

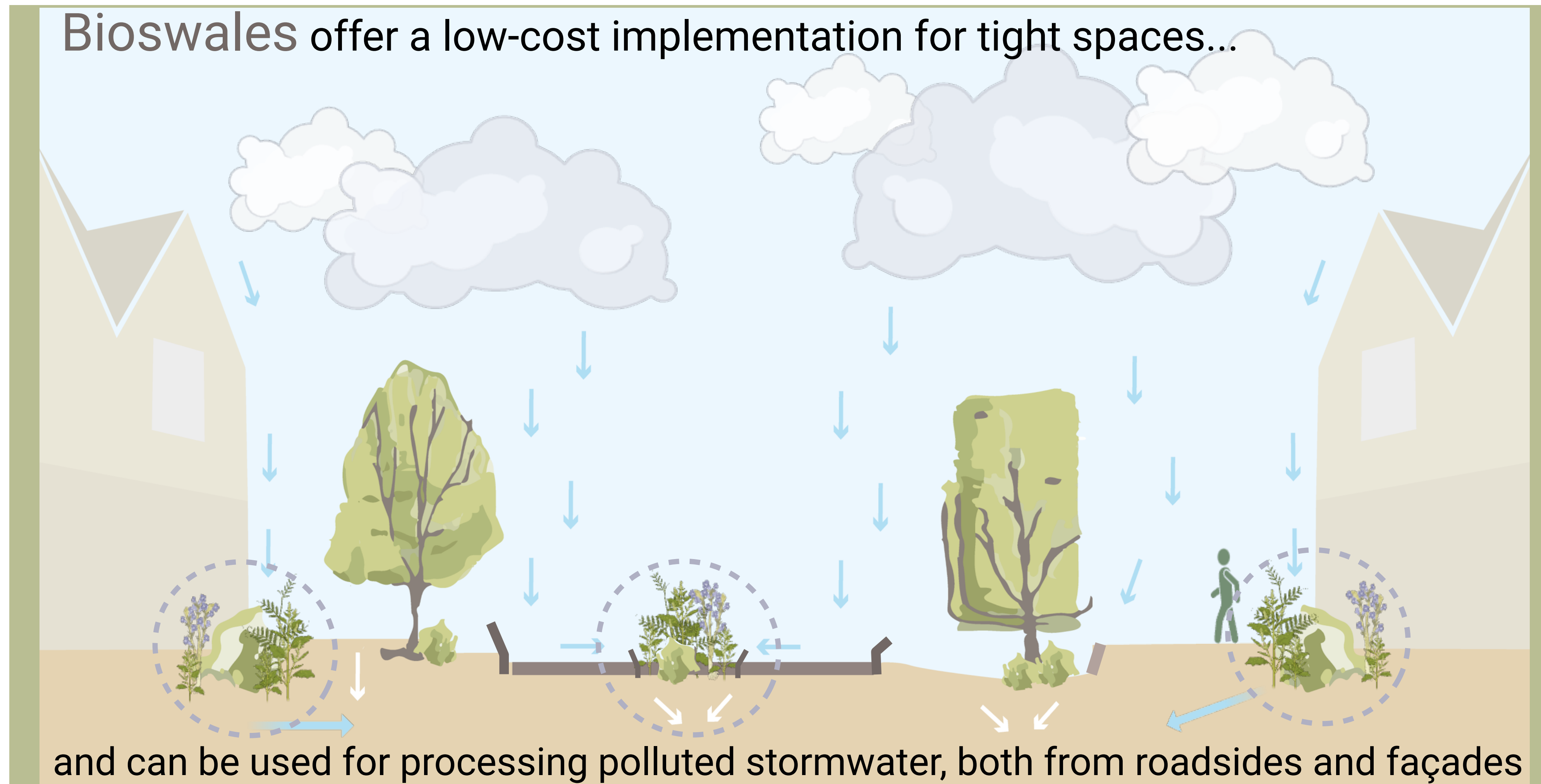
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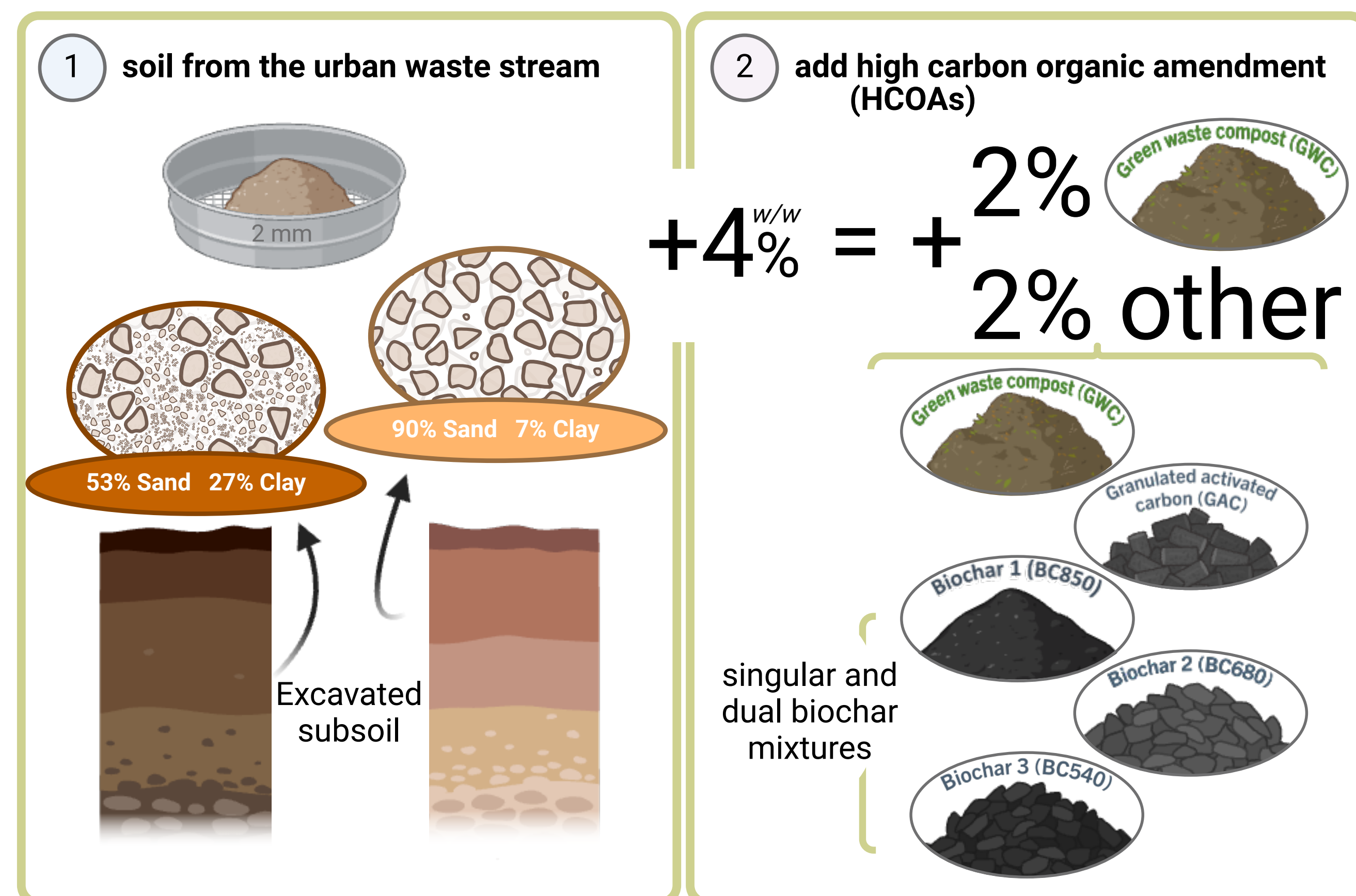
BACKGROUND AND CONCEPT

- In the next 30 years many areas face **intensified storm events** and an **increasing urban population**
- Bioswales** along with other forms of stormwater-processing systems, need to take on **multiple functions**, not only **infiltrating large quantities of run-off** but also **processing the city's polluted waters** that put other urban green (incl. street trees) at risk
- 4 interlinked projects at the Technical University of Munich** work in tandem on developing and assessing **urban stormwater solutions**, using the **city of Munich as a case-study**

Bioswales offer a low-cost implementation for tight spaces...

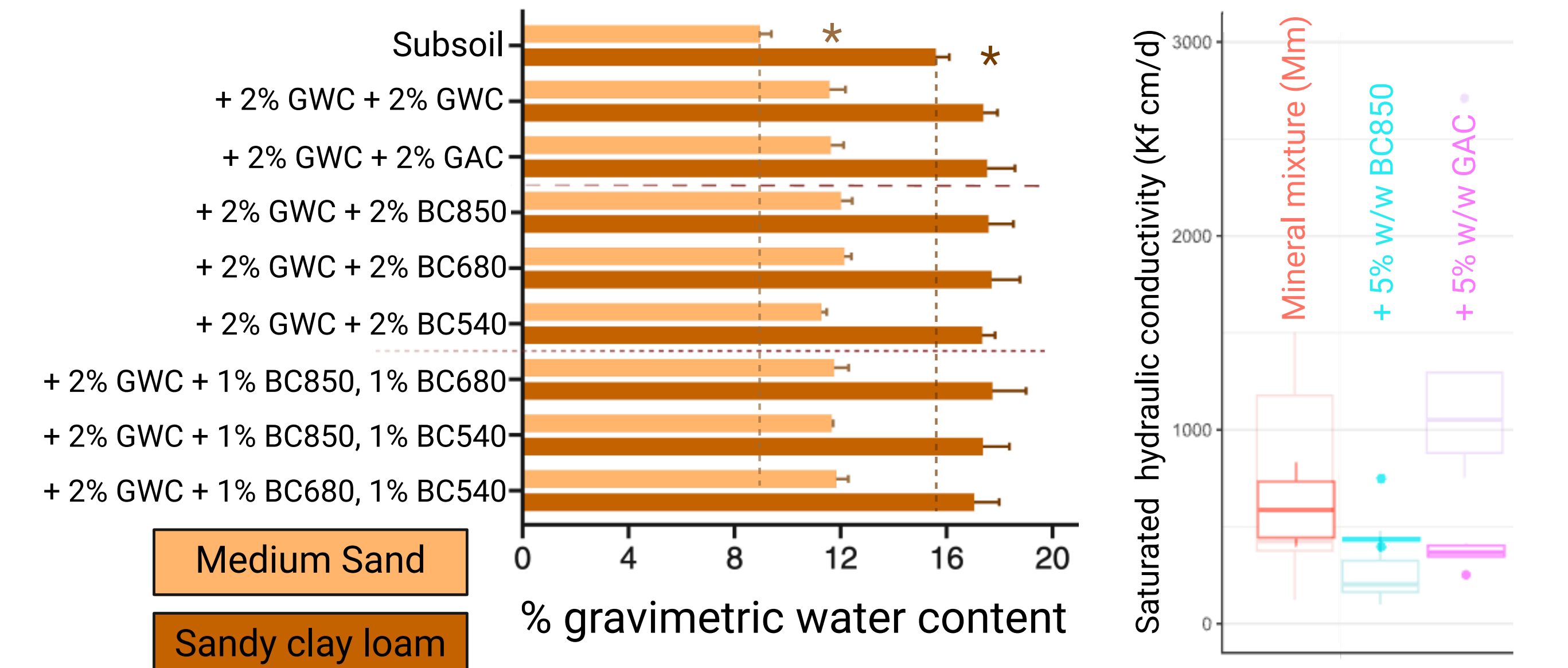
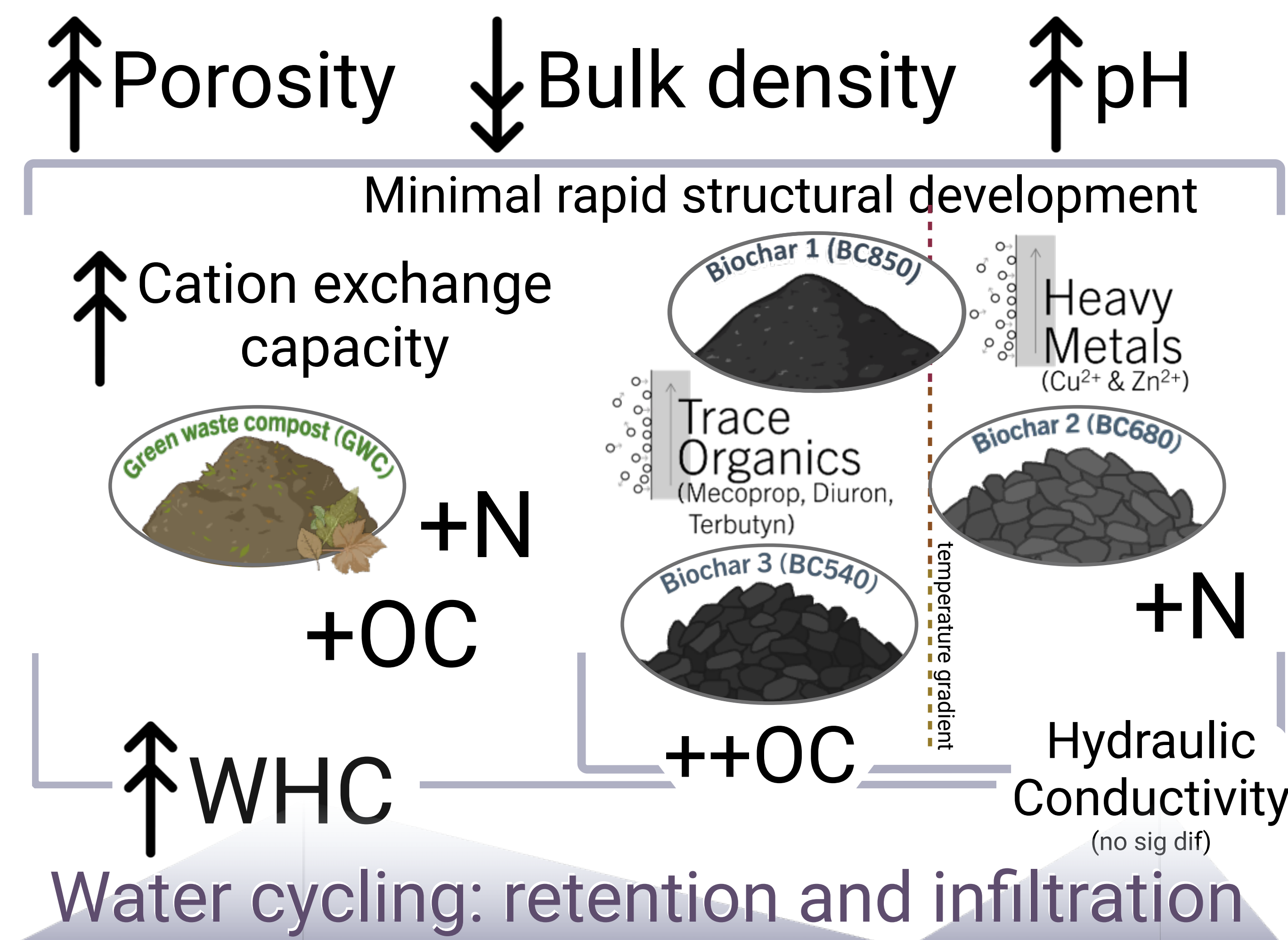


CONSTRUCTING SOIL SUBSTRATES AS PART OF A CIRCULAR ECONOMY



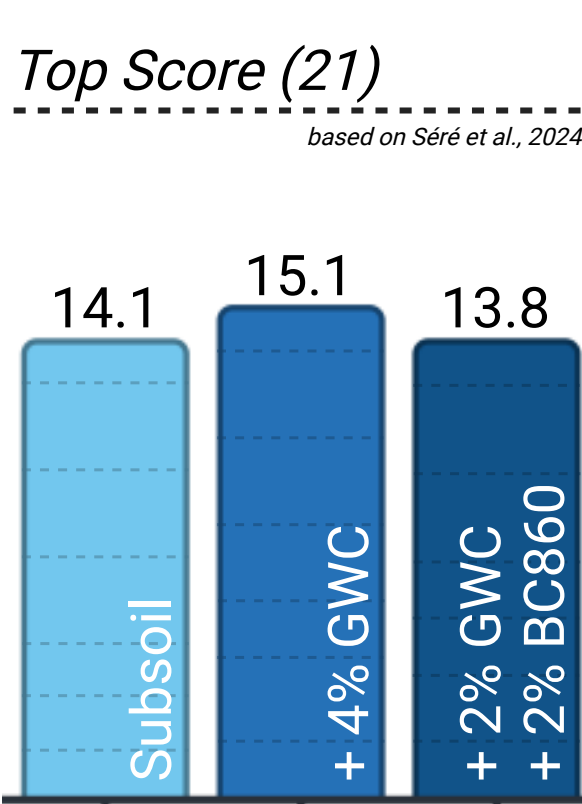
- Construction and demolition waste** accounts for **37.1% of waste in the EU** [2] by mass
- Without further modification, this waste is often **unfit to be used as a functioning soil** and **cannot provide urban ecosystem services**
- Mixing various HCOAs (high carbon organic amendments)** allows us to design our soil with the end purpose in mind, overlapping benefits from **organic matter of different qualities**

HIGH-CARBON ORGANIC AMENDMENTS TO SUPPORT MULTI-FUNCTIONAL URBAN SOILS



Summary of results from joint projects at TUM
Porter et al., *in progress*; Paez et al., *in progress*

ASSESSING SOIL HEALTH OF BIOCHAR-AMENDED SUBSTRATES



- Séré et al., 2024 introduces an **indicator-based tool** for planners **evaluating urban soil health**, essential for a city's sustainable development
- Using this tool, soil health of **select, constructed soil substrates** from Porter et al., *i.p.* are compared
- The assessment **tool does not yet capture the benefits provided by biochar** - docking points for high CN values and lacking a direct measure of water holding capacity

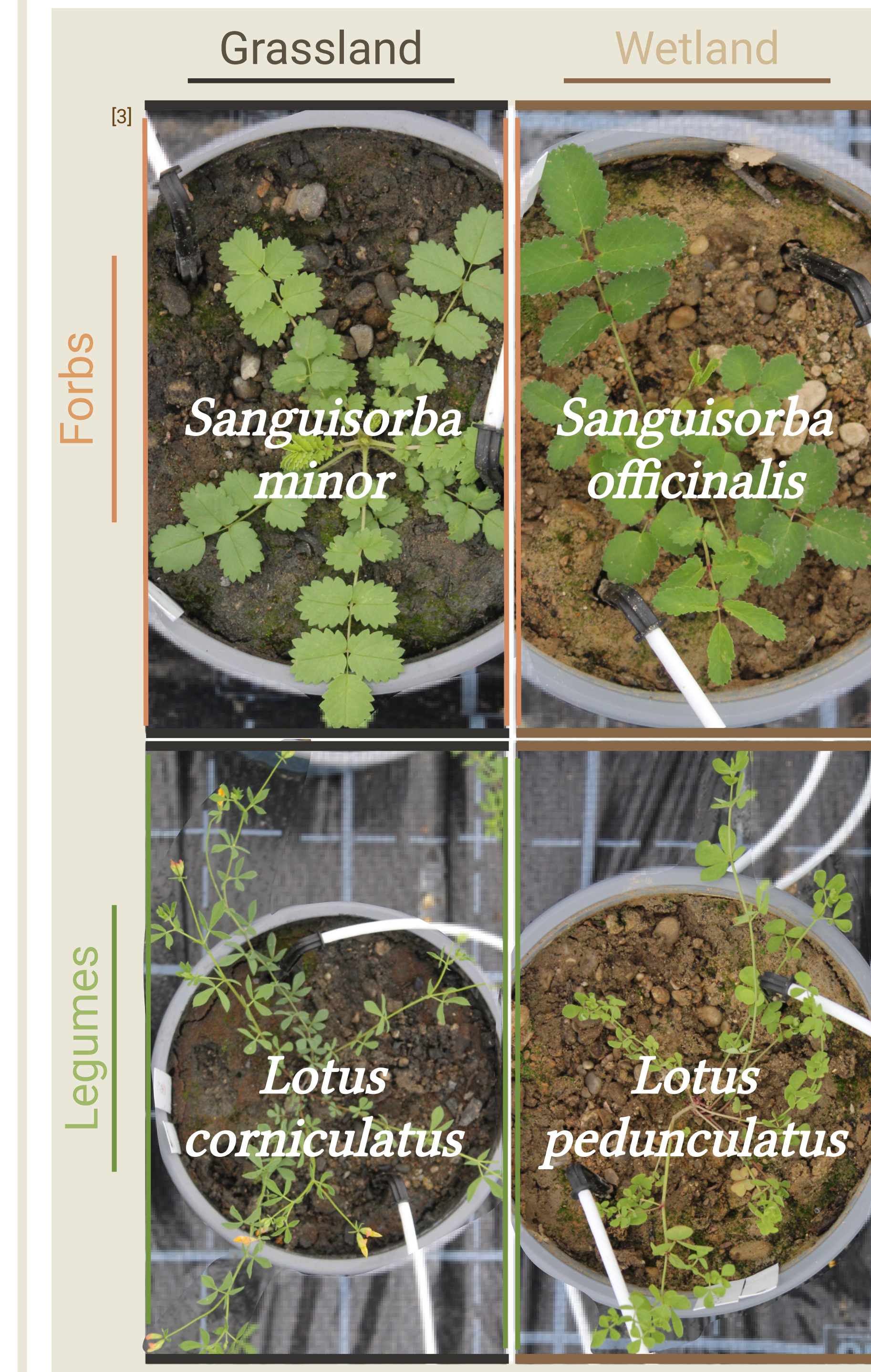
NEXT STEPS: PLANT FERTILITY AND CARBON BALANCE IMPACTS OF INTENSIVE WETTING, STAGNATION AND DRYING CYCLES

EXPERIMENTAL SET-UP

Tested Substrates
Sand and sandy clay loam (< 10mm) with or wo/ BC850

Water Treatment
1) **Control**, daily watering with even distribution of Munich's estimated rainfall over the 10-week experimental period (calculated via surface area)

2) **Flooding** with 5 times the estimated rainfall (potential catchment size - DWA-138A) combined with **stagnation** for 72 hours & **drying** for 4 days (7 day total cycle)



AIMS AND OPEN QUESTIONS...

- Determining substrate fitness for plant vitality**
 - To quantify the difference in **biochar's capability** to "**recover**" **species vitality** in different soil textures
 - We hypothesize all species to have **stronger development in biochar-amended substrate mixtures** per its high nutrient- and water-retaining capacity
 - To assess **development of root traits** in grassland versus wetland species for **resilience to flooding and saturation**
- Carbon balance shifts in calcareous soils**
 - To compare the flooding-response of native plants on the **soil carbon balance** by **quantifying carbon pools from the plant to the rhizosphere to the bulk soil**
 - To track **biochar's incorporation into the system** - does biochar **occlude within aggregates** or stay in the light-fraction, **susceptible to leaching?** Changes due to a flooded/stagnated system?

FIRST RESULTS SUGGEST...

- Lotus corniculatus*
 - Under **control conditions** biochar has **no effect on biomass**
 - Flooding and stagnation** decreased above-ground biomass by approximately **50%**
 - The **addition of BC850** recovered **30%** of the biomass in the **sandy clay loam**, and **35%** of the biomass in the **sand**
 - Below-ground?**



Like the poster?



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Interested in the projects?
Reach out!
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