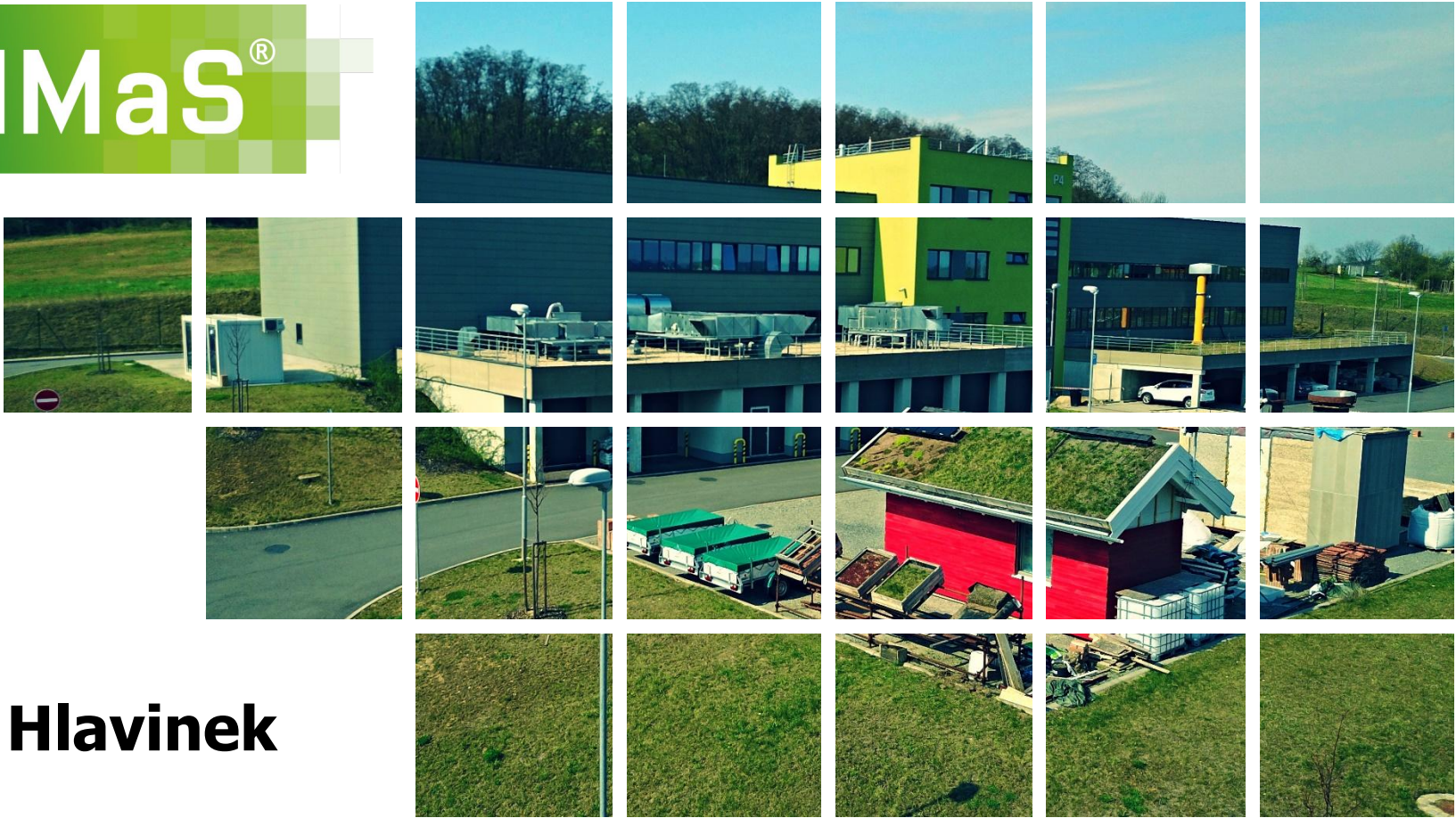


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Petr Hlavinek

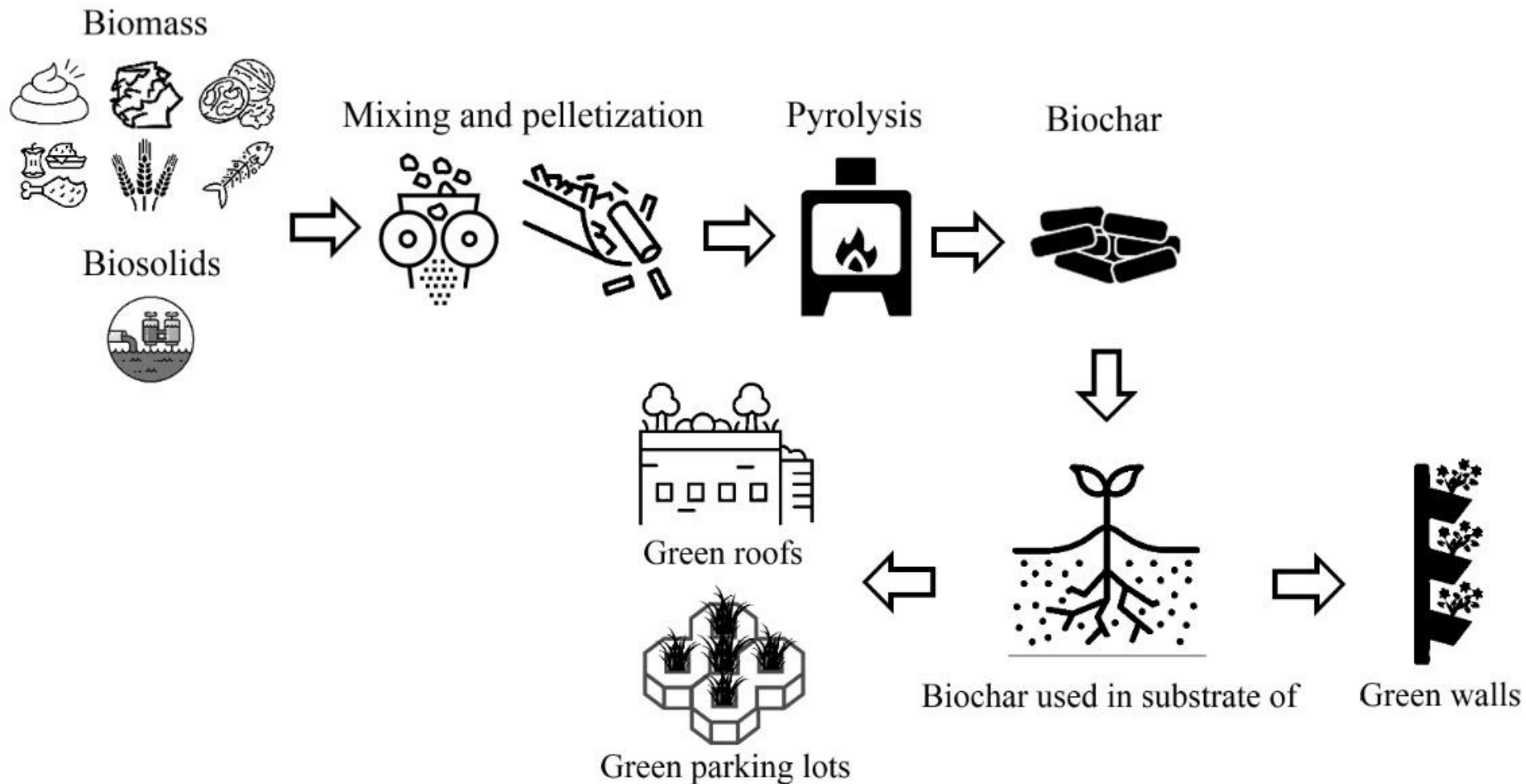
Use of biochar for blue-green infrastructure

Research Group – MWM (Municipal Water Management)

- The Research Group AdMaS – MWM (Municipal Water Management) with its technical infrastructure, is been led since the end of 2014 by prof. Ing. Petr Hlavínek, CSc. MBA with the following research agenda:
- **Research Agenda of RG AdMaS MWM:**
 - Technologies of wastewater and drinking water treatment (membrane technologies, advanced oxidation technologies, etc.);
 - Waste management, including sewage sludge (eg application of sewage sludge drying technologies - belt, solar; waste heat treatment technology - microwave and thermal pyrolysis and torrefaction);
 - Design, measurement, diagnostics and evaluation of the technical condition of engineering networks, chemistry of drinking and waste water, etc.
 - Solution of interdisciplinary connections of buildings, engineering networks and the region;
 - Problematic of „Smart Cities“; "blue-green infrastructure“



Schema of biochar production and use in green infrastructure



Common applications of biochar in European Union

1. Application in blue-green infrastructure (BGI)
2. Sorption of pollutants from wastewater
3. Use of biochar as supplement feed for animals
4. Application in composting
5. Application in forestry
6. Application in agriculture

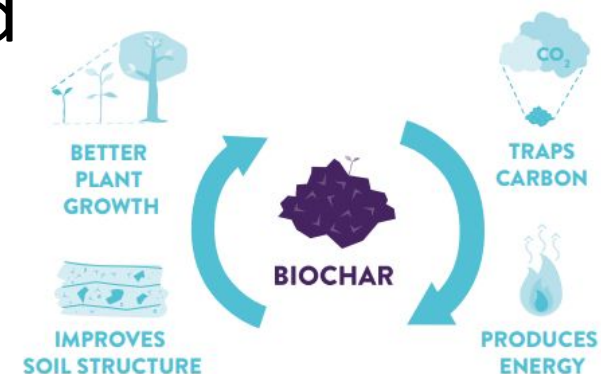


Biochar has its potential use (due to its properties) for:

- Green roofs and vertical gardens;
- root wastewater treatment plants;
- city parks, community gardens and other public greenery;
- zoological and botanical gardens and golf courses.

Benefits of using biochar in BGI

- **Increases water retention** in the soil;
- **reduces the penetration of nutrients** into groundwater;
- **reduces** harmful gases (**GHG**) from atmosphere;
- **sequesters** large amounts of **carbon** in the soil,
- increases soil quality and **supports plant growth**;
- **stabilizes soil contaminants** and prevents their entry into plants;
- **lightens the soil.**



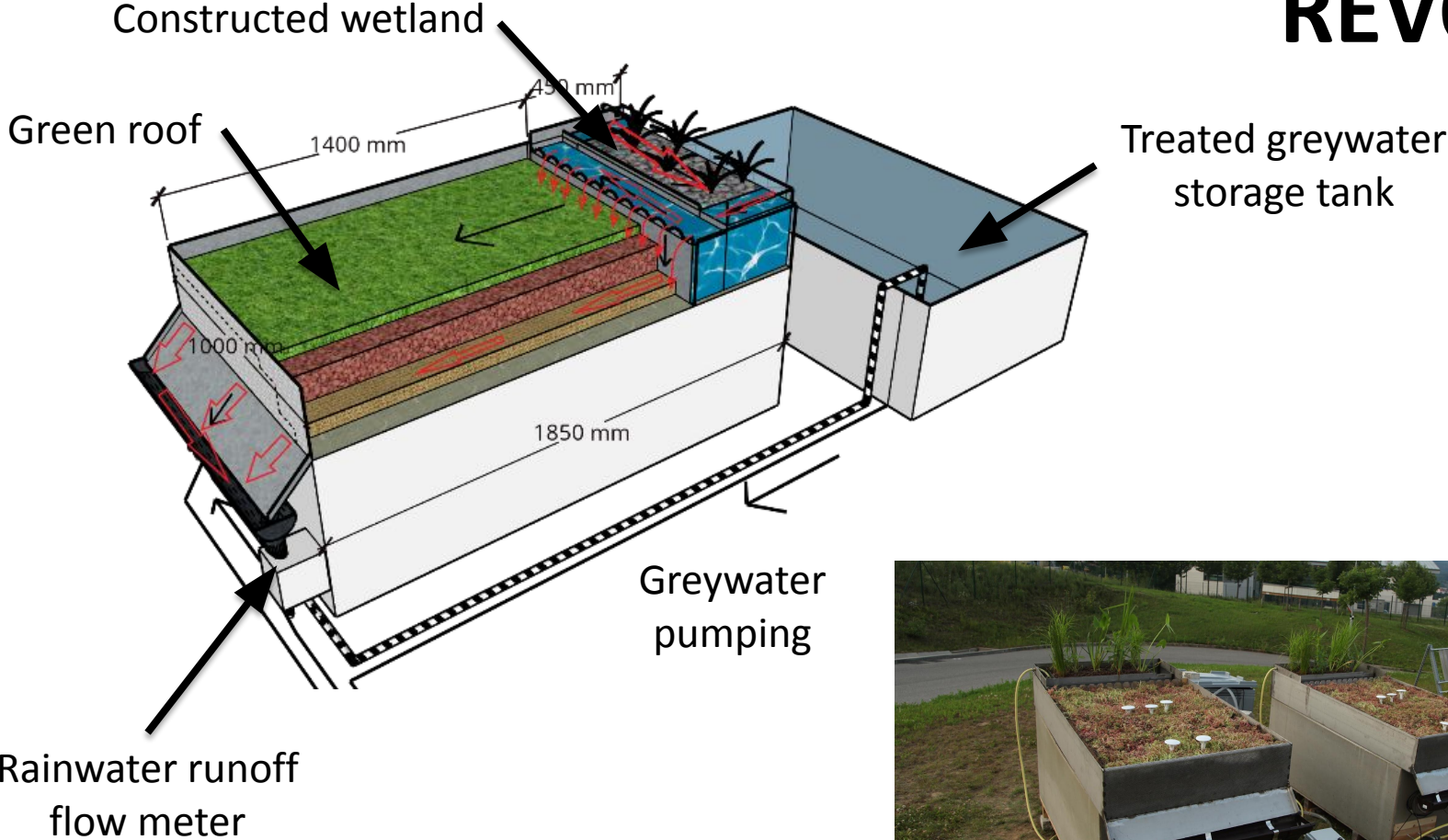
Biochar in BGI at AdMaS

REVOZIM

Project REVOZIM – Recycling of Water and Waste within the Green Infrastructure of Municipalities

- AdMaS Research Centre solves the project, which responds to the need of municipalities to comprehensively address water management in accordance with the principles of Smart City and with the principles of circular economy.
- One of the objectives is to verify the performance of the new concept of a combination of constructed wetland and extensive green roof irrigated with treated greywater.
- The growing medium of the extensive part of the roof contains a fraction of recycled crushed brick and biochar in volume 10 %.

Biochar in BGI at AdMaS REVOZIM



Schema of green roof module.



Green roof modules after installation.

Biochar in BGI at AdMaS REVOZIM



WITHOUT BIOCHAR

WITH BIOCHAR

Comparison of green roof modules
after 4 months from installation.



WITHOUT BIOCHAR

WITH BIOCHAR

Comparison of green roof modules **after**
2 years from installation.

Biochar in BGI at AdMaS

REVOZIM

- Green roof at natural swimming pool in the pilot locality, of the town Třešť;
- Composition of the biochar layer: brick crumb, crushed marl, expanded clay, peat, **biochar (vol. 10 %)**



Comparison of part of the Green roof with and without biochar.

Biochar in BGI at AdMaS

REVOZIM

Results:

- Biochar made from sewage sludge acts as a nutrient source which boosts vegetation growth and supports evapotranspiration;
- biochar significantly reduced excess nutrient leaching;
- constructed wetland part has proven a high potential to reduce the nutrient concentration in treated greywater.

Biochar in BGI at AdMaS

Green parking lots

Project for the use of biochar in the green parking lots

- The aim of this research is to optimize the structural layers (ratio of clay, gravel and biochar) of green parking lots with grassing blocks.
- Design of structural layers is optimized to allow maximum water infiltration into the subsoil and at the same time keep the requirements for load-bearing capacity of structural layers.
- Laboratory tests was performed focusing on basic physical and mechanical properties, water permeability and adsorption of oil drips.

Biochar in BGI at AdMaS

Green parking lots



Load-bearing test



Moisture sensor



Rainwater storage tanks



Three parking lots with different construction layers.

Biochar in BGI at AdMaS

Green parking lots

Results:

- The performed control static load tests show that the biochar additive does not affect the compactibility and load-bearing capacity of the construction layer.
- The designed structural layers have the potential to adsorb oil drips.

- Current research has shown an improvement in the soil properties of substrates when using biochar in BGI, especially fertility, water holding capacity and soil remediation.
- Biochar can long-term sequester carbon and reduce GHG from the atmosphere.
- Biochar improves economic and environmental applications with a focus on sustainability and circular economy.

Thank you for your attention



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ADVANCED MATERIALS, STRUCTURES
AND TECHNOLOGIES

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