The Okavango River Basin Transboundary Diagnostic Analysis

OKACOM

GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET

EPSMO

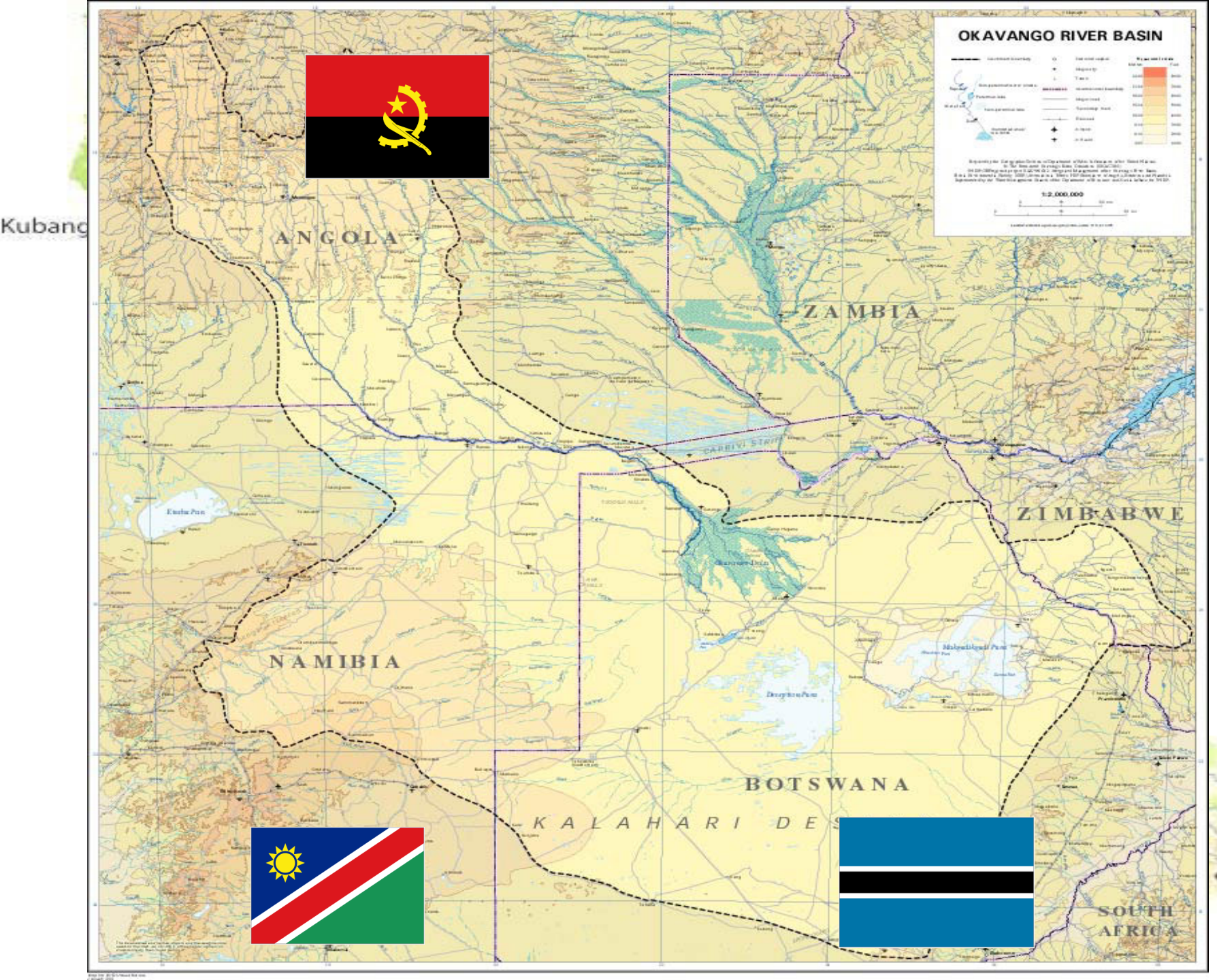
Environmental Protection and Sustainable Management of the Okavango River Basin

The Environmental Protection and Sustainable Management of the Okavango (EPSMO) Project is an initiative of the Permanent Okavango River Basin Water Commission (OKACOM).

- implemented by United Nations Development Program (UNDP)

- executed by the United Nations Food and Agriculture Organization (FAO)

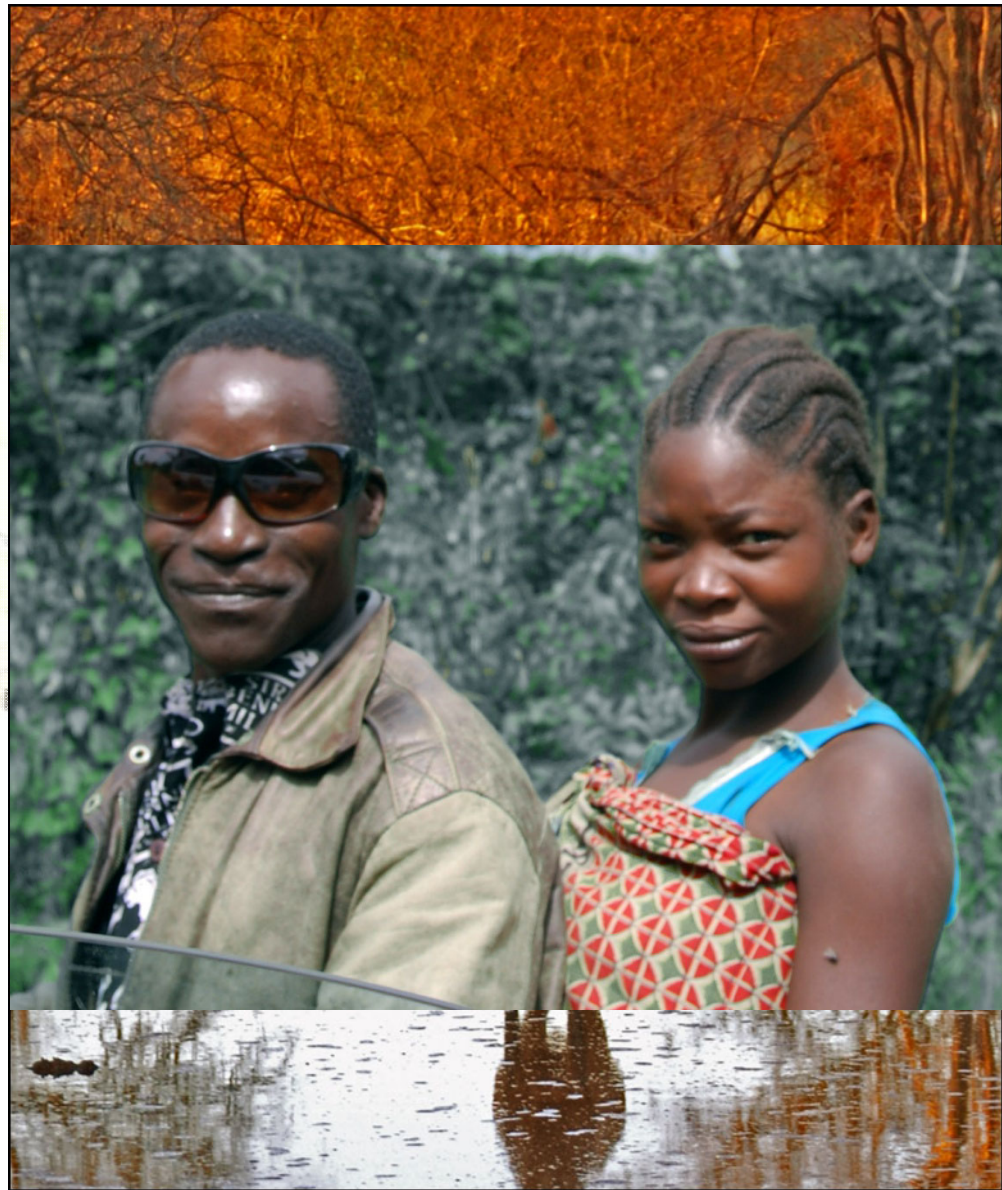

Kubango
Ogooué
Congo
Kasai
Congo
Lake Victoria
Lake Tanganyika
Rufiji
Lake Malawi
Cuanza
Zambezi
Kunene
Kwando
Cubango
Cuito
Lake Kariba
Zambezi
Okavango Delta
Limpopo
Limpopo
Orange
Atlantic Ocean
Indian Ocean
5°S
20°S
35°S
15°E
30°E
45°E
0 200 600 1000 km
bo
Maun
Okavango rivers
Perennial rivers
Ephemeral and fossil rivers
International border


OKAVANGO RIVER BASIN
1:2,000,000
ANGOLA
ZAMBIA
ZIMBABWE
NAMIBIA
BOTSWANA
SOUTH AFRICA
Etosha Pan
Makgadikgadi Pans
Kubang
Maun

	Okavango	Mekong	Nile	Kagera Tanzania	Zambezi
Basin Area (km^2)	429,400	822,200	160,000,000	59,000	1,360,000
Annual flow (km^3)	10	495	84	8	100
River length (km)	1,100	4,800	6,671	700	3,000
Population in basin (million)	1	60	160	13.6	31.7
Riparian countries	3	6	10	4	8

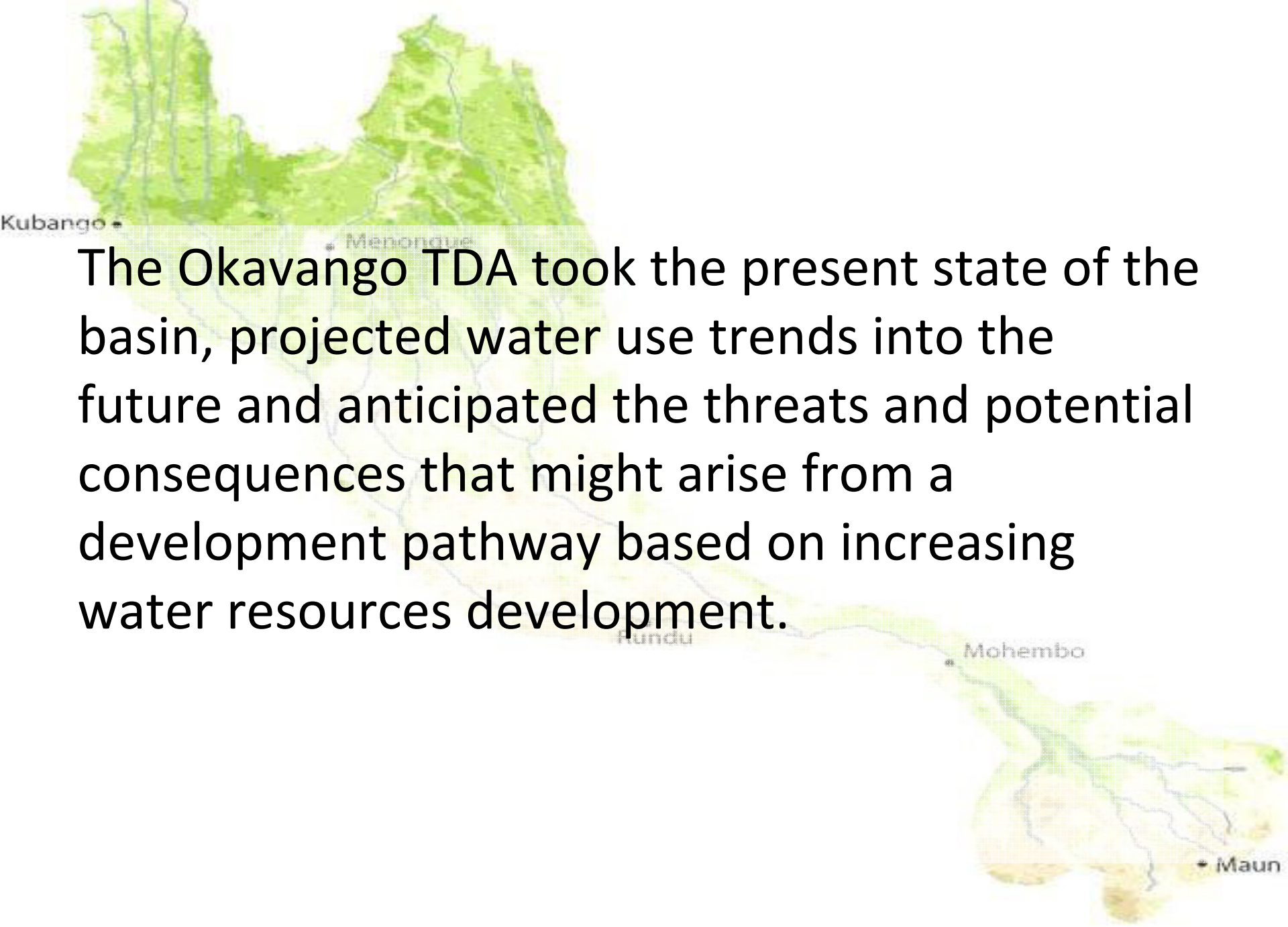
Problem …

- A river basin in near pristine condition with emerging pressures
- Most of the basin and most of the water from the Angola section
- Significant information and data gaps for especially in the Angola section of the basin
- Dynamic and sensitive worlds largest Ramsar site
- One of the driest regions
- Need to anticipate issues
- Need to inform management planning
- Promote a vision for the basin, the chance to start on the right path



Approach …

- Innovative methodology used: whereas most TDAs identify existing problems, Okavango TDA identified potential problems
- based on water use scenarios.
- Based on scientific analysis and expert opinion this TDA anticipate social and economic impacts and the requisite policy and institutional challenges



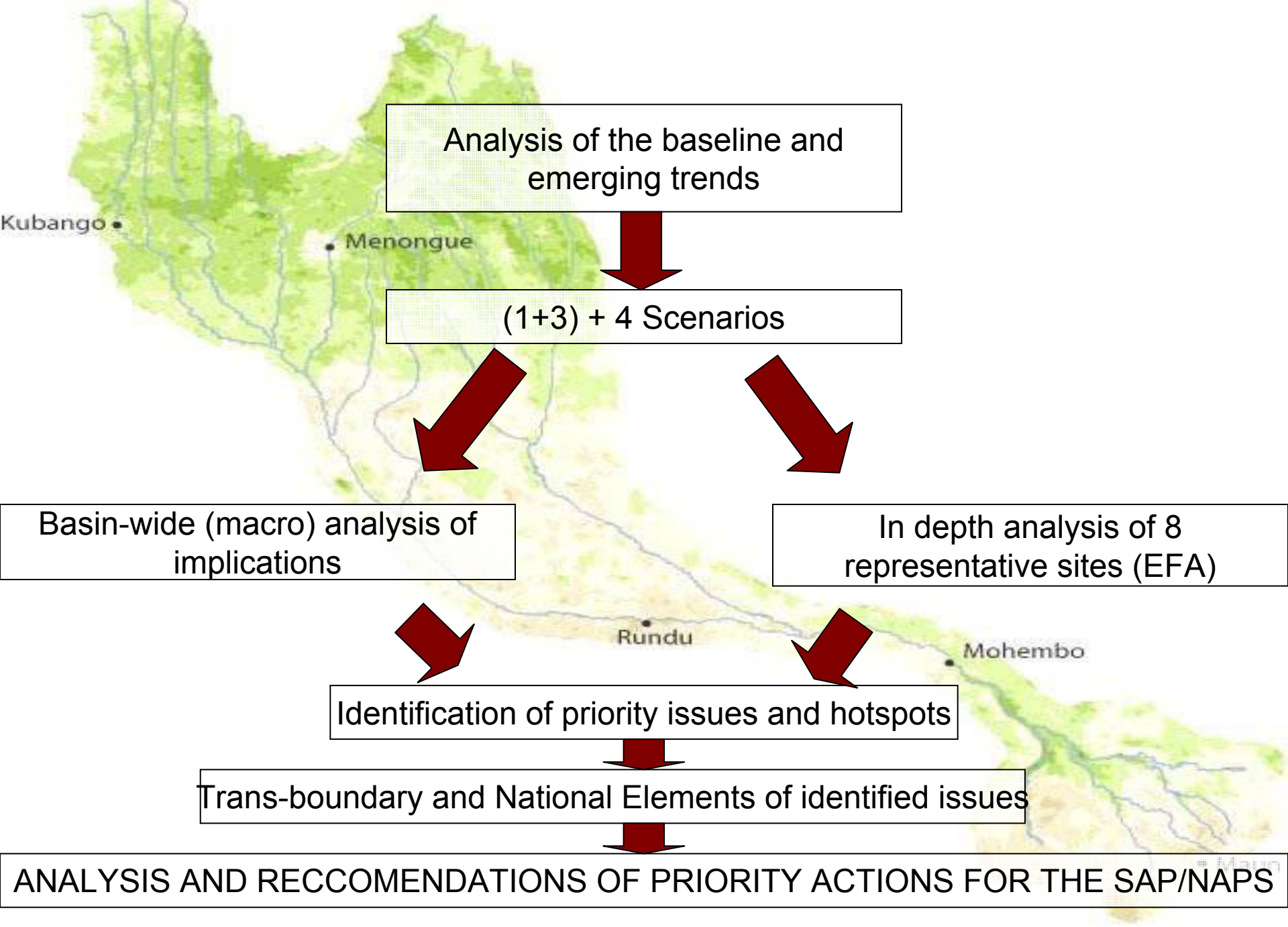
The Okavango TDA took the present state of the basin, projected water use trends into the future and anticipated the threats and potential consequences that might arise from a development pathway based on increasing water resources development.

Teamwork..

- full multi-disciplinary team appointed in each country
  - hydrology, hydraulics, geomorphology, geohydrology, water quality, vegetation, aquatic invertebrates, fish, birds, river-dependent mammals, resource economics and socio-cultural issues, irrigation
- Integration/coordination team
- Existing structures provided TTT, ISC and NCU services
- Process driven by OKACOM
- Close links with a number of initiatives including GEF National BD project

The methodology

- analysis of the baseline and emerging trends– the present state of the ORB.
- three water resources scenarios- based on the observed trends and national development plans
- three hydrological models to describe the actual hydrological response to these water uses
- database of ecological responses to hydrological changes - through extensive field surveys and research and detailed scientific and participatory exercise,
- ecological responses translated into socio-economic impacts
- macro-economic assessment



Analysis of the baseline and emerging trends

(1+3) + 4 Scenarios

Basin-wide (macro) analysis of implications

In depth analysis of 8 representative sites (EFA)

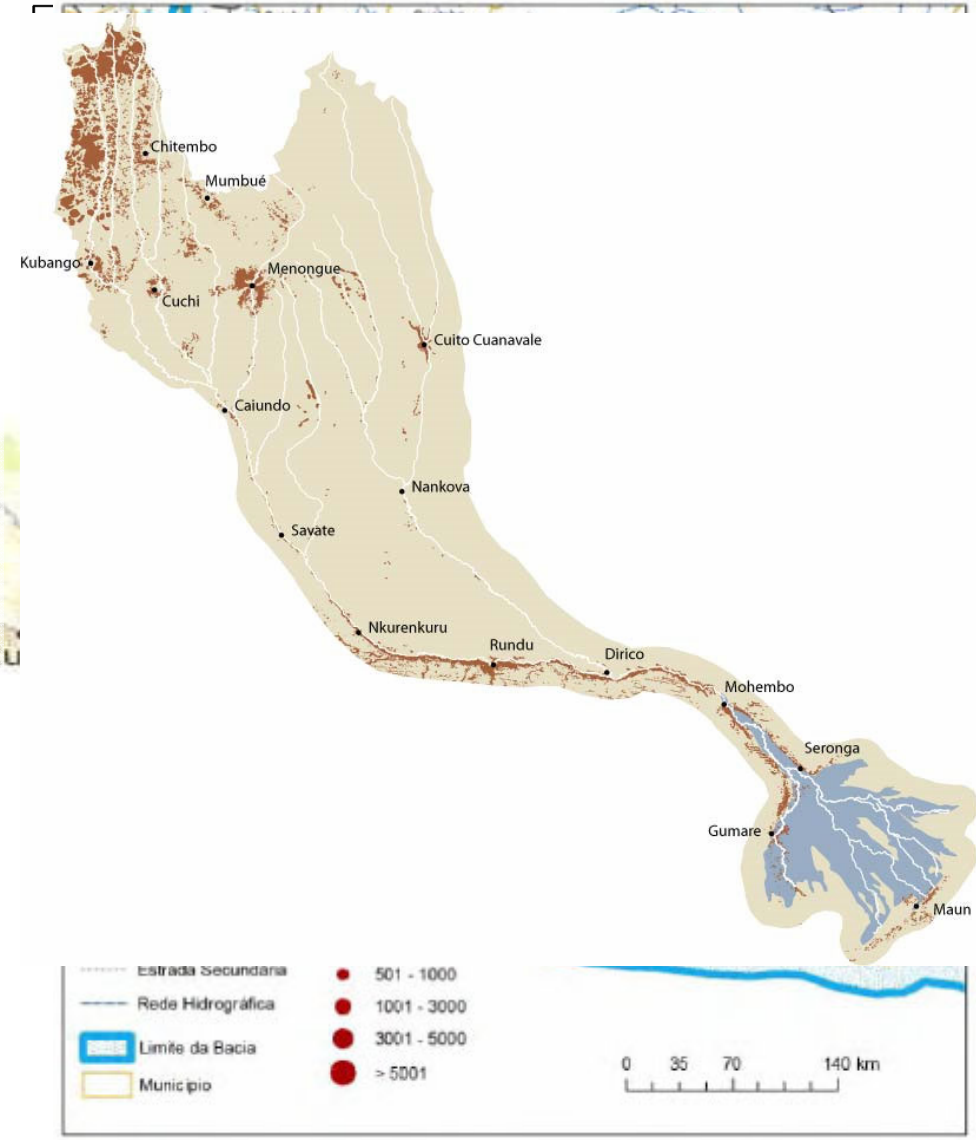
Identification of priority issues and hotspots

Trans-boundary and National Elements of identified issues

ANALYSIS AND RECCOMENDATIONS OF PRIORITY ACTIONS FOR THE SAP/NAPS

Status Quo

- Geographic scope and ecosystem boundaries
- Physiographic features
- The ecosystem and its components
- Socio-economic dynamics
- Land use
- Macro-economics
- Governance

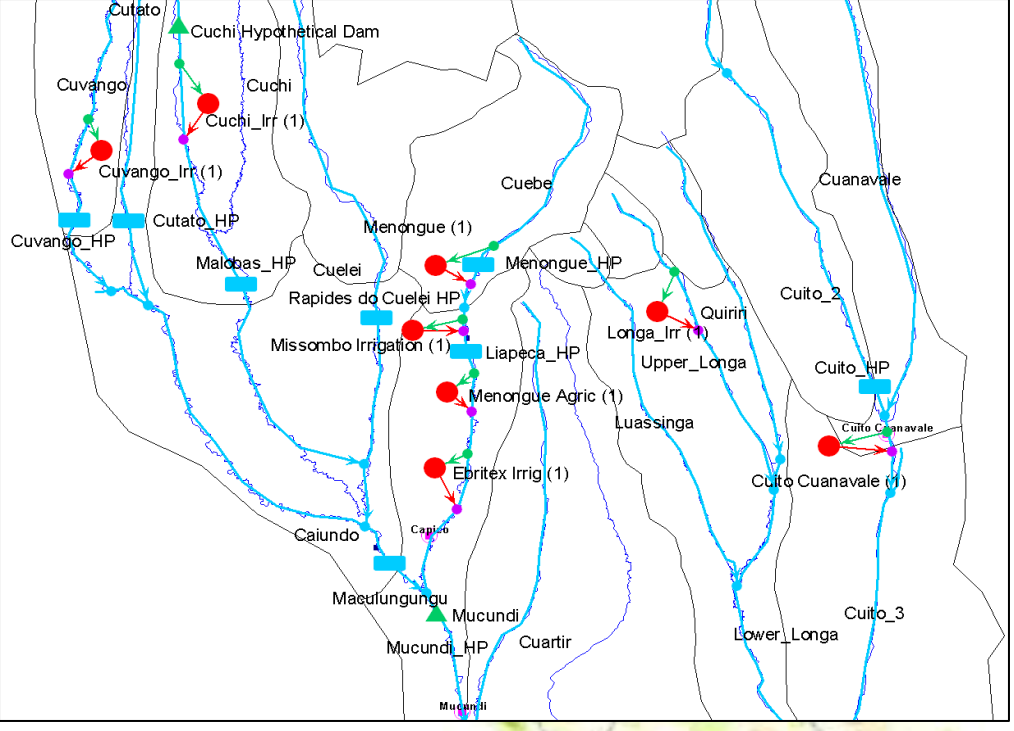


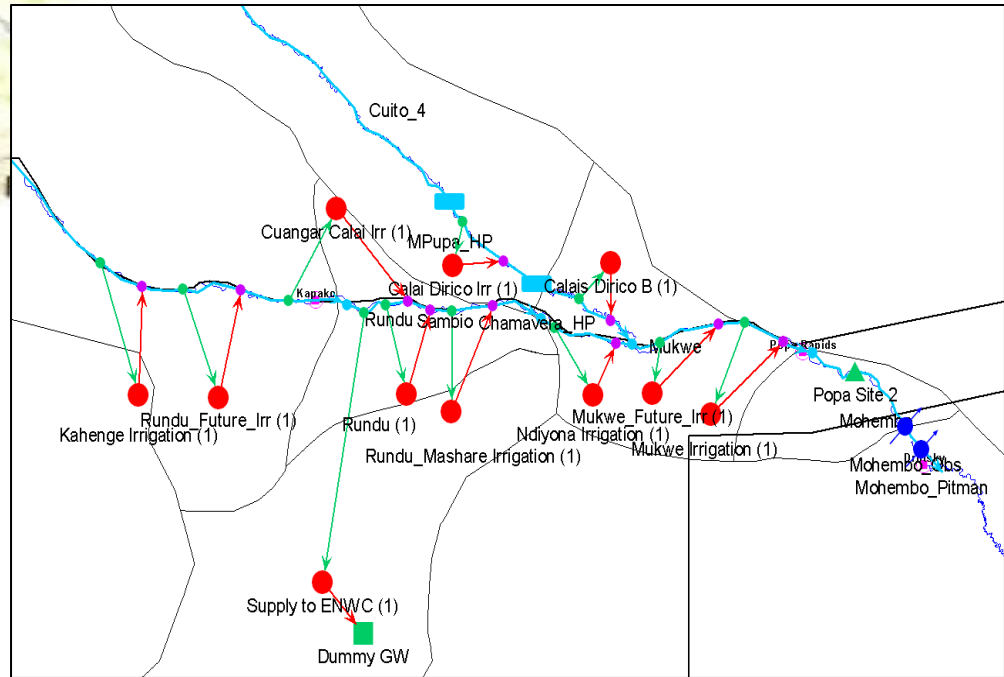
Trends observed

- **Population increasing** steadily at rates of Angola 2.7%, Namibia (urban 2.5%, rural 1.5%) and Botswana 1.5%
- Food self-sufficiency policies expected to **increase demand for irrigation** from the current 3000 ha
- **Tourism growth** exceeding 3 per cent per annum
- Up to 12 (mostly run-of-river) **hydroelectric projects** under consideration in response to regional demand
- **Increasing urbanization**: at least 2.5 per cent vs 1.5 per cent in rural areas
- **Land use change** concentrated in certain areas
- **Demand for water** may rise from 101 Mm^3/yr to over 6,600 Mm^3/yr by 2025
- Water quality good but **local source pollution**
- **Climate change**: increased rainfall and evaporation

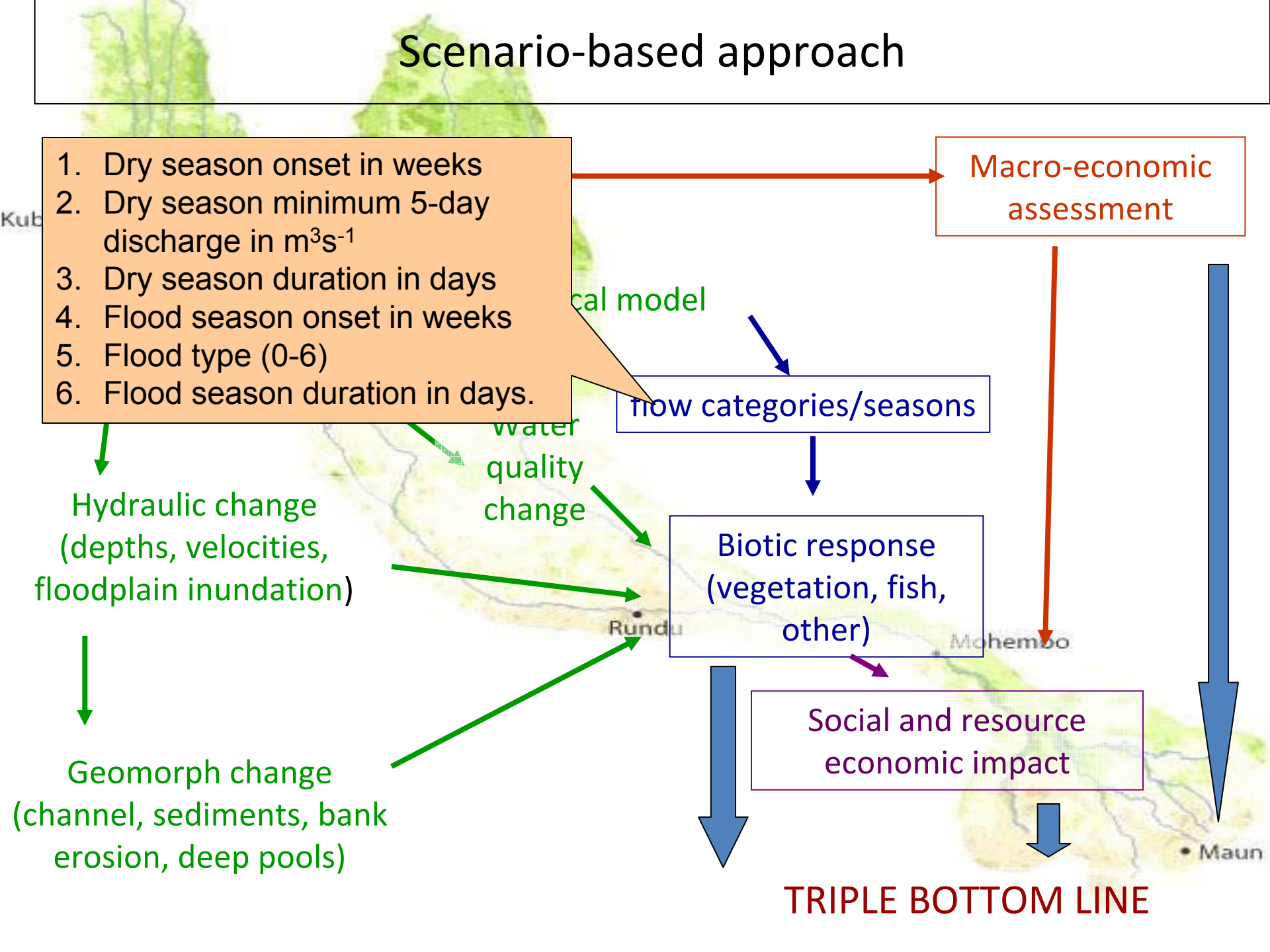
Possible development pathways

Scenarios *Based on proposed basin developments*	
Present	2700 ha irrigation, urban water demand in three centers
Low	Increased urban consumption due to Angolan resettlement. 21000 ha irrigation. One storage and three run-of-river hydro stations.
Medium	205000 ha irrigation. One storage and four run-of-river hydro stations. One interbasin transfer of 17 Mm^3 per
High	350000 ha irrigation. One storage and nine run-o-river hydro stations. Extended interbasin transfer of 100 Mm3 per annum. Additional urban water development scheme.
Climate Change Dry	Driest climate change scenario
Climate Change Wet	Wettest climate change scenario


Cutato
Cuchi Hypothetical Dam
Cuvango
Cuchi
Cuchi_Irr (1)
Cuvango_Irr (1)
Cuebe
Cuanavale
Cutato_HP
Cuvango_HP
Menongue (1)
Malobas_HP
Cuelei
Menongue_HP
Rapides do Cuelei HP
Quiriri
Cuito_2
Longa_Irr (1)
Missombo Irrigation (1)
Liapeca_HP
Upper_Longa
Cuito_HP
Menongue Agric (1)
Luassinga
Cuito Cuanavale
Ebritex Irrig (1)
Cuito Cuanavale (1)
Caiundo
Maculungungu
Mucundi
Cuito_3
Mucundi_HP
Cuartir
Lower_Longa

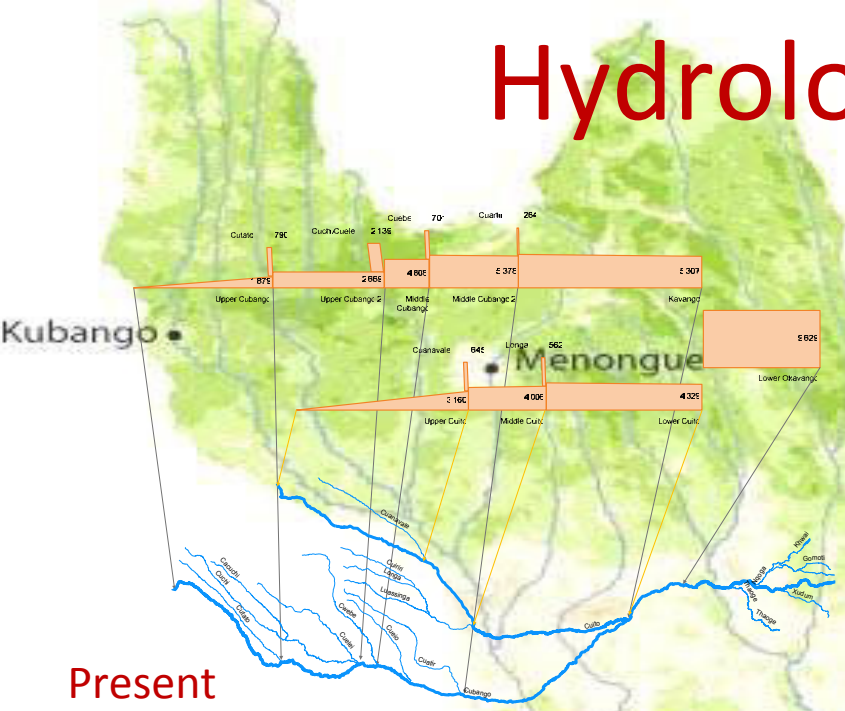

Cuito_4
Cuangar Calai Irr (1)
MPupa_HP
Kapako
Calai Dirico Irr (1)
Calais Dirico B (1)
Rundu Sambio Chamavera_HP
Mukwe
Popa Rapids
Popa Site 2
Rundu_Future_Irr (1)
Kahenge Irrigation (1)
Rundu (1)
Mukwe_Future_Irr (1)
Ndiyona Irrigation (1)
Rundu_Mashare Irrigation (1)
Mukwe Irrigation (1)
Mohembo_Pitman
Supply to ENWC (1)
Dummy GW

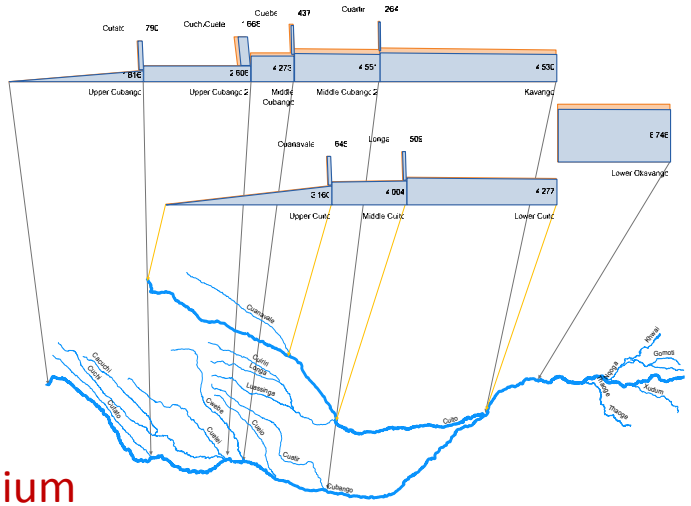
Scenario-based approach

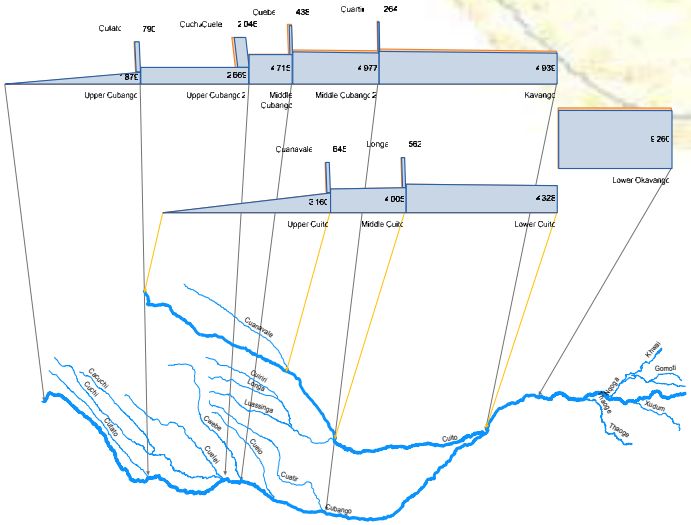


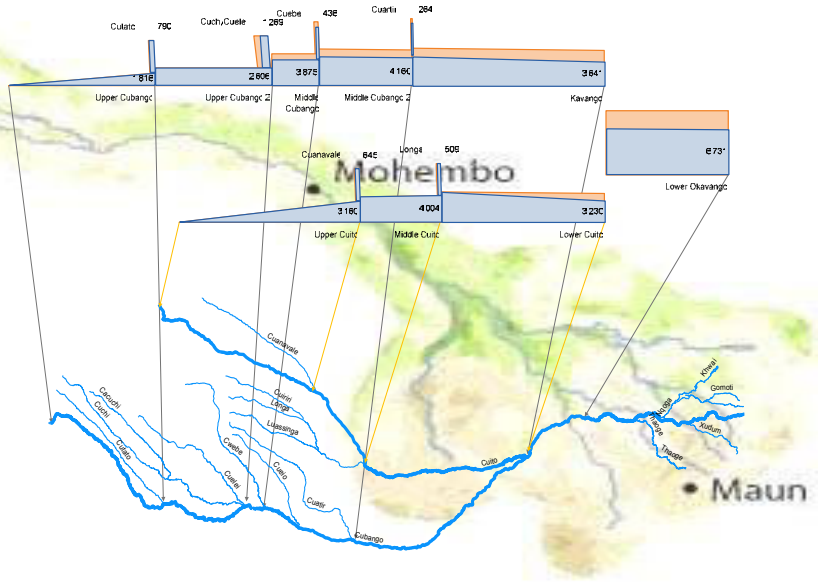

Kubango
Maun

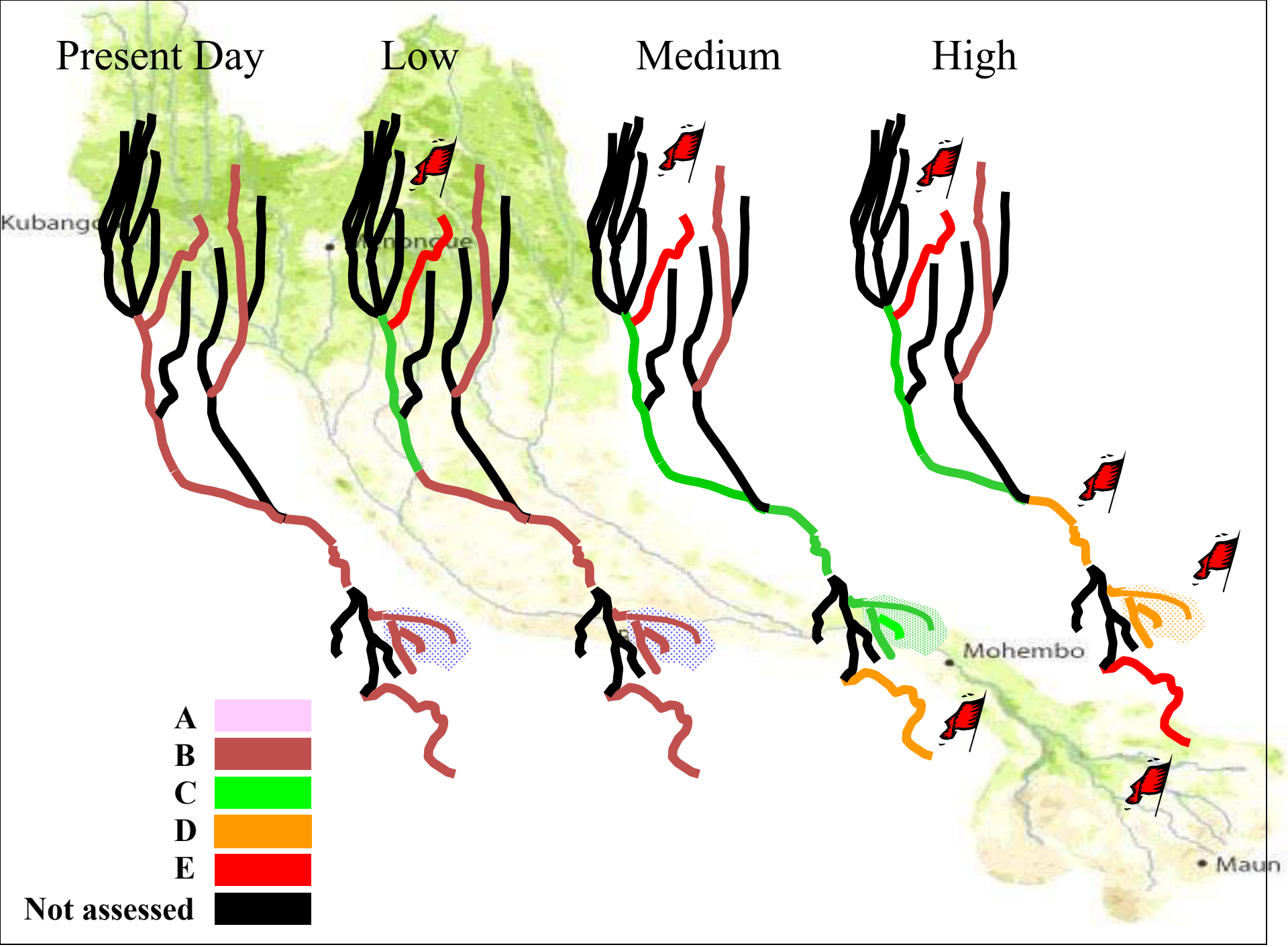
Hydrological impact

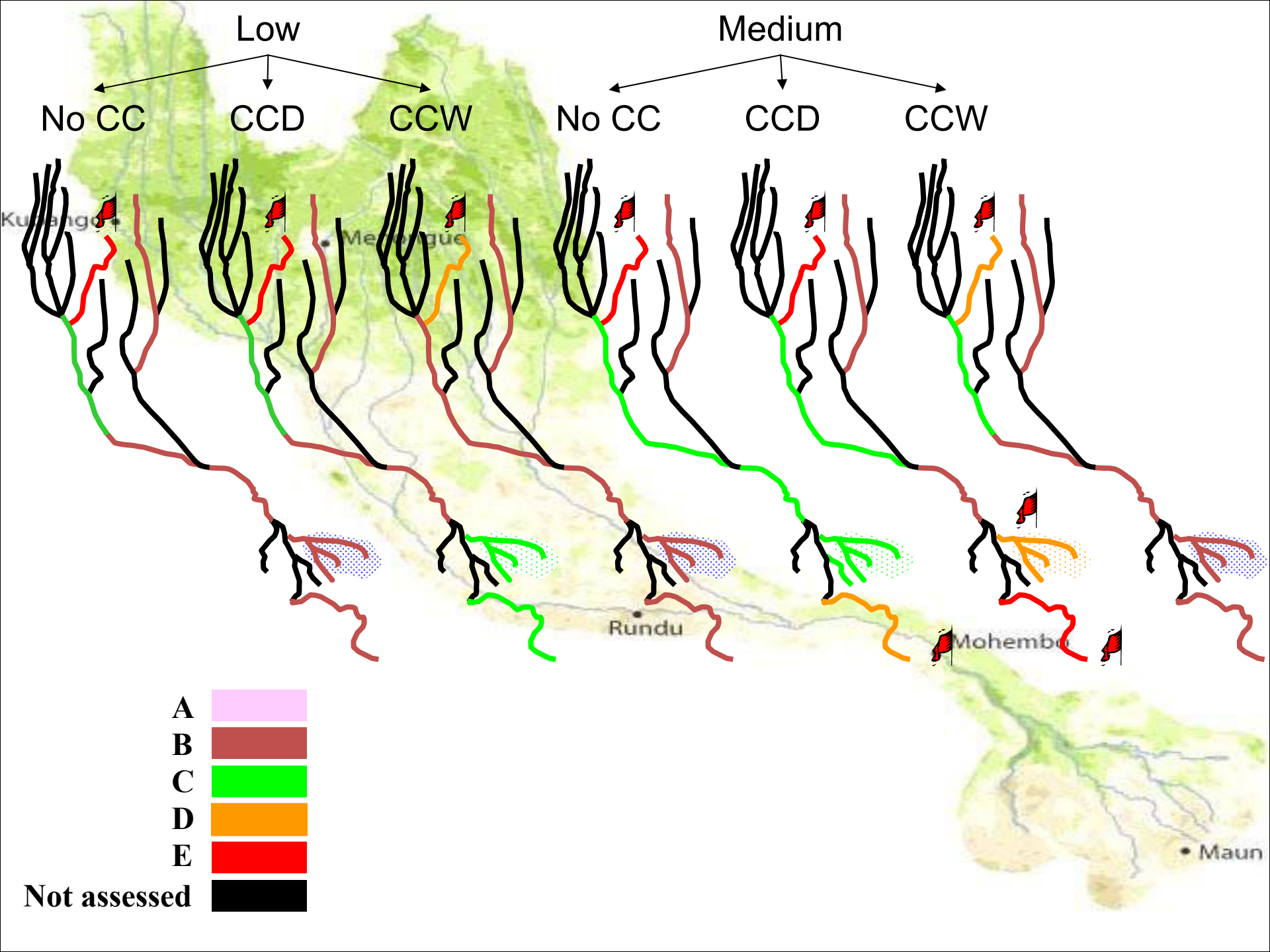




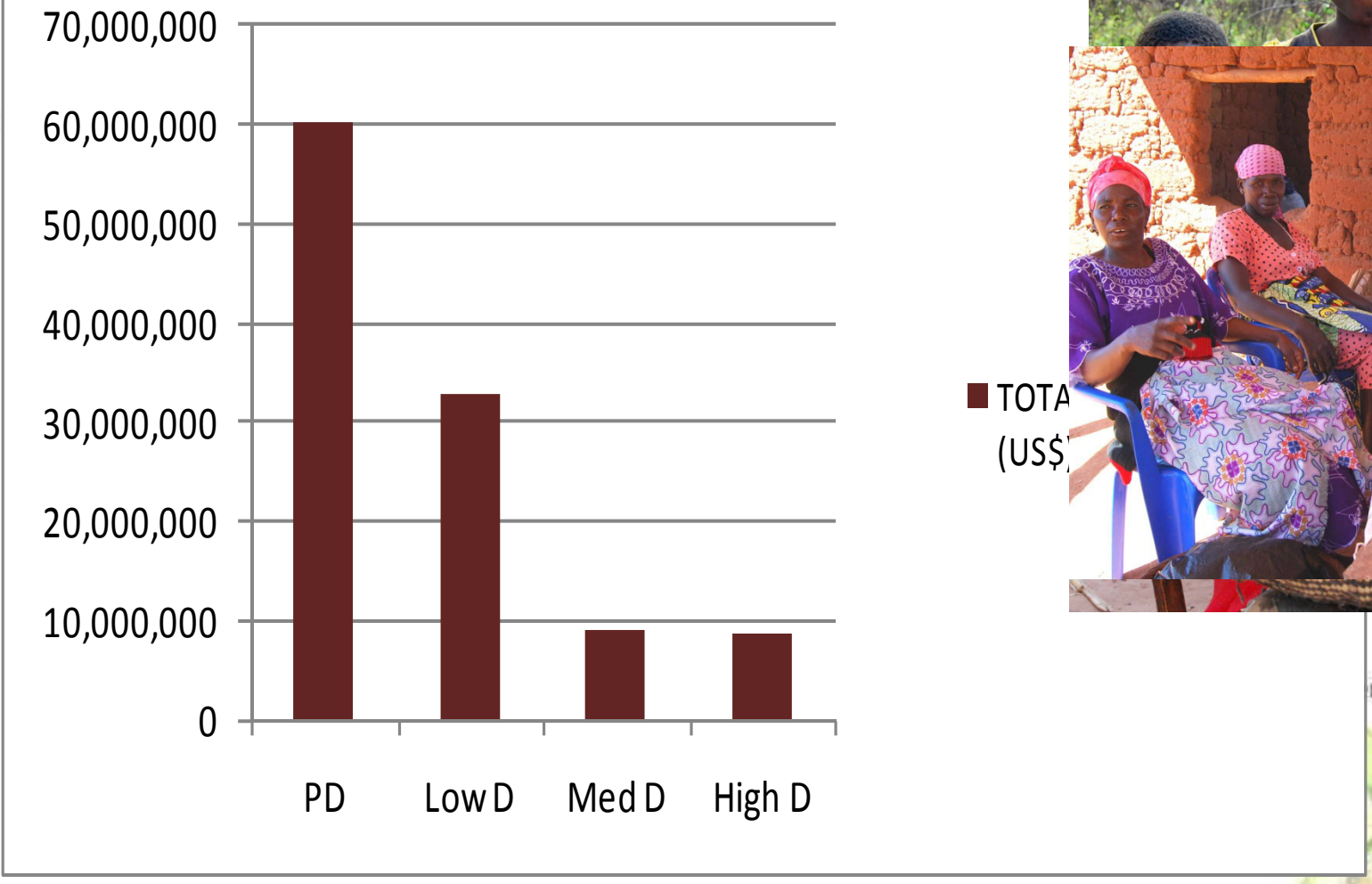


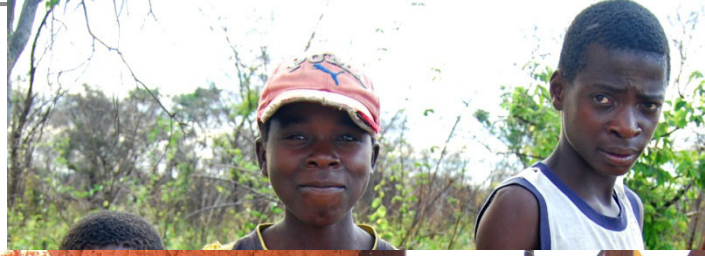


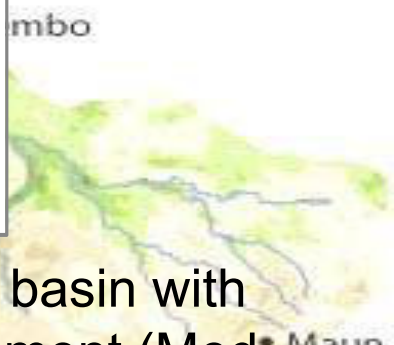

Present Day
Low
Medium
High
Kubango
Mohembo
Maun
A
B
C
D
E
Not assessed


Low
Medium
No CC
CCD
CCW
No CC
CCD
CCW
Rundu
Maun
A
B
C
D
E
Not assessed

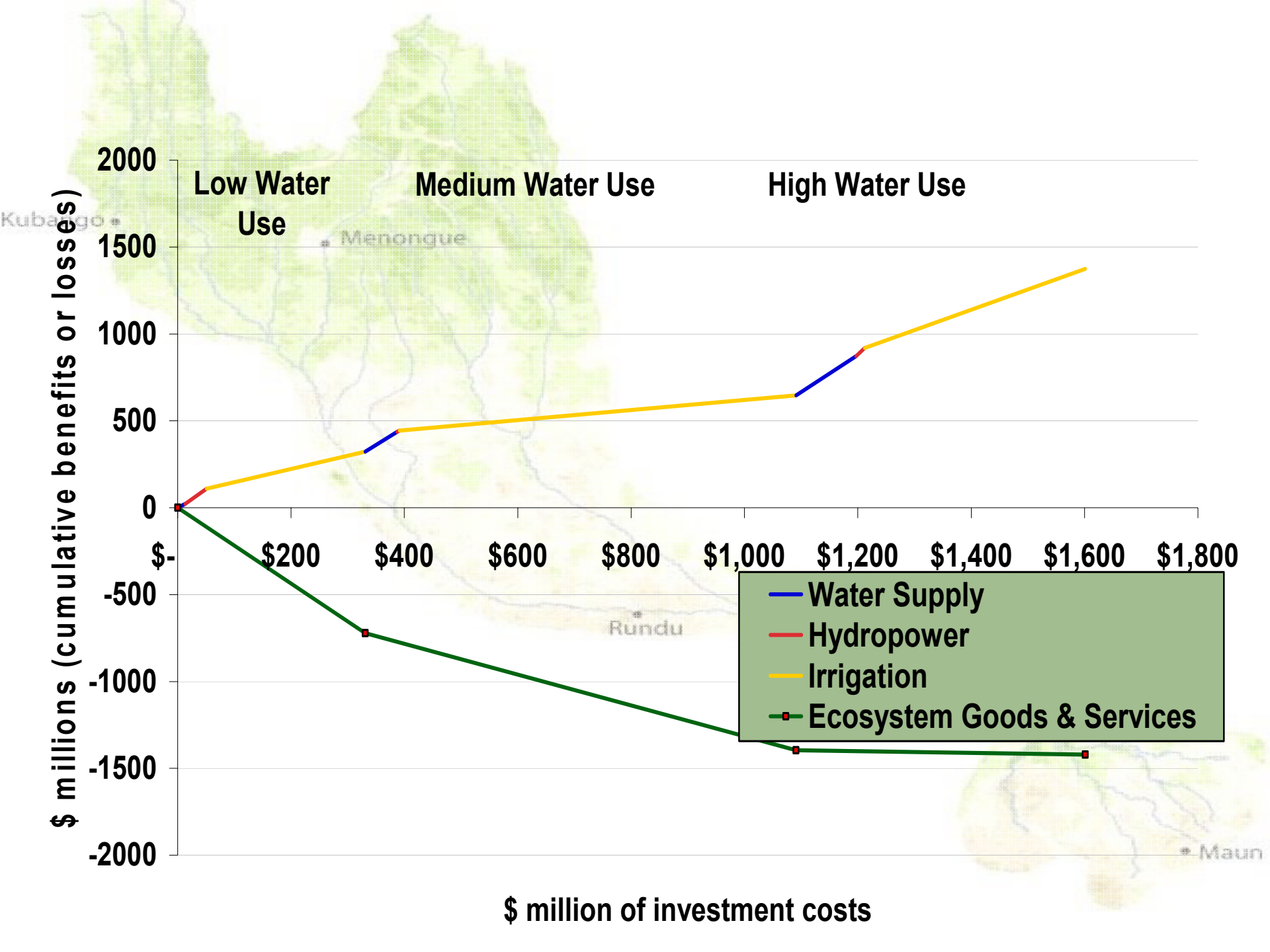
TOTAL livelihood value (US$)







The short term implications for livelihoods in the Okavango river basin with present day (PD), low development (Low Dev), medium development (Med Dev) and high development (High Dev) water use scenarios (US$, 2008)


Low Water Use
Medium Water Use
High Water Use
2000
1500
1000
500
0
-500
-1000
-1500
-2000
$-
$200
$400
$600
$800
$1,000
$1,200
$1,400
$1,600
$1,800
$ millions (cumulative benefits or losses)
$ million of investment costs
Water Supply
Hydropower
Irrigation
Ecosystem Goods & Services

The TDA Causal Chain Analysis….

a. changes in the river flow: quantity, timing, quality and sediment context
b. changes in the abundance and diversity of flora and fauna and requisite ecosystem services
c. changes in the socio-economic conditions of the people living in the basin, especially with regards to distributional equity and access to resources

Water Resources Development -> TransB Carriers -> negative impacts

Key Findings

- Placement of abstraction and impoundments important. Will greatly influence flow variability
- Sediment transport unique and important especially for Delta. Certain HEP and landuse developments will impact
- Irrigated agriculture poses the greatest challenge
- The planned run-of-river HEP plans will have little impact on flow but can affect sediment. No site for major dams
- Upper Cuito influenced by natural erosion careful landuse planning required
- The two tributaries serve complementary hydrological functions (dev on one can be mitigated by other)
- WS&S is unlikely to have a significant impact, people will Angola will rely on direct use for some years
- OKACOM ideally situated to drive reform and manage

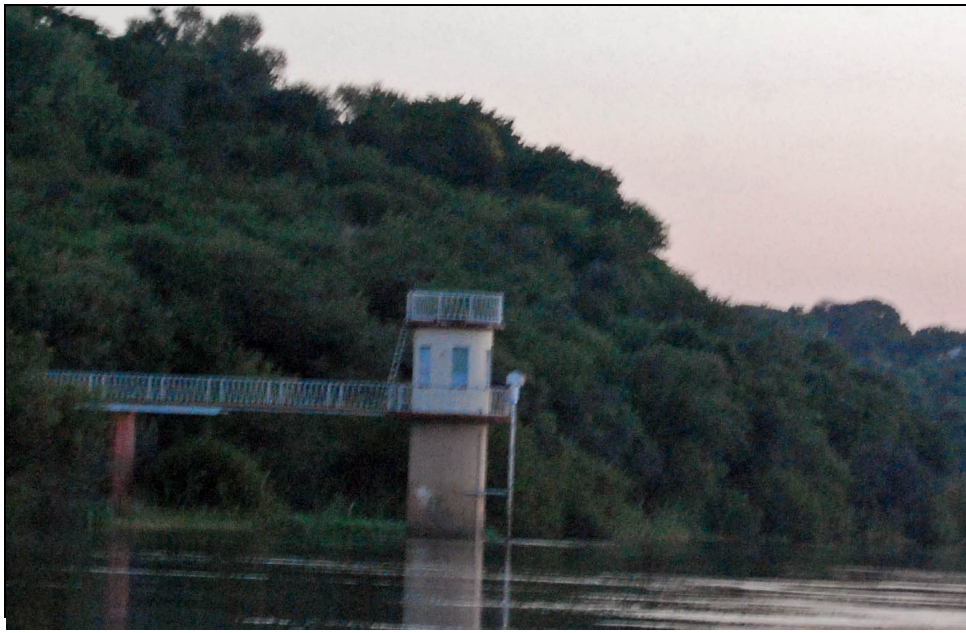
Distribution of current economic benefits of the river is skewed downstream.

Benefits of future WRS development will start to accrue upstream but the indirect costs of development will be paid mostly downstream.

OKACOM has the potential to arrange benefit sharing mechanisms exploiting significant comparative advantages (i.e. tourism vs. irrigation)

Hotspots

- Angolan floodplains
- Cuito catchment
- Biodiversity and abundance
- Delta
- Maintaining social services & cohesion



From the Commission

“The new tools a