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Ecohydrology and Nature Based Solutions for sustainable management of cities and adaptation to climate change

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Sustainable development is based on three capitals – economic, social, and environmental. The latter one is usually still most undermined in strategies and actions related to urban environment:

- Grey infrastructure being for centuries a core of city fabrics, characterizes with limited adaptability and responds to environmental challenges only up to the level foreseen by designers.
- Conventional approaches, based on over-engineering and command-and-control approaches is however no more sufficient in managing risks related to global changes: climate uncertainty, inhabitants population dynamics, social expectations and aspirations and economic/resources realms.
- Urbanisation leading to overall increase of impermeable area and degradation of city greenery and semi-natural suburban zones, leading to degradation of biodiversity, disturbance of water cycle, urban heat balance, results in deterioration of people health and well-being. Finally, all those contribute to high costs of cities operation and maintenance, and handicaps societal processes.
- Our predictability capacities for the ecological systems behaviour decrease with progressing pressures – which is well visible in cities.

Under these challenges, building cities resilience by restoring the regulatory functions and other ecosystem services provided by natural capital, should be priority for cities management. Integrating blue-green infrastructure and nature based solutions into city planning, can improve its adaptability and self-regulatory potential of ecosystems, emerging from feedbacks between vegetation and water cycle. The strength of this interaction in cities depends however both on water availability and condition of vegetation (diversity and local and spatial structure, including its connectivity within the city and with the cities surroundings). On the other hand, the level of stress on the water and greenery system in cities is so high, that such approach needs special concepts and approaches to succeed.

This paper will refer to two concepts related to blue-green infrastructure operation in cities. It will refer to the concept of ecohydrology from the perspective of the UNESCO IHP, which in 1997 adopted this approach by using ecosystem properties as management tool is one of pillars of sustainable water management, also in cities. It will also refer to a new-born concept of Nature Based Solutions, applied in order to improve the performance of the natural system in cities, and provide benefits in the context of the ecological, societal and economic challenges. Examples of implementation of ecohydrological measures and NBS from EU project implemented in Poland will be presented.