Foreword to the Special Issue on Urban Remote Sensing for Smarter Cities

URBAN growth models predict rapid increases in extent and populations all over the world. It is anticipated that over two-thirds of the population will live in cities by 2050 [item 1) in the Appendix]. The fastest growing cities in the world are in the developing countries where the infrastructure growth has not been matching the urban growth thereby creating a range of socio-economic issues [item 2) in the Appendix]. In developed countries, urban monitoring mainly consists in tracking more subtle changes and densification within cities. In both cases, poorly planned urbanization can lead to greater risks to the quality of life and thereby significant economic risks.

Remote Sensing can play a big role in efficient urban planning by provide a wide range of tools in line with the emerging paradigm of "Smart City." The concept of smart cities is aimed at improving the quality of life of the urban citizens, by promoting timely infrastructure development, protecting and enhancing green areas, promoting energy efficiency, reducing pollution, improving thermal comfort, etc., [item 4) in the Appendix]. It participates in the implementation of several of the 17 Sustainable Development Goals, listed by the United Nations in the UN 2030 Agenda.

This special issue which follows the biennial Joint Urban Remote Sensing Event (JURSE) held in Dubai, United Arab Emirates, in March 2017 was aptly titled "Urban Remote Sensing for Smarter Cities." The special issue reflects the current status of the rapid urban growth and application of remote sensing to address these challenges. This foreword summarizes the content of the special issue with an overview of the new research directions that are being covered.

The special issue consists of 15 papers covering a wide range of topics providing a glimpse of the state of the art in the fields of urban mapping and analysis using data from diverse sources. The papers cover following thematic areas:

1) Classification and object detection.
2) Change detection.
3) Disaster response.
4) Urban climate.
5) Socio-economic analysis.

There is a good mix of papers focusing on novel methodologies and recent applications. The emerging topics such as deep learning and urban energy modeling are well represented along with novel applications such as usage of night time light images from the international space station. The special issue has a significant focus on urban climate modeling, with papers presenting different aspects, such as urban heat islands, local climate zones, urban energy models, and thermal flows. While these papers significantly rely on thermal infrared images, it is clear that other data modalities such as LIDAR are extensively used in the models. The trend of fusion of multiple data sources is validated following the previous special issue [item 5) in the Appendix]. As in the previous special issues [items 5)–7) in the Appendix], there is significant ongoing work on the methods to efficiently utilize the rich spatial information in very high-resolution images from satellites and unmanned aerial vehicles. At the same time, the usage of medium and low-resolution images, both from optical and radar instruments, is still pertinent especially in relation to mapping urban extent. The special issue also addresses the aspects of time series analysis for monitoring using change detection and for updating maps. The Sentinel 1 and 2 sensors are now fully operational and will play an active part in the monitoring and understanding of the dynamics of urban systems.

Eventually, the upscaling issue is addressed in several papers. This is now of utter importance so as to better understand current trends at the scale of a country and between various areas around the world.

We sincerely hope that the special issue caters to your interests and inspires new approaches and applications, which are much needed to constantly address the emerging challenges of the rapid urban growth and its effects on the global populations. The JURSE conference will continue to encourage knowledge dissemination and foster productive research outcomes. We are looking forward to the 2019 edition in Vannes, France.

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APPENDIX
RELATED WORK

1) United Nations, World Urbanization Prospects: The 2014 Revision, 2015.
2) UN-HABITAT, World Cities Report 2016. Urbanization and Development: Emerging Futures. 2016. [Online]. Available: http://wcr.unhabitat.org/main-report/. Accessed on: Jul. 25, 2018.
3) J. E. Patino, and J. C. Duque, "A review of regional science applications of satellite remote sensing in urban settings," *Comput., Environ. Urban Syst.*, vol. 37, pp. 1–17, 2013.
4) P. Verducci and U. Desideri, Architecture, urban design, energetic systems. Design of eco-sustainable industrial parks with very low environmental impact, reduced use of water and energy resources and optimized waste management. Perugia, Italy: Morlacchi Editore, 2012.
5) D. Tuia, P. Gamba, C. Juergens, and D. Maktav, "Foreword to the special issue on urban remote sensing," *IEEE J. Sel. Topics Appl. Earth Observ. in Remote Ses.*, vol. 9, no. 5, pp. 1763–1766, May 2016.
6) P. Gamba, U. Stilla, C. Juergens, and D. Maktav, "Foreword to the special issue on human settlements monitoring using multiple Earth observation data," *IEEE J. Sel. Topics Appl. Earth Observ. in Remote Ses.*, vol. 5, no. 4, pp. 1071–1075, Aug. 2012.
7) C. Almeida, P. Gamba, C. Juergens, D. Maktav, and B. Salmon, "Foreword to the special issue on human settlement observation and monitoring from space," *IEEE J. Sel. Topics Appl. Earth Observ. in Remote Ses.*, vol. 7, no. 10, pp. 3995–3997, Oct. 2014.

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