Vilnius, LT DEM 4

Gintautas Stankūnavičius

Annual meeting, 25-27 October 2023, Valencia, Spain

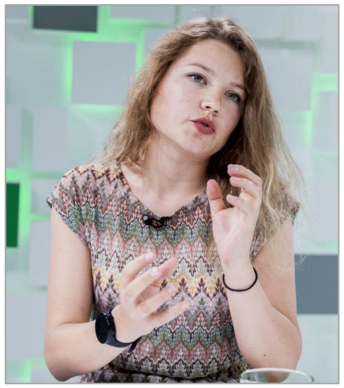
The HuT: The Human-Tech Nexus - Building a Safe Haven to cope with Climate Extremes

The HuT: The Human-Tech Nexus - Building a Safe Haven to cope with Climate Extremes

Vilnius, LT

Our recent team:

Viktorija Mačiulytė
Gintautas Stankūnavičius
Giedrė Godienė

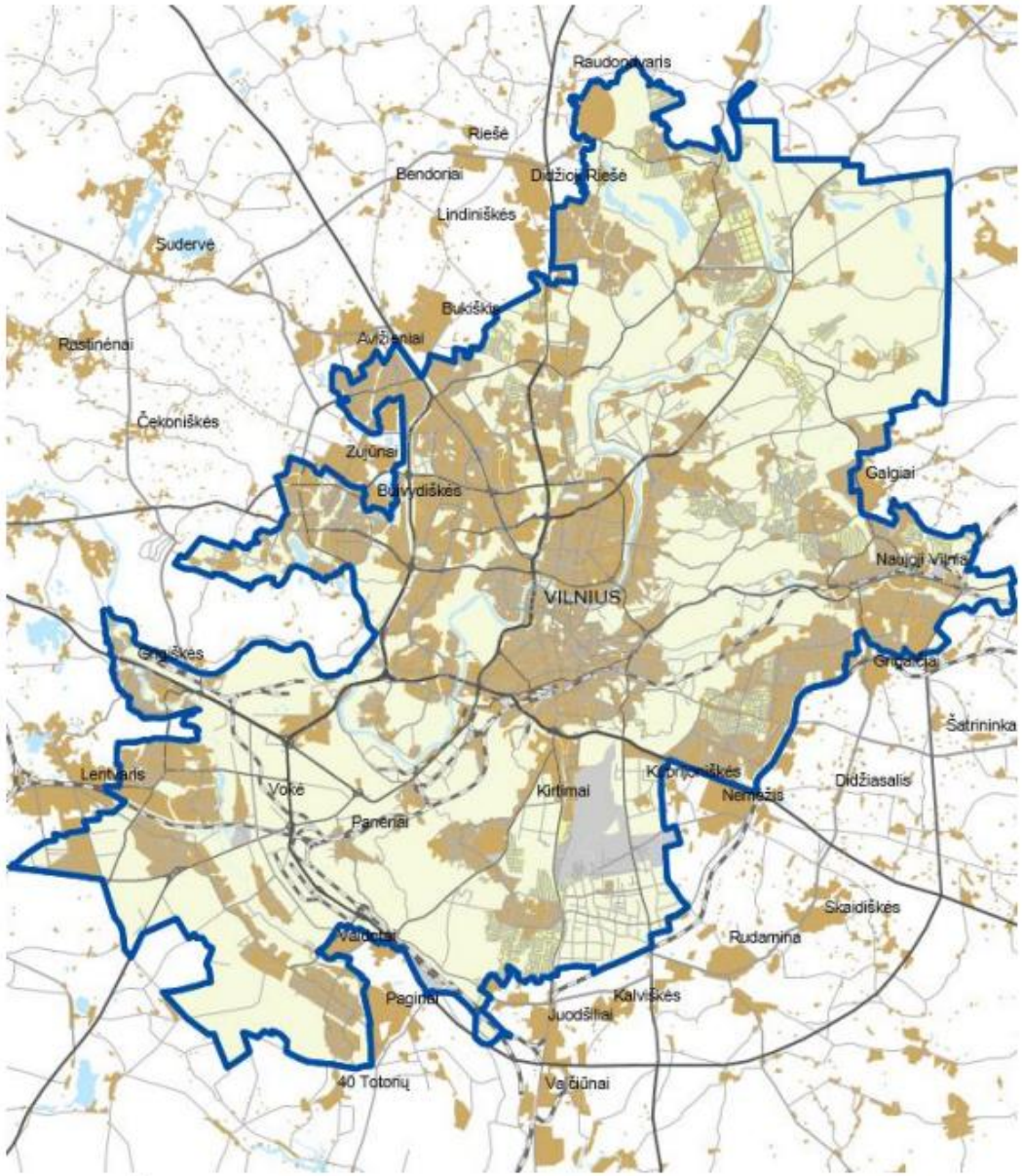


VILNIUS

Vilnius (0,589 mln inhabitants)
the growing capital of Lithuania

Area 400,47 km²
Blue/green areas: 61%
Protected - 17,3% of total area
Impermeable coatings - 12% (2018)

Altitude differencies 153 m

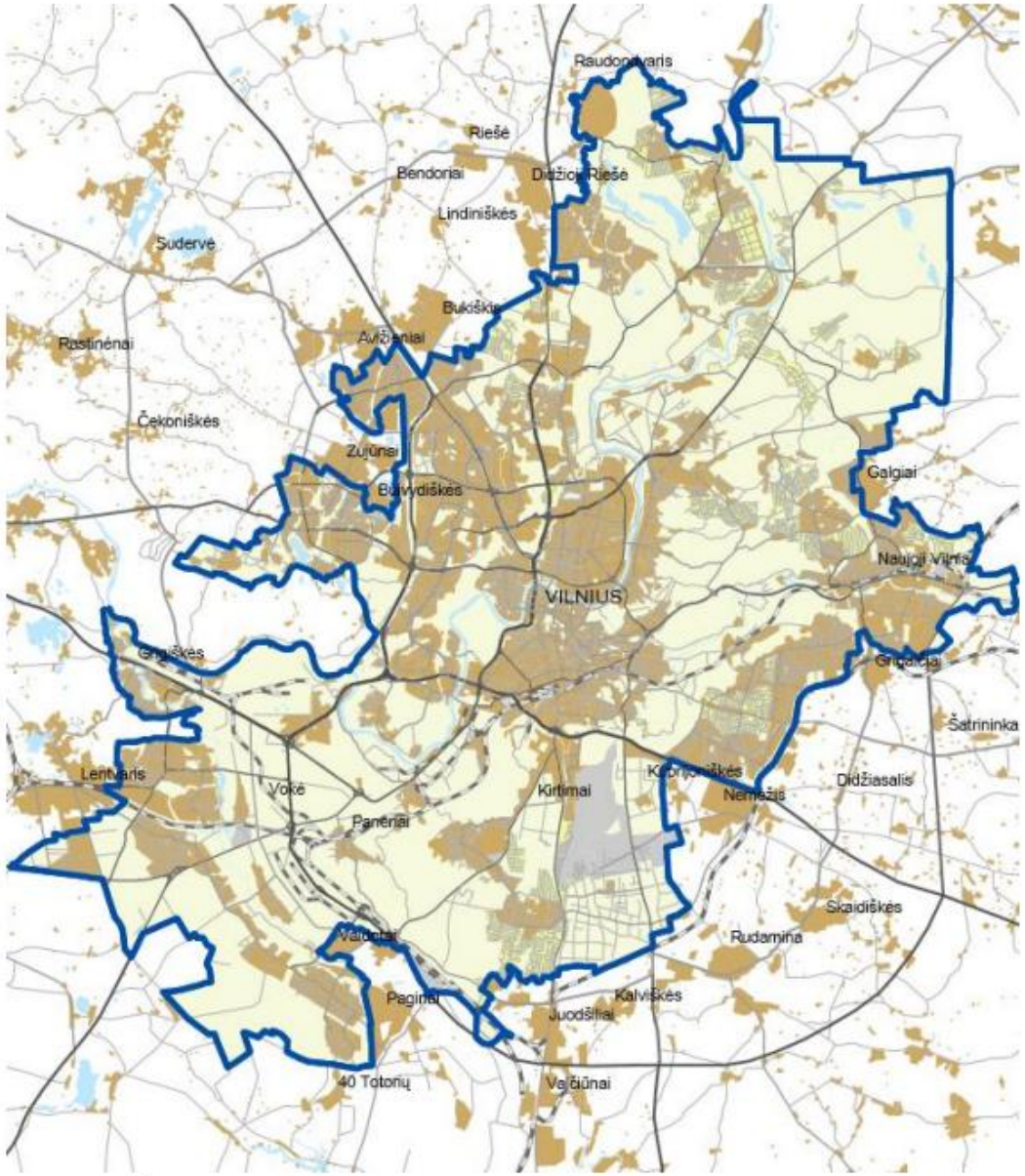


VILNIUS

Vilnius
the growing capital of Lithuania

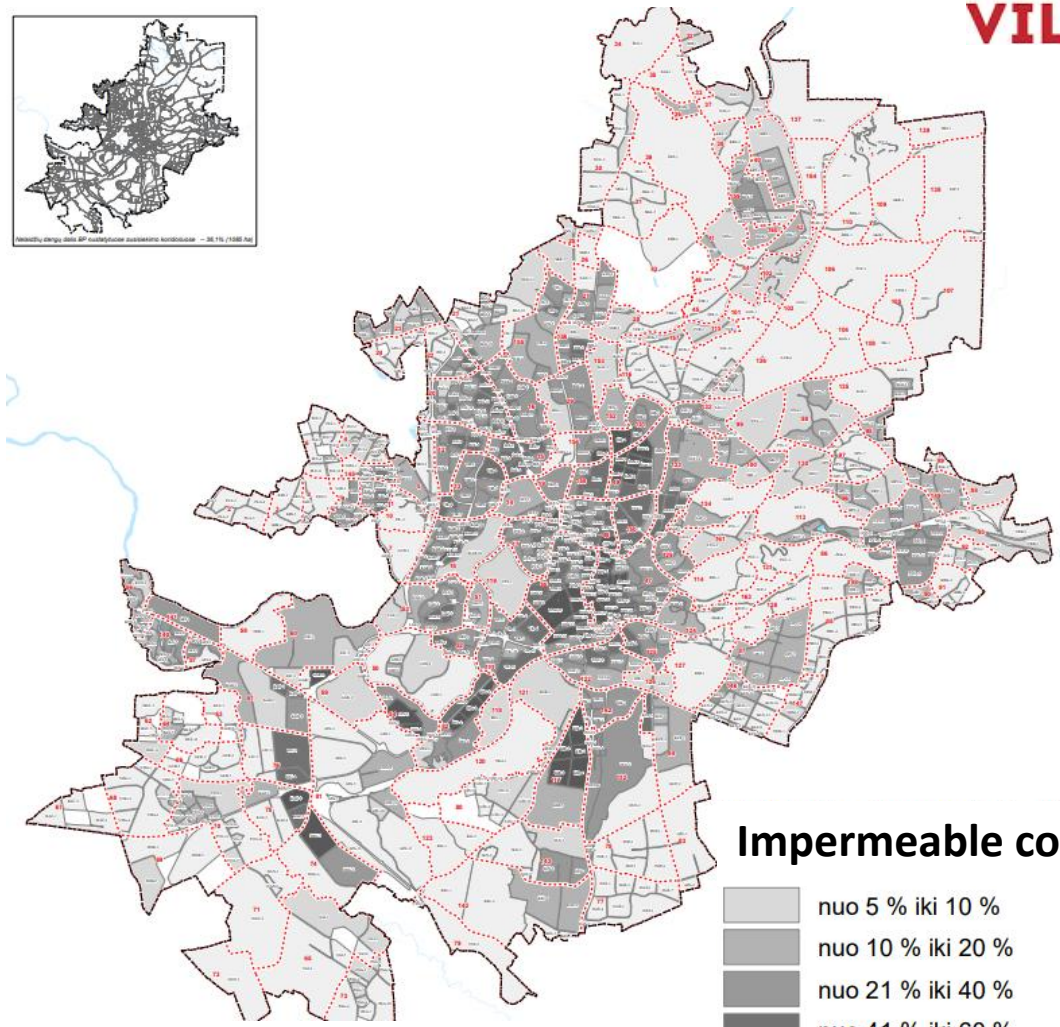
Area 400,47 km^2
Impermeable coatings - 12% (2018)
Municipal planning regulation on technogenic coatings since 2022

Altitude differencies 153 m



Built up areas, Vilnius

VILNIUS



Impermeable coatings, 2018

- nuo 5 % iki 10 %
- nuo 10 % iki 20 %
- nuo 21 % iki 40 %
- nuo 41 % iki 60 %
- daugiau kaip 60 %

2017 06 28, Narbutas str., Vilnius

2017

2022

2022-06-09 J. Kubiliaus str., Vilnius, Lithuania

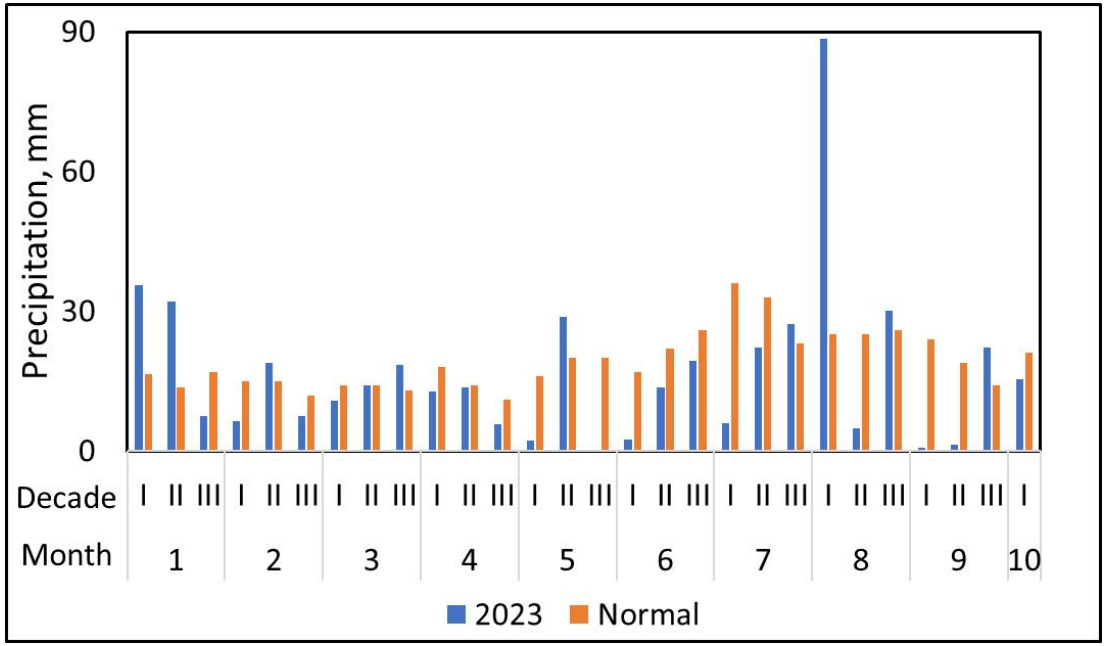
2022-06-09 Rinktinės str., Vilnius, Lithuania

2022-06-29 Western bypass,
Vilnius, Lithuania

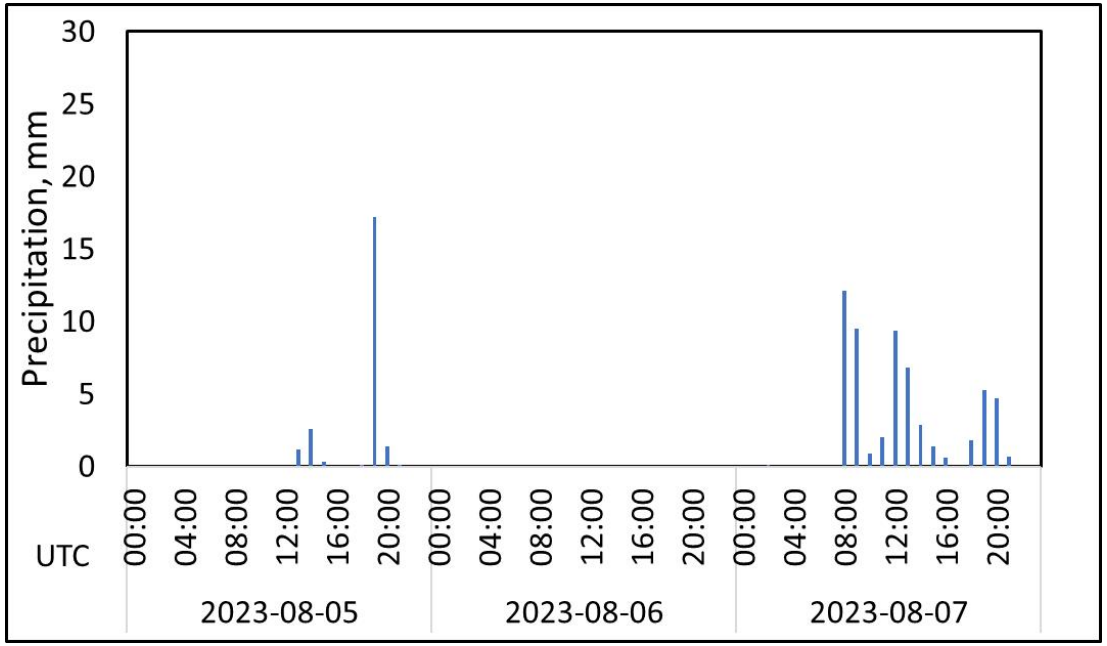
Damage after 2022-06-29 heavy rain
Western bypass, Vilnius, Lithuania

Anomalous season of 2023

- In general this warm season was very dry and hot
- Only the first 10 days of August were very wet
- During this short period - several heavy rains that were associated with pliuvio floods in Vilnius.
- Record September: the mean air temperature in Lithuania was +16.5 °C (positive anomaly of 3.7 °C).
- This was the warmest September since 1961.



The precipitation rate (mm/ 10 days) in Vilnius in 2023



The most intensive rains in 2023

Collaboration with CMCC
Precipitation data

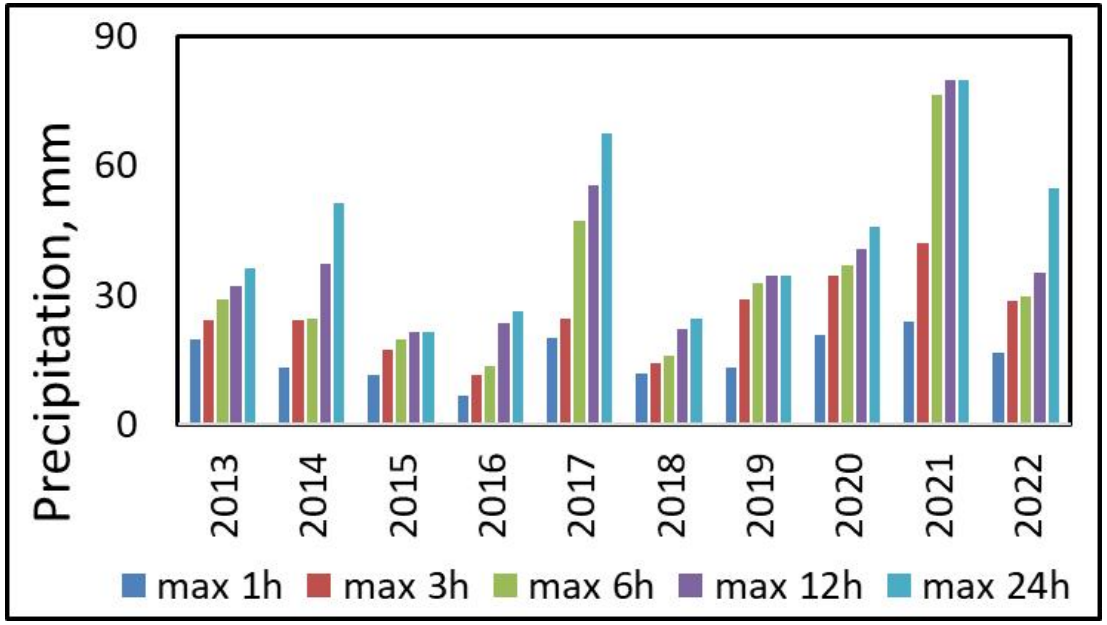
- **Initial precipitation data were collected at two meteorological stations in Vilnius:**
  - hourly data (Vilnius synop station, VU station)
  - 10 min data (Vilnius synop station) for 2012-2022
  - daily data (Vilnius synop station)
  - digitalised pluviograph data (Vilnius synop station) for 1998-2012 (not used)

Scheme of data providing stations

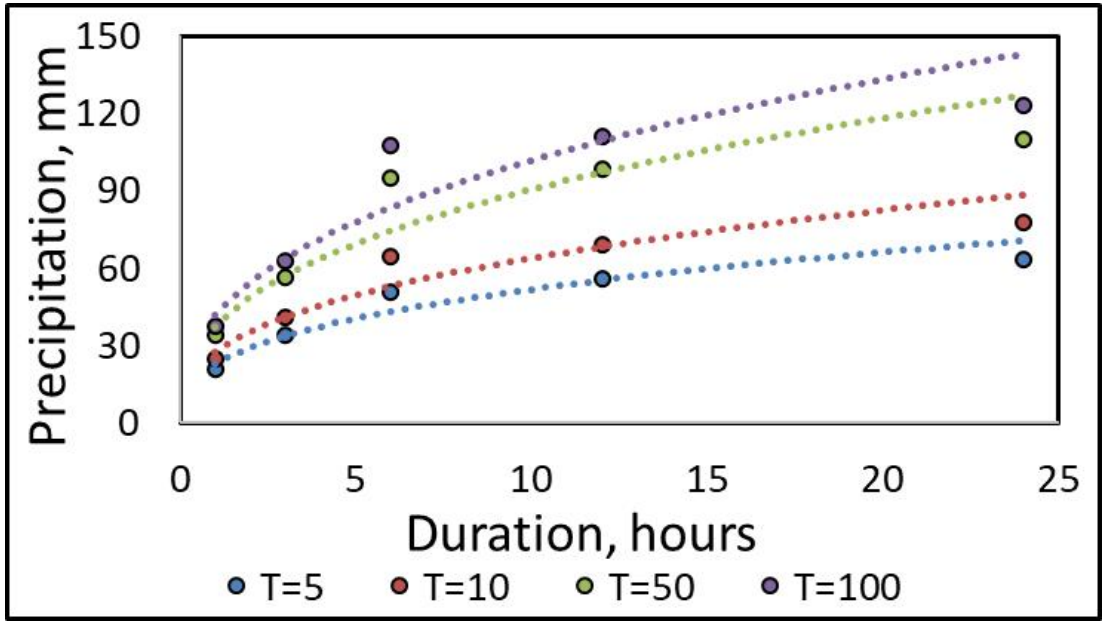
Analysis of precipitation data

- Thanks to Guido and Lisa for their support and input assessing the quality of the data and their efforts to construct the IDF curves.

- **Next steps:** we are planning to assess the future extreme precipitation events (impact on Vilnius city area) using climate forecasts data.



The maximum amount of precipitation in Vilnius



IDF (least squares method) in Vilnius

DEM 4 in 2023

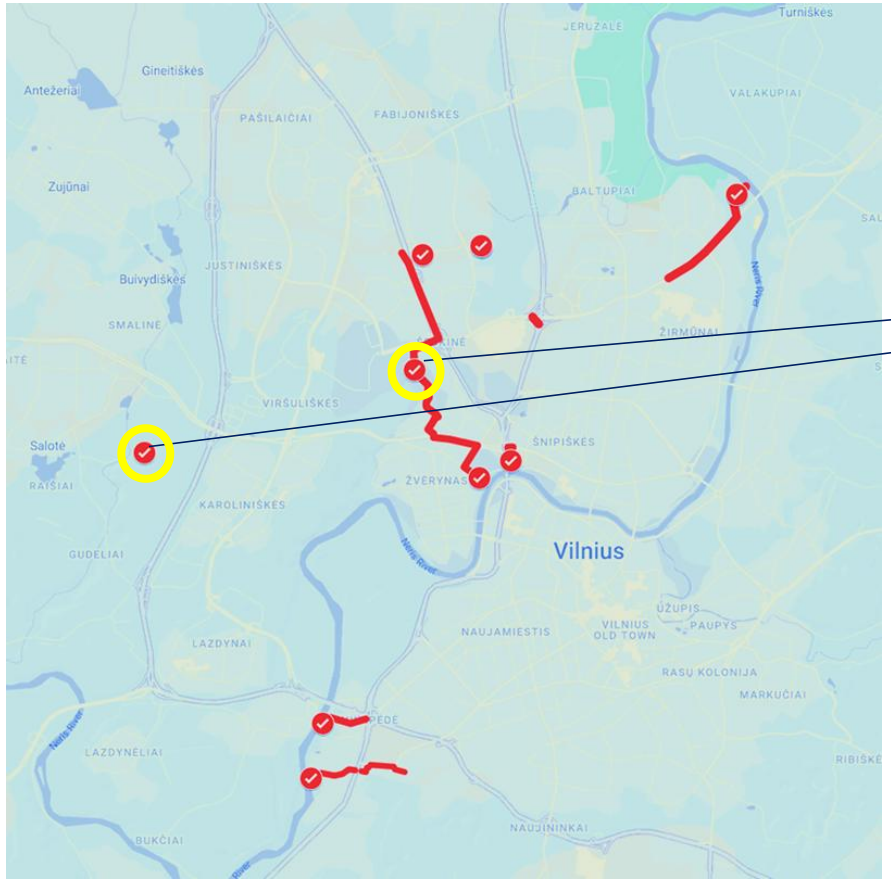
May 2023 ir June-mid July 2023

Visits to the 2 newly installed rainwater treatment facilities in Vilnius during lowest water level and after heavy rain conditions

An increase of built-up and impermeable artificial surfaces in urban area, also with the full use of underground space force to increase flow of surface runoff water into the underground piping systems.
Urbanization of river embankments, intensification of construction and shrinking naturally permeable areas lead to the necessity of constructing huge and expensive large-diameter collectors.
Nevertheless, even new underground pipes facilities fails to meet the need to collect and transmit extreme rainwater runoff: **surface rainwater from higher storms must be collected in open basins that occupy valuable urban land, mostly natural ecological and recreational areas**.

Both rainwater treatment plants were installed by the Vilnius municipality company UAB "Grinda", both partially financed by EU cohesion funds, but their terrain, design and use are very different.

Surface wastewater infrastructure projects implemented by UAB "Grinda" 2016-2023



The **Karoliniškės rainwater** treatment plant - in a relatively open, low area, where the Sudervė stream merges with 2 tributaries. The large water reservoir was built without regard to the surrounding landscape.

The **Šeškinė** treatment plant is larger, but it was surrounded by a forest, in a dry valley of the erosive Šeškinė hill massif. The area is bordered by the Karoliniškės State Landscape Reserve.

Karoliniškės rainwater treatment reservoir visit 2023 06 15

2023 **Lowest water** levels (drought conditions persisted for almost 1.5 months)

Šeškinė rainwater treatment reservoir visit

2023 06 15. The **Lowest water** levels, drought conditions persisted for almost 1.5 months)

Šeškinė and Karoliniškės rainwater treatment reservoir visit

Heavy rain of 2023 08 07

Sausra ir liūtis. Šeškines-Žvėryno paviršinių nuotekų talpykla Vilniuje. Foto G. Godienės

Karoliniškių paviršinių nuotekų talpykla.

DEM 4 in 2023

May 2023 ir June-mid July 2023

The HuT for you and for me

2 meetings - seminars with representatives from Vilnius municipality and UAB Grinda (munic. company responsible for eliminating the consequences of extreme events)

8th May: ”Freely available online weather forecast sources: their reliability, accuracy, optimal forecast length, variety of information, forecast interpretation and added value (compared to official/ public forecasts)”

31st May: “Classification and techniques of weather forecasts. Use of visualized and "raw" data. Comparison of synoptic and numerical weather prediction approaches for extreme events. Supporting information - processed satellite images and standard (Eumetsat) products”
Lecturer and moderator of the meetings - G. Stankūnavičius

DEM 4 in 2023

16 July-31 August 2023

Gathering and verification of meteorological data time-series of the past for calibration of hydrological model including snow-melting process.

DEM 4 in 2023

16 July-31 August 2023

Vilnius Municipality is started preparation of
“EMERGENCY MANAGEMENT PLAN OF VILNIUS MUNICIPALITY”

Our team member, dr. **Viktorija Mačiulytė**,
is a member of Working group, representing
Lithuanian Hydrometeorological Service under the Ministry of Environment

DEM 4 in 2023

16 July-31 August 2023

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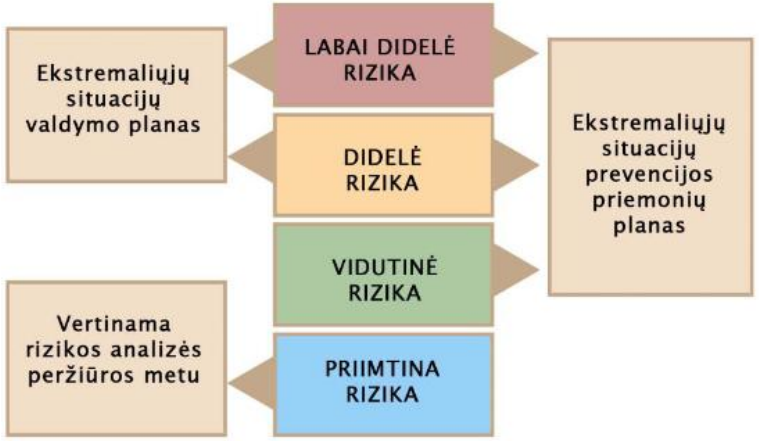

The official criteria for the devastating rain rate (PR) in Lithuania:

- **dangerous rain**: t ≤ 12 hours - PR more than **15** mm but less than **50** mm
- **severe rain**: t ≤ 12 hours - PR **50 - 80** mm
- **catastrophic rain**: t ≤ 12 hours – PR more than **80** mm

There are quite a few rains in Vilnius, which able to initiate floodings in the city. These cases are not always directly related to the rain rate, but also to the damage it icaused. For example, a landslide, destroyed roads, etc.

DEM 4 in 2023

16 July-31 August 2023

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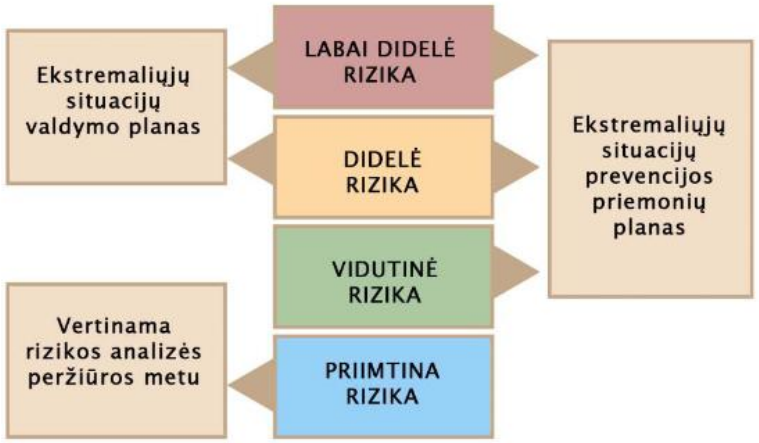

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It is still difficult to distinguish extreme cases, because it could be also related to the sensitivity and eligibility of the infrastructure itself.

Do you think it is worth taking into account the parameters/sensitivity of the infrastructure?

Thank you for attention
and visit Vilnius