UNISCAPE En-Route International Seminar
Recovering river landscape
UNISCAPE Napoli
University of Naples Federico II
Napoli, Italy
28-30 September 2015

BLUE-GREEN INFRASTRUCTURE TO INCREASE RESILIENCE: CASE STUDIES FROM SOUTHERN ITALY URBAN BASINS

Viviana Pappalardo[1], Daniele La Rosa[2], Francesco Martinico[3]
University of Catania, Department Civil Engineering and Architecture;
1 pappalardoviviana@gmail.com, 2 dlarosa@darc.unict.it, 3 fmartinico2@gmail.com

Traccia b: Resilent spaces of river fruition
Keywords: Sustainable urban drainage systems, blue-green infrastructure, urban resilience

Abstract

Human settlements and activities in river basins have historically developed through the relation between water and natural drainage systems. Frequently this relation have been solved in the transformation of lands with consequent impacts on habitats, natural water balance and safety issues. Urban settlements that spread indifferently over these landscapes are now facing the challenge of re-balancing the impacts of their presence in fluvial areas.

Soil sealing as results of urban and infrastructure development is becoming factor of concern for the increase of risk level in urban contexts. It is one of the main reasons for the modifications of natural hydrological processes and recurring failures of urban drainage systems during heavy rainfall events.

Resilience is the capacity of a system to cope with and recover from the shocks caused by extreme events while retaining the same functions, structures, feedbacks, and identity (1). Contemporary research on urban systems looks at resilience as a framework able to produce policies and projects that better integrate water and flood risk management in urban planning. Resilient urban planning and design make cities more capable of responding to sudden perturbations, adapting to long-term future changes and achieving higher level of sustainability over time.

Strategies for flood management planning in urban systems include control of runoff volumes, increasing of drainage systems' capacity, spatial planning and building regulations (2). In particular, blue-green infrastructure are identified as sustainable measures for flood risk management and technologies to compensate future urban developments. They are increasingly recognized ways to operationalize the concept of resilience to urban floods and incorporate it into urban planning and water sensitive urban design (3). While traditional infrastructure for stormwater management (pipes, channels, other artificial drainage components) are designed to be effective but monofunctional, blue-green adaptation measures make use of natural processes and produce significant other benefits to urban and natural environments (4).

This paper is about *Sustainable Urban Drainage Systems* (SUDS) as urban components of blue-green infrastructure and discusses their role in increasing the resilience capacity of the urban system. Among the variety of ecosystem services provided by blue-green infrastructure, this study focuses on a selection of services, namely the regulating ecosystem services (water flow regulation and runoff mitigation), that are considered accountable for the increasing of resilience capacity of urban systems.

In particular, the study assesses the impact of urban development changes during the last decades by mapping the variation of run-off coefficients and comparing the flow rates at different return periods. This is done for an urban basin within the municipality of Avola, south Italy, characterized by medium-high density urban fabric. Furthermore, examples of possible green infrastructure design (5) are proposed, according to site-specific variables such as geo-physical features, urban morphologies, land uses, indicators representative of the resilience capacity.

References

(1) Walker,B., Holling, C.,S., Carpenter, R.S., Kinzig, A., 2004, *Resilience, adaptability and transformability in social–ecological systems*, Ecology and Society 9 (2): 5.

(2) Goubersville P., 2012, *Urban flooding and Resilience: concepts and needs*. Geophysical Research Abstracts Vol. 14, EGU2012-14282

(3) Balsells,M., Barroca, B., Amdal J.R., Diab, Y., Becue, V., Serre,D., 2013, *Analysing urban resilience through alternative stormwater management options*. Water Science & tecnology, 68:2448

(4) Voskamp, I.M., Van de Ven, F.H.M., 2014, *Planning support system for climate adaptation:Composing effective sets of blue-green measures to reduce urban vulnerability to extreme weather events*. Building and Environment, http://dx.doi.org/10.1016/jbuildenv.2014.07.018

(5) Privitera, R., Pappalardo, V., La Rosa, D., Barbarossa, L., 2014, *Infrastrutture verdi per il drenaggio delle acque meteoriche nel progetto della città resiliente*. Urbanistica Informazioni 257:145-149