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JRC/EXPO 2015 "Urbanisation in Europe and the World" Workshop

Abstract of invited speakers

Stamatia Halkia

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Contact information
Name: Matina Halkia
Address: Joint Research Centre, Via Enrico Fermi 2749, TP 480, 21027 Ispra (VA), Italy
Email: matina.halkia@ec.europa.eu
Tel.: +39 0332786242

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JRC/EXPO 2015
"Urbanisation in Europe and the World" Workshop

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Authors

Halkia Stamatia[1]

[1] European Commission, Joint Research Centre (JRC), Ispra, Italy

Introduction

With more than half of the global population living in cities and an expected acceleration of this trend in the next years in particular in Asia and Africa, it is vital for a range of applications to map, monitor and understand the complexity and dynamics of urban environments, in order to meet the needs for sustainable urban development. Surprisingly, until today, there are no tools that allow this globally, at a sufficient spatial resolution.

In the last years, tools and methodologies have been developing towards global and regional human settlement mapping. The resolution, geographic extent, and thematic consistency allowing planners to design and evaluate best planning practices, seems to be the technical challenge. Among the available tools, JRC's European Settlement Map, based on JRC's in-house GHSL technology, and recently published on the European Environment Agency data portal, proposes a new way to map, monitor and analyse human settlements across urban and rural continental Europe, at a sufficiently fine scale to allow territorial and regional comparative analysis. It has already been used succesfully for measuring land-use efficiency by European policy makers. https://www.youtube.com/watch?v=1rPHJ6WZt8s).

This workshop, organised after the 1st Global Human Settlement Workshop in October 2014, aims to bring together planners, from international and national practice, from academia, and policy, to discuss how new mapping tools can inform spatial planning, as well as promote best practice in territorial and regional policy making, bridging across traditional dichotomies of 'urban' and 'rural' settlements.

Thematic discussions are developed around reference data available, technologies for global settlement mapping, case studies, as well as policy themes and planning guidelines.

Technical discussions are geared towards experienced and novice users of new mapping tools for planning, while policy themes are developed to inform tool developers on what is relevant and useful in the context of international initiatives for a sustainable built environment.

What is aimed to be discussed in these three days during this workshop, is only part of what could be covered by a topic as complex and multifaceted as urbanisation. We only aim to take a vertical point of view on one aspect of urbanization, the built environment and people living in it, while examining how remote sensing technology or other emerging technologies could inform policy for urban sustainability and viceversa. This is still an emerging discourse. As we are investigating it humbly, we hope to elucidate only aspects of the challenges ahead, rather than encompass the entire process and phenomenon of urbanisation in the 21st century, about to reveal itself in unprecedented ways and surprise us all. We hope that you will get a taste of the excitement lying ahead during this workshop.

Matina Halkia
chair, JRC/EXPO 2015 Urbanisation in Europe and the World

27th May 2015: Urbanisation in Europe

When All The World's a City: Europe in an Entirely Urbanised World

Keynote speech: Michael Batty

Centre for Advanced Spatial Analysis (CASA)

University College London
(UCL) 90 Tottenham Court
Road London W1N 6TR, UK,

Email: m.batty@ucl.ac.uk; Web www.complexcity.info

By the end of this century, more than 90% of the world's population will be living in cities. By 2140, according to current projections, the entire population will be urbanised and when all the world's a city, then there will be some debate abut what a city is. We stand in fact at a threshold between a completely non-urban world and an complete urban one, with the time it has taken to make this transformation likely to be no more than 5000 years, a fraction in the history of the human species. Accompanying this transition is the fact that the total population is beginning to converge on a steady state – following a demographic transition which will mean that growth will not longer be the predominant concern but it is likely to be redistribution, migration. In this talk I will sketch the pattern of growth of cities over the last 5000 years, speculate on the future distribution of cities, and say a little about urban sprawl and the spread of cities. Entirely new forms of urban area are likely to reflect a completely urbanised world, akin to what is happening in many parts of China, for example, where the town-country is merging into vast mega cities. It is tempting to think that a world where everyone is urban will be as homogeneous as this seems to imply but we will show that this is far from the case and geographical distinctions based on culture and economy will be just as significant as they ever were. The purpose of this talk is to cement the point that although we have a good idea of some of the broader parameters of future urbanisation, in the small, we have little idea of what the urban future will look like for it will be guided by massive technical change as well as new patterns of migration which will change the urban landscape that we have know out of all recognition. I have examined some of the these speculations before and I urge readers to look at my TEDxLondon talk which is available at https://www.youtube.com/watch?v=qO0h_oSwySw

How the science of cities can help European policy makers: new analysis and perspectives

Lewis Dijkstra

Directorate General for Regional and Urban Policy

European Commission

Email: Lewis.Dijkstra@ec.europa.eu

The increasing availability of data at the urban level is rapidly changing how they can be analysed and compared. Official statistics at this level have improved, but remote sensing and big data are increasingly contributing to our understanding of how cities work. The increase of data availability and the higher resolution of this data means that the boundaries and the indicators we use become more important. This presentation will provide a number of examples of new indicators and how sensitive they are to where the city boundary is drawn. It will conclude with a critical assessment of the indicators proposed to monitor the new UN urban sustainable development goal.

Session 1: European reference data, models, indicators moderated by Lewis Dijkstra

The European Settlement Map

Matina Halkia

Joint Research Centre

European Commission

Email: Matina.Halkia@jrc.ec.europa.eu Website: http://ghslsys.jrc.ec.europa.eu

Mapping Human Settlements from Space
https://www.youtube.com/watch?v=1rPHJ6WZt8s

Recent advances in satellite image technology, has made urban analysis possible using maps generated by automatic methods. Despite the enormous computational and statistical challenges which come with bigger and more refined data, human settlement mapping by GHSL technology demonstrates its added value. In Europe, when the GHSL technology is compared with other reference datasets, the resolution improvement is striking. The representation of built, non-built and green areas in European capitals reveals differences in the urban fabric that are being observed by automatic extraction of information for the first time. Furthermore, the European Urban Atlas, the flagship project of the European Union mapping more than 300 urban zones in Europe, can benefit greatly from the refinement of residential areas by building block and different types of urban green integrated by way of the GHSL technology. Information about the location of people, become more specific when local statistics are used in conjunction with the urban fabric, further enhanced by ancillary information on land use. Finally, the availability of these data in a harmonized and consistent format, in Europe and globally, make it possible to perform regional and global comparisons between human settlements, which in many global contexts was not possible before. The European Settlement Map produced with the JRC in-house GHSL technology provides consistent, harmonized mapping of the built environment at a resolution where regional and urban analysis is possible and accessible at large.

An integrated approach of urban system and flows

Marie Cugny-Séguin

European Environment Agency

European Commission

Email: Marie.Cugny-Seguin@eea.europa.eu

Enhancing the sustainability of the Union's cities is one of the priorities objectives of the 7th Environment Action Programme 'Living well, within the limits of our planet', in particular agreeing on a set of criteria to assess the environmental performance of cities, taking into account economic, social and territorial impacts. However, cities and urban areas in Europe are very heterogeneous because they are located in different geographic situations (littoral, mountain, island, fluvial corridor, etc.), have different climate, heritage (morphology, size, age of housing, spatial segregation, etc.) and trajectory (shrinking cities, sprawl, innovation, etc.), activities (industry, tourism, etc.), urban management, population (demography, ageing), etc. For all these differences, it is impossible to take into account all the complexity of urban systems and, finally, to compare cities in general.

The European Environment Agency and European Topic Center Urban-Land–Soil are contributing to the analysis of the urban sustainability through the development of a cities' typology taking into account a large number of thematic urban domains which are considered to be relevant. The cities' typology is seen as a mean to analyze changes in a group of cities with similar characteristics. In addition, new indicators have been developed to analyze urban sprawl and green areas inside and around cities.

Regional modelling for urban planning: a tool to foster territorial cohesion in Europe

Carlo Lavalle

Joint Research Centre

European Commission

Email: Carlo Lavalle@jrc.ec.europa.eu

Territorial cohesion is included in the Constitution of the European Union to complement the Union objectives on economic and social cohesion. The need and the right for all EU citizens to access essential services, basic infrastructure and knowledge and a clean natural environment further highlight the significance of territorial cohesion.
The achievement of higher levels of cohesion of the European territory presents several challenges because of the intrinsically dual-sided nature of the policies which might have direct or indirect impacts on the territory. From one side, EU wide policies and programmes (e.g. TEN-T, CAP, ERDF/CF, etc.) respond to wider European frameworks where the continental dimension is considered. From the other, national and sub-national policies set local strategies, priorities and plans and are moreover the ultimate implementers of EU programmes. Whether or not European and local visions coincide, it is often difficult to correlate causes with observed territorial effects.

The Directorate General Joint Research Centre (DG JRC) of the European Commission (EC) is contributing to the analysis of territorial cohesion with the Land-Use-based Integrated Sustainability Assessment (LUISA) Modelling Platform, the aim of which is to provide an integrated methodology based on a set of spatial tools that can be used for assessing, monitoring and forecasting the development of urban and regional environments. LUISA allows quantitative and qualitative comparisons at pan-European level, among areas subject to transformation due to policy intervention. A further characteristic is that it adopts a methodology that simultaneously addresses the EU perspective on the one hand, and the regional / local dimension on the other. These features allow investigating and understanding territorial dynamics in a wider continental dimension while considering local and regional driving forces.
The presentation illustrates how European wide policies and investments are considered in LUISA by combining the outputs from economic and sectoral models (such as RHOMOLO, GEM-E3, TRANSTOOLS and others) with the dynamic spatial allocation of population, activities and services which consider local specificities and constrains.

On Poverty, EU2020 targets and Culture & Creativity: what do EU city level analyses reveal?

Michaela Saisana

Joint Research Centre

European Commission

Email: Michaela.Saisana@jrc.ec.europa.eu

As EU leaders look for ways to make their economies more competitive and to achieve higher levels of growth, prosperity and social progress, cities are typically identified as playing a crucial role. Today roughly 3/4 of the EU population live in urban areas and the number of city dwellers keeps rising. The Joint Research Centre (JRC) and the Directorate General for Urban and Regional Policy have been analysing progress on employment, innovation, climate change and energy, education and poverty and social exclusion through key performance indicators of the Europe 2020 strategy. Recently, the JRC research agenda has included culture and creativity because of its potential as engine for diversity, growth and jobs in Europe. This presentation sketches upon the main results from a number of JRC studies that shed light on bottlenecks faced by the EU cities and on creative and innovative initiatives put in place by cities in Europe and worldwide.

Session 2: European urban analysis and case studies moderated by Matina Halkia

Mapping urban green infrastructure in Adelaide with GHSL

Sharolyn Anderson

School of Natural and Built Environments University of South Australia Email: Sharolyn.Anderson@unisa.edu.au

!

Green Infrastructure is a widely used term that suffers from numerous inconsistent and diverse definitions. Here we use the definition established by the Green Infrastructure Project of South Australia: Green Infrastructure consists of the network of vegetation, water bodies, and ecosystems that provide multiple environmental, economic, and social values and benefits to human settlements. This includes but is not limited to parks, reserves, backyards, gardens, rivers, wetlands, bike paths, squares, plazas, cemeteries, and green roofs. Human well-being manifests from an interaction of social, human, natural and built capital. The value of the ecosystem services provided by green infrastructure in urban environments results from a spatial interaction between built and natural capital. These values are ever more recognized by health professionals, water managers, urban planners, policy makers and landscape architects around the world. Rapid growth of urban areas has the potential to produce unlivable and unhealthy cities. Human settlements should be healthy places where natural systems are valued for the critical functions and services they provide. Little research to date has produced spatially explicit characterizations of the complex nature of green infrastructure including the form and function of these networks of natural and built capital. We mapped the green infrastructure of Adelaide, South Australia using proprietary cadastral data, Landsat imagery, and census data. We present several functional surfaces of green infrastructure that characterize the following: water recreation, carbon sequestration, native bird habitat, bike paths, social events, and aesthetics. Many of these functional surfaces can be mapped and characterized with the GHSL and Landsat imagery alone for virtually any urban area of the world. This may be a significant benefit provided by the GHSL to parts of the world lacking high quality cadastral data.

Modelling urbanization processes in Europe

Filipe Batista e Silva

Joint Research Centre

European Commission

Email: filipe.batista@jrc.ec.europa.eu

The expansion of cities is often associated with environmental and social problems such as soil imperviousness, pollution, climate change, congestion, or crime. Simultaneously, as bigger cities concentrate critical mass and foster social interactions through proximity and networks, they become more efficient and productive, generating growth and innovation at faster paces than smaller cities or rural areas. Cities in Europe have expanded greatly in the last two centuries due to overall demographic growth and capacity to attract people from rural areas. However, with the forthcoming population stabilization or decline in certain parts of the continent (fifth stage of the demographic transition), urbanization trends may halt or continue depending on the relative capacity of cities to attract new migrants. Either way, the future of Europe is closely tied to the future of its urban agglomerations.

The European Commission is aware of the crucial role that cities play in the economic, social and territorial development of the European Union. Therefore, it needs analytical and modelling tools that help foresee how cities will evolve in the next decades, and assess the direct and indirect impacts of policies with spatial implications. The LUISA – Land Usebased Integrated Sustainability Assessment modelling platform – is one of such tools. It is a spatially explicit modelling platform that projects future land use and activity changes given macro drivers (social, economic, climatic) and local conditions (geography, spatial planning, neighborhood). In this oral presentation, the LUISA model will be introduced by explaining how it works and how it can be used to model urbanization processes in Europe given different scenario assumptions and land use policies. Results of a 'business-as-usual' scenario will be shown to illustrate urbanization trajectories throughout Europe until 2050.

Processes of urban regionalization in Italy:

focus on mobility practices explained through mobile phone data in the Milan urban region

Fabio Manfredini and Francesco Curci

Department of Architecture and Urban Studies

Politecnico di Milano, Italy

Email: fabio.manfredini@polimi.it

In our talk we will present main outcomes of much research carried out at the Department of Architecture and Urban Studies (DAStU), Politecnico di Milano, dealing with the analysis and the interpretation of current trends of urbanization of the Milan urban region by using different data sources.

The Milan urban region has been not only one of the most evident case of processes of metropolitan development in Italy after the second World War, but also one of the most interesting cases of regionalization/explosion of the urban during the last part of the century.

We will focus on the processes of spatial development occurred in the last decades and on the exploration of mobility practices as a relevant research issue linked with the complexity of the socio-spatial fabric and the emergence of new multiple centralities. New forms of mobility are emerging in the contemporary city and have intensified the density and typologies of movements that traditional sources are unable to describe with procedural continuity. We will demonstrate how new data sources, namely mobile phone data, can help in understanding mobility patterns, in describing and assessing urban changes and diversified uses of the city.

The role of up-to-date high resolution human settlement data in South Africa

Nale Mundau

South African National Space Agency,

South Africa

Email: nmudau@sansa.org.za

Human settlement data have become indispensable data required as input during various aspects of planning and monitoring including infrastructure development and environmental management. The advancement in remote sensing technology provides the capability to map human settlement data in detail. The use of traditional pixel based classification approach and manual digitisation using high spatial resolution imagery have proven to be time consuming and resource intensive methodologies and yield poor classification accuracy for for human settlement data extraction.

This presentation proposes an object-based approach to extract human settlement data from high resolution imagery to support developmental projects. The proposed methodology will be tested at areas with different housing structures and landscape to evaluate its robustness towards development of a national human settlement layer. SPOT 6 satellite images were used in this study. Both multispectral and panchromatic images were used for this investigation. The images were orthorectified and a 1.5m spatial resolution pan-sharpened imagery was created. The classification algorithms were developed using radiometric values and shape properties of the segmented image objects. The radiometric values were mainly used to separate built up areas and non-transformed areas. Shape variables were used to separate building structures from other built-up areas. The results show the location of building structures .The results can be used to study urbanisation and to support development projects. The accuracy of the results is yet to be assessed.

A statistical representation of urban population and its evolution

David Levy

National Institute of Statistics and Economic Studies

France

Email: David.Levy@insee.fr

A way to represent urban population, with 3 parts :

- the first part speaks about evolution, we have produced movies which present the location of urban population for about 200 years (spatial smoothed density) ;
- the 2nd part could be a presentation of our recent work on the new EUropean degree of urbanisation (DEGURBA) classification with french data. We have completed this classification and I think this can interest other contries ;
- In the third part I could present how to mesure the accessibility to services (as school, doctor...) in an urban territory. We have developped a tool in this way.

28th May 2015: Global urbanisation today

Keynote speech: Mark Montgomery

Stony Brook University, USA
and

Population Council, New York, USA

Email: mmontgomery@popcouncil.org

In the foreseeable future, as the world's total population continues to grow, the overwhelming majority of that growth will take place in the cities and towns of low- and middle-income countries. Many of these countries have already passed the half-way point in terms of urban percentages, and most of those remaining will make the transition in the next 20 years. As was the case in Europe and north America not so long ago, the passage of poor countries to their urban futures will occur in fits and starts, accompanied by the inevitable mistakes in policies and investments, but the process of urbanization is both inexorable and over the long term, a necessary accompaniment to the process of sustainable development.

Some of the features of today's astonishing urban transformation are routinely mis-understood by researchers and policy-makers alike. Outside the lowest-fertility countries (e.g., China), urban population growth owes more to natural increase than to in-migration. Migrants are often imagined to be flooding into peri-urban areas; but the evidence (such as it is) fails to confirm this impression. Migrants are also commonly asserted to be streaming into slums--but again, surprisingly little quantitative evidence supports this assertion. And the notion that urban poor are mainly slum-dwellers can itself be challenged: in India, for example, one analysis shows that far less than a majority of the urban poor live in slums. On-the-ground socioeconomic studies will be needed to complement and properly frame the measures of housing quality that can be derived from remote-sensing methods, so that the concentrations of poor housing as glimpsed from space are not taken uncritically to identify the locations of all ``urban poor''.

In contemplating the changes that are underway, researchers and policy-makers have arguably over-concentrated attention on the largest urban settlements in poor countries---the so-called ``mega-cities''---and given too little attention to the myriad of small and intermediate-sized settlements in which a far greater proportion of urban dwellers live. As a rule, these smaller places exhibit lower levels of average income than the large cities and have lower levels of public service delivery (electricity, water supply and sanitation). Where their governments are concerned, smaller cities and towns are overseen by local governments that are generally under-staffed, under-resourced, and which are often woefully lacking in the access to data on their constituents that are needed to look ahead and plan effectively for future population growth and spatial expansion. In marked contrast to local governments in Europe and north America, the local governments of poor countries are seldom supplied with the spatially detailed socioeconomic data from population censuses they need to base their actions upon evidence.

The new land-cover data that we are discussing in the workshop therefore have great potential not only for the scientific understanding of the spatial aspects of the urban transformation, but also (when combined with other data) for urban governance. In particular, these new data help to pinpoint where settlements are growing in regions subject to climate hazards and other extreme-event risks. The

data are even detailed enough to suggest where rural populations live, enabling distinctions to be drawn between rural villages connected to nearby cities via networks of roads and markets, and villages that are isolated from these urban centers of potential economic growth. With time, one hopes, these new data will enable our field to supplant the out-dated simplistic rural/urban binary classifications with more nuanced and graduated measures of connectedness that should better inform policy.

Session 1: Tools and methods for global urban analysis moderated by Ellen Hamilton

Landsat GHSL: global mapping of settlements

Martino Pesaresi

Joint Research Centre

European Commission

Email: Martino.Pesaresi@jrc.ec.europa.eu Website: http://ghslsys.jrc.ec.europa.eu

Mapping Human Settlements from Space
https://www.youtube.com/watch?v=1rPHJ6WZt8s

Presentation of the concept behind the Global Human Settlement Layer (GHSL) project and the preliminary results from the processing of the global Landsat data records from the past 40 years. Sharing of the data inside the GEO Global Human Settlement Working Group (GHS WG), supporting the SB-04 task. Continuity of the GHSL 2016+ trough Sentinel data processing.

The methods and the data presented here are developed in the frame of the Global Human Settlement Layer (GHSL) project supported by the European Commission, Joint Research Center (JRC). Because of the institutional mandate of the project, the core scope of the human settlement (HS) theme discussed here is to support the global security and crisis management (GSCM) applications domains with global, fine scale information. In these applications, physical characteristics of the HS - as number of buildings, their surface, and their typology (size, high) and spatial patterns - are important information supporting decisions with large social and economic impact. This information typically supports activities as damage and reconstruction assessment, impact assessment, disaster early warning and alerting, losses estimates, exposure and risk mapping and post-disaster need assessment (PDNA), just to mention a few.

To date, the expanded user list of the HS information includes population spatial modeling, census planning, regional development and planning, transport planning, urban and global climate modeling, spatial epidemics analysis, ecological studies, environmental protection, agricultural fragmentation studies, and historical landscape protection. As in the GSCM applications, their geographical scope may include national, regional/continental, and global coverages as well. The GHSL input satellite data processed so far (April 2015) is organized in four epochs: 1975, 1990, 2000, 2014 processed from global Landsat data archives. The GHSL is made by open and free input data and will be available as open and free information facilitating the sharing and the standardization of the information between different scientific and user communities. The GHSL information production process is

automatic, open and reproducible, contributing to the scientific control and validation of the human settlement measurements.

The basic components of the GHSL are built-up areas and population. The GHSL built-up areas of the different epochs are made by satellite sensors at 75, 30, and 15 meters of spatial resolution with different multispectral and panchromatic spectral characteristics, standardized to a seamless 30-m-resolution global information product. Open and free population data will be used for production of ~300-m resolution population density grids matching the GHSL epochs. The GHSL is the finest scale globally-complete representation of the human settlements available today as open and free data and is the unique consistent attempt to represent the global dynamic of human settlement. Yearly update of the GHSL built-up areas will be available after 2016 by automatic processing of a continuous stream of open and free Sentinel data at 5-m and 10-m of spatial resolution!with active radar and passive multispectral optical sensors, respectively.

With the support of the Group on Earth Observations (GEO), a new Global Human Settlement Working Group (GHS WG) was launched at the first Global Human Settlement Workshop hosted by the European Commission, Joint Research Centre, on 21-22 October 2014. http://www.earthobservations.org/ghs.php The GHS WG is committed to develop a new generation of measurements and information products assessing new scientific evidences about global human settlement, supporting global policy processes with agreed, actionable and goal-driven metrics. IN particular, the UN Third Conference on Housing and Sustainable Urban Development (Habitat III, 2016), the concurrent post-2015 processes on sustainable development, the UN Framework Convention on Climate change, and the Hyogo framework for disaster risk reduction. The GHSL data is freely shared among the partners of the GHS WG for pre-release testing activities. The official release of GHSL will be done at the Habitat III conference in October 2016. To date, the GHSL is actively used and tested in more than 40 research teams in the World Bank, United Nations agencies and programs, and internationally established academy.

Remote Sensing and Spatial Indicators for Detecting Urban Trajectories

Maik Netzband

University of Bochum

Germany

Email: maik.netzband@rub.de

Satellite data and further geo-information data are used for landscape ecological evaluations, e.g. to predict structural diversity in landscape, to derive quantitative data on open space fragmentation and on interlink of biotope structures. Satellite images are just as much used to identify compensational areas for planning of building land in conurbations or to quantify landscape metrics by means of derived medium and high resolution satellite parameters in order to calculate neighbourhood relations of objects. Within the last two decades landscape structure indices or metrics have been implemented on remote sensing image data for different mapping scales.

Nature, in particular in the suburban cultural landscape is described regarding indicators such as structure (line or planar expansion, cutting, island areas, etc.), dynamics (entry of the modification processes) and texture (neighbourhood relations to other land use forms). This is based on the identification and computation of static and dynamic indicators that help providing a synthetic assessment of suburban landscapes. The indicators will also allow the comparison of the environment's condition in different conurbations. A methodological approach is presented applied to different parts of Europe in growing as well as shrinking urban regions, after which monitoring and evaluation of a landscape diversity in suburban landscapes are feasible on the basis of medium and high resolution satellite data.

Towards an urban taxonomy: characterizing cities and urban development modes from space

Eleanor Stokes

Yale University, USA

Email: eleanor.stokes@yale.edu

Co-authored by: Miguel O Roman, NASA Goddard Space Flight Center, Greenbelt, MD, United States,

and Karen C Seto, Yale University, New Haven, CT, United States

Currently, the world is in the midst of the largest global demographic transition in history. In the last 50 years, global urban populations have increased by 3 billion, and an additional 2.5 billion urban residents are expected by 2050. Considering urban areas already account for 6776% of global energy consumption, 71-76% of global greenhouse gas emissions, and 80% of the global GDP, urbanization will lock-in development modes, life-styles, and travel behaviors with long-lasting implications for urban sustainability, socioeconomic equality, and climate change.

Critical to predicting the impact of urbanization on global emissions and urban equity, is to understand how urban population increases are being accommodated in the built environment. What types of cities are being built? How are their forms, structures, and growth patterns different? Some urban areas have primarily expanded in extent, creating low-density expansive built infrastructure at the perimeter of existing cities and along connection corridors. In other cities, infilling and increases in building heights have densified existing urban cores. In this talk, we discuss the availability of detailed spatial data for describing urban settlements, and enabling standardized cross-comparisons across cities. We present recent analyses characterizing urban areas and urban growth using Landsat, SeaWinds, Suomi-NPP VIIRS, and DMSP-OLS sensors, revealing nuances in the urbanization processes shaping the built environment, and the drivers of energy demand, energy and infrastructure access, and emissions between cities.

EO4Urban: Preliminary Results on Sentinel-A SAR Data for Global Urban Services

Yifang Ban

KTH Royal Institute of Technology,Sweden

Email: yifang@kth.se

With more than half of the world population now living in cities, and 2.5 billion more people expected to move into cities by 2050, urban areas pose significant challenges on the environment. Although only a small percentage of global land cover, urban areas significantly alter climate, biogeochemistry, and hydrology at local, regional, and global scales. Thus, accurate and timely information on urban land cover and their changing patterns is of critical importance to support sustainable urban development.

EO4Urban is a new project within the ESA DUE INNOVATOR III program. The overall objective of this research is to evaluate multi temporal Sentinel-1A SAR and Sentinel-2A MSI data for global urban services using innovative methods and algorithms, namely KTHPavia Urban Extractor, a robust algorithm for urban extent extraction and KTH-SEG, a novel object-based classification method for detailed urban land cover mapping. Ten cities around the world in different geographical and environmental conditions are selected as study areas. Sentinel-1A SAR and Sentinel-2A optical data will be acquired during vegetation season in 2015 and 2016. Historical ENVISAT ASAR and ERS-1/2 SAR data will be selected from the archives for monitoring of urban development.

Single-date Sentinel-1 SAR data over Milan, Italy, Nanchang, China, Jakarta, Indonesia and Mexico City, Mexico were acquired for the research. Multitemporal SAR data over these cities and other cities will be processed as soon as more Sentinel-1A SAR data become available. The preliminary urban extraction results showed that urban areas and small towns could be well extracted using a single-date Sentinel-1A SAR data with the KTH-Pavia urban extractor. It is expected that the results will be further improved using multitemporal Sentinel1A SAR data.

This research and development is expected to produce a pilot global urban services demonstrator using multitemporal Sentinel-1A SAR and Sentinel-2A MSI data. The project will contribute to i). better understanding of the urban products and services that the end users require; ii). development of novel and robust methods and algorithms for improved urban services to planners to support smart and sustainable urban development; ; iii). better understanding of the capacity of Sentinel-1A SAR and Sentinel-2A optical data for detailed urban land cover mapping and urbanisation monitoring; iv). the goals and activities of GEO SB-04 Global Urban Observation and Information Task and GEO SB-02 Global Land Cover Task.

Session 2: Population data for spatial planning Moderated by Richard Sliuzas and Daniele Ehrlich

Gridded Population World version 4

Greg Yetman

Geospatial Applications Division

CIESIN, Columbia University, USA

Email: gyetman@ciesin.columbia.edu

The newest version of Gridded Population of the World (GPW) integrates over 14 million census boundaries and population estimates to create global surfaces of population counts and other variables, including age and sex breakdowns, over a twenty year period. Based on a simple proportional allocation model, the data are appropriate for use as independent variables with biophysical data. Further work is being undertaken to refine the spatial distribution of GPW using the relationship of population distribution to physical parameters (emitted light) and land cover classifications. Work is also proceeding on using GPW as an input with other data to provide a consistent definition of urban extents.

Monitoring Global Urban Expansion

Alejandro Blei

New York University, USA

Email: alex.m.blei@gmail.com

Monitoring Global Urban Expansion is a multi-phase research initiative that seeks to gain better understanding of urban expansion the world over by monitoring it in the entire universe of 4,000+ cities, and by collecting and analyzing evidence on the quantity of land required for urban expansion, on its physical organization and its affordability, and on the forces affecting it in a stratified global sample of 200 of these cities.

Phase I is the *Atlas of Urban Expansion* which contains maps of the areal extent of all sample cities at three time periods: 1990, 2000, and circa 2010, and which contains accompanying metrics for their populations, the density of their built up areas, the fragmentation of their built up areas and their areal compactness. Phase II is *The Quality of Urban Layouts* and contains measures of the share of land in streets and boulevards, the share of residential land that is laid out before houses are built, average size of city blocks, typical plot sizes, and access to arterial roads. Phase III(a) is a telephone and internet survey of the regulatory regime governing land and housing development in expansion areas, focusing both on 'laws on the books' as well as the application of these laws in practice. Finally, Phase III(b) is a telephone and internet survey of housing affordability to find out whether land and housing in the expansion areas of cities are affordable to the majority of urban households.

The WorldPop project: High resolution population mapping for low income countries countries using satellite-derived human settlement data

Andrew J Tatem

University of Southampton, UK

Email: A.J.Tatem@soton.ac.uk

High resolution, contemporary data on human population distributions are a prerequisite for the accurate measurement of the impacts of population growth, for monitoring changes and for planning interventions. While a wealth of data on these factors are now available for high income regions of the world, there still remain many gaps in low income regions, with data on urbanization, population distributions and population mobility often outdated, coarse resolution or lacking. The WorldPop project (www.worldpop.org) works together with national health ministries, statistical offices and international agencies to fill these gaps and produce high resolution contemporary estimates of population distributions and demographics through the integration of satellite, census, survey and other spatial data. In this presentation, Dr Tatem will focus on recent results of quantitatively testing the mapping accuracy improvements possible through incorporating the Global Human Settlement Layer and Global Urban Footprint into WorldPop modelling across a range of low income country settings.

Urban Change and Well-being: GHSL applications with survey and census data

Deborah Balk and Bryan Jones

City University of New York, USA

Email: deborah.balk@baruch.cuny.edu, bryan.jones@baruch.cuny.edu

Urbanization will arguably be the most significant demographic trend of the 21st century, particularly in fast-growing regions of the developing world. Characterizing urbanization in a spatial context, however, is a difficult task given only the moderate resolution data provided by traditional sources of demographic data (i.e., censuses and surveys). Using the case studies of Ho Chi Minh City, Dhaka, and Jakarta we demonstrate how new satellite data products and new analysis of existing satellite data, when combined with new applications of census and survey microdata, can reveal more about cities and urbanization in combination than either data type can by itself.

We overlay demographic/census micro-data and remotely sensed data to address two questions; (1) how well do satellite derived measures of urban intensity correlate with demographic measures, and (2) how well are temporal changes in the data correlated. Using spatial regression techniques, we then estimate statistical relationships between the remotely sensed and demographic data and test the ability of each to predict the other. We use two very different types of satellite derived products - the new built-up area data from the Global Human Settlement Layer of the JRC, and the Dense Sample Method (DSM) analysis of the NASA scatterometer data and – which respectively proxy for impervious surface-type changes (horizontal expansion) and increases in building heights (vertical expansion). Demographic data come from national censuses and/or georeferenced survey data from the Demographic & Health Survey Program (DHS). These different satellite-derived data products help us to better understand the evolution of the built environment and urban form, while the underlying demographic data provide information regarding composition of urban population change. Combining these types of data yields important, high resolution spatial information that provides a more accurate understanding of urban processes.

Session 3: Spatial Planning Guidelines

Moderated by Gora Mboup

(Informal) urban expansion: anticipation and preparation

Tikvah, Breimer

Institute for Housing and Urban Development Studies (IHS)

Rotterdam, the Netherlands

Email: t.breimer@ihs.nl

Efficient use of land is a complex part of the debate on sustainable urban development, which currently is mostly determined by the dominant paradigm of containment (i.e. Jenks & Burgess 2000). Containment programmes can be recognized by the presence of policies that are explicitly designed to limit the development of land outside a defined urban area ("antisprawl"), while encouraging infill development and redevelopment inside the urban area (Nelson 2004 in Angel 2012). As such, containment is enshrined in land use planning in many countries.

However, expansion beyond city boundaries need not necessarily be problematic in itself, as all depends on which urban area we are looking at. In fact, strict containment may be producing inequitable cities altogether, whilst still unable to stop damage to the environment. Theoretically, imposing a rigid city boundary is anti-poor when land prices soar because the supply of land is artificially fixed in a context of growing demand for access to land (Angel 2012). In reality, when faced with such pressures, local government is altogether unable to protect surrounding areas from informal land markets, and informality starts beyond the administrative city boundary anyway (Angel 2012, Allen et al. 2006). The pressing question for local government becomes: does containment make sense?

The alternative paradigm brought forward is that, in countries where most urban growth is now taking place, a more realistic strategy would be at least minimal preparation to permit and structure expansion of urban areas – rather than to contain them (Angel et al. 2011).

It is in the Peri-Urban Interface (PUI) that the new slums of tomorrow arise. Here we witness the highest speed of urbanization, often in margins of the law and planning, high profitability and therefore very *proactive* actors. Nevertheless, witnessing an unprecedented acceleration of the urbanization process since the 1980s/1990s, the by far most common policy approach of governments in low- and middle income countries has been that of "muddling through"[2]. Sadly, the PUI also suffered from years of negligence by researchers (Allen et al. 2006, Adell 1999). Consequently, local governments face a huge challenge in terms of adequate, up to date data.

In the context of ongoing research, anticipation refers to 'the question how urbanization that is still forthcoming in PUI can be anticipated through analysing the curre spatial structures/patterns and land market dynamics, and trying to predict the direction of this

[2] After Durrand-Lasserve 1997, in Berner 2001, p. 296.

urban expansion. Thereby the real challenge is perhaps *not* so much monitoring but to understand the markets, actions and negotiations that are taking place here and intervene into these dynamics' (Breimer 2014). Special attention is paid to "pirate urbanization" (after Abramo 2007); the phenomenon of *residential* parts of the city which in their origin have informal selling of the land. *How* to analyse geo-spatial imagery is part of ongoing exploratory and interdisciplinary research. Such research must move away from rural-urban dichotomies, recognizing that the PUI does not exist in isolation, but is embedded in metropolitan and regional rural-urban systems.

Spatial planning guidelines: a professional association's viewpoint

Pietro Elisei

International Society of City and Regional Planners, ISOCARP Email: pietro.elisei@urbasofia.eu

Contemporary urban planning is called to face different and complex challenges. Cities are booming in countries with emerging economies, while are shrinking in Europe and other countries with more mature economies. On a side, it is evident and pressing the demand for the creation of urban dimension, on the other, there is the need to reinvent a post industrial economy that is less space consuming, but even less dependent on existing productive infrastructures and facilities. In between these extremes, there is a relevant grey zone of economy in transitions. Normative planning tools very often, independently on context, are not capable to manage the urban transformations. There is the need in present urbanism to focus more on the way of designing participatory planning processes capable to set up shared, coherent, sustainable and effective solutions. Enlarged decision making, pragmatic contextualization of innovative technologies and a re - conceptualization of the role of public space can help professionals to find answers to the many and pressing challenges daily breeding in the urban realms.

International guidelines on urban and territorial planning

Remy Sietchiping

UN Habitat

Email: Remy.Sietchiping@unhabitat.org

Our contribution will cover the International Guidelines on Urban and Territorial Planning, Global urbanization process (with reference to Sustainable Development Goals and Habitat III), urban-rural linkages including in the context of food security, or any other related topics aligned with the interest of both UN-Habitat and the Milan Expo 2015.

Key Elements for Sustainable Urban Policy in the UNECE Region

Gulnara Roll

UNECE, Housing and Land Management Committee

Email: Gulnara.Roll@unece.org

The UNECE Committee Housing and Land Management is the only intergovernmental body, which joins high-level government officials from 56 UNECE member States who cooperate on and exchange experiences and best practices on housing, urban development and land management. The Committee adopted in 2013 its Strategy for Sustainable Housing and Land Management in the UNECE Region and in 2014 agreed on the Geneva UN Charter on Sustainable Housing. These two high-level political documents promote an integrated approach to planning and building sustainable cities and human settlements in the UNECE region and principles of compact, smart, efficient, low-carbon and inclusive cities. The Committee also develops studies and guidelines, including those on urban planning; national and regional capacity building events are organised in the region.

The Committee is currently the preparation of a Regional Report for HABITAT III Conference which will provide input to the development of the Regional and Global Urban Agenda to be adopted by the HABITAT III Conference.

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