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World Bank Next Generation Drought Index

Project Summary

The Next Generation Drought Index Project (NGDI) is a practical framework to help better monitor, anticipate, and trigger financial response to severe drought events. NGDI is led by the World Bank's Crisis and Disaster Risk Finance team, which helps client countries design and implement financial resilience solutions to disasters. The project consortium includes the International Research Institute for Climate and Society at Columbia University (IRI, project lead), the International Water Management Institute (IWMI) and AIR Worldwide.

Together the consortium developed a framework that facilitates access to latest drought indicators (e.g. satellite based soil moisture data) and an easy way to combine them into a single composite index. The project relies on a combination of state-of-the-art earth observation (EO) data, such as precipitation, soil moisture and vegetation greenness, advanced risk modeling and novel methods to close critical socioeconomic data gaps via mobile technologies. Guidelines are also provided to support the design process for future drought indexes, which must be tailored to specific needs, co-generated with stakeholders and satisfy key performance indicators (KPIs) that follow a transparent development design, calibration and validation process.

The need for more effective drought indicators that can provide more accurate early warning and better performing parametric insurance products is exacerbated by the increasing trend in world hunger, after years of steady decline. More than 820 million people are currently affected by malnutrition and another 130 million people might suffer from acute malnutrition due to COVID-19. By 2050, the number of people in need of humanitarian assistance annually due to the impacts of extreme climate events could double. Drought is not the only root-cause for malnutrition, but one of the most important ones. Various organizations are currently developing anticipatory financing mechanisms that focus particularly on drought risk. Understanding which state-of-the-art datasets, methods, and technologies exist, what their added-value and uncertainties are in the context of parametric drought insurance and how they can be used, improved and combined is key to reducing basis risk in the context of advanced financial instruments in low-income countries. Government's understanding of the cost-benefit considerations of the choice of drought indicators and relative systems is equally important in ensuring sustainability of drought indicator systems.

Through a prototype toolbox, suggested index elements, and datasets/simulations the NGDI project will enable decision-makers to evaluate and compare insurance index options that best meet their specific needs. The prototype toolbox provides a concrete example to support decision makers through the operational design process. Currently, the first two countries in which NGDI is being piloted are Senegal and Mozambique.

Objectives

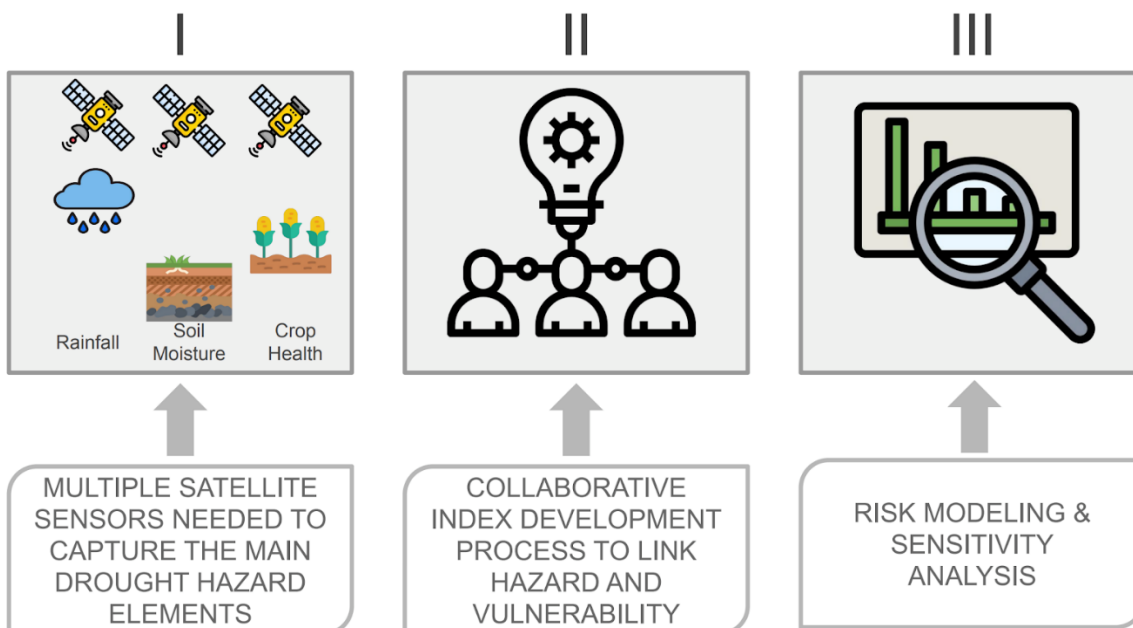
NGDI has two overarching goals: to aid decision-makers in unpacking critical index design processes and tailor drought indexes to meet their specific needs at micro and macro scale. To do so, the NGDI project aims to explain critical design trade-offs as well as ways to compare the strengths and weaknesses of different EO datasets and index design choices.

As illustrated in the figure below, the NGDI project will answer critical index design questions, such as:

I) Choice of Satellite-based variables: Which satellite-based variables perform best with regard to capturing historical drought impacts? Where are ‘clusters’ (e.g areas with similar moisture characteristics) that can help to decide how many different indices are needed to cover large areas? How can rainfall deficits be confirmed via soil moisture anomalies and information about the response of the land surface or specific crops?

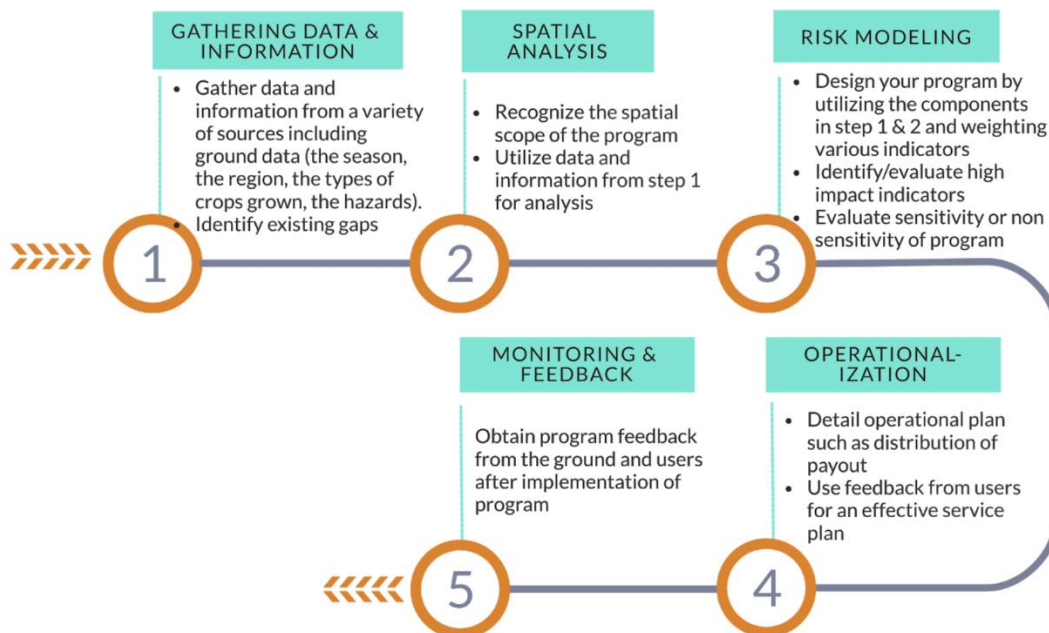
II) Role of socio-economic data: Which socioeconomic data are available to close the gap between drought hazard and impact information? How does vulnerability analysis fit into the index design, calibration and validation process?

III) Validation: how well does a system work? Which methods are best suited to quantify the robustness of an index? How do decisions related to the index design process (e.g. datasets, payout frequencies, insurance windows) affect the overall sensitivity?



A novel Co-Design Process

The co-design process aims specifically to strengthen risk ownership in target countries. It is composed of five interrelated phases (illustration below), aiming to establish a data-driven logical design process that starts with an inventory of available data and ends with a feedback process.



Main Project Outputs and their Added-Value

The following table shows a list of the NGDI project components and the respective outcomes in terms of added-value to the drought indicator capacity of the specific country of interest.

Project Outputs	Added-value
Inventory of EO data and drought indices	Overview of strengths and weaknesses of drought indices.
'Convergence of evidence' approach applied to EO data	Additional level of confidence; No need to rely on a single data source
Interactive online dashboard	Immediate visual feedback to changes in index parameters
Integrated risk modeling and detrending of climate data	Simplification of complex relationships; KPIs; increased robustness of index design
Guided expert assessment process	Hybrid risk design process relying on quantitative EO data and expert knowledge
Low-cost data collection framework for mobile technologies	Complementation of historical socioeconomic surveys with up-to-date information