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Danijela Milanović,
Borislava Blagojević,
Ljiljana Vasilevska

Nature based stormwater management solutions for housing area – Case study of roof garden implementation

Универзитет у Нишу
ГРАЂЕВИНСКО АРХИТЕКТОНСКИ ФАКУЛТЕТ
University of NIŠ
FACULTY OF CIVIL ENGINEERING AND ARCHITECTURE

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Introduction

Planning, design, maintenance strategies - Nature Based Solutions (NBS/NbS);

Integrated Stormwater Management specific approaches – SUDS, WSUD etc.

Roof garden = green roof = vegetated roof;

Multiple benefits from rooftop gardens documented;

The research aim: **to assess site-specific public benefits related to roof runoff for hypothetic roof garden implementation in the study area**.

Material and methods

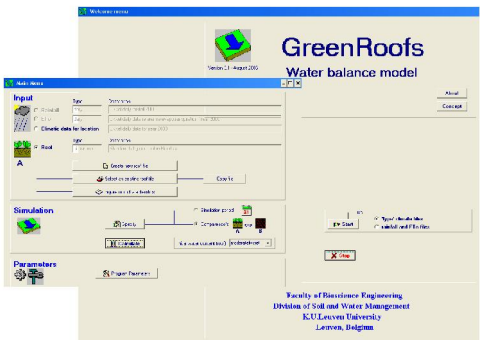

Study area

- 'Krive livade', City of Niš, Serbia, a typical large housing estate from the 1970s;
- Urban pattern: repetition of group of buildings + generously dimensioned public open spaces
- Why this neighbourhood?
  - Intensive transformations from the 1990s;
  - Similarity of features;
  - Simulation replicability potential;
  - A compact group of buildings;
  - Frequent pluvial flooding;
  - Closeness of MS Niš.

Material and methods

Methods

- Daily water balance model 'The GreenRoof model' (Raes et al., 2006)



Meteorological data
- A 'normal' year 1997 (*Psum*=591.1 mm);
- *Pdaily* (RHMSS,-);
- Monthly *ET0* (Gocić&Trajković, 2010, 2014).

Roof characteristics
- Flat roof, pitched roof – as it was/is
- Green roof – Manufacturesr specification (Optigruen, 2021).

Program parameters
- The substrate standard depth for flat RG = 7cm
- Standard correction for fully exposed roofs

Simulation
- Period: 01.01.-31.12.
- The initial water content on the roof - moderately wet conditions

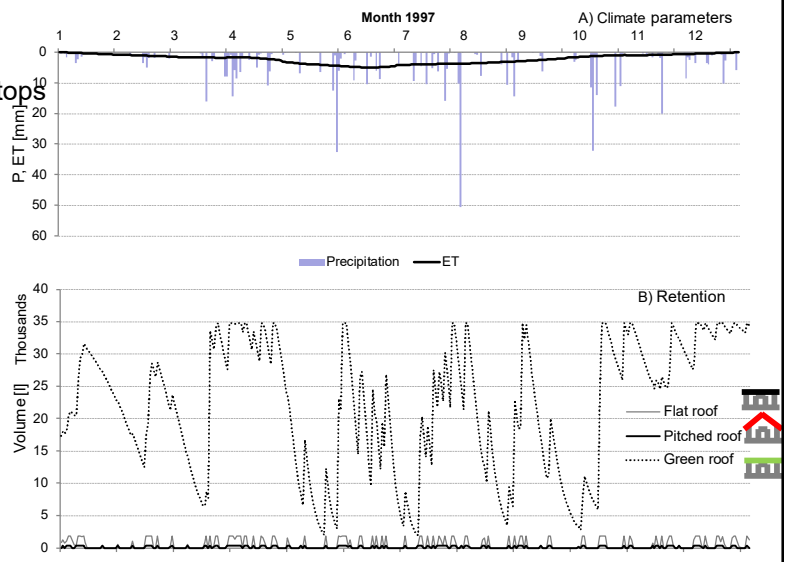
Results and discussion

The response from three studied rooftops

Rainfall – retention

Rainfall – runoff

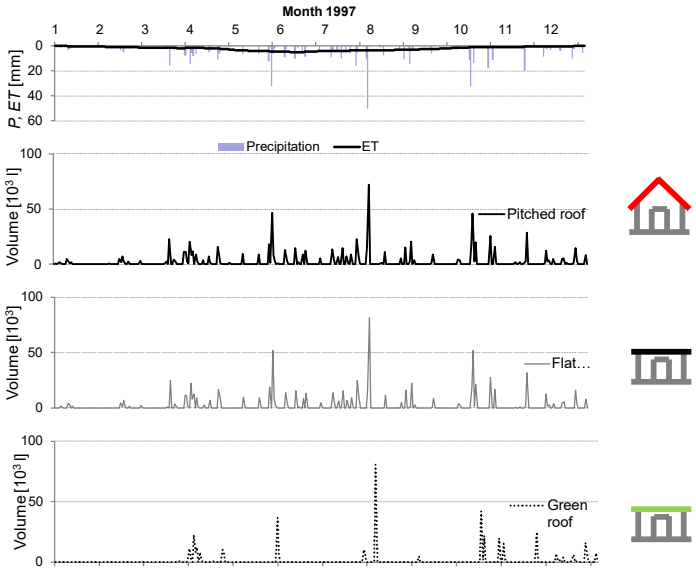
Roof efficiency indicators



Results and discussion

The response from three studied rooftops

Rainfall – runoff



Results and discussion

The response from three studied rooftops

Roof efficiency indicators in the year 1997.

Roof efficiency indicator			
Min. precipitation triggering runoff [mm]	0.3	2.2	1.2
Max. number of days without runoff	17	83	32
Max daily runoff volume [$l \cdot 10^3$]	72.0	80.5	81.7
Runoff coefficient	0.95	0.43	0.82

Conclusion

Public benefit from roof garden implementation:
1.Lessening stress from the combined wastewater system;
2.Lowering risk of pluvial flooding;
3.Quantification of benefits through cost estimate of roof runoff volume sanitation at WWTP possible.

Recommendations:
•To include roof gardens as technical elements in SWM system preliminary design approach.
•To investigate implementation of roof grdens in the urban retrofitting design process.

The importance of the approach applied in the research:
1)to assess peached roof potential,
2)to compare different types of roofs according to the site-specific conditions.

Can you imagine more roof gardens like this one?