Seed Funding Global South 2022 – Project report

Wastewater treatment and reuse in food processing

- **Chair at TU Berlin:** Environmental Process Engineering
- **Partner country/countries:** Brazil
- **Partner institution (s):** Federal University of Rio Grande do Sul (UFRGS)
- **Addressed Sustainable Development Goals (SDGs):**

SDG 3: Good Health and Well-being
SDG 6: Clean Water and Sanitation
SDG 12: Responsible Consumption and Production
SDG 17: Partnerships for the Goals

A great part of the nutrition of contemporary society is based on processed foods. During industrial processing of fruits and vegetables, part of the food compounds may transfer to processing waters and be wasted. At least partially, this happens with polyphenols, plant metabolites which have been correlated with disease prevention. As natural antioxidants, there is a growing interest in their use in the food, pharmaceutical and cosmetic industries. Their global market was estimated at US$ 1.6 billion in 2021, with an expected compound annual growth rate of 7.4% between 2022 and 2030. Their recovery from food processing wastewaters could help address sustainability and circular economy issues and, as high-added-value substances, they may contribute to offset wastewater treatment costs and encourage water reuse schemes, which are increasingly seen as an adaptive tool against the climate-change-related decrease of water supply. Furthermore, in many cases (e.g., olive mill wastewaters), their removal from wastewaters is relevant for reducing toxicity and allowing subsequent biological treatment. Given the importance of polyphenols, the more than 20% contribution of agroindustry to Brazilian gross domestic product, and the position of the food industry as the third largest industrial water consumer, this cooperation project with Brazil aims at the treatment of food production wastewater for water reuse and the selective recovery of polyphenols through membrane separation and adsorption processes. The Sustainable Development Goals addressed are 3 (Good Health and Well-being); 6 (Clean Water and Sanitation); 12 (Responsible Consumption and Production); 17 (Partnerships for the Goals).

Within the context of seed funding from TU Berlin, the Chair of Environmental Process Engineering worked together with the Laboratory of Corrosion, Protection and Recycling of Materials at the Federal University of Rio Grande do Sul (UFRGS, Brazil) and conducted exploratory visits to identify industry partners for project development. In August, Professor

Andrea Bernardes from UFRGS visited the German group and their lab structure. She attended one of the largest trade shows for the process industries worldwide and contacted potential material providers, visited the water and wastewater treatment plant of a partner industrial laundry site, which reuses water, and visited a winery in Werder, as a potential partner which could provide wine by-products for polyphenol recovery.

Then, in October, Professor Geißen, Jonas Pluschke and Laura Ramos visited UFRGS. They also made exciting visits to potential industrial partners in nearby cities. The first of these was *Estância das Oliveiras*, a producer of olive oil in a high-tech controlled mill. The company also focuses on eco-tourism and is interested in sustainable production. At the moment, their wastewater is collected in a pit and distributed over time to the olive groves and could provide an interesting source of polyphenols. The following visit was to *Beifort,* a company which focuses on producing special fertilizers, fungi and enzymes for crop yield improvement, and organic substrates and soil conditioners from composting, especially from wastes of nearby wineries. The company also focuses on research and is now studying pyrolysis and hydrothermal carbonization of grape pomace. The last visit was to *Chandon*, a sparkling wine producer. At various points of processing, polyphenol-rich concentrates are generated, which could be exciting study topics.

The seed funding project made it possible to strengthen the partnership between TU Berlin and the Federal University of Rio Grande do Sul as well as initiate direct contact with potential partner companies which were very engaged and interested in the sustainable use of wastes and wastewaters. The researchers returned home not with one, but with three possible projects.