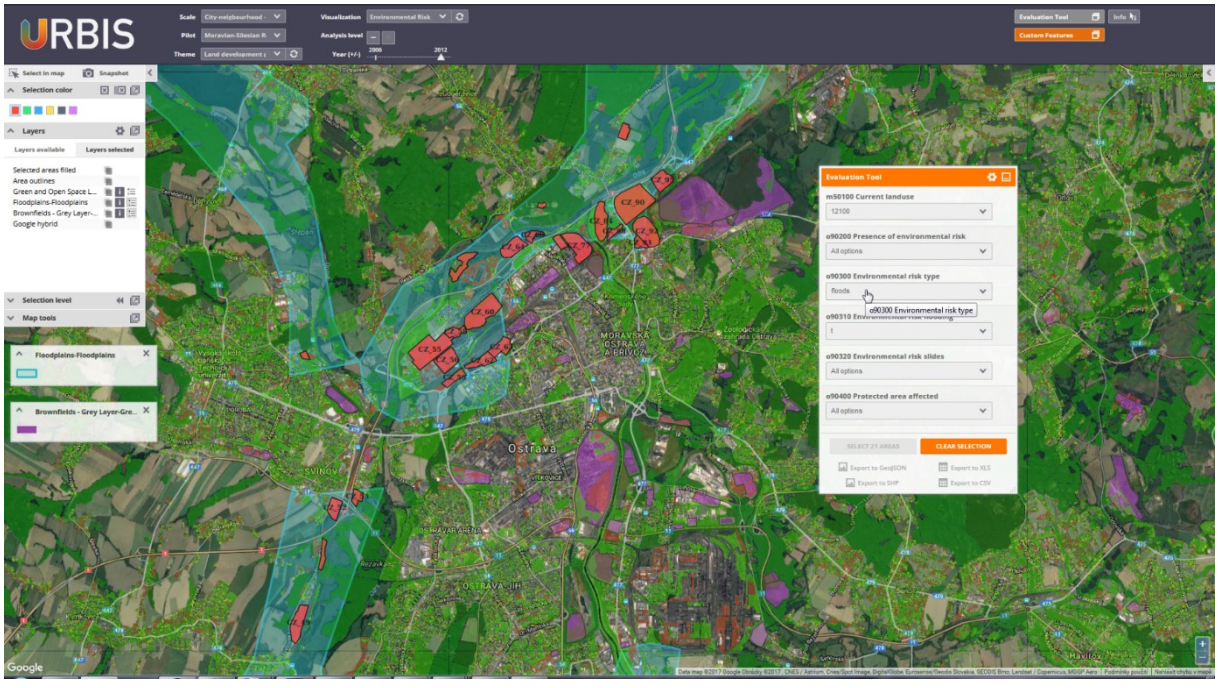


Figure 9 URBIS Solutions - Flood Risk Assessment - specifying characteristics of each site relevant for estimation of flood risk, based on location in respect of defined flood zones and other site characteristics

URBIS Solutions - Solar and Biomass Energy Potentials

Context

Meeting the goals of energy security and CO2-neutrality, require that cities create commonly agreed long-term strategies to frame the energy transition and ensure its viability and execution. Decentralised renewable energy production at city and city-region levels can be provided by a variety of sources including solar and biomass. Site potentials for the production of solar and biomass energy are typically unknown and unexplored, and consequently solar and biomass energy assessment tools offer huge potential to support the political needs for energy security, CO2-neutrality and the energy transition.

Challenges / needs

URBIS Solar and Biomass Energy assessment tools permit the evaluation of the development potentials of sites and specification of their suitability for generating renewable energy resources. Accordingly sites which are currently underused or vacant may provide ample opportunities for the production of renewable energies.

URBIS Solar and Biomass Energy assessment tools:

- support solar and biomass energy production;
- assess the energy performance of buildings;
- define energy potential according to a variety of factors including size of site, orientation, relation to the sun, and fertility of the soil. etc.

Solutions

URBIS Solutions – Solar and Biomass Energy Potentials is based on URBIS Green and Open space layer and include following elements (Figure 10 below):

- **Production of dataset** - ***URBIS Green and Open space layer*** – to identify open spaces in the city with potential for solar or biomass energy production;
- **Delivery of indicators** – specifying characteristics of each site relevant for estimation of the potential for solar or biomass energy production, including site area, location, slope, distance to transportation networks;
- **Support of integration of local specific datasets or knowledge** - information about sun exposure or soil fertility, investor and local planning indicators;
- **Support of interactive thematic analysis** - focusing on assessment of potentials for solar or biomass energy production in the city/region via the ***URBIS Integration Tool and Evaluation Tool.***

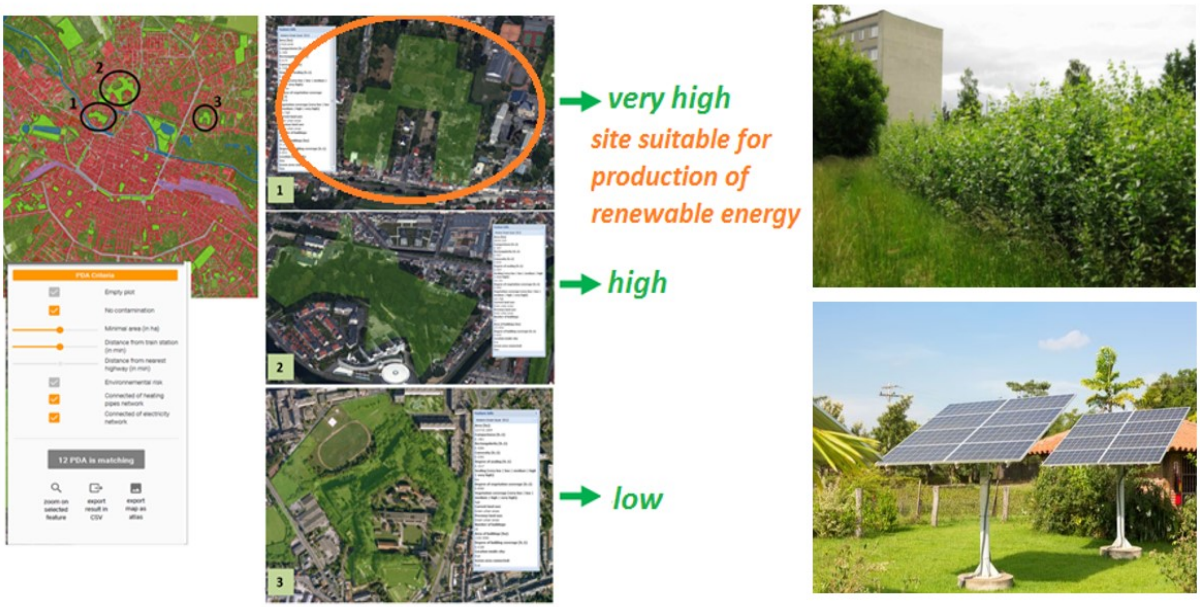


Figure 10 URBIS Solutions - Solar and Biomass Energy Potentials - estimation of the potential for solar or biomass energy production, including site area, location, slope, distance to transportation networks

URBIS Integration and Exploration Tool

Context

Effective data-driven decision making requires support the decision making processes via an easy-to-use tool flexible to choose analysis level and seamless integrating data and indicators with additional information in transparent environment. In land management domain it means embedded in the integration tool**,** intended specifically for the assessment of the (re)development potential of the site e.g. brownfield site or vacant urban site more generally. This advanced filtering functionality shall provide ability for interactive:

- Filtering of analytical units (sites) based on values of multiple criteria or indicators
- Visualization of selected units in map and charts
- Export of selected units as a GIS layer or as a table with e.g. indicator values

Challenges / needs

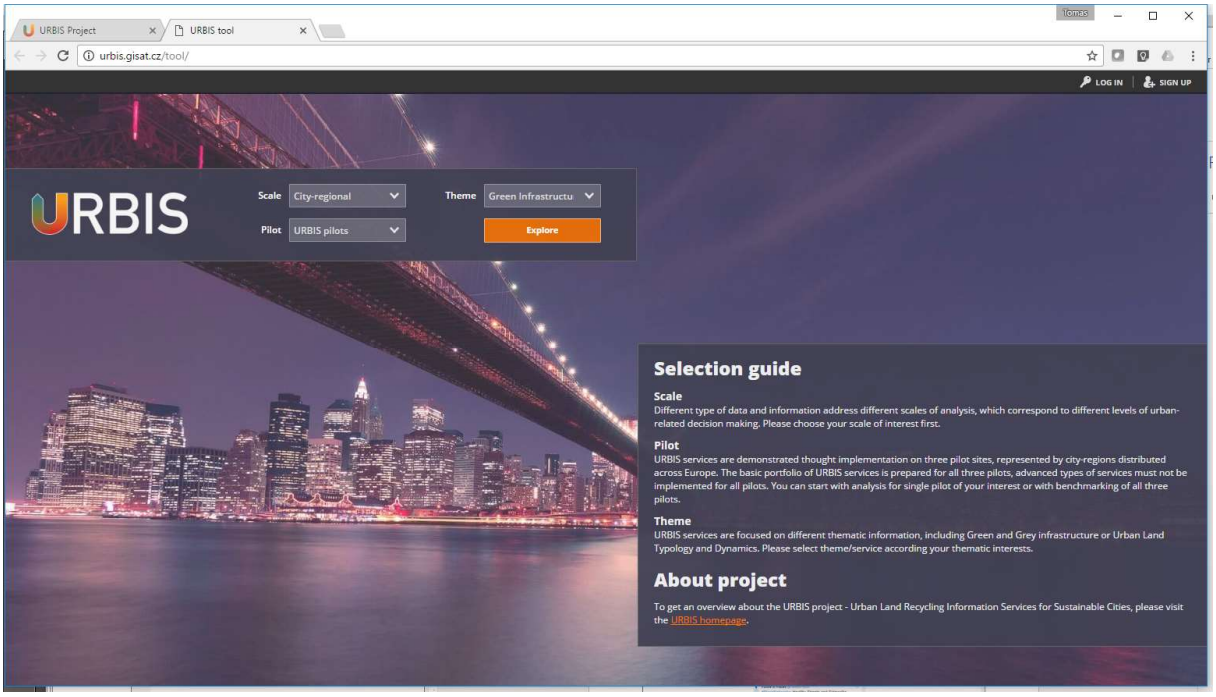
The URBIS Integration tool supports the requirement for a platform which can support interactive user driven analysis of project results and communication between the user and provider of the services. To meet this need, a web-based application has been developed, built on open source programming approaches. This URBIS Integration tool provides an environment, which supports decision making at different stages of the urban and regional planning policy development and implementation process, by providing tools for interactive multi-scale land use planning assessments of the city and the surrounding city-region.

Solution

URBIS Integration Tool enables (Figure 11 below):

- Direct access to URBIS results - visualization/presentation of URBIS products
- Setting and sharing user-defined layouts and views
- Interactive analysis of URBIS results in map window, charts and tables
- Multi-temporal analysis
- Visualization of quantities e.g. indicator values, in thematic maps (choropleths)
- Interactive selection, filtering and benchmarking of analytical units at different hierarchical levels e.g. site, sub-city district, core city area, and functional urban area.
- Exporting results and selection as graphics, tables or GIS layers
- Displaying and exporting site specific information
- Integration and visualization of users´ own spatial datasets

The tool is available online at http://data-exploration.ict-urbis.eu/tool/



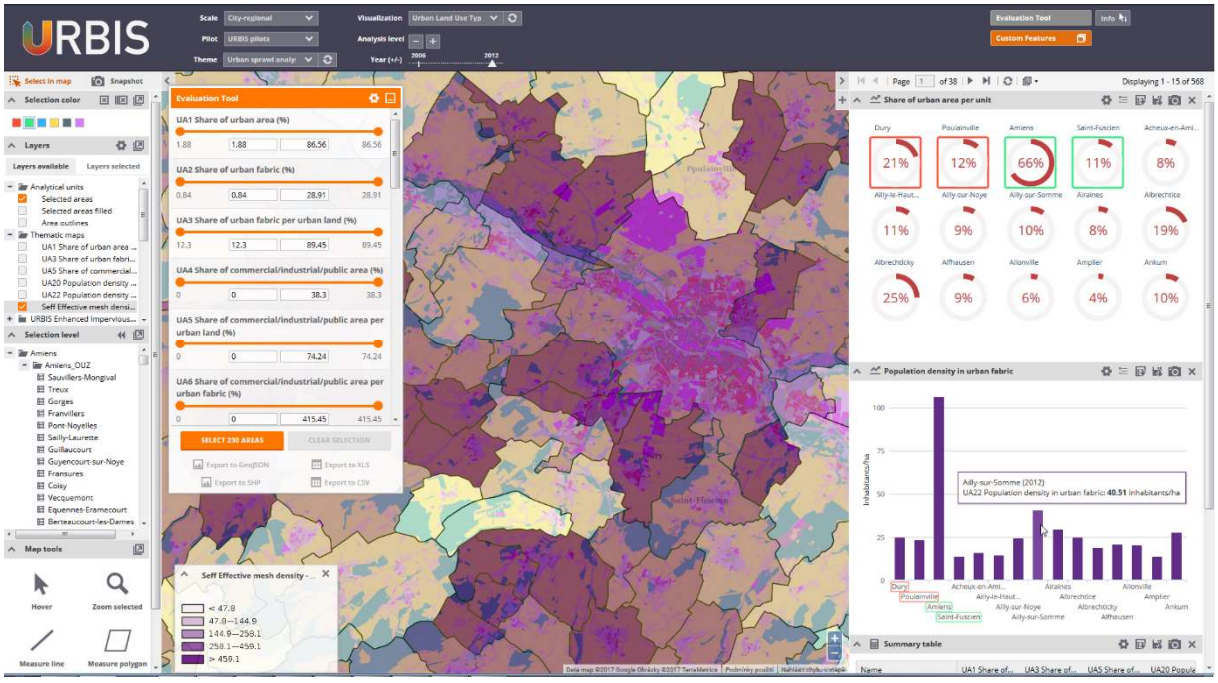
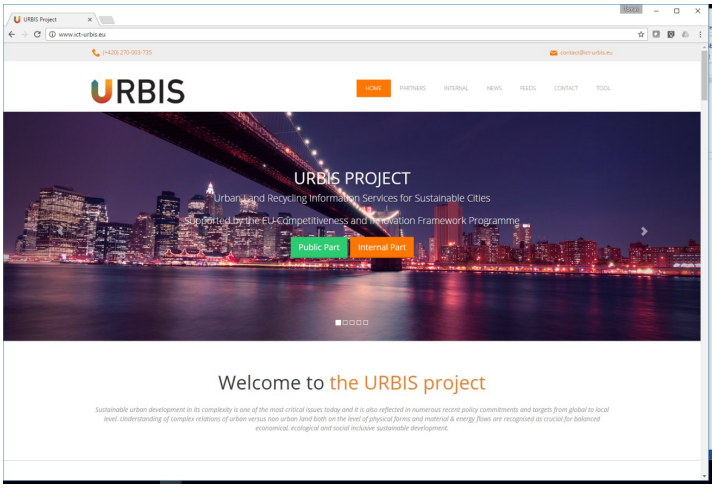


Figure 11 URBIS Integration Tool with embedded URBIS Evaluation Tool

URBIS Project Website

URBIS project website including the URBIS Integration and Evaluation tool can be accessed on http://www.ict-urbis.eu/.

The URBIS website contents include information about the project itself, objectives and the partners, all contact information and communication channels (e.g. Twitter), URBIS news section and descriptions of results – URBIS solutions. More, additional supporting materials as e.g. URBIS brochures and leaflets are available too.



URBIS website contents is currently transformed to be better suited for commercial exploitation use in the URBIS post-project period.

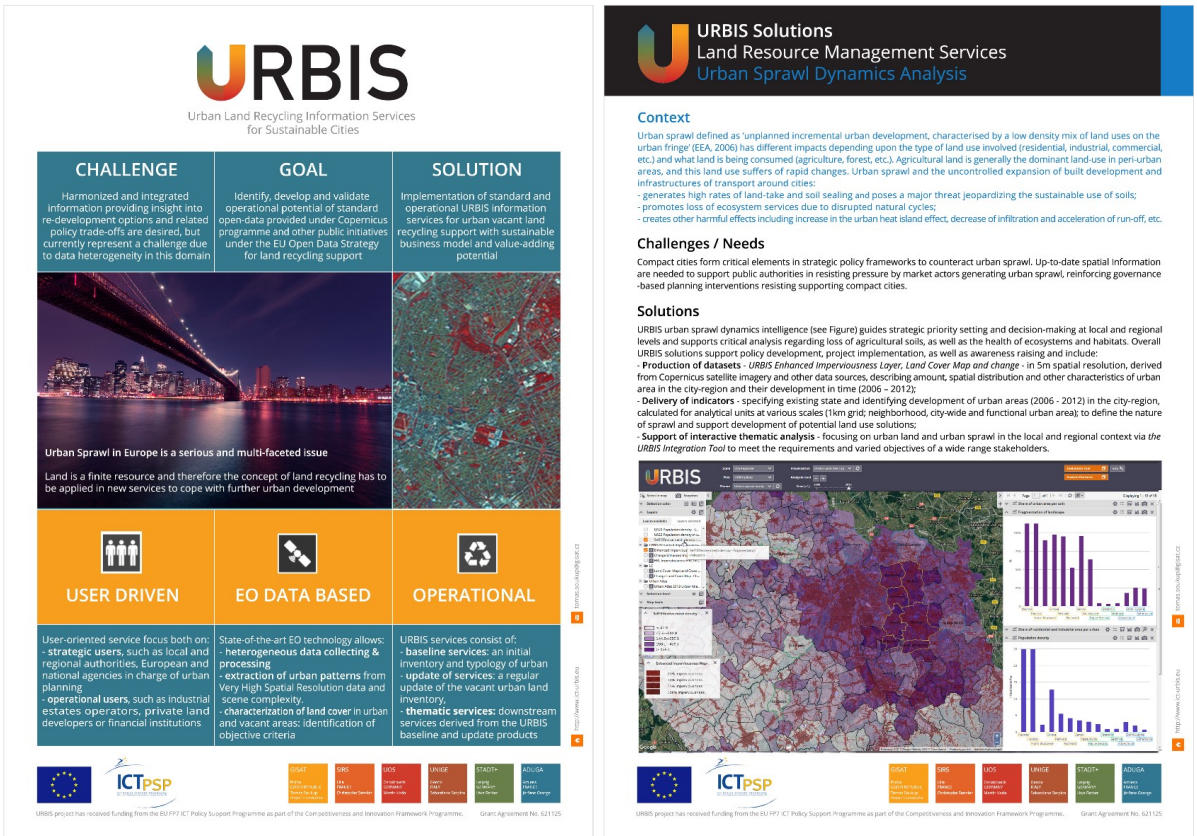


Figure 12 URBIS Project Solutions leaflets

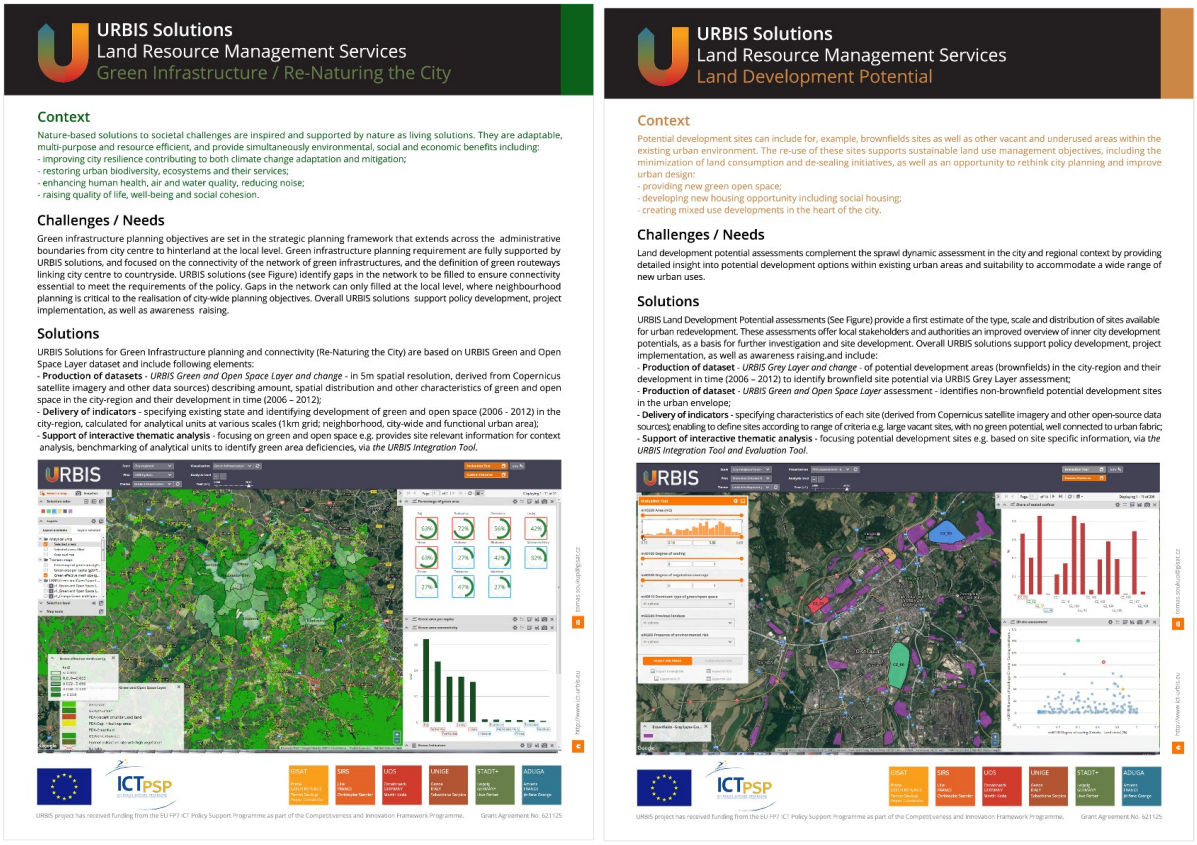


Figure 13 Example of available URBIS Project Solutions leaflets

Project impact

Internal impact

The URBIS project had significant internal impact within each of participating partner institutions. It helped to exploit the internal expertise and human capital, and initiated a mutual enrichment process that led to a well-established collaboration, willing to continue even after the end of the URBIS project. Users' requirements were identified and well documented and urban planning expertise has been combined with EO/GIS one so that the potential of source data was assessed as well as methods for the data processing developed and the resulting service feasibility evaluated. The URBIS solutions have been developed in an iterative process presenting first, intermediate and final results to urban planning practitioners represented by test pilots experts. Receiving feedback from users, and adjusting the methodology, products and outcomes accordingly provided an excellent opportunity for the URBIS partners to validate services in a real operational environment at local and regional level and thus design and implement an optimal combination of technologies to address selected land use management challenges. This would be hardly possible without the URBIS project support.

In summary, cross-domain expertize fertilization and exchange and participation of both domain and technical types of experts in the project consortium lead to a stimulation of internal innovation

potential in each partner institution and increase each partner and consoritum as a whole competitiveness and efficiency.

External impact

URBIS tools and methodologies have been developed in relation to key user requirements to maximise the effectiveness of the land use planning solutions offered. The prime challenge for urban planners in pursuing the effective governance of the cities and regions of Europe are the high degrees of complexity, interconnectedness and multiple interactions between socio-economic factors in a territorial frame, which create major barriers to the effective specification and implementation of sustainable urban development.

In response the first principle dimension of user requirement is integrated urban management which aims to address the gaps between sectoral policies, between planning and implementation processes, and between different departments across functional urban areas. Requirements include integrated assessment tools supporting simultaneous assessment at different urban scales, including neighbourhood and citywide scales, and as well as monitoring assessments across the levels of governance that permit EU level assessment of city performance on a common basis of assessment.

URBIS also responds to the second dimension of user requirement, for greater bottom-up stakeholder engagement in the urban planning and decision-making process. Such engagement provides essential inputs in respect of the diversity of opinion necessary to effectively plan the modern city, to secure the quality of integrated assessment, and to support the democratic legitimacy of the urban plan. New intelligence enhanced assessment capabilities and more effective communication procedures developed by URBIS support stakeholder engagement in the urban planning process, offering new insights into policy-making and co-production of plans.

URBIS brand therefore supports integrated and participatory specification, assessment, and delivery of urban development strategies, together with associated user requirements for specific indicators, tools and methodologies with the following characteristics:

- delivering operational level support to cities e.g. land development impact (socio-economic and environmental) assessment tools defining land development potential (PDA);
- supporting European level monitoring requirements – on a harmonised basis (Urban Atlas);
- integrating across sectoral boundaries at the city regional level e.g. transport and land use;
- integrating with the different levels of governments e.g. EU and local.

In addition, external influences grant further opportunities for rhe URBIS Solutions marketing. Sustainable development of cities and surrounding regions (which is in focus of the URBIS Solutions) is high in global agenda of SDGs implementation activities. This goes also along with the demand for Green infrastructure planning support and the requirement for decision support for regeneration of underused/vacant land such as brownfields. Overall, spatial information and services market, which is essential to support effective urban and regional planning, is growing globally. At the European and global level, there is also a demand for harmonized solutions (pan-European coverage, global comparability). Further evidence on this issue concerning the potential scale and rates of market

growth is provided by the PwC Copernicus Market Study[1]. More , availability and relevance of open data is increasing as many governments promote and provide open data. In addition, open data quality, accuracy and reliability are increasing, too. As such there is a real potential for major upscaling and replication of the URBIS Solutions offer in support of both integrated and participatory governance. Common standards and regulations like INSPIRE and their discovery service provide also easy access to further datasets. URBIS Solutions has also the potential to target this niche markets because of its flexibility.

Based on the URBIS Solutions, the business strategy has been developed for further exploitation activities within and beyond the project duration. Notably, stakeholder engagement with strategic European level as well as operational regional/local level governed by EuroCities, CEMR or JPI Urban Europe has been established. Beside, engagement with other potential users within sustainable development support domain, mainly with International Financial Institutions (IFIs), has intensified as well as coordination with the Copernicus Land Local activities. Namely, links has been explored to promote the URBIS Solutions to in the context of recent activities toward Sustainable Development Goals (SDGs) implementation and related indicators development both at national and global level. The URBIS service portfolio is now ready for spatial roll-out, change detection as well as implementation of more thematic information services. The above mentioned domains are considered as the most promising target areas for the ongoing project exploitation activities by the project partners.

[1] This Market Report summarizes the main findings from two studies, prepared by PwC for the European Commission and published in 2016: (1) The report on the Copernicus downstream sector and end user benefits, and (2) The report on the socio-economic impact of Copernicus.

Deliverables produced within the project

Following list provides overview of deliverable provided during the URBIS project duration.

Del. No.	Deliverable name	Version	WP	Nature	Dissemination level
2.1	Report on End-User Requirements	1.0	2	R	RE
2.2	Report from the First Stakeholder Board Workshop	1.5	2	R	RE
2.3	Vacant Urban Sites Typology Based on Land Use Potential Criteria	1.2	2	R	RE
2.4	Pilot Studies Documentation Report	2.1	2	R	RE
3.1	Existing vacant urban site inventory initiatives	1.5	3	R	RE
3.2	Draft of common vacant urban site inventory methodology	1.5	3	R	RE
3.3	Draft of common vacant urban site inventory methodology	1.5	3	R	RE
3.4	Best Practice Guide for URBIS Inventory	2.0	3	R	RE
4.1	URBIS Services detailed technical specifications (Baseline, Update and Thematic services)	1.1	4	R	RE
4.2	Spatial database of relevant processed data for each case studies	1.0	4	R	RE
4.3	INSPIRE compliant functionalprototype V1	1.0	4	R	RE
4.4	Updated spatial database of relevant processed data for each case studies	1.0	4	R	RE
4.5	Functional prototype V2 and INSPIRE compliance	1.0	4	R	RE
5.1	3 pilot studies operational – service operation report	1.0	5	R	PU
5.2	Report on first outcomes of the	1.0	5	R	RE

	information service implementation in each pilot site				
5.3	Report from the second stakeholder board workshop	1.2	5	R	PU
5.4	3 pilot studies operational - service operation report update	1.7	5	R	RE
5.5	Final report on the information service implementation in each pilot site	1.0	5	R	RE
5.6	Best practice guide to implement URBIS service for decision makers	1.0	5	R	PU
6.1	Project Webpage	1.0	6	O	PU
6.2	URBIS project fact sheet	1.0	6	O	PU
6.3	Dissemination Plan	2.0	6	R	PU
6.4	Dissemination activities intermediary report	1.0	6	R	RE
6.5	Draft of Business Plan	1.0	6	R	PP
6.6	Draft of Exploitation Plan	1.0	6	R	PP
6.7	Report from the third stakeholder board workshop	1.2	6	R	RE
6.8	Exploitation plan of URBIS project's results	1.5	6	R	RE
6.9	Business plan for URBIS information service provision	2.0	6	R	PP
6.10	Final report on dissemination activities	1.5	6	R	PU

Table 6 - Deliverables Table

URBIS consortium at glance

- **GISAT s.r.o. (CZ)** (Coordinator)
- Systèmes d'information à Référence Spatiale (SIRS SAS) (FR)
- Universitaet Osnabrueck (UOS) (DE)
- Universita Degli Studi Di Genova (UNIGE) (IT)
- Projektgruppe Stadt Und Entwicklung, Ferber, Graumann und Partner (Stadt+) (DE)
- Agence De Developpement Et D'urbanisme Du Grand Amienois Association (ADUGA) (FR)

Subco: David Ludlow - UWE (UK)

URBIS pilot site partners

- Moravian-Silesian Region (CZ)
- Greater Region of Amiens (FR)
- City of Osnabrück (DE)


Amiens


Ostrava


Osnabrück

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