

3

NEWSLETTER SEPTEMBER 2023

September 2023

DEAR RTG-UGI team

A few intense months with a lot of work and seminars have now passed since our last RTG newsletter.

Here you can now find a new issue that has been prepared with inputs from the entire consortium. The newsletter will now be published quarterly, anyone is welcome to contribute to the next issue.

And now please enjoy the newest issue with lots of inputs from the PhD students, the management group and the RTG in general.

Warm regards,
Astrid

SUMMARY

- 02 Management
- 03 Next Steps & Upcoming Events
- 04 Updates
- 05 Doctoral Forum
- 06 Journal Club
- 07 Urban Typologies
- 08 Cluster RC1
- 12 Cluster RC2
- 14 Cluster RC3
- 16 Diversity circle



Management

Dear RTG-UGI members,

The past few months have been quite exciting and marked by some new developments in the RTG-UGI. A year and a half has passed since the RTG began in April 2022, during which we have held over 55 events, seminars, exchange meetings and courses. We have had international guests such as Maha Deeb, Sarah Bekessy, David Kendal, DAAD exchange students and others.

We filled our information channels (homepage, X, Wiki, and few others) with information on our research and our team. Unfortunately, the search for a system modeler has not been successful yet, but we continue to try to recruit a new person for the RTG synthesis. We are very hopeful at the moment in this regard. More about this in the future, since we have a few options to integrate a second post-doc for this.

Overall, the developments - especially the exchange in July - have shown that we can and will grow with the RTG. In the long term, we are trying to improve communication in the RTG and to avoid top-down decisions. To do this, we must all pull together and not lose mutual respect. The Reflection Day in September is a first day for a shared exchange. We hope to conduct this format on a regular basis and thus further strengthen the consortium. Here's to another successful year and a half!

Warmest regards,

The RTG management group



NEXT STEPS & UPCOMING EVENTS

RTG Reflection Day	On 22th September in Munich, 9:00 - 16:00
Course on Data Visualization	11 & 12 October in Freising - held by Cédric Scherer
Seminar Anne Nielsen	01 December at the Oscar-von-Miller Forum
Retreat	March 2024, information will follow

Outside our RTG-UGI

GfÖ Annual Meeting	12 – 16 September in Leipzig
Aqua Urbanica	09 – 10 October in Garching
World Forum on Urban Trees	16 – 20 October in Washington
BIOMET Conference	19 – 21 March in Offenbach
World Sustainable Built Environment Conference	12 – 14 June digital
IUFRO	23 – 29 June in Stockholm
PLEA 2024	25 – 28 June in Wroclaw
NBS conference	18 – 20 June in Oxford

UPDATES ON SOFTWARE/PLATFORMS IN THE RTG

Wiki

It only has some basic information on it now, but we can continue to fill it out. It would be nice if you personalize the SP information. You can also add info's on paper you are writing on, conference participations and experimental devices you can share or lend.

Here is the [link](#)

Website

[Here is the link to your official webpage.](#) If you want to share some information there, please contact Astrid.

Data Science Storage (DSS)

We have a TUM Data Container for Big Data storage. You can put here your big datasets for storage and exchange. Link: <https://dssweb.dss.lrz.de/ui/login/>

EX (formerly Twitter)

An EX account is existing for our RTG-UGI. Please contact Andrew, Mahtab or Astrid if you want to post something.

[\(7\) TUM UGI Research Training Group \(@TUM UGI RTG\) / X \(twitter.com\)](#)

Linked In

We have a Linked In Project. Linked In active people have been added. <https://www.linkedin.com/groups/9356568/>

Zotero

Shared library created with files for each publication. Please contact Andrew if you want to be added.

[My Library | Zotero](#)

Miro board

Please find here the work on the urban labs/systems model

[Urban Lab, Online Whiteboard for Visual Collaboration \(miro.com\)](#)

Research Gate

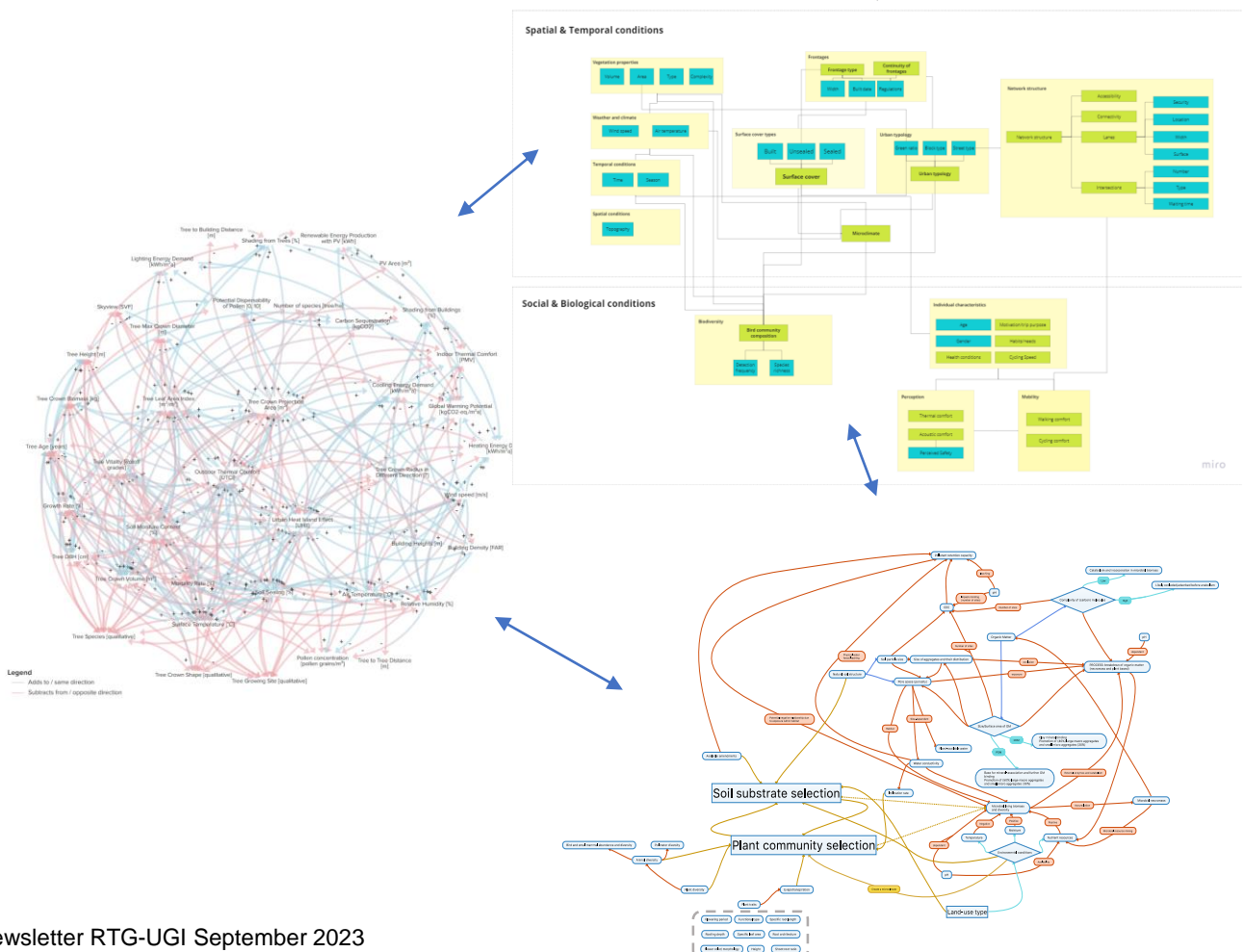
Projects were removed, so our RTG-UGI cannot be found there anymore ☹

DOCTORAL FORUM

DEAR RTG-UGI group

This was another productive semester for our doctoral forum! The Journal Club was a good occasion for us to meet regularly and advance on the concept of the system model. Although there is still a lot to do to develop the system model, each cluster is working actively to bring it forward. The dynamic of collaboration within the clusters is promising and the first results will soon be visible. Moreover, we are glad to have welcome Caroline Trost between us and look forward to working together!

Julia & Liza



JOURNAL CLUB OUTCOME

BY MOHAMMAD RAHMAN

Following our system model workshop in December 2022, all the three clusters were requested to do an impact matrix analysis. To better understand the interactions and dynamics within particular PhD projects and defining the variables and proceed to the development of causal loop diagram (CLD), we organized a Journal Club during the summer 2023.

Starting from April 18, every Tuesday between 14 and 16, 2023, 13 PhD fellows presented 26 papers within next 14 weeks. Everyone presented one latest review paper to explain the state of the art in their own field as well as one original research paper close to their own PhD approach. The idea was to define the most important variables and link with the other important variables of other PhD projects. During each session we discussed, how and which variables could be coupled with the CLD that will allow a comparative assessment of multiple variables, based on the analysis of benefits and co-benefits produced, as well as the identification of trade-offs among three thematic clusters.

At the beginning, we tried to connect variables from each PhD project with one another; however, it turned out to be very complex. Therefore, we decided to have impact matrix analysis and development of CLD for each cluster. At the end of October 2023, all the clusters are going to submit their individual report with causal loop diagram. The next step is to combine all the individual results into single simplified CLD. Consequently, we want to write a first joint conceptual paper about the utilization of system thinking for policy formulation while commenting on the targeted UGI interventions, setting performance targets and standards, future scenario development and analysis. In the next years, the CLD can be refined and tested with the data driven from each sub-projects.

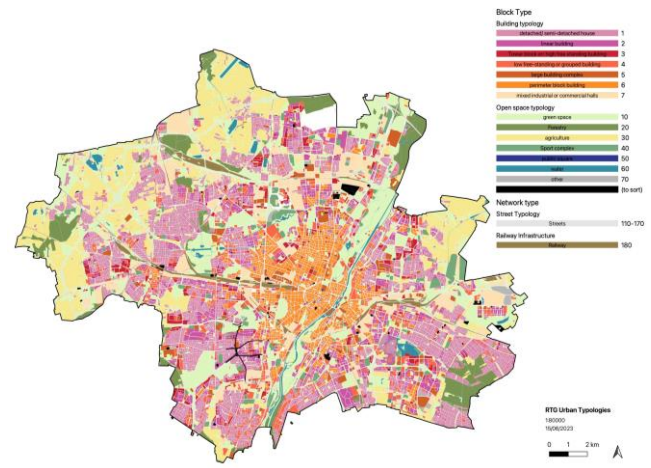
Urban Typologies

By J. Micklewright, R. Reitberger, N. Pattnaik, M. Baghaiepoor, L. Parhizgar, H. Yazdi, M. Rahman

Still working on the urban typologies mapping, but progressing fine...

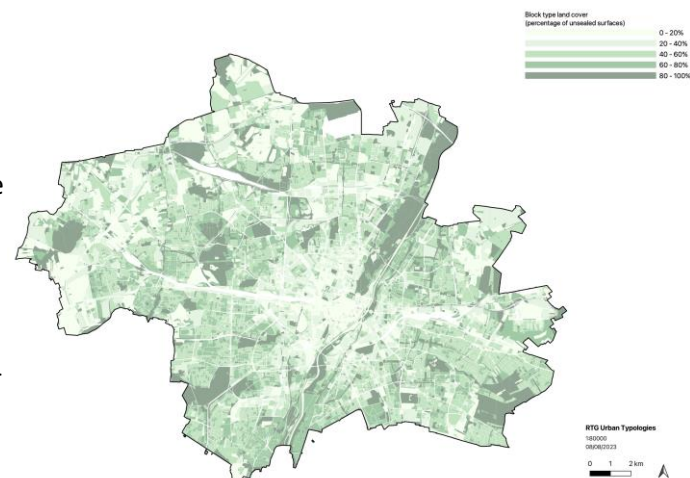
Latest updates:

Similar to the work of Bartesaghi Koc et al. (2017) the developed typologies combine built structure, land use and vegetation characteristics. These typologies rely on two main pillars, the “Block type” which includes the building and the open space typologies and the “Network type”, which includes the streets typology and the railway network. The land cover and the canopy cover percentage which stands for the vegetation cover is then applied as a further sub-categorization of these typologies.



The spatial datasets were developed based on GIS data sets which were gathered from the following sources: the building and open space types were provided by the city administration of Munich and further simplified to 7 types; the vegetation originates from the LULC Map of Munich developed by S. Bae at the chair of Prof. Dr. W. Weisser and the street classification is still under definition.

Once the street typologies will be finalized, these typologies will be shared with the whole RTG and the first statistical analyses will be run based on sub-project results. After a first exchange with the German Aerospace Center (DLR), collaboration possibilities (e.g. shared data) have been identified. The DLR is currently checking their requirements for sharing data with the RTG. If better quality or more recent data gets available through this collaboration, the urban typologies can be updated.



CLUSTER RC1

Andrew Fairbain, Mahtab Baghaiepoor, Julia Micklewright, Ishika Alim, Elizaveta Fakirova, Hadi Yazdi

Sub-projects advancement

Meetings within the research clusters, agreements, future steps

Andrew:

- WP1: Paper in preparation about investigating the biodiversity of public urban squares in Munich
- WP2: To better understand the drivers of urban biodiversity, we focus on one taxonomic group and undertake large-scale monitoring throughout the city. For this, we are developing methods and workflows for monitoring birds using acoustic recorders. We are investigating machine learning to automatically identify bird species in recordings. We have developed an experimental R-package, "chirpR", to automate some of the analysis of acoustic recordings.
- WP3: The results of WP2 and WP3 will be used as a proof-of-concept case study in a presentation at the GfÖ 2023 in Leipzig.
- Outlook: This year and next summer, we will continue investigating how different urban features affect bird diversity. This will culminate in the development of a distribution model for birds in the city which can then be used to predict changes in bird diversity under different scenarios.

Mahtab:

- This subproject focused on developing the theoretical framework and methodological approaches in the past months.
- The results encompassed the development and refinement of innovative research methods through a dedicated course and workshops, the supervision of master theses focusing on finding the potential of connected green corridors for cyclists in Munich, and the formulation of street typologies adaptable to the broader research group's objectives.

Julia:

- In the past months, phase 1 of the project was tackled with the conduction of the first literature review on the potential benefits of private green frontages, the collection of necessary GIS data sets relative to the urban structure and land cover, and the elaboration of the method for the frontages mapping analysis.

Ishika:

- The conceptual framework of the project has been developed. Project objectives and research questions of the research project were defined. The literature review has been conducted.

Liza:

- The focus of the study was changed and the all before collected data was divided into two potential papers. One of them is taken as a priority: "Collaborative governance arrangements for UGI in the context of complex urban land ownership patterns"
- A suitable framework for the analyses was identified and tailored to align with the specific needs of this study.

- Based on the initial study focus: a list of 84 case studies was prepared, that was refined down to 24 prime cases; a total of 31 semi-structured interviews have been conducted. The information was transcribed, translated and prepared for further analysis. For each of the cases, a case study profile was created. Based on the rearranged focus of the study, the total of **10 cases** out of 24 were taken for further analysis.
- Currently, the structure of the potential paper is still being developed. The missing data will be collected, and the data analysis will begin.
- An internship was undertaken at the Urban Planning Department in Munich from 9th to 27th January 2023

Hadi:

- The result of objective 1 (A Target-driven Tree Planting and Maintenance) was published in Journal of Digital Landscape Architecture – see below.
This step proposes a conceptual novel approach for designing UGIs from a 3D voxel point of view in cities to maximize the leaf area considering existing spatial conditions and objectives.
- Objective 2: The data paper is submitted in Scientific Data journal by Nature – see below
- The TreeML model is under development and the result will be submitted in Fall 2023 in Sustainable Cities and Society journal by Elsevier.
- An TreeML-Species recognition model is under development and the result will be submitted in winter 2024 in Remote Sensing of Environment journal by Elsevier.
- Furthermore, TreeML-planter will be developed and submitted until end of 2024.

Conferences

Conferences that were visited as a listener

Liza:

- URBIO 2022 (28-30 November) - “Integrating Biodiversity in Urban Planning and Design Processes”, Leipzig

Julia:

- Urban Future Conference 2023, Young Leaders Program, Stuttgart

Presentations

Conferences and other events where the PhD Candidate gave a presentation

Andrew:

- GfÖ 2022 conference in Metz: *The effect of design features on biodiversity in urban squares*
- GfÖ 2023 in Leipzig: *Enhancing bird surveys: Evaluating acoustic monitoring and BirdNET for assessing urban bird diversity*

Mahtab:

- SP2 research framework and proposed methodology will be presented at the Cycling Research Board annual meeting, October 2023 in Wuppertal.

Liza:

- PhD course: Researching Landscape Governance (May 8 and May 15 – 18, 2023)
- Workshop for social science methods (14 -15 March, 2023)
- 2023 ESG Mentoring Initiative organized by the Earth System Governance - the network of scientists in the field of governance. Mentor: Maarten Hajer, Utrecht University

Further events

Papers under work

Start date, estimated date of submission, in collaboration with, for what journal

Liza, Julia, Mahtab

- Workshop for social science methods (14 -15 March, 2023)

Andrew:

- Paper about WP1: *Examine the impact of design elements on biodiversity in urban squares.*
- Paper about WP2: BirdNET is in preparation

Mahtab:

- Research collaborations within RC1: two papers describing the bigger picture of RC1. The papers evolve around mobility and its adjacent areas in the city

Liza:

- *Analyses of Governance Modes: Multi-Level UGI Governance Arrangements in Munich*, paper on the thematic analysis, submitted until end of the year
- *How NBS governance modes foster environmental justice: empirical insights from European cities*, Conference paper on System Model. Probably for the PLEA Conference.
- The perspective paper on Landscape Governance as an outcome from the Landscape Governance Workshop.

Julia:

- Paper on phase 1: *The latent potential of frontages: a typological approach to frontages as an urban green infrastructure element in the context of Munich*, planned submission at the end of the year, target journal: Landscape and Urban Planning
- Paper on system model of RC1: *Urban Green Infrastructure for Resilient Urban Transformations: a System Modeling Approach for multifunctional street networks*. Abstract submitted to PLEA 2024. Shared first authorship with Mahtab

Hadi:

- The data paper is submitted in Scientific Data journal by Nature and it is under review now

Publications

Andrew:

- Book of abstracts GfÖ conference Metz 2022: *The effect of design features on biodiversity in urban squares*
- Fairbairn, A., Thornhill, I., Martin, t. E., Hayward, R., Ive, R., Hammond, J., Newman, S., Pollard, P., Palmer, C. A.: *The short-term impacts of Hurricane Maria on the forest birds of Dominica*. Journal of Caribbean Ornithology 35, 2022, 70-82

Liza:

- Linke, S., van Lierop, M., Erlwein, S., Fakirova, E., Pauleit, S. and Lang, W. (2022). *Climate Change Adaption between Governance and Government—Collaborative Arrangements in the City of Munich*. Land 2022, 11(10), 1818. DOI: 10.3390/land11101818

- van Lierop, M., Fakirova, E. (2022). *Strategies and tools for just collaborative planning of nature-based solutions*. 58th ISO-CARP Congress “From wealthy to healthy cities”. Brussels, Belgium, October 2022

Hadi:

- Yazdi, H., Shu, Q., Ludwig, F. (2023): *A Target-driven Tree Planting and Maintenance Approach for Next Generation Urban Green Infrastructure (UGI)*. Journal of Digital Landscape Architecture, 10.14627/537740019
- Yazdi, H., Mügge, G., Movafagh, S., Fallahi, M. H., Ludwig, F., Moazen, S.: *The Effect of Improper Interfering in The Historical Architecture on Energy Wasting (Case Study: Bibi-Roqayyeh House, Yazd, Iran)*. IOP Conference Series: Earth and Environmental Science 1196 (1), 2023
- Yazdi, H., Vukorep, I., Bazazzadeh, H.: *The Methods of Deep Learning and Big Data Analysis in Promoting Sustainable Architecture*. IOP Conference Series: Earth and Environmental Science 1078 (1), 2022, 012136
- Yazdi, H., Sad Berenji, S., Ludwig, F., Moazen, S.: *Deep Learning in Historical Architecture Remote Sensing: Automated Historical Courtyard House Recognition in Yazd, Iran*. Heritage 5 (4), 2022, 3066-308

Julia, Andrew, Liza:

- Grabowski, Z., Fairbairn, A. J., Teixeira, L. H., Micklewright, J., Fakirova, E., Adeleke, E., Meyer, S. T., Traidl-Hoffmann, C., Schlöter, M., Helmreich, B.: *Cosmopolitan conservation: the multi-scalar contributions of urban green infrastructure to biodiversity protection*. Biodiversity and Conservation, 2023, 10.1007/s10531-023-02614-x

CLUSTER RC2

Farzan Banihashemi, Roland Reitberger, Nayanesh Pattnaik, Leila Parhizgar, Carolin Trost

Sub-projects advancement

Meetings within the research clusters, agreements, future steps

Roland & Farzan:

- Set up a machine learning (ML) model based on artificial neural networks. 100,000 parametric building simulations were conducted to generate training data for the model. We combined this ML model with a 3D model of the trees and buildings in the city of Munich to analyze the influence of urban trees on buildings' energy demand and indoor comfort bottom-up.
- Regarding the synergistic improvement of several aspects by UGI, we finished a first study that included indoor thermal comfort, outdoor thermal comfort, heating, and lighting energy demand (see publications).
- Within this work, we set up an urban simulation model that captures various aspects and can be expanded in the future.

Nayanesh:

- The first stage of this study investigated the influence of surface coverage on outdoor thermal comfort, with a particular emphasis on understanding the cooling effect provided by shrubs and quantifying the effects of different surface coverage on reducing heat stress. To achieve this objective, a field measurement campaign was conducted in 15 public squares of varying green coverage in Munich during warm, summer days.

Leila:

- For the first objective, we used the cadaster data of five cities in Germany, encompassing 5-10 years of tree monitoring. Following the calculation of city-specific annual mortality rates, we examined the association between mortality rate and Diameter at breast height (DBH) size classes using multivariable logistic regression models.

Carolin:

- The general idea of SP9 is to focus on verifying the risk of aerobiological origin in space and time for Augsburg and Munich. For this purpose, an aerobiological information tool based on urban ornamental trees and concentrations of airborne pollen grains is proposed. In order to achieve these multiple technologies will be used.
- The remote sensing technique LiDAR is used to determine the exact position of objects, in this case buildings and trees, to create a high-resolution digital surface model (DSM) of the environment. The processing of this model is done with GIS.
- In combination with pollen data collected with different instruments (volumetric 7-day Burkhard pollen trap, pollen monitor HUND, Swisens-Poleno and portable pollen traps) risk maps for Augsburg and Munich can be created.

Presentations

Conferences and other events where the PhD Candidate gave a presentation

Roland & Farzan:

- Sustainable Built Environments Conference 2023 in Thessaloniki

Nayanesh:

- World Forum of Urban Forestry in Washington DC (October 2023)
- GfÖ-conference in Leipzig (September 2023)

Leila:

- ZSK-Workshop Grüne Plätze in Munich (February 2023)
- Poster at GfÖ-conference in Leipzig (September 2023)

Papers under work

Start date, estimated date of submission, in collaboration with, for what journal

Roland & Farzan:

- Marx, Reitberger, Kleeberger, Lang: *Automated Workflow for Simulating the Effect of Green Façades on Indoor Thermal Comfort*
- Banihashemi, Reitberger, Ehlers, Lang: *Starting from the bottom to the city: A deep learning based approach for integrating microclimate and occupant behavior into urban energy analysis* in Applied Energy
- Reitberger, Palm N., Palm H., Lang: *Urban Systems Exploration: A Generic Process for Multi-Objective Urban Planning to Support Decision Making in Early Design Phases* in Building & Environment or Energy, Sustainability and Society

Nayanesh:

- Pattnaik, Rahman, Pauleit : *Effect of green quantity and structure on thermal comfort in public squares* in Urban Forestry and Urban Greening

All cluster 2 members:

- WSBE Conference 2024 - Reitberger, Pattnaik, Parhizgar, Trost, Yazdi, Rahman, Lang,...: *A systems perspective on the relationship of urban green infrastructure and the built environment*

Publications

Roland & Farzan:

- Conference paper at the Sustainable Built Environments Conference 2023: Reitberger, R., Theilig, K., Vollmer, M., Takser, I., Lang, W.: *Connecting building density and vegetation to investigate synergies and trade-offs between thermal comfort and energy demand – a parametric study in the temperate climate of Germany*. IOP Conference Series: Earth and Environmental Science, 10.1088/1755-1315/1196/1/012034.

CLUSTER RC3

Natalie Pérez-Curtidor, Lauren Porter, Swanandee Nulkar, Nadja Berger

Sub-projects advancement

Meetings within the research clusters, agreements, future steps

Natalie:

- Leaching and adsorption experiments (kinetic and isotherm) have been conducted in different biochars for selecting the best performing materials for biocide and heavy metal removal.
- Preliminary results show that high-temperature (850°C) biochar from mixed forest residues (Biochar 1) has a comparable zinc removal to granular activated carbon (GAC). Biochar 1 shows a higher copper removal than GAC, and the removal of diuron and terbutryn from Biochar 1 is comparable to that of GAC.

Lauren:

- In drying mixing novel high carbon organic amendments (HCOAs) of a practical percentage with a native Munich subsoil, as well as a sandier soil from a neighboring city, both substrates see a shift towards macroaggregation within a 30-day incubation period.
- The initial structural development in both constructed soils can be attributed to primary particle size distribution, mineral composition and original state of aggregation, with HCOAs inputs, microbial activity and residual available mineral binding surfaces having minimal to no effect
- In a first short-term study, there is evidence that the type of HCOA incorporated will not impact initial soil structure development, allowing for flexibility in construction and practitioners' choices. Studies incorporating native vegetation as an influencing factor are now underway.

Swanandee:

- In the first year we performed a greenhouse experiment where we added different materials with differing sorption capacity for heavy metals to the soil which derive from construction waste (crushed brick material vs sand). We used the heavy metal accumulating plant *Deschampsia cespitosa subsp. cespitosa* as a model and investigated microbial community structure as well as their resistome (collection of all resistance genes in a community) towards at the plant soil interface, as well as in the bulk soil and on the roots. The different soil samples were artificially contaminated with $ZnCl_2$ and $CuCl_2$. The experiment was performed together with other SPs.
- As expected the application of the heavy metals to soil strongly effected microbial biomass independent from the amendments added, mostly in bulk soil as well as at the plant soil interface. We found a strong reduction of N in the microbial biomass, mainly in the treatments amended with sand, indicating that the heavily metal application strongly influenced microbial communities involved in N turnover. First data from the analysis of total microbial communities confirmed these results. The resistome profiles are still under investigation.

- Based on the outcomes of the first experiment (short term effects) we want to assess long term consequences of heavy metal addition to soils using samples from sites which have been contaminated for > 10 > 50 years and > 200 years

Nadja:

- To study different native plants for their potential use in urban drainage systems as described in Objectives I and II, a greenhouse experiment was conducted in 2022–23. Five species of the grass family, originating from habitats with low to high soil moisture, were subjected to conditions similar to those in infiltration swales, and above- and belowground traits were measured after 3 months of treatments, that included different substrates, heavy metal pollution, and cyclic flooding/drying.
- We found that grasses from habitats with either fluctuating or continuously higher soil moisture showed higher biomass production, while the substrate amendment (sand or brick sand) had no effect.

Natalie:

- Poster presentation at the 11th International Conference on urban water NOVATECH 2023, in Lyon, France: “Implementing biochar and compost as organic amendments for improved pollutant removal in bioswales.”
- Pitch presentation at 42. Assistenztreffen der deutschsprachigen siedlungswasserwirtschaftlichen Institute, Zürich, Switzerland

Lauren:

- Two conferences

Nadja:

- Poster presentation of the SP13 results shown above at the GfÖ conference 2023 (September 12-16, Leipzig)

Natalie, Lauren, Nadja:

- coming poster presentation by SPs 10, 11 & 13 at the Aqua Urbanica in October in Garching „Die wasser- und schadstoffbewusste Stadt“

Presentations

Conferences and other events where the PhD Candidate gave a presentation

Publications

Natalie:

- To be submitted Q1 2024: Paper about choosing a suitable biochar for resilient removal of biocides and heavy metals from stormwater, including results from leaching and adsorption experiments.

Monika & Maha:

- Deeb M & Egerer M. The beautiful life of urban soils and their structure. Frontiers for Young Minds, section Earth Sciences (submitted: 31 July 2023)

DIVERSITY CIRCLE

The Diversity Circle also had a break during the past weeks due to holiday reasons.

We are still working on joint seminars, our handbook and other topics. At the moment, we plan to conduct a small workshop by a professional on managing unconscious bias/impostor syndrome in science during the UGI-Retreat next March 2024. Further information on this will follow soon.

Natalie also shared her experience of a great seminar on body language and voice training. If you are interested, we will try to make places available for you or even organize a seminar on this topic.

Please note that the money for Gender Equality Measures was only used to a limited extent. You can still use this money, e.g. for data analysis courses for women, diversity topics open for everyone, extra conferences etc.

Please contact the Diversity Circle and the Coordinator if you are in need of money for this purpose.

Monika, Natalie, Nayanesh, Johannes & Astrid



**Have a nice fall and
winter time!**

