BOOK OF ABSTRACTS

ALL IUFRO CONFERENCE 2022

Forests in a Volatile World –
Global Collaboration to Sustain Forests and Their Societal Benefits

INTERNATIONAL UNION OF FOREST RESEARCH ORGANIZATIONs

HEADQUARTERS, VIENNA AUSTRIA

University of Applied Arts ("Die Angewandte")
A-1030 Vienna, Vordere Zollamtsstraße 7
21-23 September 2022

Evidence integration for coherent policy: perspectives on managing soil-forest-water-climate interactions

Lulu Zhang, *United Nations University Institute for Integrated Management of Material Fluxes and of Resources (UNU-FLORES), Dresden, Germany; Kai Schwärzel, Thünen Institute of Forest Ecosystems, Eberswalde, Germany; Karl-Heinz Feger, Institute of Soil Science and Site Ecology, Technische Universität Dresden, Tharandt, Germany; Yanhui Wang, Institute of Forest Ecology, Environment and Nature Conservation, Chinese Academy of Forestry, Beijing, China*

The United Nations and its member states increasingly seek nature-based solutions to support sustainable development. Forests provide many ecosystem services to meet our needs for timber and food while supporting critical ecologic functions that include but are not limited to fixing carbon, supplying drinkable and clean water, controlling soil erosion and reversing land degradation, and conserving biodiversity. Global initiatives, such as the Bonn Challenge and the New York Declaration on Forests call for restoring 350 million hectares of forestland worldwide by 2030. Rewilding and forestation are good intentions to support achieving SDGs, requiring large public funds and private investments. Therefore, their sustainability must be evaluated against co-benefits and trade-offs by considering resource interactions, natural constraints, and regional priorities. We use a case study in China to show how co-benefits and trade-offs of ecosystem services result from forestation. Our process-based observations at forested sites and natural grassland showed that forestation had altered the water cycle and rainfall partitioning into green and blue water fluxes. Planted forests deplete subsoil water during the main growing season due to water loss through enhanced evapotranspiration, preventing groundwater recharge through seepage in water-limited areas. Forestation in non-humid climate consumes an amount of water close to (in average rainfall years) and is likely to exceed (in drier years) the annual precipitation, presenting a trade-off in water supply services. This explains the findings of significant observed declines in streamflow of rivers, in which forestation made a considerable contribution. On the other hand, forestation protects soil from erosion, improves physical health, and promotes carbon storage in aboveground biomass and underground soil. Our measurements showed that in addition to the extra carbon stored in tree biomass, the forest soil organic carbon content (within one meter) reaches a comparable level as natural grassland after 30 years, which will have a net gain beyond this time horizon. We argue that with climate change resulting in more frequent and prolonged droughts over larger areas, global greening efforts in water-limited regions require careful integrative evaluation and sustainability assessment. It should pay attention to integrating evidence of synergies and trade-offs across resources that is vital for effective carbon fixation and land-based production while achieving water security in a changing environment. It concludes that monitoring data, consolidating process-based knowledge, and translating evidence into coherent practices and policy could assist to manage and balance ecosystem services to ensure a successful forest development.