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Urban morphological determinants of temperature regulating ecosystem services in African cities: the case of Dar es Salaam, Tanzania

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Urban green structure provides important regulating ecosystem services, such as temperature and flood regulation, and thus, has the potential to increase the resilience of African cities to climate change. Green structures within urban areas are not only limited to discrete units associated with recreational parks, agricultural areas and open spaces: they also exist within zones which have other primary functions, such as church yards, along transport routes, and within residential areas. Differing characteristics of urban areas can be conceptualised and subsequently mapped through the idea of urban morphology types. Urban morphology types are classifications which combine facets of urban form and function. When mapped, UMT units provide biophysically relevant meso-scale geographical zones which can be used as the basis for understanding climate-related impacts and adaptations. For example, they support the assessment of urban temperature patterns and the temperature regulating services provided by urban green structures.

There are some examples of the use of UMTs for assessing regulating ecosystem services in European cities but little similar knowledge is available in an African context. This paper outlines the concept of urban morphology types (UMTs) and how they were applied to African case study cities (Cavan et al., 2012). It then presents the methods used to understand temperature regulating ecosystem services across an example African case study city, including (i) a GIS-based assessment of urban green structures, and (ii) applying an energy balance model to estimate current and future surface temperatures under climate change projections. The assessment is carried out for Dar es Salaam, Tanzania. Existing evidence suggests increases in both mean and extreme temperatures in the city. Historical analysis of the number of hot days per year suggests a rise from a maximum of 47 days per year in the period 1961-87 to 72 days per year in 2003-2011 (Giugni et al., 2012). Mean temperatures in the climate zone are estimated to increase by at least 1°C between 1971-2000 and 2021-2050(CSIR, 2012).

Dar es Salaam is represented using around 1700 UMT units mapped across 43 UMT categories for the year 2008. Modelled surface temperature profiles for the city are presented, including an assessment of the potential impact of changing green structure cover within selected UMT categories. Provisional recommendations are made concerning the potential contribution of green structures as a climate adaptation response to the increasing temperatures in Dar es Salaam, which could be relevant for other African cities in similar climate zones.

References

Cavan, G., Lindley, S., Yeshitela, K., Nebebe, A., Woldegerima, T., Shemdoe, R., Kibassa, D., Pauleit, S., Renner, R., Printz, A., Buchta, K., Coly, A., Sall, F., Ndour, N. M., Ouédraogo, Y., Samari, B. S., Sankara, B. T., Feumba, R. A., Ngapgue, J. N., Ngoumo, M. T., Tsalefac, M., Tonye, E. (2012) CLUVA deliverable D2.7 Green infrastructure maps for selected case studies and a report with an urban green infrastructure mapping methodology adapted to African cities. http://www.cluva.eu/deliverables/CLUVA_D2.7.pdf. Accessed 18/12/12.

CSIR (2012) CLUVA deliverable D1.5 Regional climate change simulations available for the selected areas http://www.cluva.eu/deliverables/CLUVA_D1.5.pdf. Accessed 8/1/13.

Giugni, M., Adamo, P., Capuano, P., De Paola, F., Di Ruocco, A., Giordano, S., Iavazzo, P., Sellerino, M., Terracciano, S., Topa, M. E. (2012) CLUVA deliverable D.1.2 Hazard scenarios for test cities using available data. http://www.cluva.eu/deliverables/CLUVA_D1.2.pdf. Accessed 8/1/13