

# **Ecosystem services provision and landscape urbanization degrees. Spatial assessment in upper Silesia, central Europe**

Luis Inostroza<sup>ab</sup>

<sup>a</sup> *Institute of Geography, Ruhr Universität Bochum, Germany, [inostroza@technotope.org](mailto:inostroza@technotope.org)*

<sup>b</sup> *Universidad Autónoma de Chile, Chile*

## **Abstract**

Landscapes are providers of fundamental ecosystem services (ES) which are crucial for society, such as supplying commodities, regulation, providing aesthetics and recreation. However under a process of landscape urbanization potential provision of ES will eventually shrink. Landscape urbanization is a complex spatial process which takes place in areas usually far beyond urban cores, making it difficult to quantify. Those areas are providers of fundamental ecosystem services, which are vital for urban sustainability. Yet, there is no evidence on the spatial variability of the relationship between ES and landscape urbanization. To explore these relationships a spatial analysis was carried out in Upper Silesia, central Europe. The aim is to explore specific measures and indicators for advancing the use of ES in landscape planning. Technomass indicator was used to assess the levels of landscape urbanization. In a second step the potential provision of ES was assessed on a land cover based method. To ascertain the spatial variability between urbanization levels and ES provision across the landscape a geographically weighted regression model was developed. Results show a statistically significant variability across the landscape for several ES, showing that this relationship is not constant. Such assessments are vital for advancing in the use of ES framework in landscape planning.

## **Key words**

Poland, Czech Republic; technomass; geographically weighted regression

Ahern, J., Cilliers, S. and Niemelä, J., 2014. The concept of ecosystem services in adaptive urban planning and design: A framework for supporting innovation. *Landscape and Urban Planning*, 125, pp.254-259.

Cadenasso, M.L., Pickett, S.T. and Schwarz, K., 2007. Spatial heterogeneity in urban ecosystems: reconceptualizing land cover and a framework for classification. *Frontiers in Ecology and the Environment*, 5(2), pp.80-88.

Eigenbrod, F., Bell, V.A., Davies, H.N., Heinemeyer, A., Armsworth, P.R. and Gaston, K.J., 2011. The impact of projected increases in urbanization on ecosystem services. *Proceedings of the Royal Society of London B: Biological Sciences*, p.rspb20102754.

Gómez-Baggethun, E., Gren, Å., Barton, D.N., Langemeyer, J., McPhearson, T., O'Farrell, P., Andersson, E., Hamstead, Z. and Kremer, P., 2013. Urban ecosystem services. In *Urbanization, biodiversity and ecosystem services: Challenges and opportunities* (pp. 175-251). Springer Netherlands.

Gómez-Baggethun, E. and Barton, D.N., 2013. Classifying and valuing ecosystem services for urban planning. *Ecological Economics*, 86, pp.235-245.

Kareiva, P., Watts, S., McDonald, R. and Boucher, T., 2007. Domesticated nature: shaping landscapes and ecosystems for human welfare. *Science*, 316(5833), pp.1866-1869.

Marcus, L. and Pont, M.B., Towards a social - ecological urban morphology: integrating urban form and landscape ecology.

Plieninger, T., Draux, H., Fagerholm, N., Bieling, C., Bürgi, M., Kizos, T., Kuemmerle, T., Primdahl, J. and Verburg, P.H., 2016. The driving forces of landscape change in Europe: A systematic review of the evidence. *Land Use Policy*, 57, pp.204-214.

Raudsepp-Hearne, C., Peterson, G.D. and Bennett, E.M., 2010. Ecosystem service bundles for analyzing tradeoffs in diverse landscapes. *Proceedings of the National Academy of Sciences*, 107(11), pp.5242-5247.

Troy, A. and Wilson, M.A., 2006. Mapping ecosystem services: practical challenges and opportunities in linking GIS and value transfer. *Ecological economics*, 60(2), pp.435-449.