

Effect of Electro-kinetic Remediation of Dredged Sediments on Zucchini Growth

Hussein J. Kanbar^{1*}, Mohamed T. Ammani¹, Jeanne Simon², Anne Pantet¹, Ahmed Benamar¹

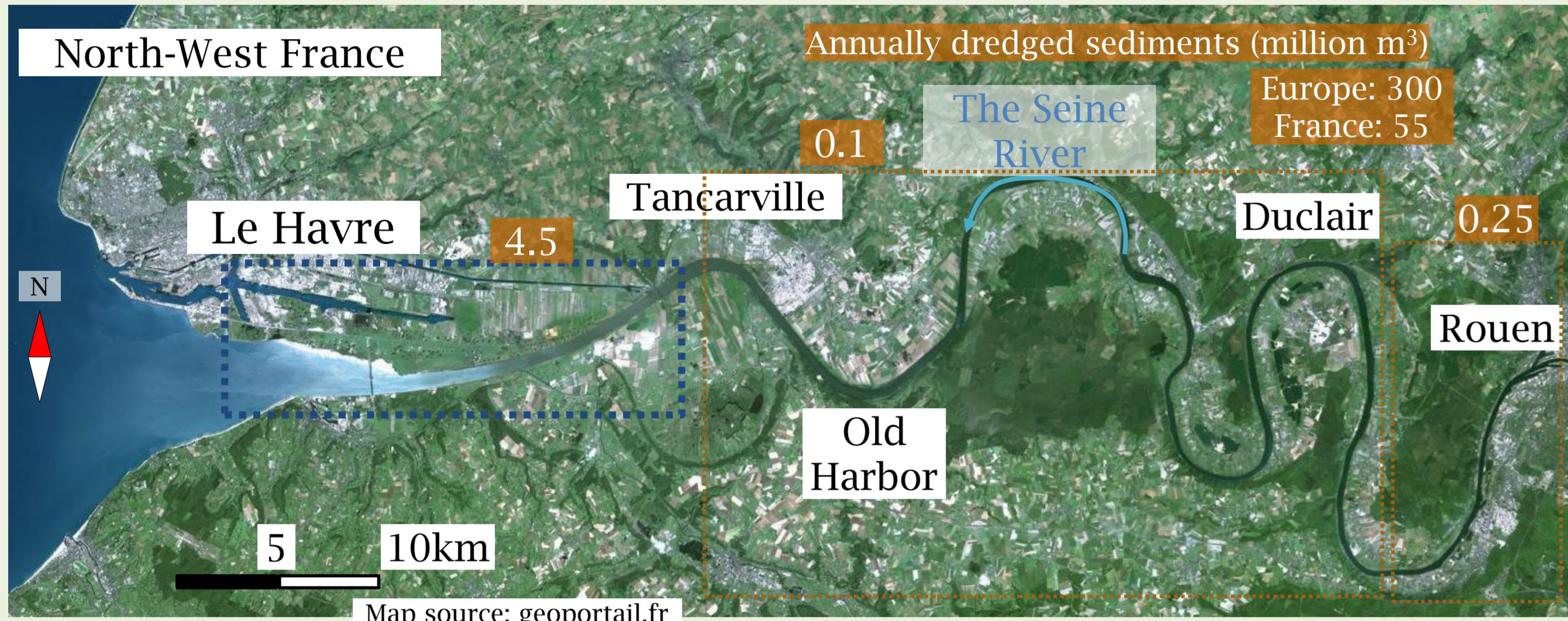
Hussein.kanbar@univ-lehavre.fr

¹ Laboratoire Ondes et Milieux Complexes (LOMC), UMR 6294 CNRS, Le Havre Normandie University, 76600 Le Havre, France

² CATÉ experimental station (Station expérimentale du CATÉ), 1609 Vézendoquet, 29250 Saint-Pol-de-Léon, France

1. Introduction

- Sediments settle in waterbodies (e.g., lakes, reservoirs, and channels)
 - affect the natural flow of water systems
 - deteriorate normal ship navigation and channel functioning
 - sediments are periodically dredged
- These sediments are often considered as wastes



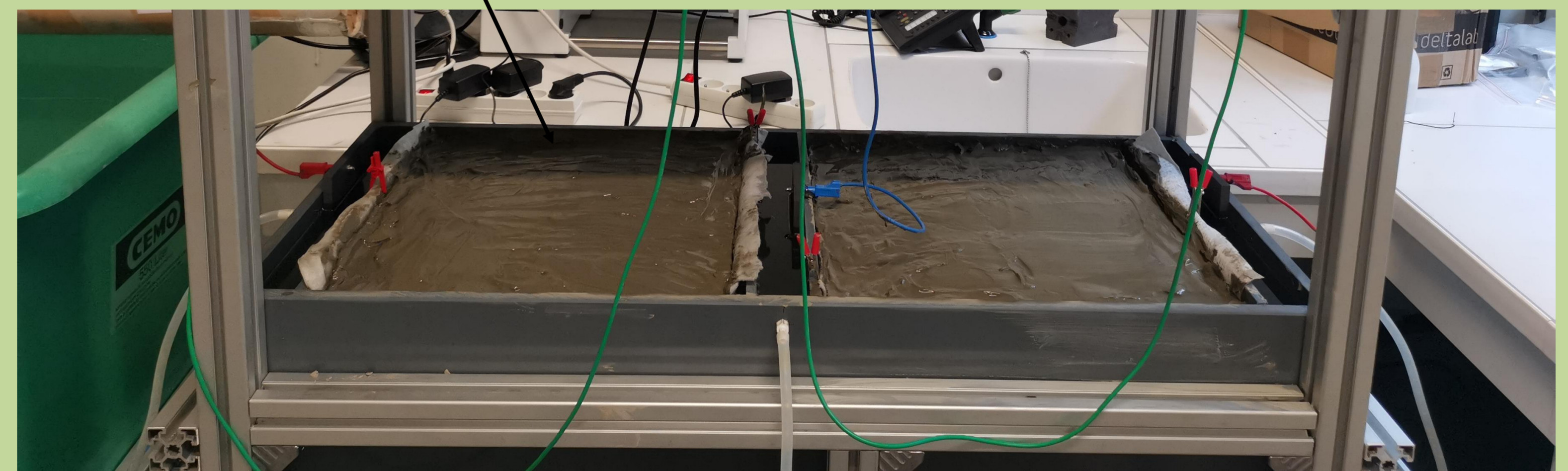
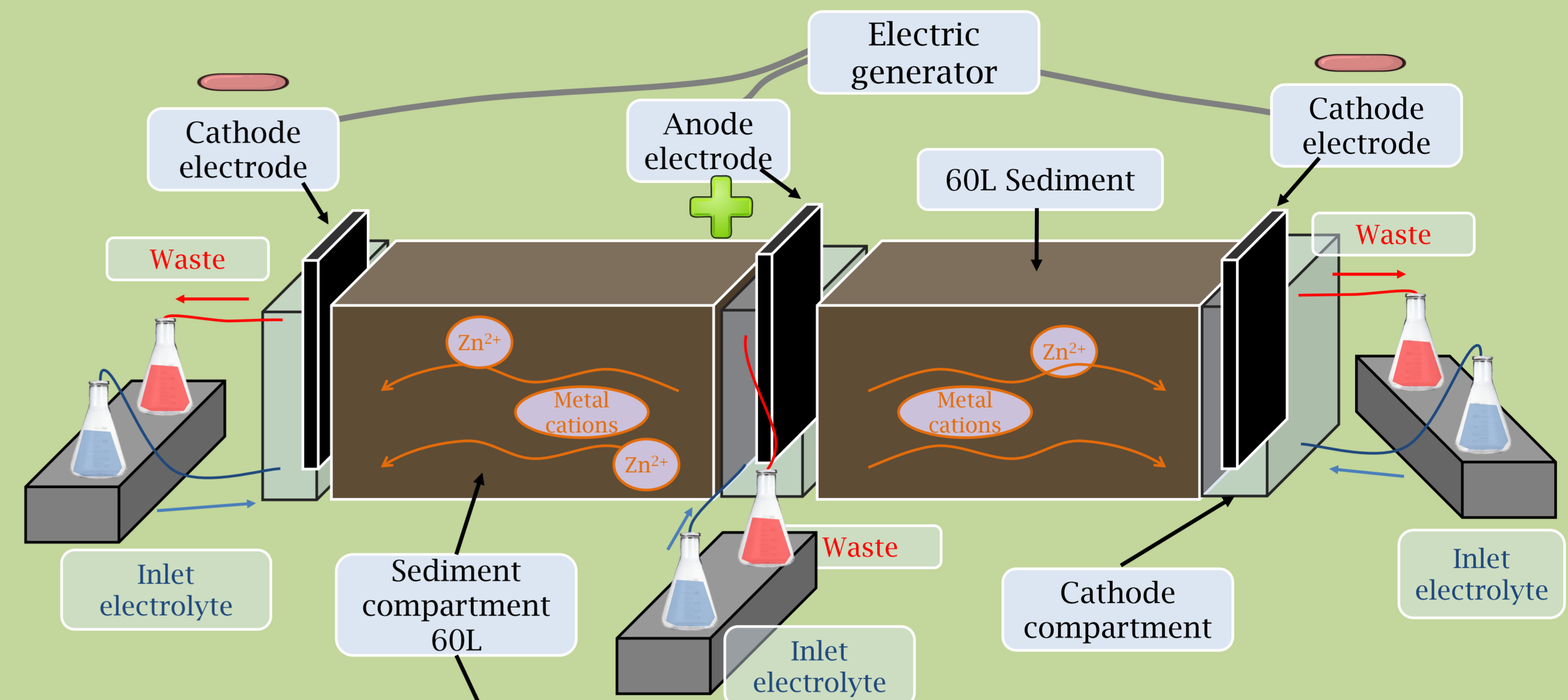
- In Europe, ~300 Mm³ of sediments are annually dredged; 55 Mm³ in France
 - hidden benefits of dredged sediments → reaching a circular economy ?

Objectives

- Electro-kinetic remediation (EKR) of dredged sediments to reduce metal contents
- Agricultural soils + dredged sediments → reconstructed soils
- Suitability of growing zucchini plants in those reconstructed soils
- Metal accumulation in zucchini fruits
 - Reconstruction of safe, suitable, and sustainable soils from dredged sediments, hence *reconstructed soils*

2. Methodology

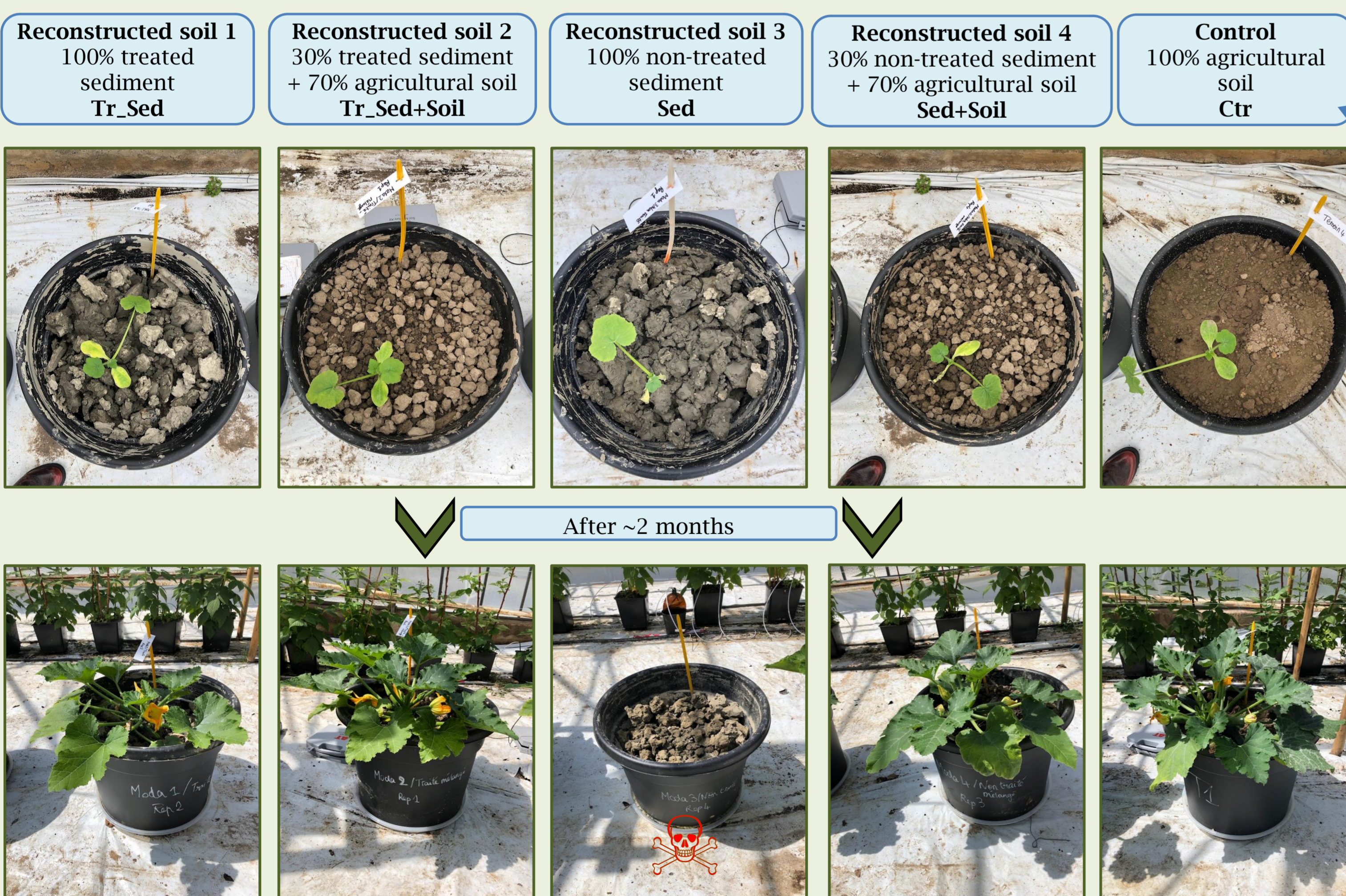
Electro-kinetic Remediation (EKR) to Treat Sediments



- The physico-chemical properties were monitored
- Spatial variation of metal, mineral, and organic contents
- Initial and EKR-sediments were then used to form reconstructed soils

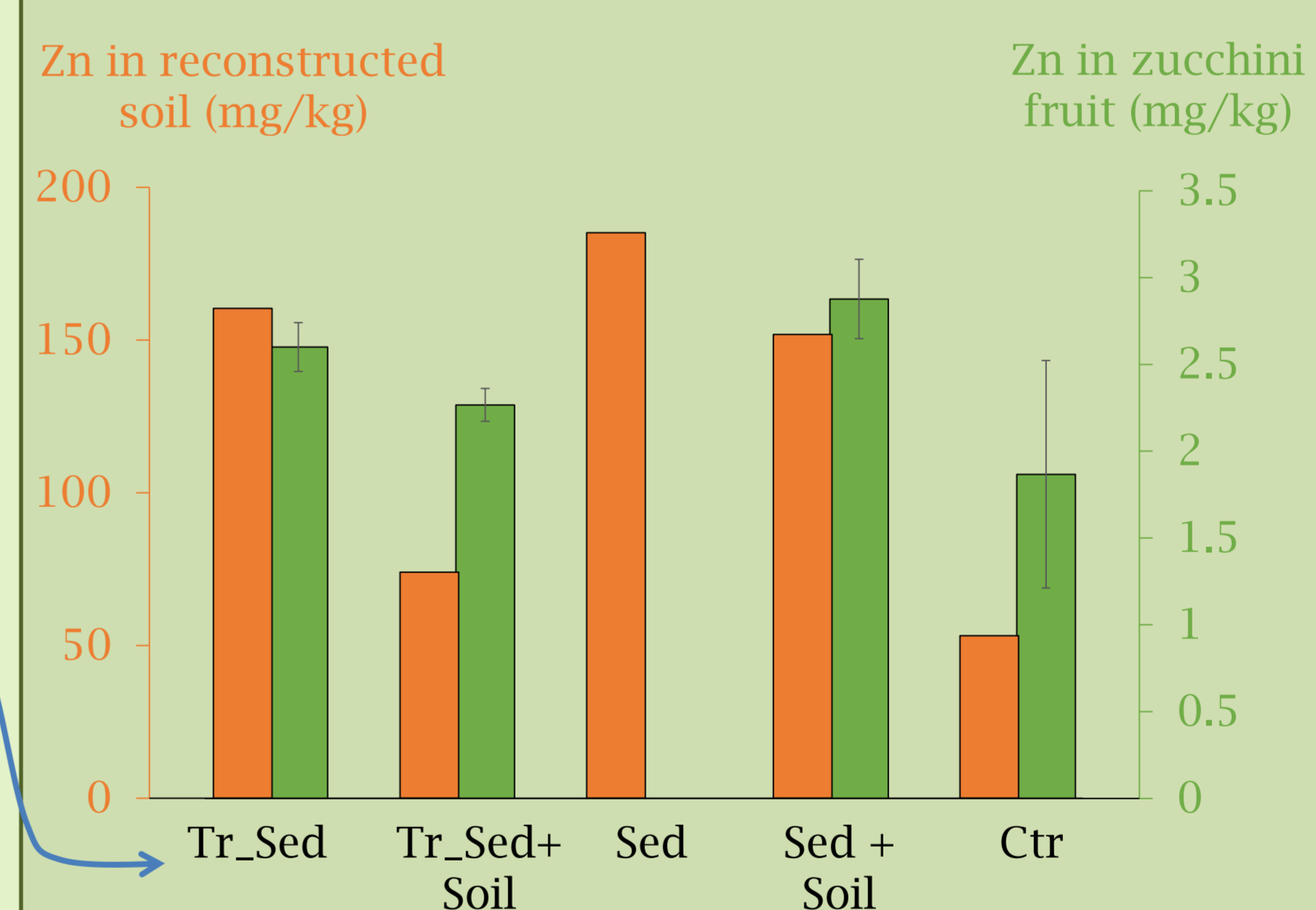
3. Growing Zucchini Plants in Reconstructed Soils

- Four reconstructed soils were formed by initial and EKR-sediments and an agricultural soil; each had four replicates
- Zucchini plantlets were grown and the fruits were collected and analyzed for metals

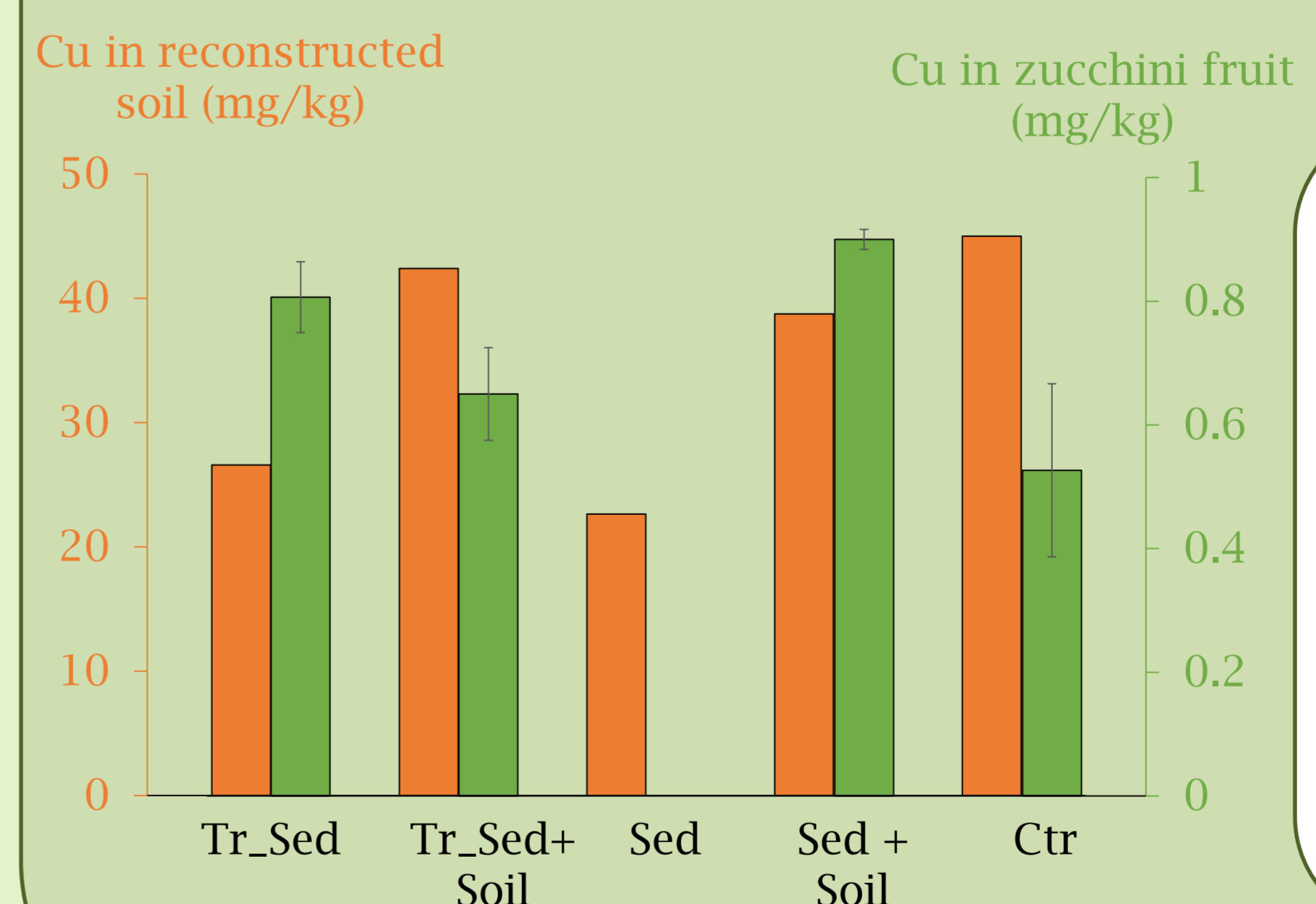


- EKR-sediments proved to be suitable media for growing zucchini
- Initial sediment (non-treated) was not able to keep zucchini plants alive

4. Accumulation of Zn and Cu in Zucchini Fruits



- EKR reduced Zn contents
 - relatively low Zn for treated sediments + agricultural soils
- Zn in sediments > agricultural soil
- Zn in zucchini was not proportional to Zn in reconstructed soil



- Cu in Ctr > sediments
- Zucchini grown in sediments had high Cu → Cu is more available in sediments
- Cu of Zucchini grown in Tr_Sed < initial Sed
 - EKR reduced available Cu for zucchini

5. Related work

- Effects of EKR on particle size, physico-chemical properties, microbial population, and organic, mineral, and metal contents
- Description of metal behavior caused by EKR

6. Conclusion

- EKR rendered the sediments suitable for zucchini growth
- Reconstructed soils containing EKR-sediments are a promising approach to grow zucchini without affecting metal accumulation
- Re-using dredged sediments after suitable treatment can produce healthy, safe, and sustainable soils → reaching a circular economy concerning sediments