

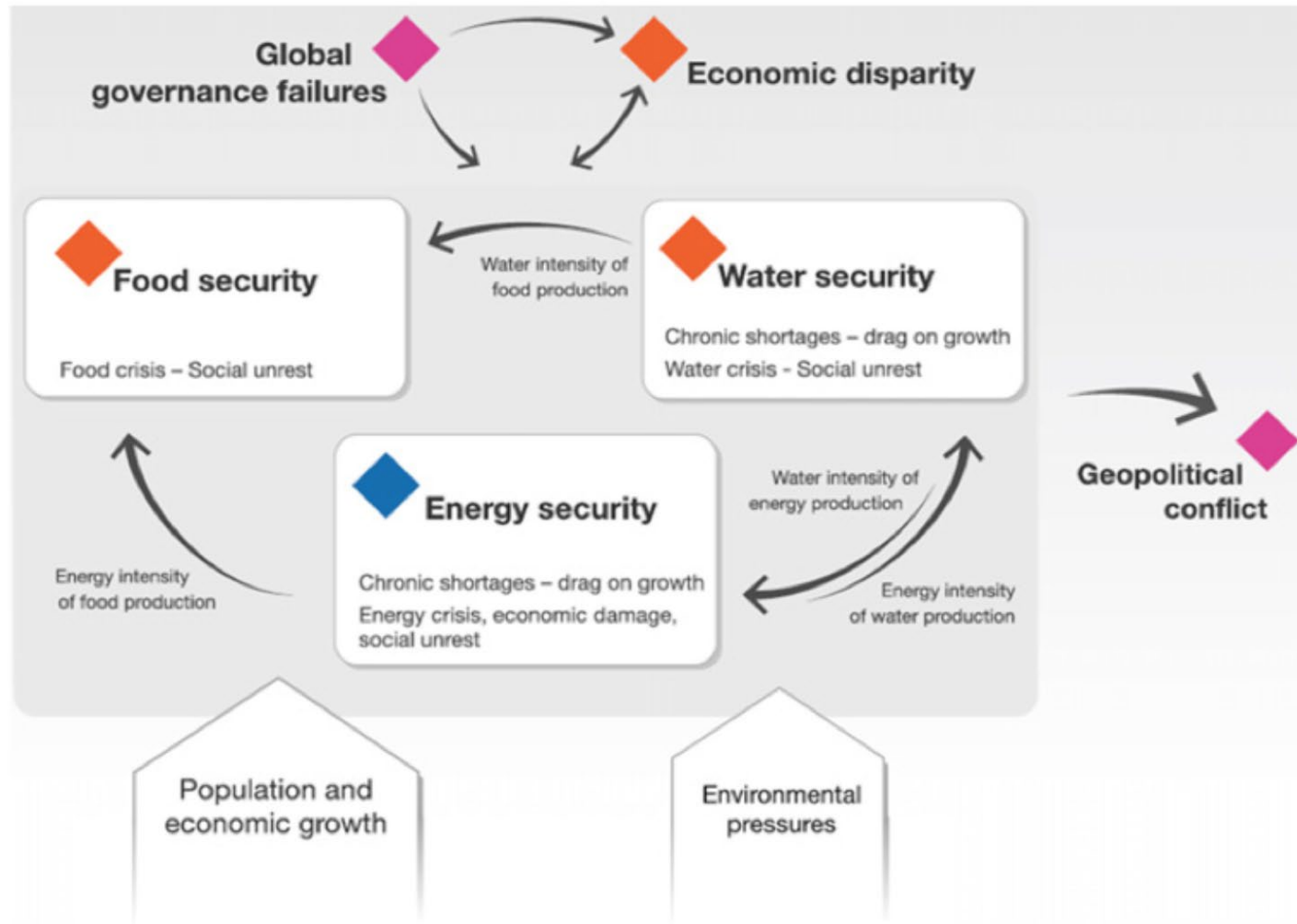
How can water-energy-food-ecosystems nexus investments be an opportunity to finance transboundary water projects?

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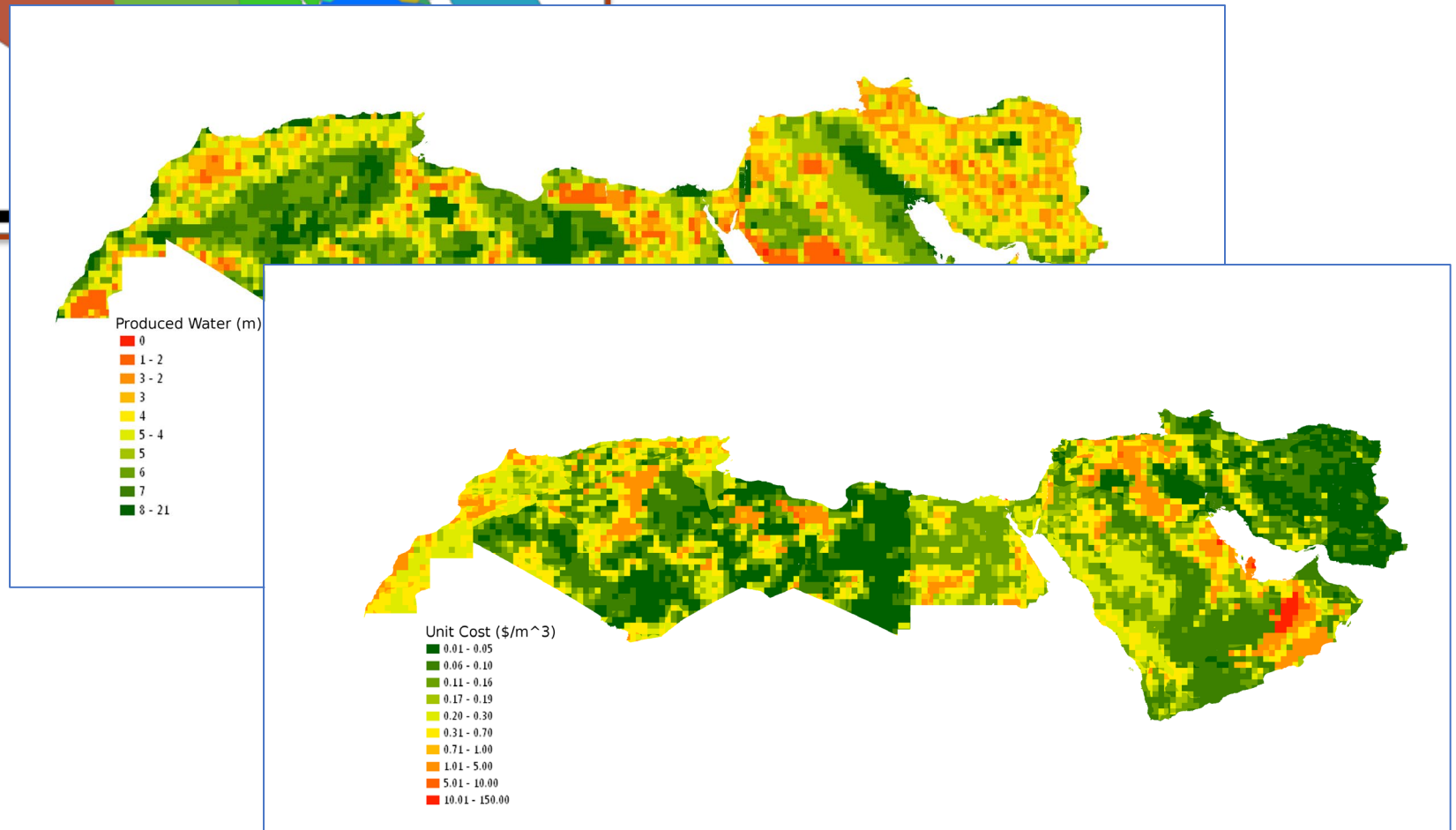
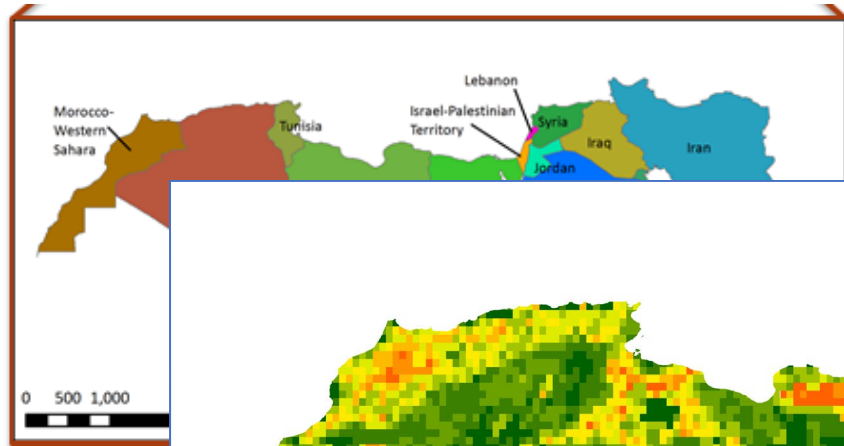
Nexus -> Environmental Security



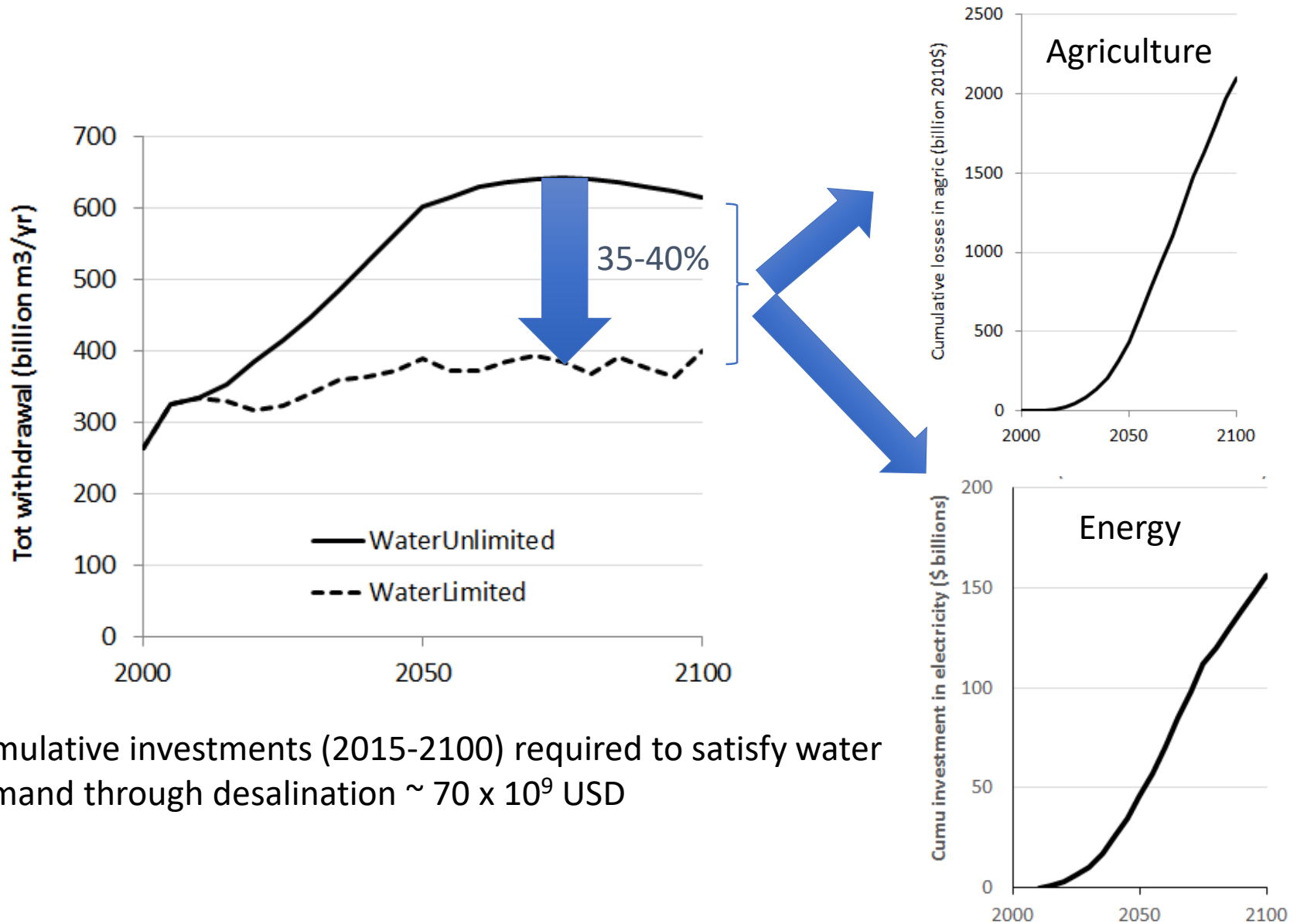
Nexus schematic with a WEF security focus (Bazilian et al. 2011).

Middle East and North Africa (MENA)

Most water-scarce region on Earth.
Overexploited transboundary groundwater.
Expansion in food and energy investments.



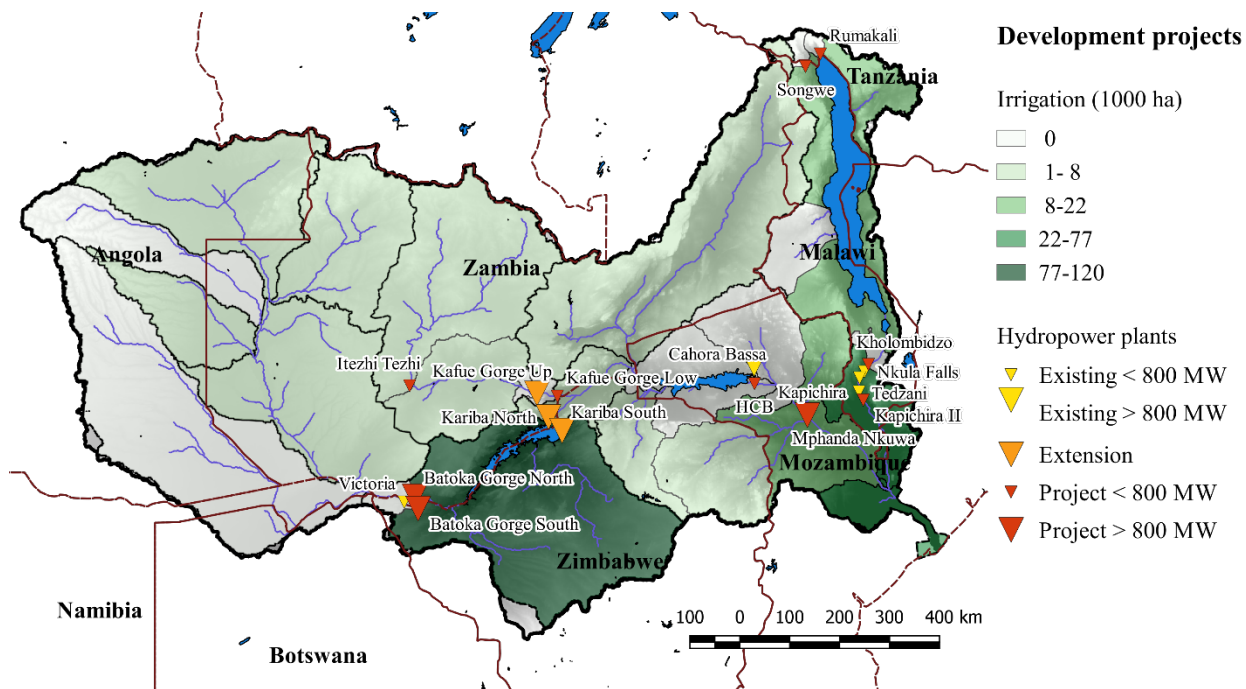
Implications of water scarcity on needed investments



Cumulative investments (2015-2100) required to satisfy water demand through desalination $\sim 70 \times 10^9$ USD

Zambezi River Basin

Challenges: achieving balance between economic growth (inclusive of ensuring environmental sustainability) and the risk of droughts and floods posed by a historically highly variable climate, a risk which is predicted to be further exacerbated by climate change (reduction in runoff of 40 percent by 2050). Strategic planning in the basin (8 countries) led to prioritization of infrastructure investments in water, irrigation and hydropower in a 20+ horizon.



During the course of the preparation of the Plan an inventory of current and future projects was prepared which contains details on 251 existing infrastructure developments, including:

- 12 hydropower projects;
- 50 urban, rural and multipurpose water supply projects;
- 186 agriculture projects; and
- Mining and other projects.

In addition, the inventory contains details of 282 planned projects with a total estimated cost of 28 billion USD, including:

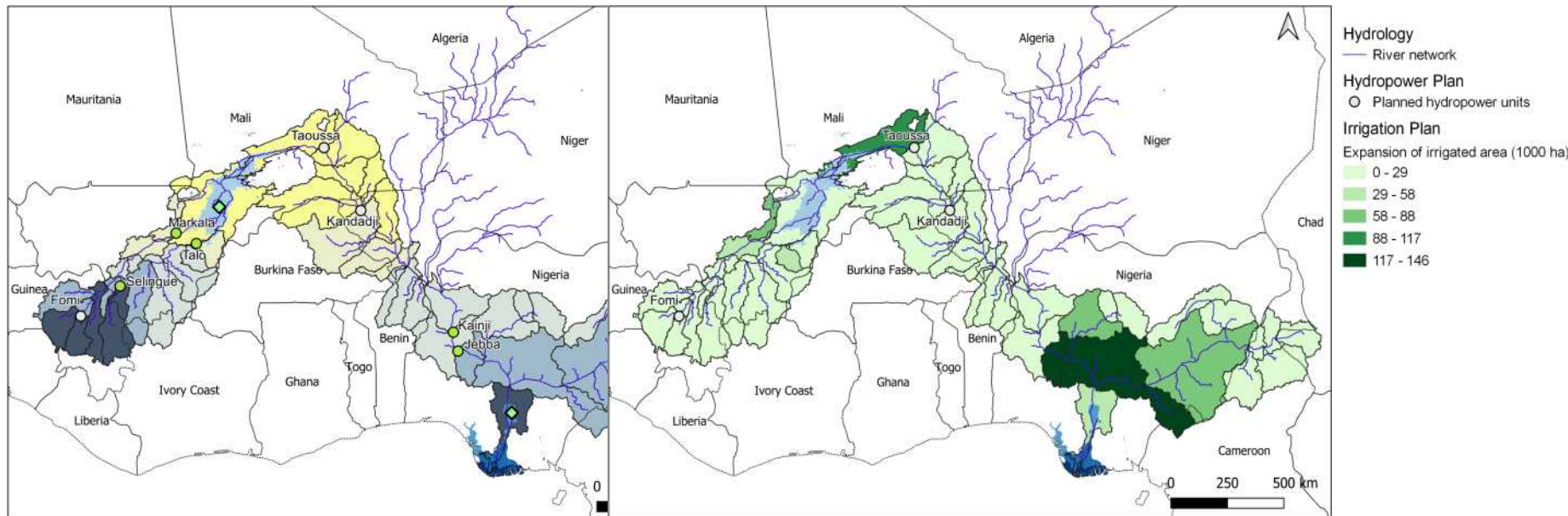
- 26 hydropower projects;
- 116 urban, rural and multipurpose water supply projects;
- 120 agriculture projects; and
- 20 mining and other projects.

Each Member State has their own national development plans and sectoral plans and policies. The common feature of these plans is that they all prioritise the need for economic growth and to address the high levels of poverty through inclusive growth which supports the livelihoods of the poorest sector of the economy, whilst ensuring environmental sustainability.

~ 1.6M km²
8 countries
47M people

Source: Strategic Plan for the Zambezi Watercourse 2018-2040

Niger River Basin



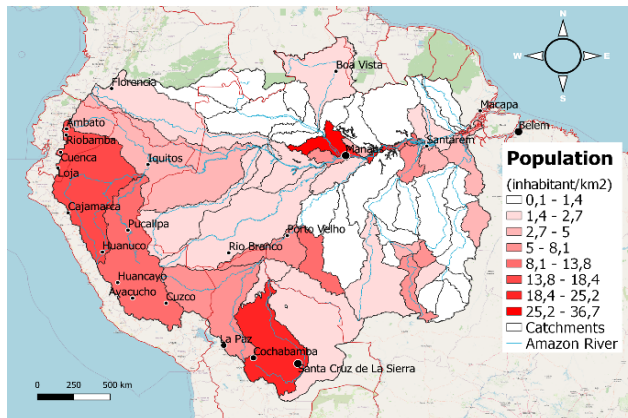
~ 2.1M km²
9 countries
130M people

Challenges: Fast population and economic growth -> 400M people by 2050; power generation to more triple by 2040; increases in irrigation of double or more are projected.

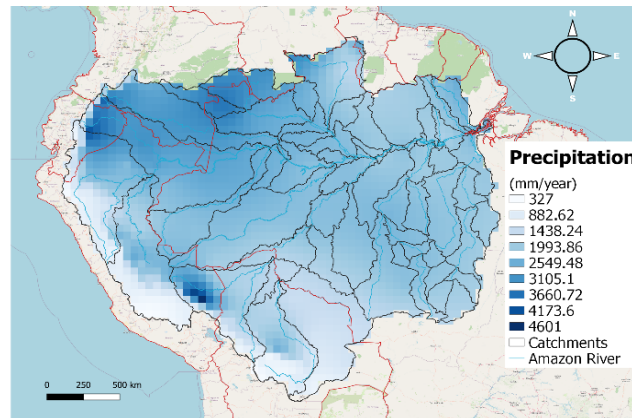
Indicators	Irrigation Plan	Hydropower Plan	Both Plans
Agriculture benefit (M\$/year)	+2,704.4	-0.1	+2,704.3
Hydropower benefit (M\$/year)	-0.8	+39.2	+38.2
Downstream flow (Mm ³ /year)	-1,755.7	-671.4	-2,423.6
Hydropower production (GWh)	-14.1	+676.3	+659.1
Net irrigated area (1,000 ha)	+636.4	0.0	+636.4
Net irrigation consumption (Mm ³ /year)	+1,797.5	0.0	+1,797.4
Reservoir evaporation (Mm ³ /year)	0.0	+1,137.9	+1,137.9

Source:
Technical University of Denmark 2020

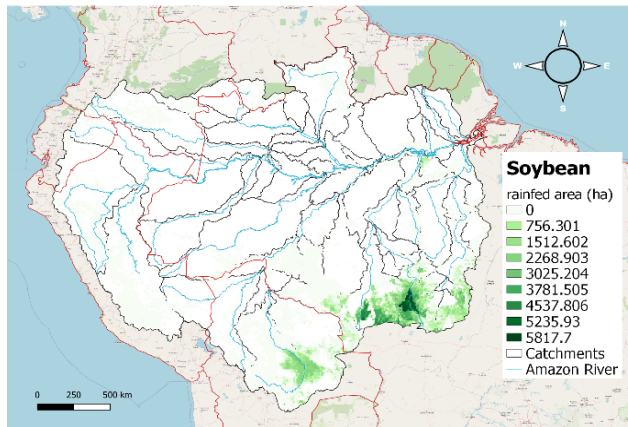
Amazon River Basin



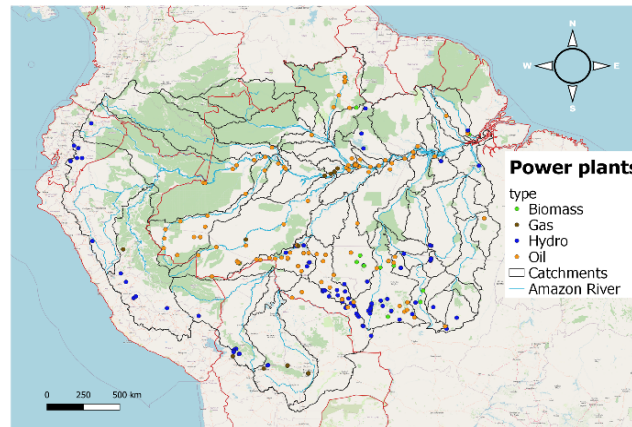
Source: Own production from LandScan and World Cities database



Source: Own production from CRU Global Climate Dataset



Source: Own production from SPAM 2010



Source: Own production from Global Power Plant Database (WRI)

~ 6M km²
8 countries
~45M people, AND:
30,000 plant species
2,000 fish species
1,800 bird species
65 reptile species
35 mammal families

Challenges: balancing economic development (and infrastructure investments) with ecosystem conservation. Investments are projected in the agricultural and extractive sectors (jointly with water), leveraging its ecological assets through growth in bioeconomy.

Ongoing Challenges

- The IWRM - > NEXUS evolving paradigm
- Nexus defies traditional sectoral thinking, management and institutions -> opportunities for investment in transboundary systems
- Nexus approaches help detect inconsistencies in sectoral and national development plans -> redefine investments.
- Climate, Ecosystems, Humans -> towards “CLE²WS” frameworks.

Human activities dominate changes in water scarcity across much of the world

On average by 2050, over 60 percent of global basins attribute humans as the main driver behind non-negligible water scarcity changes

2050 Driver of Water Scarcity Changes

