Resilience Building in the Limpopo River Basin (RESILIM)

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RESILIM

Regional Meeting on Tools for the Sustainable Management of Transboundary Aquifers

28-31 July 2015

USAID FROM THE AMERICAN PEOPLE | SOUTHERN AFRICA

LIMCOM LIMPOPO WATERCOURSE COMMISSION

Resilience in the Limpopo Basin Program

WHY RESILIM ?

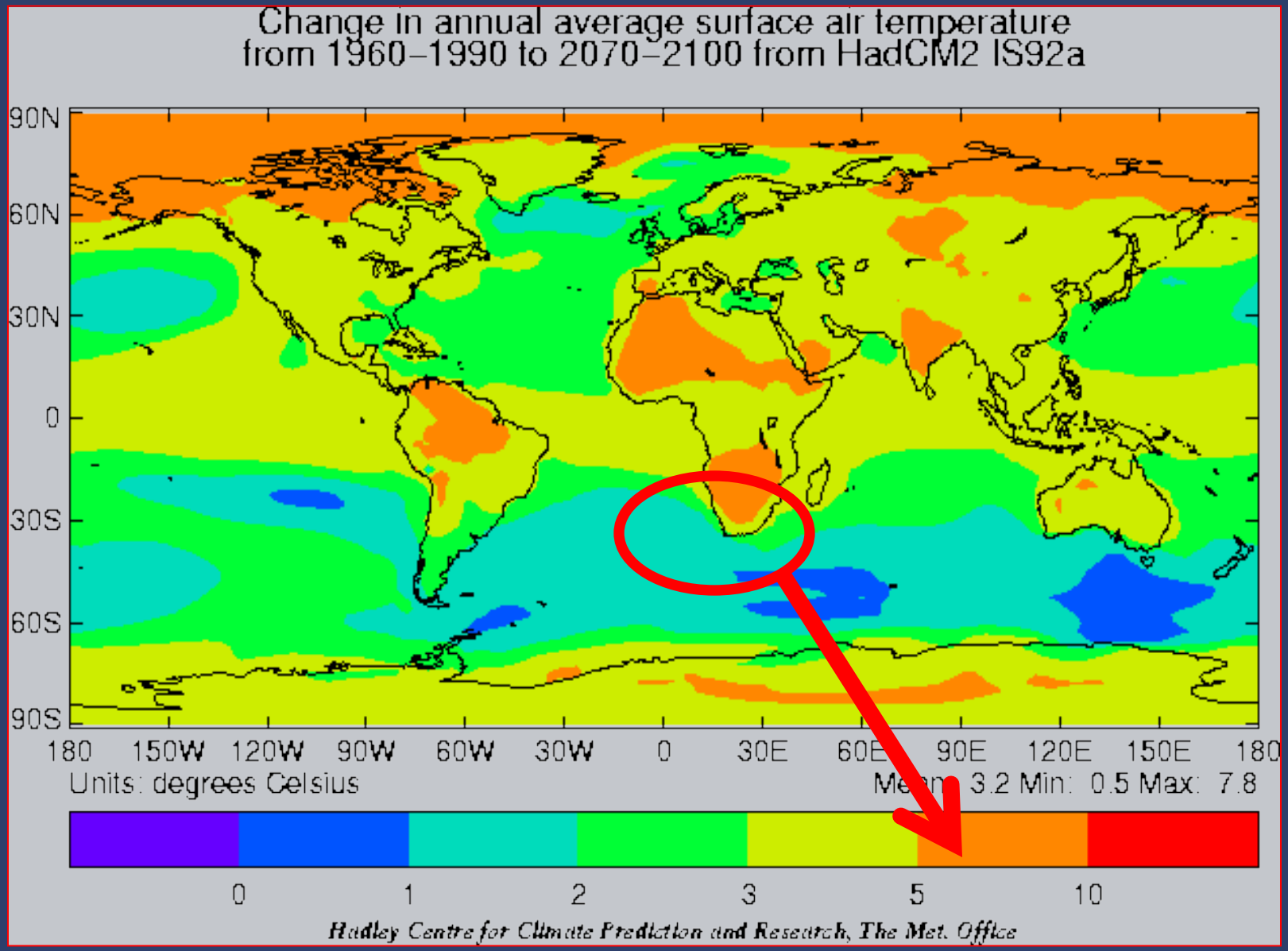
•Climate change, Demographic change and Globalization of economic systems

Presents enormous challenge to society world wide

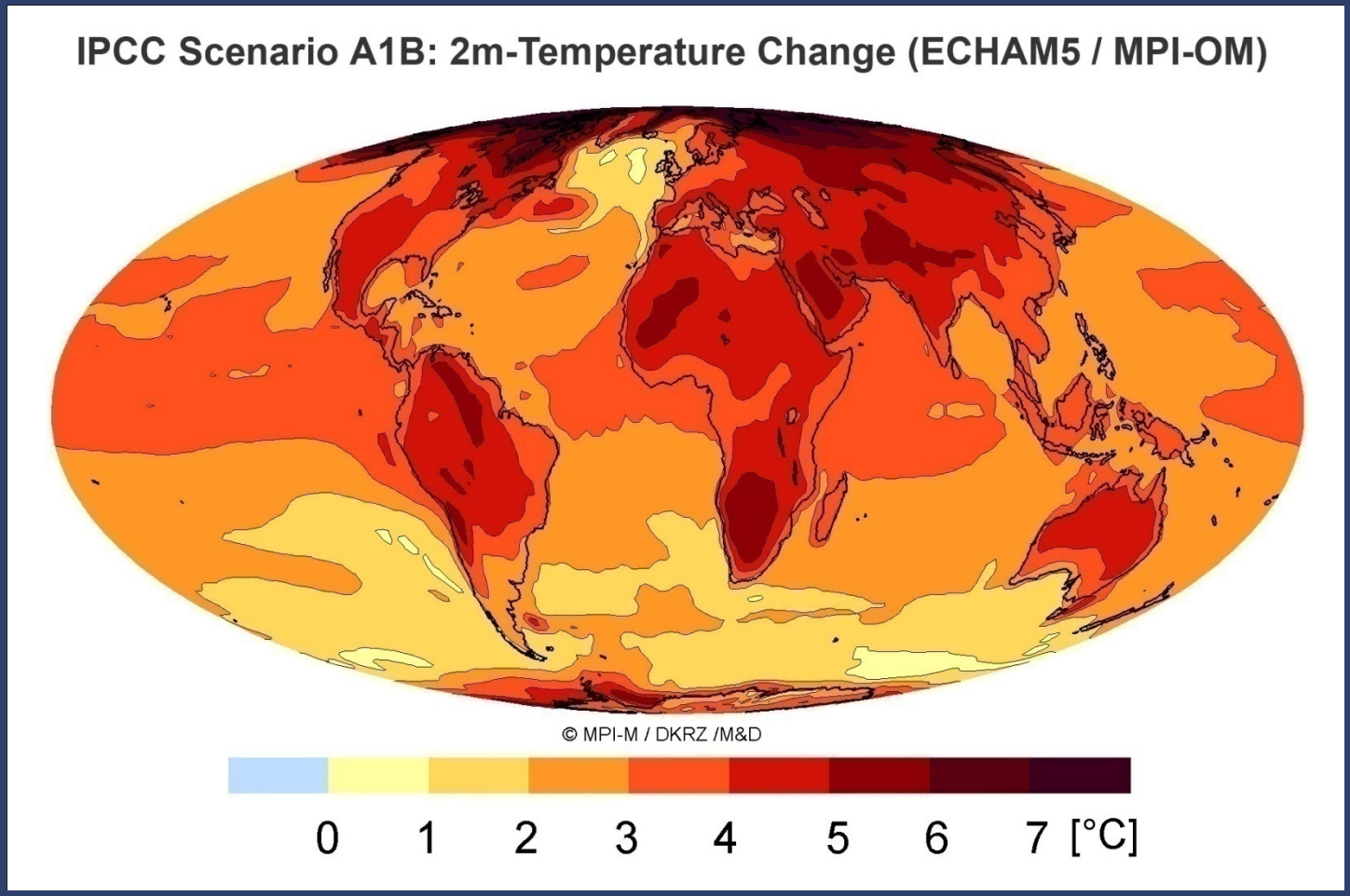
Conceptualized and operationalised to complement the existing capacity development needs and initiatives in the Basin.

Ability of a socio-ecological system to anticipate and reduce risk or adapt to shocks or disturbances (e.g. climate variability and change). This includes the ability to "bounce back" from negative impacts or to "bounce forward", transforming a challenge into an opportunity

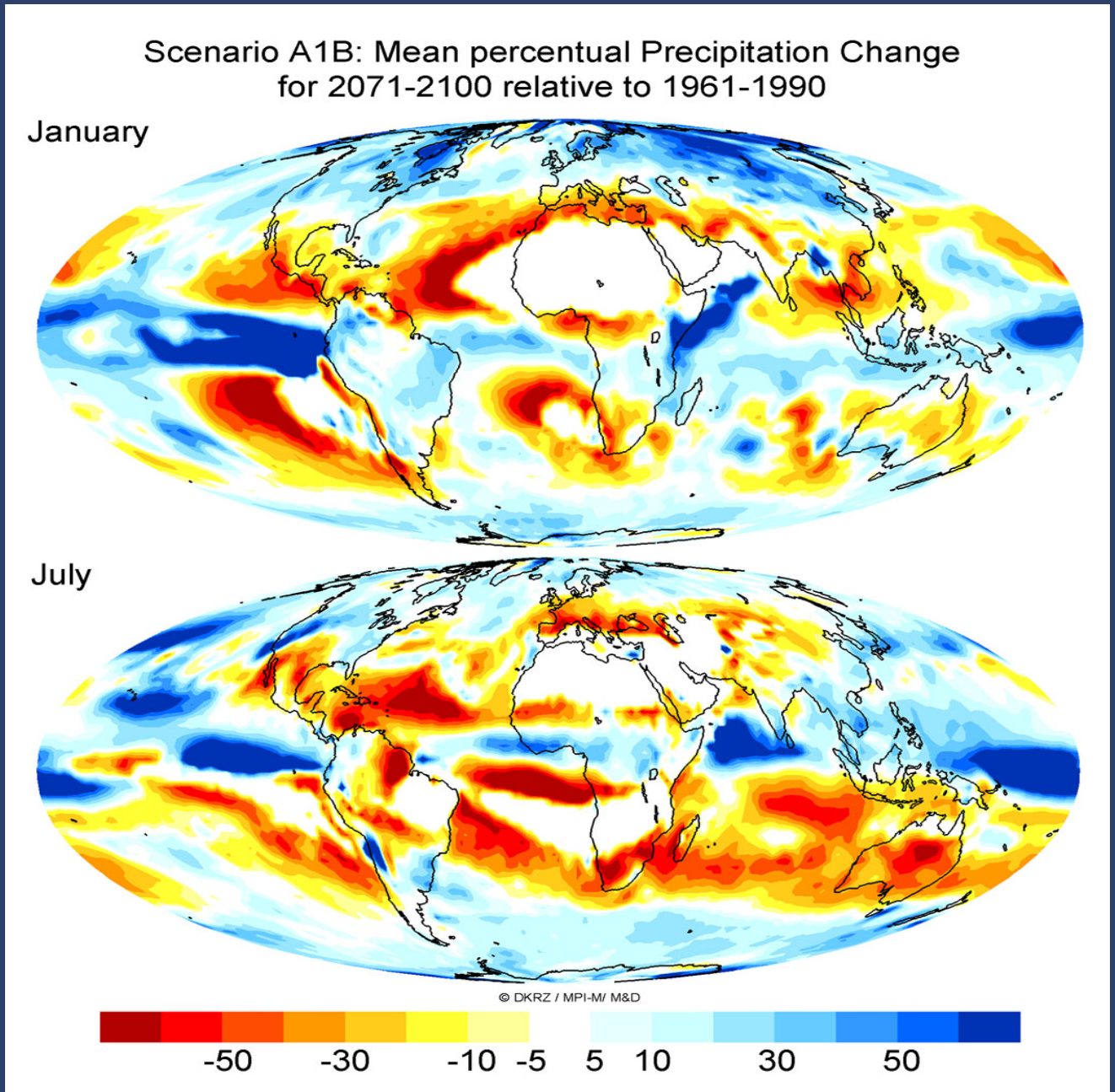
Motivation


Change in annual average surface air temperature
from 1960–1990 to 2070–2100 from HadCM2 IS92a
90N
60N
30N
0
30S
60S
90S
180
150W
120W
90W
60W
30W
0
30E
60E
90E
120E
150E
180
Units: degrees Celsius
3.2 Min: 0.5 Max: 7.8
0
1
2
3
5
10
Hadley Centre for Climate Prediction and Research, The Met. Office

Global Warming prediction for this century: Strong and negative changes for most of Africa



Less rainfall for most of southern Africa



RESILIM Program Objectives

The RESILIM program overall goal is to improve trans-boundary management of the Limpopo River Basin resulting in **enhanced resiliency of people and ecosystems**.

1. Reduce climate vulnerability by promoting the adoption of science-based adaptation strategies for integrated, trans-boundary water resource management.

2. Conserve biodiversity and sustainably manage high-priority ecosystems.

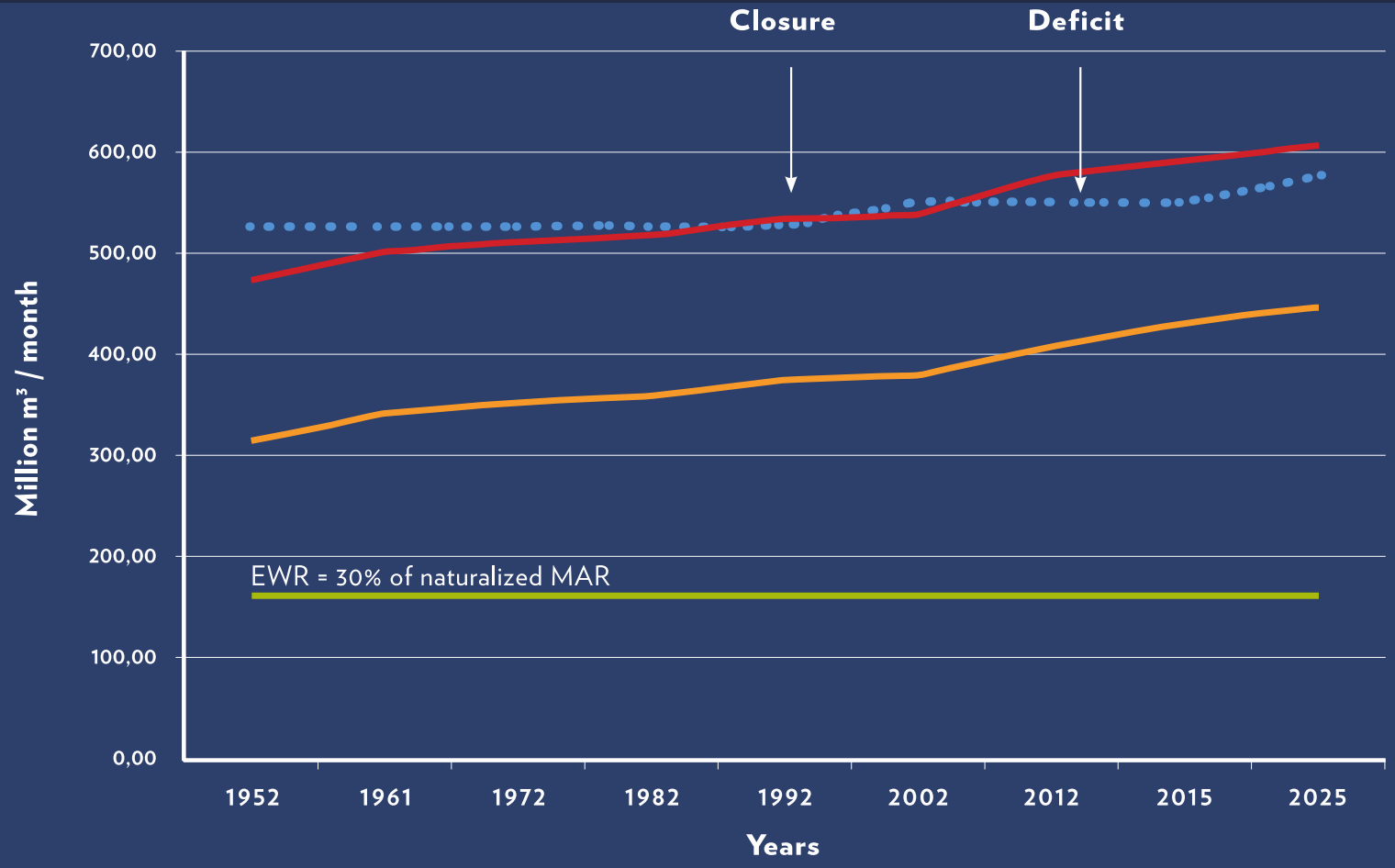
3. Build the capacity of stakeholders to sustainably manage water and ecosystem resources.

The LRB is shared by 4 countries and is characterized by water scarcity

- *Mostly semi-arid with highly a variable climate - Drought and Flooding*
- *Land-use patterns, ecosystems, and social, economic and governance systems*
- *Large rural populations*

Natural resource
Rainfed agriculture
Poverty
Less diversified eco.
Evolving governace

General Water Scarcity in the LRB is viewed in terms of "closure" and deficit



EWR = Environmental Water Reserve
MAR = Mean Annual Runoff

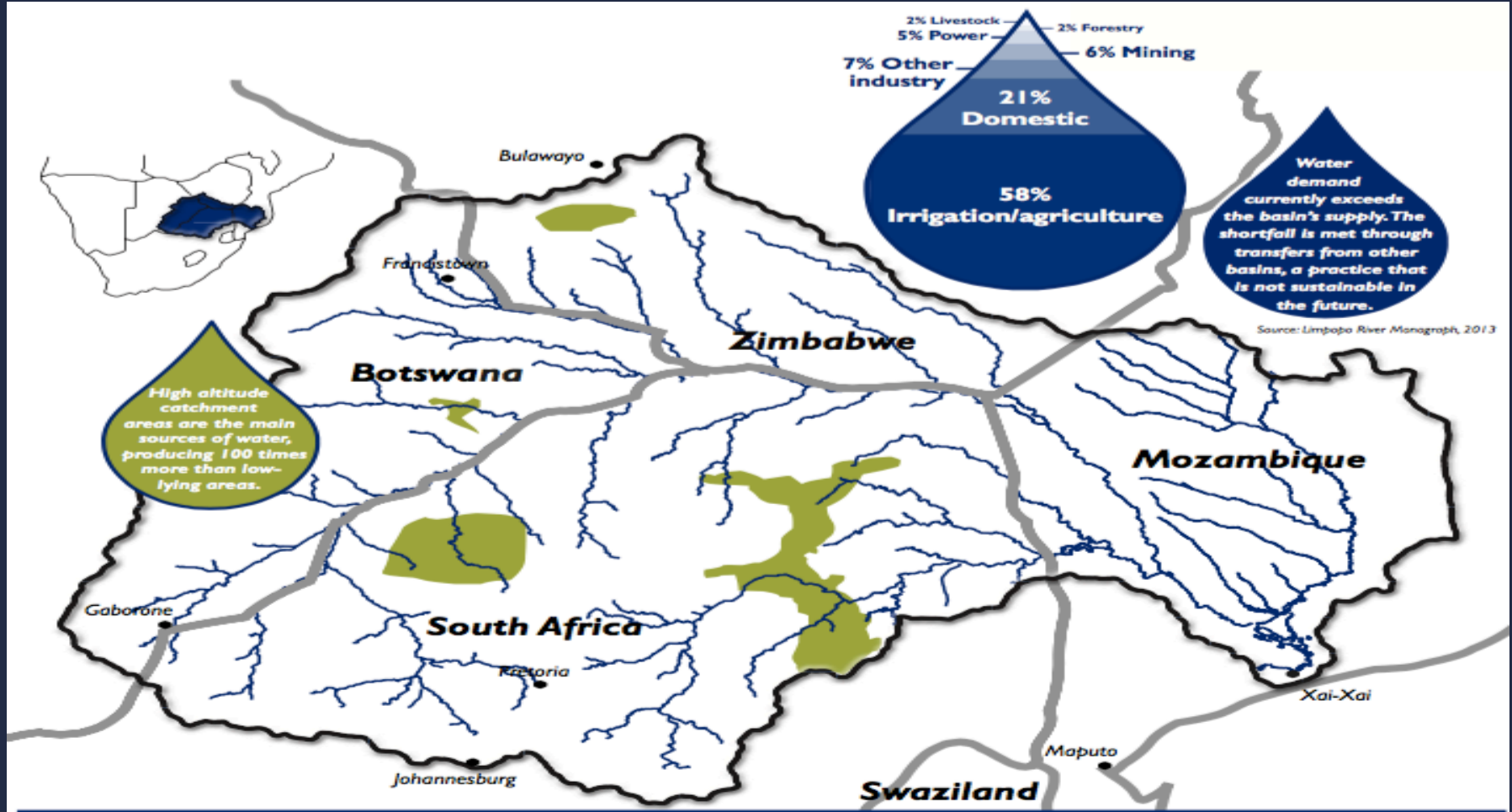
Total water available
Total water required
Total (excl. EWR)
Total (% of MAR)

Source: OneWorld, with values from:

Aurecon (2013) Limpopo River Basin Monograph

Bigcon (2010) Joint Limpopo River Basin Study Scoping Phase

…Key factors of the Limpopo Basin…



Key facts about the Limpopo River Basin

- Covers 411,000 km² of Botswana, South Africa, Zimbabwe and Mozambique, about the same area as Sweden.
- Home to 18 million people. 15 million in South Africa. 80 percent under age 25. Population is expected to grow 11% by 2040.
- Not one river, but many: tributaries from 27 sub-basins feed the Limpopo. But agricultural run-off, urban waste, acid mine damage, algae and invasive species, salisation and sedimentation compromise water quality in many, particularly the Olifants and Crocodile rivers.
- Along with 500+ bird, 116 reptile and 147 mammal species—including 75% of the world's rhino population—the basin's renowned game parks together represent one of the planet's greatest animal kingdoms.

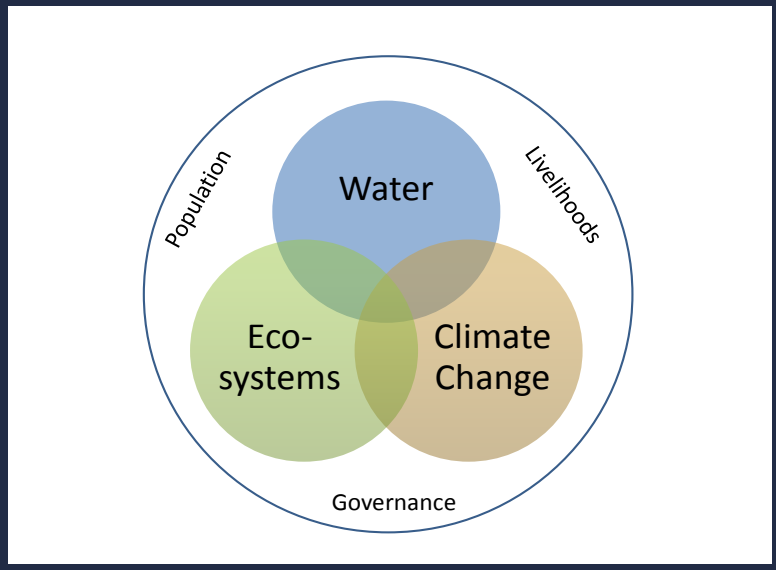
Water, biodiversity and CC – a nexus in the LRB

The LRB is already water scarce – closed status

Dimensions of water, ecosystems and livelihoods are tightly linked and interrelated, a change in one has significant impacts on the others, and vice versa

Few/ no buffers or excesses in this system of linkages in the LRB - small changes in an input pathway usually lead to clearly observable impacts on output pathways or products

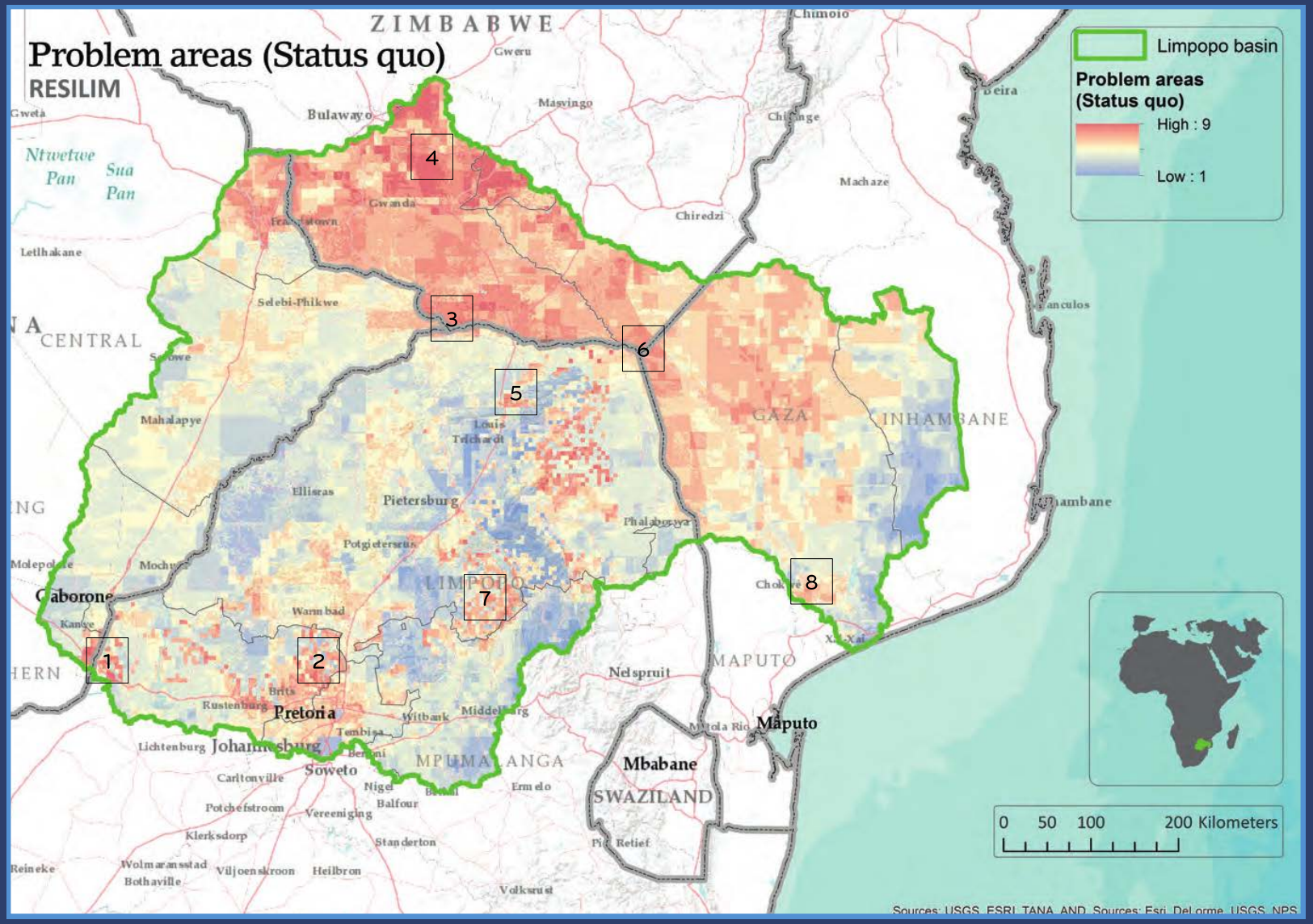
External influences: population dynamics and growth (including the economic effects), livelihood needs and the effects of governance.



A systems based approach requires a combination of methodological and synthesized analysis

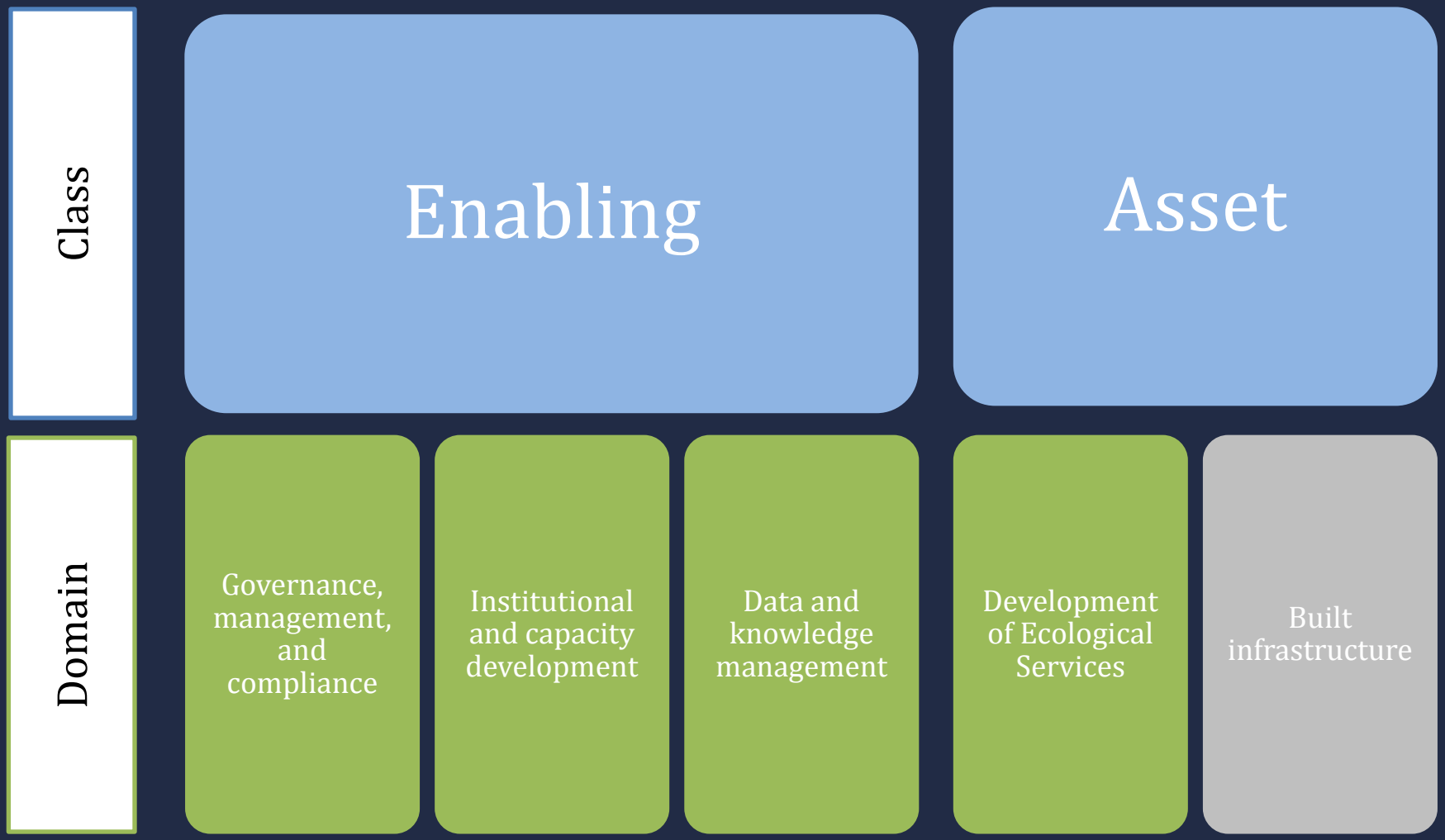
- Risk and Vulnerability Mapping
- 1st to 4th Order Impact Assessments – how does CC cascade through a system?
- Political and Livelihoods Economy Analysis
- Institutional Mapping
- Analysis of the nuances of vulnerability and development of an adaptive capacity framework
- Particiatory analysis
- Multicriteria analysis: assessing the dimensions of return on investment

Spatial mapping brings focus on specific areas revealing 8 representative case studies of vulnerability

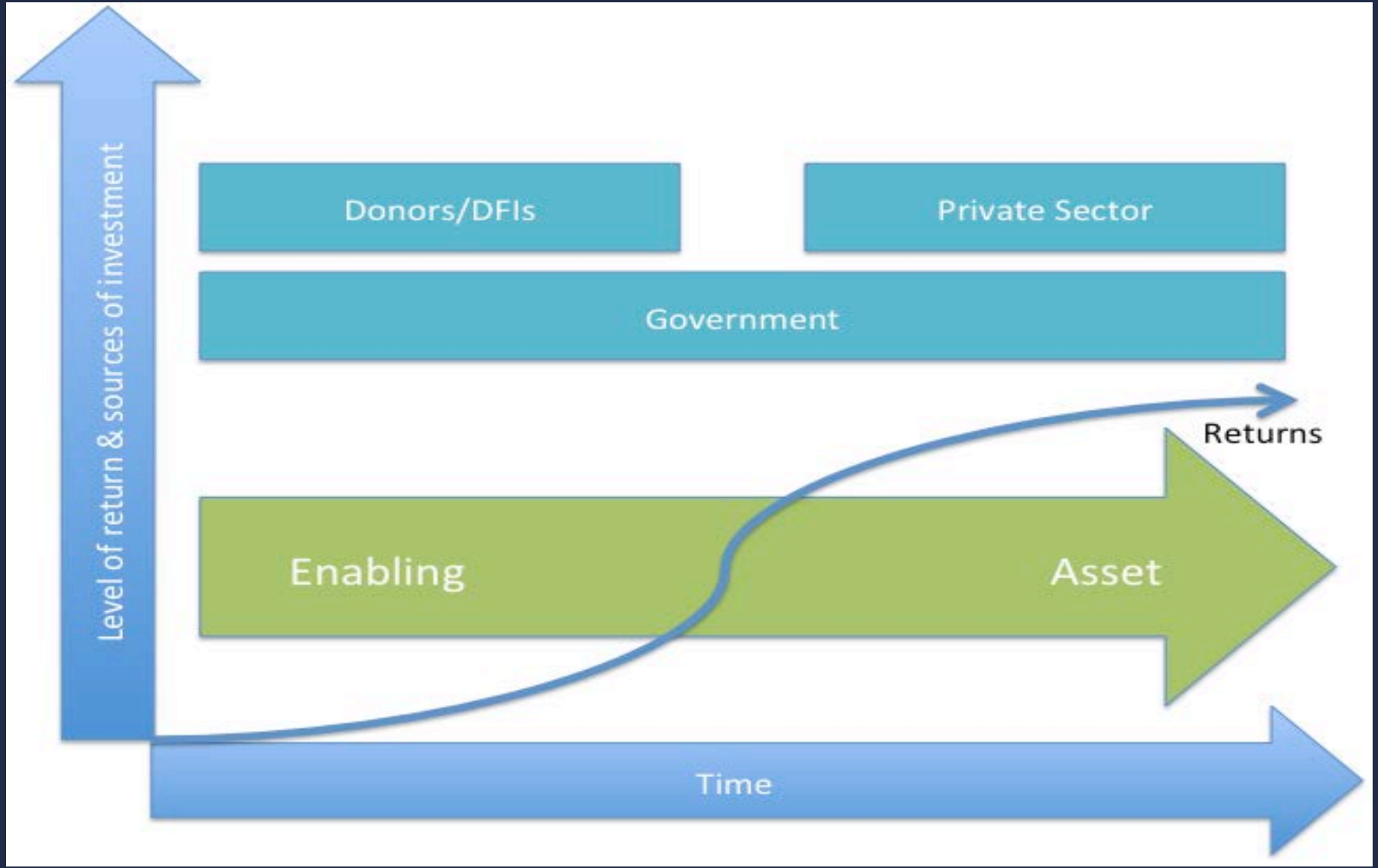


Four Integrated Investment Programs

Investment Domain By Category



Sequencing of Investors and Investments



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RESILIM : Resilience in the Limpopo River Basin Program

MMEWR
DEPARTMENT OF WATER AFFAIRS

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Resilience in the Limpopo Basin: the Potential Role of the Transboundary Ramotswa Aquifer (RESILIM-TBA)

CHEMONICS

igrac
International Groundwater Resources Assessment Centre

XRI

IWMI
International
Water Management
Institute

Overall objectives

- To support a long-term joined vision and cooperation on the shared groundwater resources of the upper Limpopo region
- To understand how to enhance overall water storage, including using the aquifer
- To facilitate joint management and better groundwater governance, focused on coordination, scientific knowledge, social redress and environmental sustainability
- To reduce poverty and inequities and to increase prosperity, livelihoods and food security in face of climate chance and variability
- To contribute to the building of trust and transparency related to the use and development of the shared aquifer resource
- To encourage the states to enter into agreements on their shared aquifer(s)

Specific objectives

A. To increase the recognition of the importance and vulnerability of the transboundary Ramotswa aquifer

B. To improve the understanding of the socio-economic importance of the aquifer area and the inequalities in water security across the population

C. To improve the understanding of the extent and hydrogeology of the transboundary aquifer resources under present and future climate and population projections

D. To assess the feasibility and best options for managed aquifer recharge (MAR) for securing the buffer and controlling the water quality, using wastewater, flood and storm water

E. To assess the feasibility and best options for small-scale irrigation (ag-water solutions)

F. To establish national and cross-border dialogue and cooperation on the Ramotswa and further encourage international cooperation on transboundary aquifers in the SADC region

G. To develop tools for shared and harmonised management and monitoring of the groundwater resources

H. To develop human and institutional capacity for shared and harmonised management and monitoring of the groundwater resources

I. To publish and disseminate results and findings

Activities and outputs

Objectives	Activities	Output
A, F	Multi-stakeholder engagement	Report on Joint strategic action plan (SAP), International conference
B	Socio-economic and institutional baseline assessment	Report on Transboundary diagnostic analysis (TDA)
C	Hydrogeological characterisation (air-borne geophysics)	Hydrogeological maps Report on hydrogeology
D	Buffer assessment and MAR solutions	Report on MAR
E	Ag-water solutions	Report on ag-water solutions
G	Hydrogeological model	Calibrated model, Scenario assessments, Report on modelling
G	Joint database	Joint database
H	Training	Training material, Trained staff in relevant organisations
I	Coordination and scientific documentation	Progress reports, Scientific papers

Defining Vulnerability

The assessment of vulnerability includes measures of:

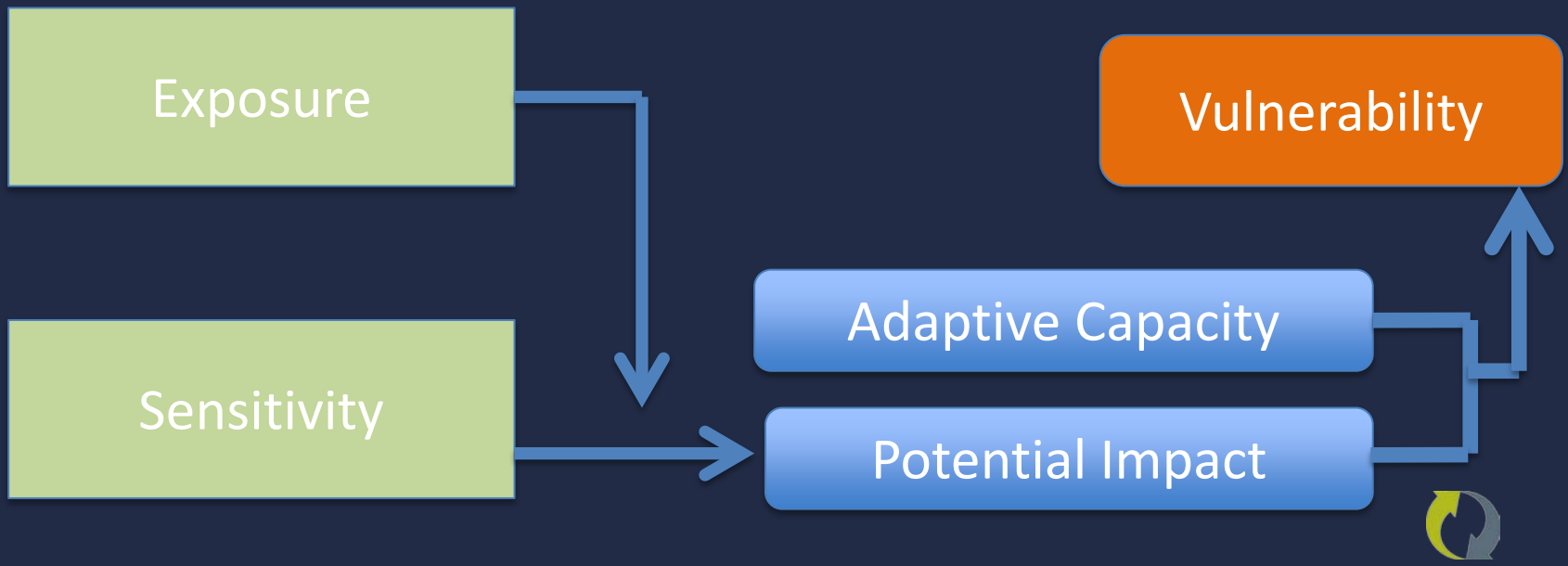
I. **exposure** to harm (climate-related risk factors) and;

II. **sensitivity** of both people and the environment to this harm

III. together these show **potential impact** to harms, and;

IV. the **capacity** of human and environmental systems **to adjust and respond** to these harms, and their consequences.

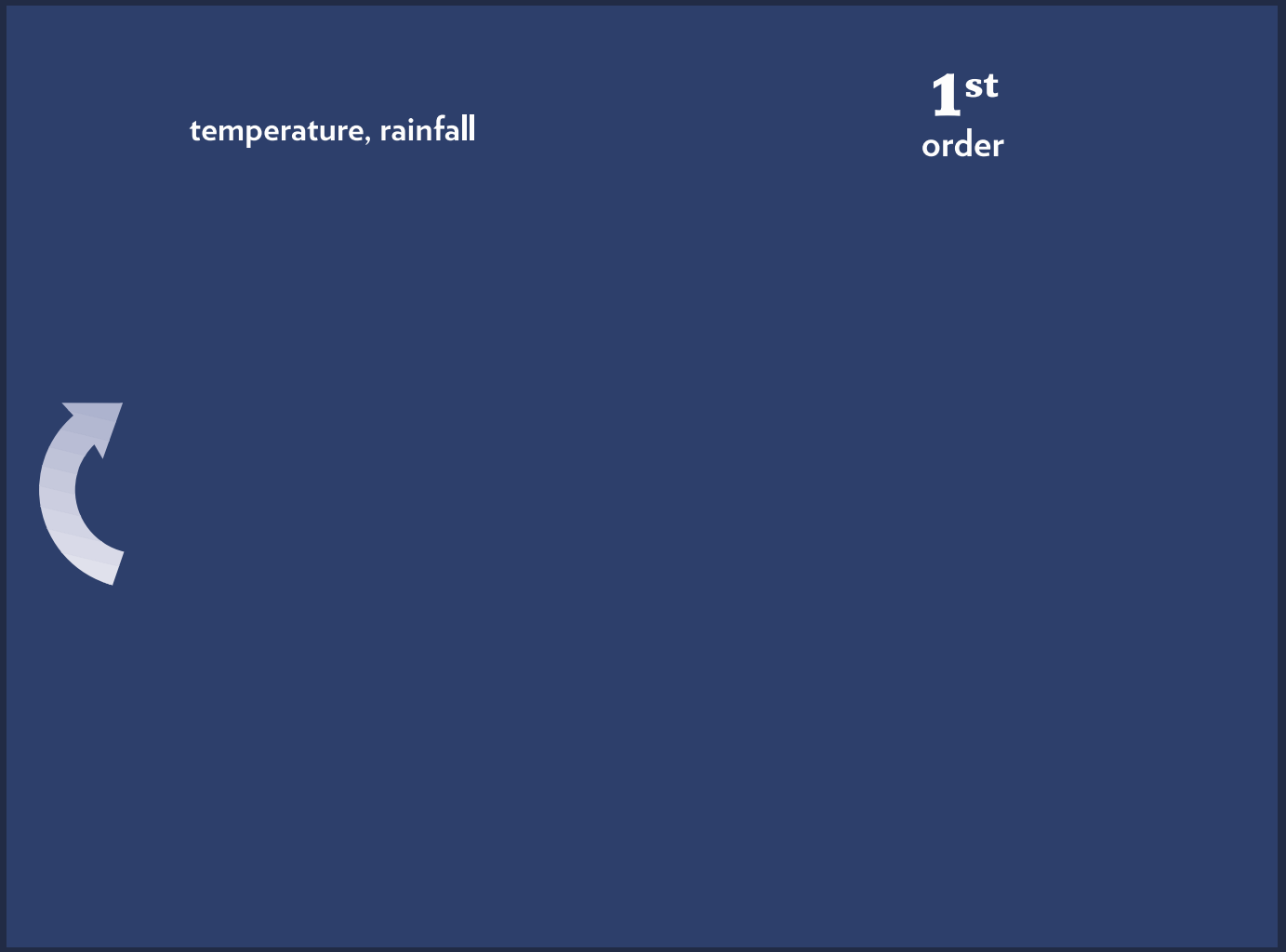
Source: The Intergovernmental Panel on Climate Change (IPCC)



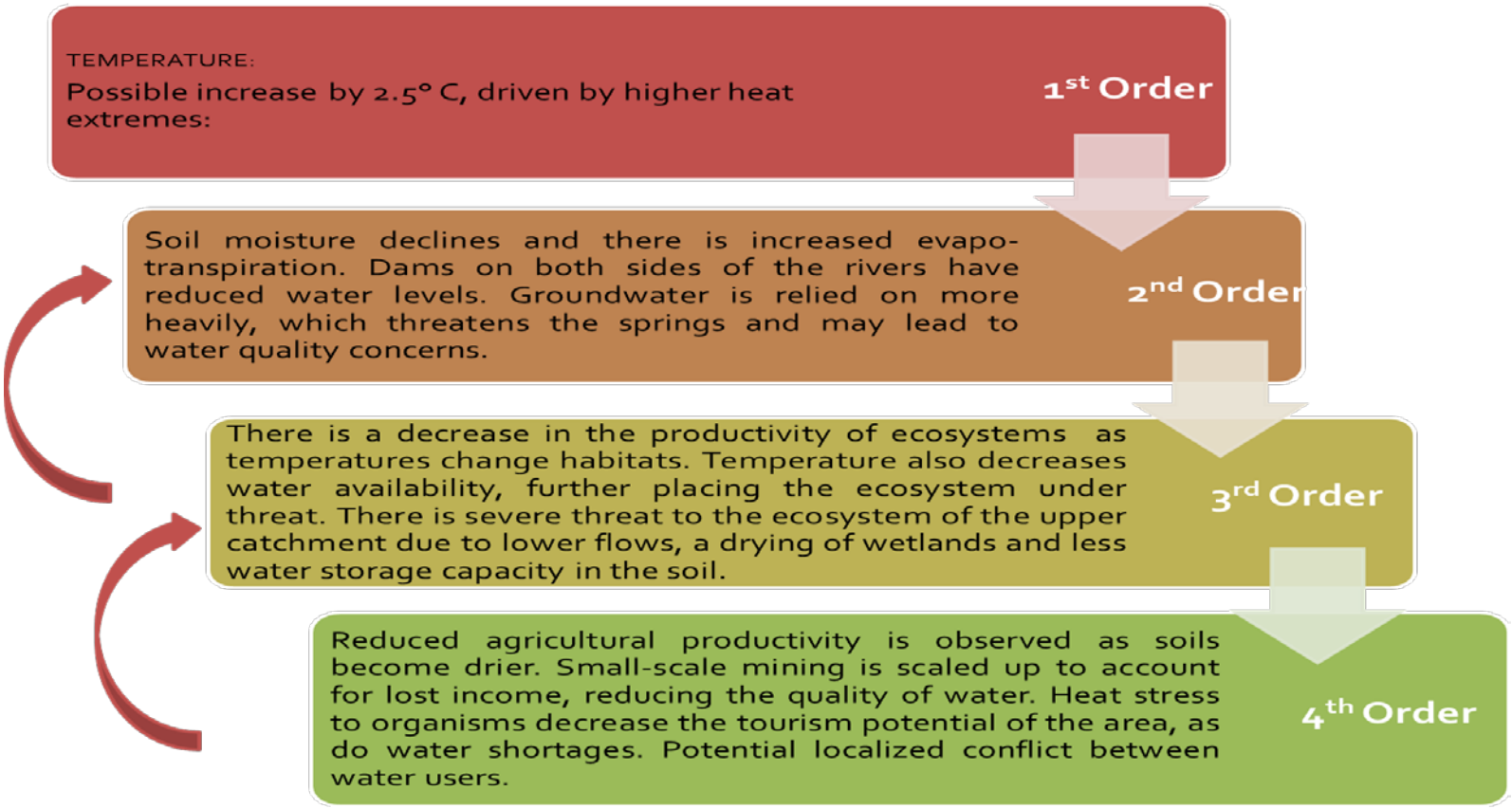
Three Stages of Analysis

Exposure	• The risk of climate events both now and in the future
Sensitivity	• How sensitive the population and environment are to the current and future climate events
Adaptive capacity	• Ability for the population to adapt to climate change

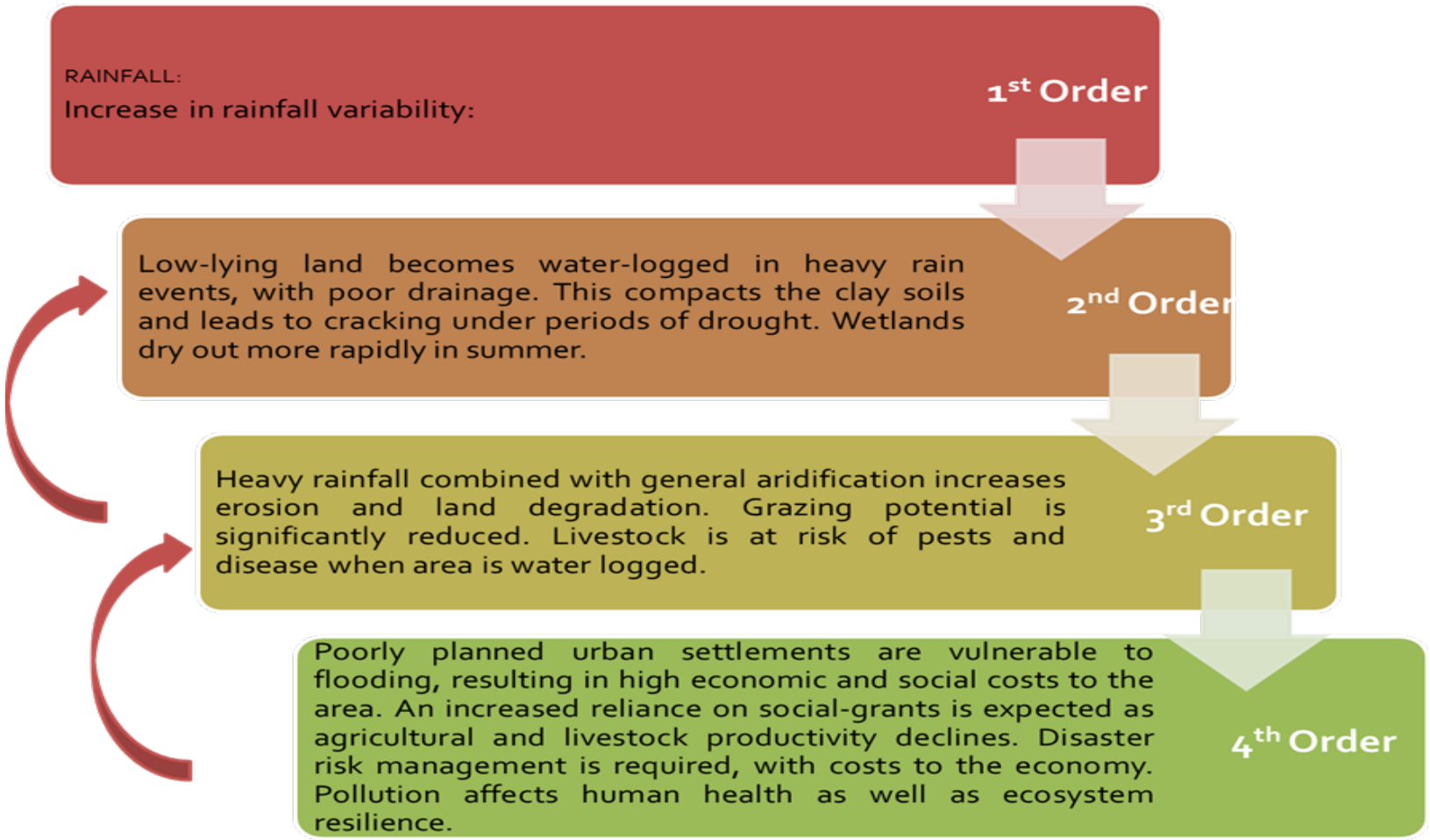
Impacts cascade through the system; assessing impacts on other components highlights where vulnerability is most concentrated, what the drivers are and identifies the elements of resilience



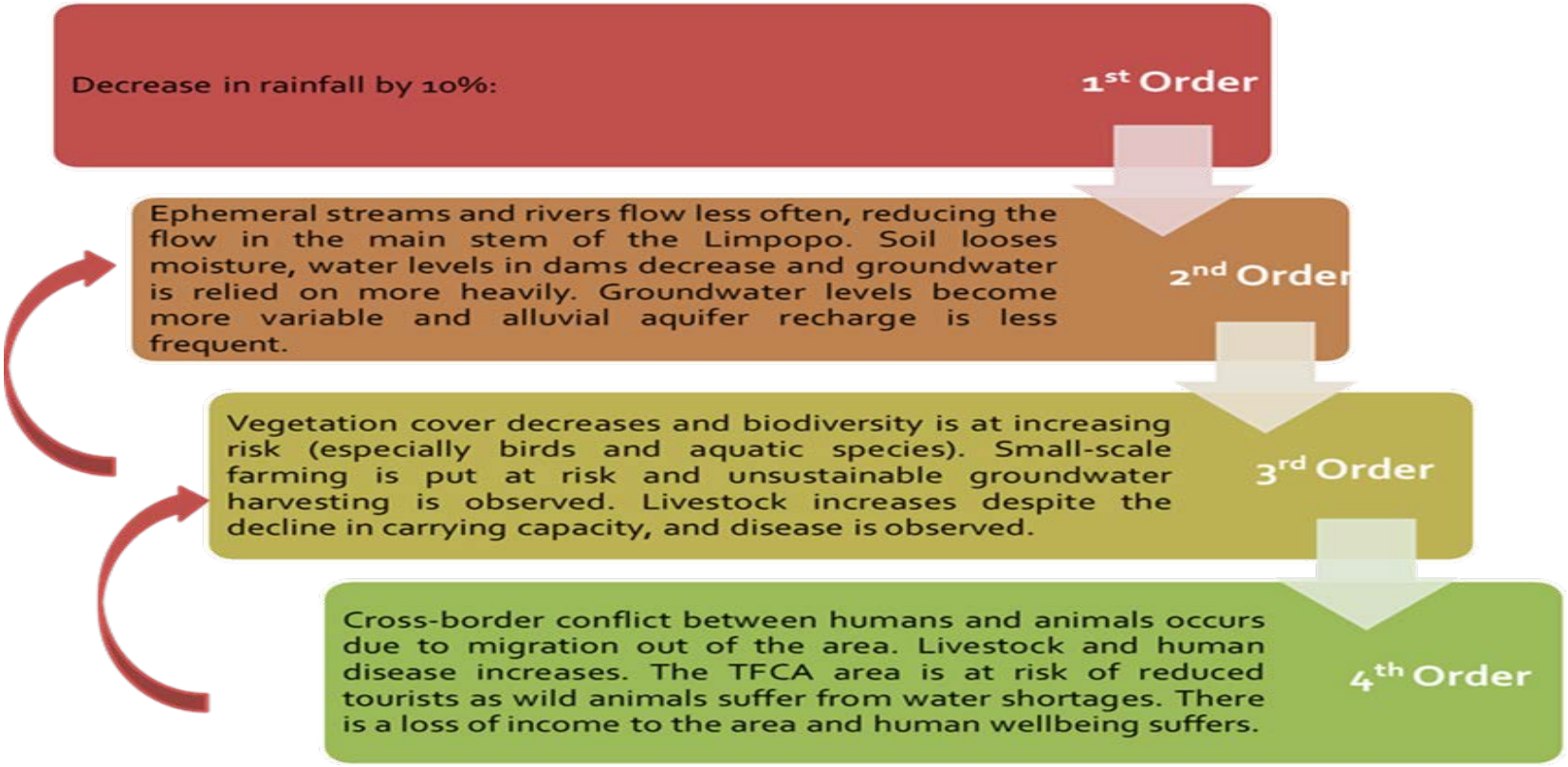
Upper Limpopo – First to Fourth Order Impact Assessment



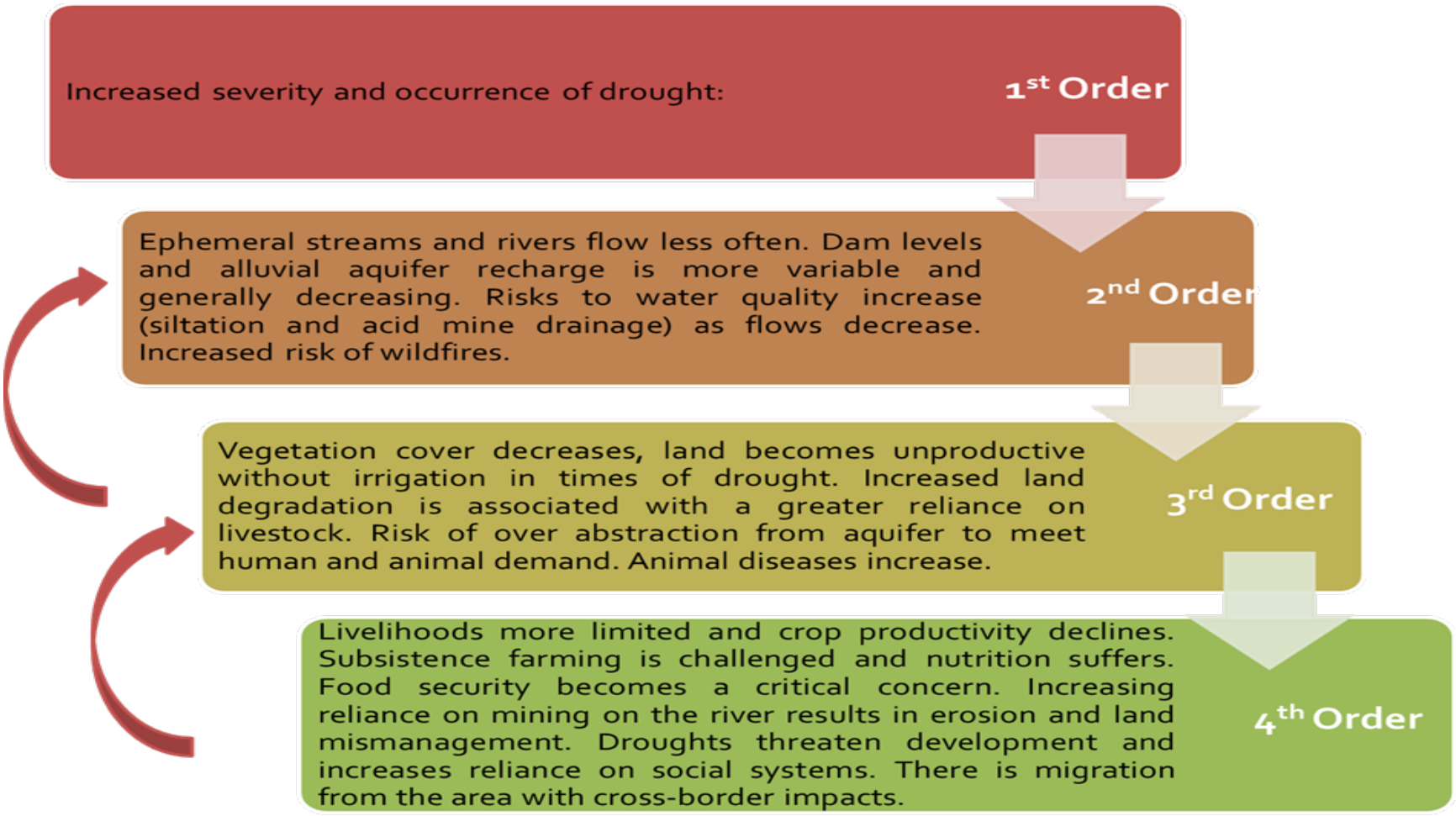
Pretoria North - First to Fourth Order Impact Assessment



Shashe - Limpopo River Confluence - First to Fourth Order Impact Assessment



Upper Umzingwane - First to Fourth Order Impact Assessment



Soutpansberg - First to Fourth Order Impact Assessment

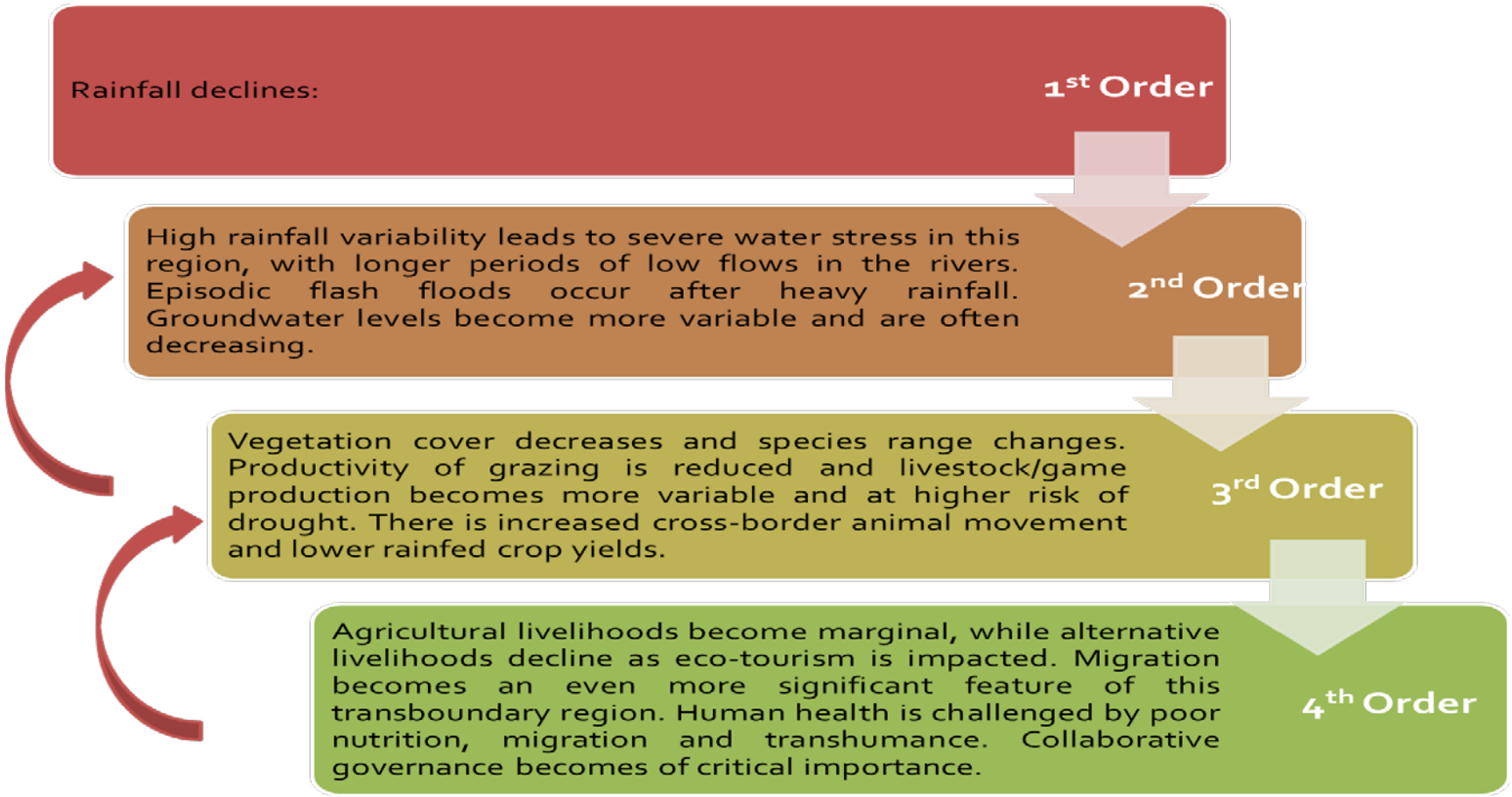
10% decrease in annual rainfall: **1st Order**

Semi-arid areas transition to arid areas, putting pressure on indigenous vegetation. A decrease in rainfall results in a proportionally higher decrease in runoff, affecting the river flow downstream. Soil moisture decreases, erosion is observed and land further degrades. **2nd Order**

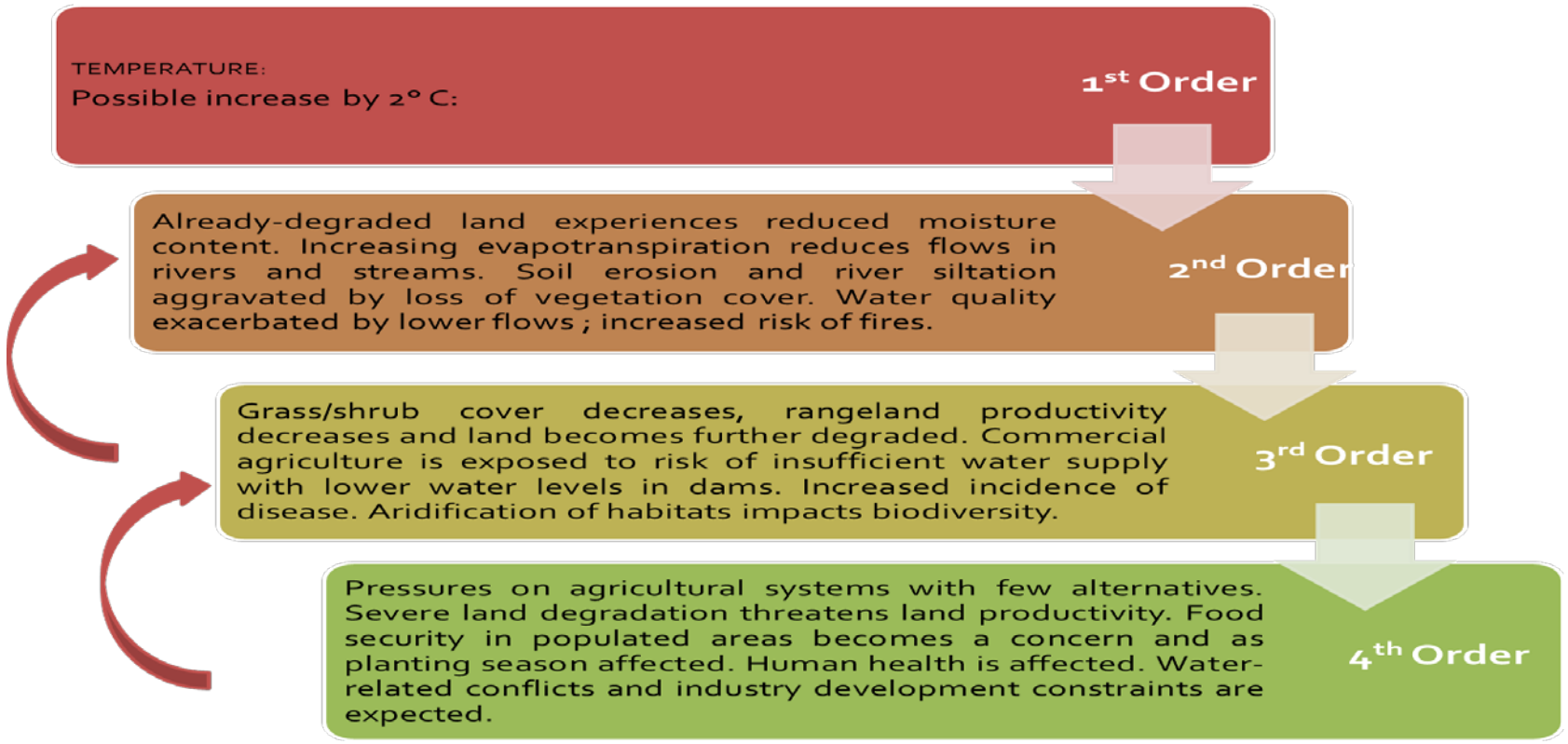
Biodiversity suffers as water supply decreases. Alien vegetation may increase, reducing water flows further. Ecosystem services (regulation and quality) decrease. Wetlands dry out. Agricultural productivity decreases and reliance on livestock increases. Water quality deteriorates and there are siltation concerns due to erosion. **3rd Order**

Reduced runoff becomes a driver of stress in the area, with negative impacts downstream. Siltation decreases productivity of infrastructure. Agricultural livelihoods as well as those reliant on the environment (such as subsistence fishers) become difficult, with increasing poverty and food insecurity. **4th Order**

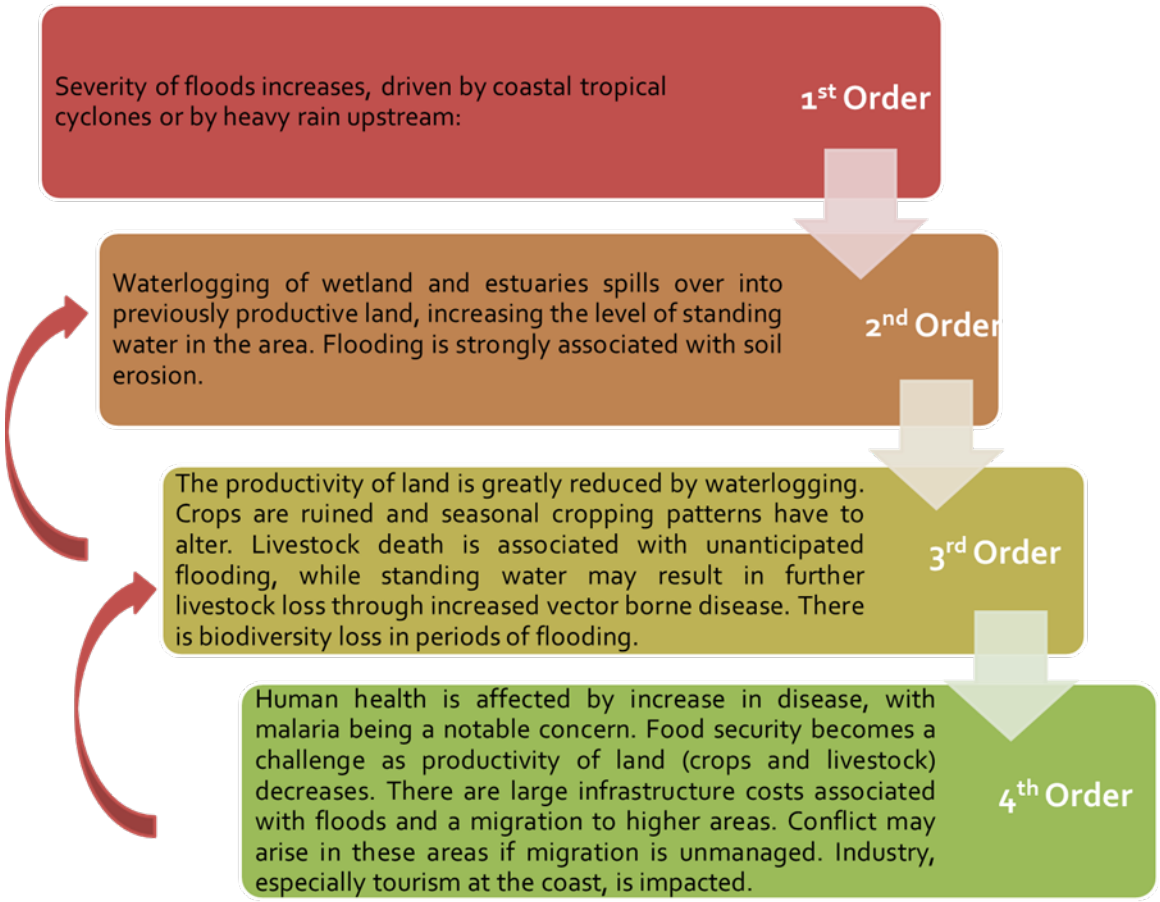
Pafuri Triangle - First to Fourth Order Impact Assessment



Middle Olifants – Former homeland area of Lebowa First to Fourth Order Impact Assessment



Lower Limpopo - First to Fourth Order Impact Assessment



Degraded land (orange) juxtaposed against high biodiversity, high runoff catchment areas (green) emphasizes the relationship between the high water and land demand on these once-fertile areas.