Next generation SMART CITIES: The role of Geomatics

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Abstract
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For the first time in human history, more than half of the global population lives in urban areas. This will increase to 70% by 2050. Urban growth is most rapid in the developing world, where cities gain an average of 5 million residents every month. As cities grow in size and population, harmony among the spatial, social and environmental aspects of a city and between their inhabitants becomes of paramount importance. This harmony depends on several cornerstones: sustainability, wealth and justice.
Will in future massive megalopolises spread across the globe? Theoretically: yes, there is no limit to the size of cities. But in practice the growth of most urban centers is bound by an inability to manage their size. Large urban centers are highly complex, demanding environments that require a long planning horizon and extraordinary managerial skills.

Since a number of years the issue of **'Smart' Cities** is being used both as buzzword and technical term to indicate the urgent need of change in the development and management of cities. Very often the 6-axes model is used in order to describe Smart Cities. Smartness then includes the areas **economy**, **mobility**, **environment**, **people**, **living**, **governance.** With this concept smart cities need investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure. They must support sustainable economic development, a high quality of life, with a wise management of natural resources, through participatory governance.
In this context the **Spatial intelligence of cities** plays an important role. It refers to informational and cognitive processes, such as information collection and processing, real-time alert, forecasting, learning, collective intelligence, distributed problem solving, which characterize "intelligent" or "smart" cities. Emphasis on the "spatial" dimension denotes that space and agglomeration are preconditions and basis of this form of intelligence. This includes the combined deployment and use of ICTs, institutions for knowledge and innovation, and physical infrastructures of cities to increase the problem-solving capability of a community.
Here is the point where **Geomatics technologies and know-how** become crucial elements in developing such concepts and maintaining them over long periods of time. Geomatics is here understood as the unity of Geodesy, Surveying, Photogrammetry/Remote Sensing, SIS, Simulation/Visualization/Cartography.
Geomatics methods and products are relevant for generating, processing and maintaining GPS/IMU observations, DSMs/DTMs, 3D/4D city models, Mobile Mapping systems, imagery: satellite, aerial, terrestrial (street views), maps, plans, historic data, road and traffic data, LBS, "smart" apps, sensors in WEB 2.0, GIS/SIS, visualizations, simulations, animations.
This presentation, after a brief definition of the smart city concept, will demonstrate and analyze to what extent Geomatics technologies can contribute to the realization and advancements of smart cities. As example and test-bed we will use the currently active SEC-FCL project (**S**ingapore/**E**TH **C**enter for Global Environmental Sustainability - **F**uture **C**ities **L**aboratory. This project has 9 research streams (modules): Urban Sociology, Low Exergy, Landscape & Ecology, Digital Fabrication, Transforming and Mining Urban Stocks, Territorial Organization, Mobility and Transportation Infrastructure, Urban Design Strategies, and Simulation Platform. The Simulation Platform is the place where geomatics and other data for all the other modules are being generated, analyzed and simulated. A new installation, the Value Asia Lab, serves as interface for interactive visualizations and simulations.
In conclusion, geospatial techniques and geomatics technologies, in combination with other engineering subjects and social and natural sciences, play an indispensable role in the development of future smart cities. It is up to the scientific, development and professional communities to make good use of these opportunities.