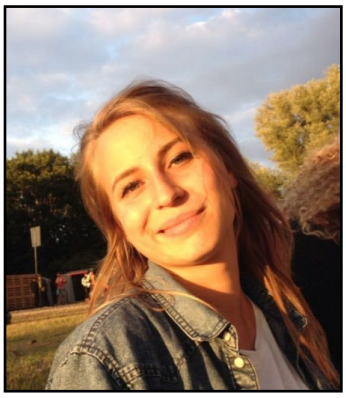
PhD Abstract

UNIVERSITY OF AMSTERDAM

Green and atmospheric water governance in arid environments



Inter-Faculty FMG/FSW Project

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Problem definition

The rapidly increasing global demand for fresh water exceeds its limited supply. Human activities, such as agricultural production, are putting available water resources for natural ecosystems under pressure. Existing governance focuses on *blue water* (surface and groundwater), *grey and black water* (polluted water) and *transboundary water*. However, *green water* (water in soils and plants) and *atmospheric water* (water in the atmosphere), receive far less attention despite being key components in the hydrological cycle and fundamental for supporting life on land. Hence, it is critical to explicitly integrate these two neglected components of the hydrological cycle into the governance agenda.

The project addresses three topics:
(a) Rethinking how to appropriately address these limited water resources within the governance arena;
(b) Studying strategies for equitably sharing and optimally using these resources, especially in arid environments across the globe where the risk of desertification and the crossing of other environmental tipping points is high;
(c) Considering the growing risk that technology, including ecosystem-based geo-engineering approaches, may pose by exacerbating existing 'water grabbing' by converting green and atmospheric water into un-usable water. For instance, inter-basin water transfers, large reforestation projects and other technologies lead to large-scale manipulation and short-circuiting of the water cycle.

Research Question

The main research question is hence as follows:
How can we anticipate the key socio-ecological challenges associated with green and atmospheric water and its relation to land degradation and design key elements of a proactive multi-level water governance system?

Theoretical Framework

The research builds on knowledge of the hydrological cycle which requires complex system knowledge from the earth and natural sciences, on the nexus soil-water-vegetation and how this can be used to sustain plant growth, mitigate degradation and prevent the surpassing of environmental tipping points based on *ecological resilience theory*. Secondly, governance issues include an analysis of the changing drivers of green and atmospheric water use, the instruments for governing water and their ability to address the drivers and the need to address the nexus between land, water, food using knowledge from water law, politics, economics and policy and prevent the surpassing of *socio-political tipping points.*

Methodology

The research is at the interface of three areas of science and under the supervision of Dr. Erik Cammeraat (*Earth Sciences*), Dr. Yael Artzy-Randrup (*Natural Sciences*) and Prof. Joyeeta Gupta (*Social Sciences*). A computational approach to study interactions between vegetation, soil degradation and water flows will be used, while considering different regimes of land use and climate change. Institutional analysis will be carried out to assess whether the current frameworks for water governance are appropriate for integrating green and atmospheric water resources. These methods will be applied to case studies in arid regions.

Expected Results

The research will develop interdisciplinary methodologies for analysing green and atmospheric water based on a modelling framework, and design principles and instruments for governing green and atmospheric water. It will enhance collaboration between IBED/FSW and GID/AISSR in addressing these complex issues.