

Executive Summary - Water Cycle and Climate Change Project (CECC)

IRD / AFD

Object :

Elaboration of products intended to better define the hydro-climatic trajectories of target regions in the intertropical zone (West African Sahel and Andean-Amazonian transition zone) by 2050. These products will be made available via a multi-functional portal allowing easy and documented access to a wide range of users (scientists, decision-makers, managers, consultancies, politicians)

Duration :

4 years : July 2021 – July 2025

Funding :

* French Development Agency (AFD) grant : 3 000 000 €

* IRD's in-kind contribution : 3 000 000 €

Context :

Water remains a major source of vulnerability, perhaps the most important, for the populations of the intertropical zone. Its scarcity leads to famine and migration, as in the great drought that hit the West African Sahel during the last thirty years of the twentieth century. But rain can also fall in excess and generate dramatic floods, like those that have occurred repeatedly over the last fifteen years. Theory, observations and models converge to predict that global warming will aggravate this chronic state of shortages and excesses, due to hydro-climatic intensification, i.e. a tendency towards more severe and more frequent droughts combined with punctually more violent rainfall. Several recent studies have shown that this intensification is already taking place in the Sahel, the southern Amazon and the Andes. Furthermore, the rapid increase in population and the resulting land degradation and poorly controlled urbanisation are increasing the pressure on the resource while making populations more vulnerable to hydro-climatic hazards. These two major effects, climate and land use, are interdependent, with consequences for the future that are still difficult to pin down precisely, as the IPCC Special Report on Climate Change, Desertification and Land Degradation, 2020, recently showed.

For several decades, IRD hydrologists have been working to better understand and characterise the functioning of tropical hydrological systems. The diversity of the environments studied has enabled us to gain a good understanding of some of the particularities of the functioning of the intertropical zone. However, all this accumulated knowledge presupposed a certain constancy of climatic and edaphic conditions, a presupposition that global change is increasingly invalidating. This is why, for the past ten years, a number of IRD researchers have been working to decipher what a non-stationary world implies for the future of water resources and flood risks in the intertropical zone. New tools and new knowledge have emerged from this repositioning; they are still partial but sufficiently innovative and adapted to the needs of the countries concerned to try to synthesise them and make them available to the various stakeholders in the water sector, in a user-friendly and adaptive form. The CECC project thus constitutes a unique partnership between AFD and IRD to test the potential of these tools and products on certain target territories, namely the West African Sahel and the transition region between the Amazon and the Andes. These two regions are very different but both are at the forefront of those where climate and land use change are generating strong disruptions to the water cycle.

Project structure :

The work of developing tools and products is structured around two main axes: i) a regional axis (basins of the Niger and Senegal rivers in the Sahel; transition zone with the Andes in the southern half of the Amazon) and, ii) a sub-regional axis built around target territories (basins of the middle Niger and the city of Niamey in Niger, basin of the middle Senegal and the city of Dakar in Senegal; Beni valley and Lake Titicaca in the Andes). In these different areas, the aim of CECC is to develop tools to characterise how global warming and changes in land use are likely to induce changes in the hydrological cycle that will modify both flood risks and drought risks. These modifications will be described in the form of trajectories, probabilised in certain cases, which will allow the managers or designers of water infrastructures (current and projected) to adjust their sizing or operation strategies to optimise their functioning and minimise their impacts. This is all the more essential as the risk of water shortage pushes the States to build reservoir dams to develop irrigation, while the increase in hydrological risk (due to increased hazards and vulnerabilities) also pushes the planning of new infrastructures (dams, boreholes, or small local developments).

This construction and synthesis work will be based upstream on a reflexive approach to better identify how the tools and products can be really useful to and usable by the various targeted actors. It will be embodied in a portal that will bring together data, tools and products. This implies an organisation in 4 axes:

- **Axis 0: Reflective support (coordination : J. Riaux, G-Eau) :** Reflective workshops, organised in the project countries, will aim to identify the expectations and constraints of the networks of stakeholders and users concerned in the target territories, in order to ensure that the body of information produced will be "usable" and "disseminable".
- **Axis 1: Regional hydro-climatic trajectories (Coordination : J.-M. Cohard, IGE; C. Peugeot, HSM; B. Sultan, Espace-Dev) :** This axis aims at building regional hydro-climatic trajectories, conditioned to different scenarios of climate evolution and land use, and intended to feed the actions of axis N°2 in the target territories.
- **Axis 2 : Products and demonstrators in target territories (Niger: coordination by G. Favreau, IGE – Senegal : coordination by A. Ogilvie, G-Eau – Andes : coordination by T. Condom, D. Ruelland, IGE & HSM) :** This line of action is based on target territories to address one or more of the 4 main issues (floods, water resources, droughts, management of hydraulic infrastructures) based on the challenges specific to these territories. Each action proposes to develop tools and demonstrators aiming to scenario how these issues could evolve in the future, due to global change, while being sufficiently generic to be adapted to other situations.
- **Axis 3: Computer portal for access to data and tools (coordination : J.-C. Desconnets, Espace Dev) :** Setting up a computer portal providing access to knowledge (scientific publications in particular), observations and data from different sources (in situ, satellite, combined), as well as to products (hydro-climatic model outputs at appropriate scales for decision-makers and managers; IDF curves) and demonstrators (risk management or risk scenario tools). This corpus of information will be documented and tools will be made available to combine its content. The IT portal is developed during the project and operationalised at the end of the project.

Project outline :

