Technical and Technological Solutions
11 December 2020

Ecohydrology for the sustainable urban water management
Maciej Zalewski, Paweł Jarosiewicz, Tomasz Jurczak
Distribution of the global Mega-Cities and intensive urban areas

Ecological footprint: 1,7

Source: NASA
Global perspective on water cycle

- Evaporation from the vegetation and soils from terrestrial ecosystems can be a very important source of precipitation for other areas.
- Global water demand continues to grow at a ratio of 1% per year (UN WWDR 2020).

Climate projections indicate that extreme precipitation, floods, droughts and heatwaves events will become more intense and frequent in many regions.
Drying catchment in the face of Climate Change

UNESCO
Ecohydrology
Danube Demosite
(Janauer 2010)
Necessity of paradigm shift for SDGs

SOCIO-CENTRIC AND MECHANISTIC – biosphere degradation

Paradigm shift

EVOLUTIONARY AND ECOSYSTEMIC – enhancement of WBSRCE

Zalewski et al. 2020
ECOHYDROLOGY

WATER CYCLE QUANTIFICATION AND RISK ASSESSMENT

ECOSYSTEM DISTRIBUTION AND ECOLOGICAL PROCESSES IDENTIFICATION
Pristine vs. Novel

NATURE-BASED SOLUTIONS AND SYSTEMIC SOLUTIONS

Mathematical modeling of N,P pollution

Distribution of Wastewater Treatment Plants

Zalewski, 2000; 2008; 2011; 2015
Intelligent Ecosystem concept

Oscillation at an intermediate range

Smart design forest

Exploitation clear-cutting

Natural forest

Forest sustainability potential (%)

Time (yr)

Nature Geoscience

Homogenization of the terrestrial water cycle

(Levia, Zalewski et al. 2020)
Ecohydrological multidimensional goal – WBSRC
Water, Biodiversity, ecosystem Services, Resilience, Culture, Education
Challenges and threats to the city development – Łódź case study

The effect of urban development on the heath island

Concentration of a benzopiren


URBAN FLOOD
Ecohydrological enhancement of sustainability potential (WBSRCE) of upper Bzura river catchment (Łódź) - LIFE08 ENV/PL/000517

Total project budget: 1,244,319 €
Before project implementation and during construction phase

**IV. 2012**

**VI. 2013**

**ECOHYDROLOGICAL HYBRID SYSTEM**
for purification of stormwater from intensively used recreation area

**Jurczak, Zalewski**

**TSS-3.4 mg/l**

**TSS-165.0 mg/l**
Ecohydrological Nature-Based Solutions

2007
2019
12 years

Bed regeneration system

Geochemical barrier - dolomite

Reduction of TSS in the SSBS
Innovation development: efficient phosphorous and other pollutants adsorbents for geochemical barrier
EH technologies for circular economy - closing the cycles with enforced NBS

Innovation Voucher under the Polish Agency for Enterprise Development for the development and optimisation of the BioKer (budget approx. 100,000 Euro)
The Best of the Best LIFE Project 2016-17

EH-REK

LIFE08 ENV/PL/000517 - Arturówek (Łódź) as a model approach to rehabilitation of urban reservoirs (2010-2015)

www.arturowek.pl

from right:
Mr Karmenu Vella - EC Commissioner,
Professor Maciej Zalewski - coordinator,
Dr Tomasz Jurczak - vice-coordinator
Holistic urban planning based on Ecohydrology – conclusions and way forward

Conclusions:

1. Cities should become a key actors in the global impact reduction and climate adaptation

2. This can be achieved through the development of international network where information, knowledge and innovations are shared.

3. City of Future should be a synergistic system supporting high quality of life, health, culture and education.
Online Pre-Conference
WATER, MEGACITIES AND GLOBAL CHANGE
7 – 11 December 2020

Thank you for your attention!

Maciej Zalewski, Paweł Jarosiewicz
maciej.zalewski@biol.uni.lodz.pl
pawel.jarosiewicz@biol.uni.lodz.pl