CONTRIBUTIONS TOWARDS SUSTAINABLE CITIES: URBAN MONITORING AND DESIGNING TOOLS

Ph. Bouillard[1,2]*, A. Athanassiadis[2], F. Paolini[2,3], S. Koutra[2], A. Galan Gonzalez[2,4], A. Z. Khan[2]

1) School of Engineering, Nazarbayev University, Astana, Kazakhstan; *philippe.bouillard@nu.edu.kz ; 2) Universite Libre de Bruxelles, BATir Dept., Brussels, Belgium; 3) La Sapienza, Civil, Building and Environmental Engineering Dept. (DICEA), Roma, Italy; 4) Escuela Tecnica Superior de Arquitectura de Madrid (ETSAM), Madrid, Spain

Introduction. The 21st century is the century of cities and urbanization [1]. We live in an increasingly urbanized world where it is projected that by 2050 over 70% of our population will live in cities. The city of the twenty-first century faces major challenges, including social and economic, excessive or even wasteful consumption of resources, transportation congestion, and environmental degradation. In order to address to these critical challenges, an urban renaissance should be founded on principles of sustainable design, economic strength, environmental responsibility, good governance and social well-being [2]. In the current and future research, three elements will be investigated: (i) understanding the consumption and functioning of cities through multi-scalar monitoring systems (ii) improving the air quality and reducing the carbon footprint of cities (iii) and the design of optimal green transportation systems.

Monitoring. This research wishes to investigate the complex functioning of urban systems regarding direct and indirect resource requirements due to their resulting environmental impact. The originality of this work lies in its context-specific and scale-sensitive approach which is achieved by combining a metabolism-based or top-down approach (Urban Metabolism) and a consumption-based or bottom-up approach (Input-Output Analysis). In addition, a correlation of these resource use indicators with local factors (socio-economic and territorial organization) will allow understanding the drivers of resource consumption and forecasting future scenarios.

Air quality and carbon footprint. The sources of pollution in cities are mainly linked to urban activities but are strongly connected to climate change. Integrated approaches, considering both environment and climate change, are needed to find long-term sustainable solutions. Advanced tools for the assessment, monitoring, modelling with innovative technological options and strategies to improve air quality and reduce the carbon footprint of urban areas are investigated.

Sustainable Transportation. Finally, the cities also have major concerns for transport. The city, in theory, allows mass public transport systems to be built, but this is reliant on the shape and form of the urban area. Transport has been essential in the development of the society. Modern lifestyles and the economic growth of the last decades have relied extensively on the fact that transport enables people and goods to move fast, long distances and at affordable prices. However, all these new impacts for modern cities becoming increasingly associated with impacts on the environment and lead us to talk about the need for "sustainable mobility" [3].

Acknowledgments. Financial support by the F.N.R.S. (Belgian Research Foundation) and InnovIris (Brussels Research and Innovation Institute) is greatly acknowledged.

References.

1. T. Kotter, "Risks and Opportunities of Urbanisation and Megacities", FIG Working Week, Athens, Greece (2004).
2. Urban Task Force, "Towards an Urban Renaissance", Final Report, Routeledge, London (1999).
3. M. Givoni, D. Banister (Eds), "Moving towards low carbon mobility", Cheltenham, UK (2013).