



Global Water Challenges

A River Basin Managers Perspective

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6 Nov 2015

(Chairman eWater –Chairman IWMI and former CE
MDBC)

The Talk Covers;

- Update on Australian Water Reform
 - Observations on Current River Basin Challenges
 - Surface and Groundwater Irrigation—where is it going???
 - Australian Water Partnership
- through the lens of WRM (how do we get to solutions??)**

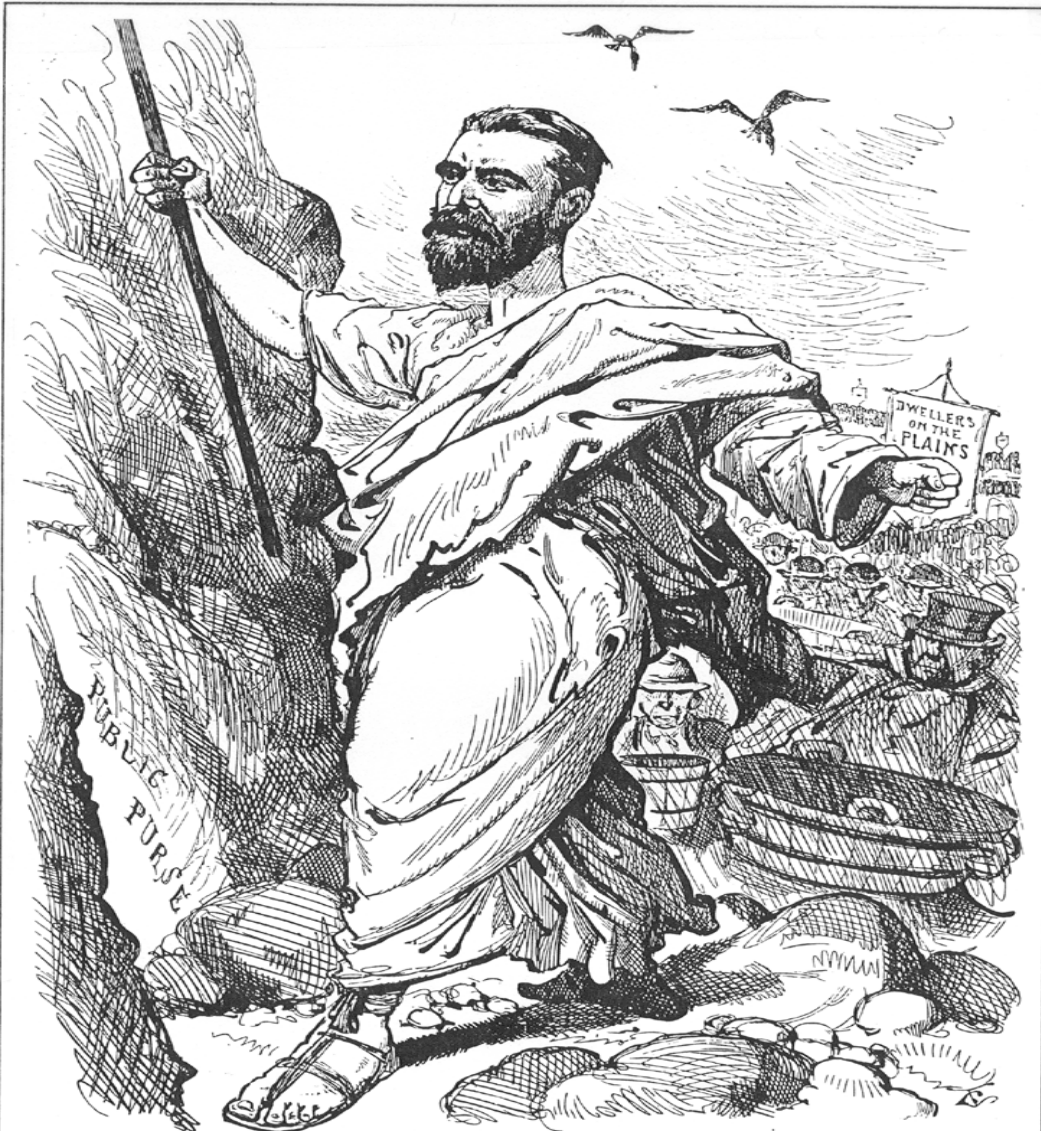
The Australian Story

Commissioner, Sir Ronald East
straddling the River Murray at Nyah,
Victoria during the drought of 1923



Alfred Deakin as Moses the Deliverer

(Melb Punch 3 June 1886)



STRIKING THE ROCK.

"THE PRINCIPAL WORK OF THE SESSION WILL BE IRRIGATION."—Hon. Deakin "Moore".

Evolution of Water Management

Pioneering and Discovery Phase
1880 – 1920

Delivery Phase 1920 – 1985

Management Phase 1985 – Present

Australia's top 3 water issues

1. Diminishing water security



Climate change and drought



Urban population growth

2. Over-allocation of resources



Rapid and poorly managed expansion of irrigation (1960s-1980s)



Uncontrolled groundwater use



Drier climate since 1950s

3. Environmental degradation



Salinity



Toxic algal blooms



Decline in native fish, birds and floodplain vegetation

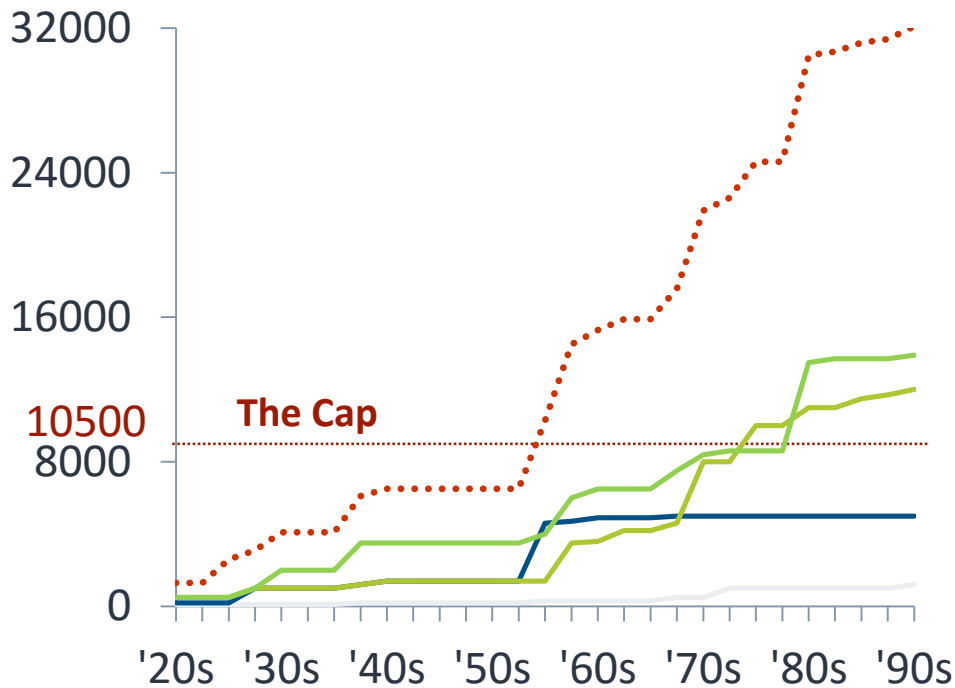
The reform agenda

Policy | Institutional | Instruments | Tools

The Murray-Darling Basin



(GL)



70% of Australia's irrigated agriculture

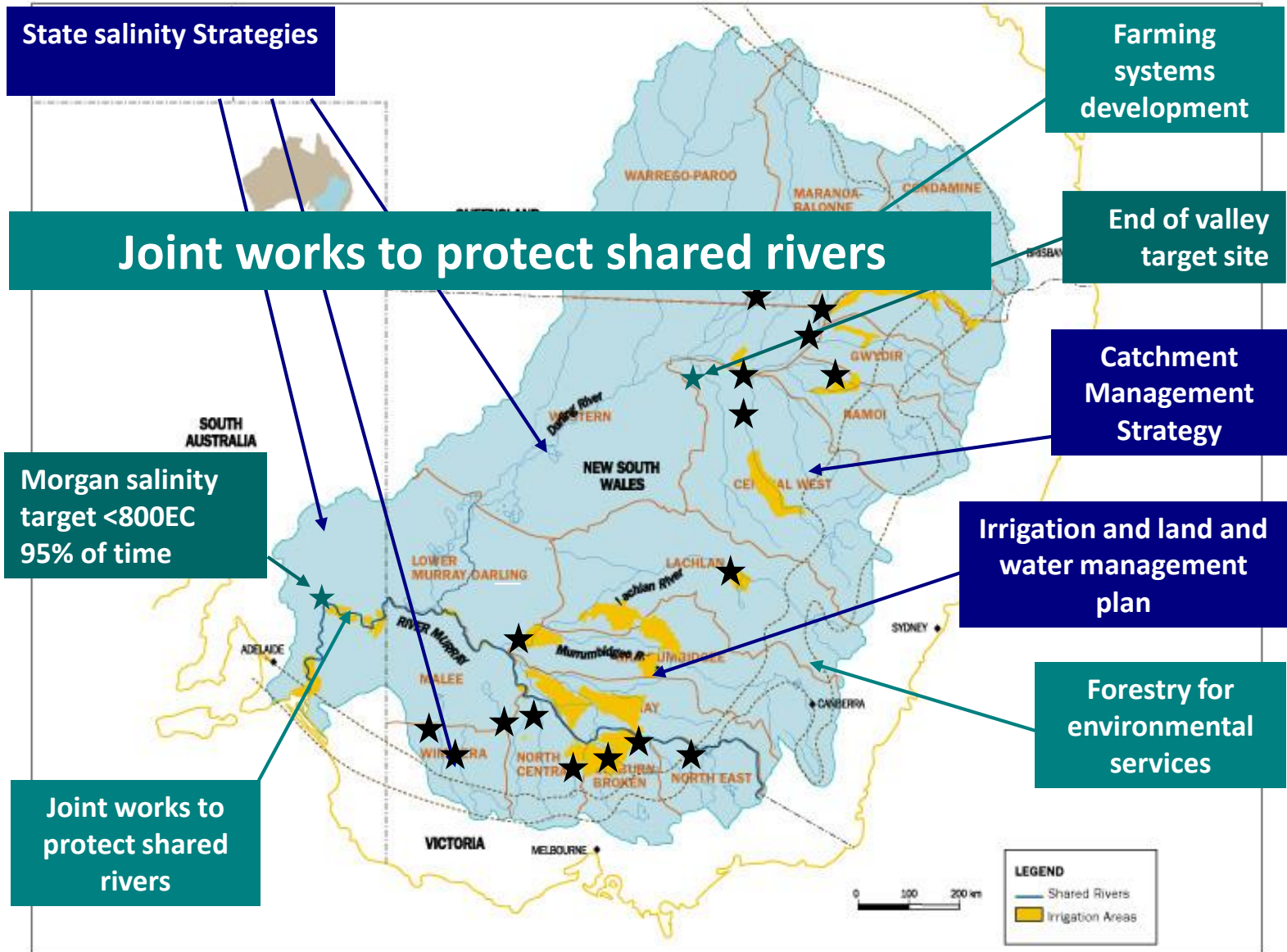
However...



Serious **over-allocation** of water between 1960s-1980s

— QLD — VIC — NSW
— MDBC TOTAL

Salinity Strategy in Summary



National water policy reform (1994-2004)

1994 COAG water reforms

- 💧 Institutional reform (rural and urban)
- 💧 Property rights and water markets/trading
- 💧 Environmental flow provisions
- 💧 Groundwater management
- 💧 **Water included in National Competition Policy**

2004 National Water Initiative

- 💧 Review and update of 1994 reforms
- 💧 New powers and role for Commonwealth (Federal) Government
- 💧 New Commonwealth Water Act (2007)
- 💧 Water for the Future fund (\$12.9 billion)
- 💧 Murray-Darling Basin Plan

The Murray-Darling Basin Plan (2010-11)

Defines 'Sustainable Diversion Limits'

- 💧 For 20 River Valleys in MDB (in different States)
- 💧 Covers surface- and ground-waters
- 💧 Will consider climate change risks

Protect environmental 'assets'

- 💧 Floodplain forests and wetlands
- 💧 Environmental flows
- 💧 Water quality and salinity

Political and social implications

- 💧 State 'Water Sharing Plans' must be accredited
- 💧 Social impacts must be considered
- 💧 **Based on 'best-available' science**
(evidence-based policy)

Better environmental outcomes

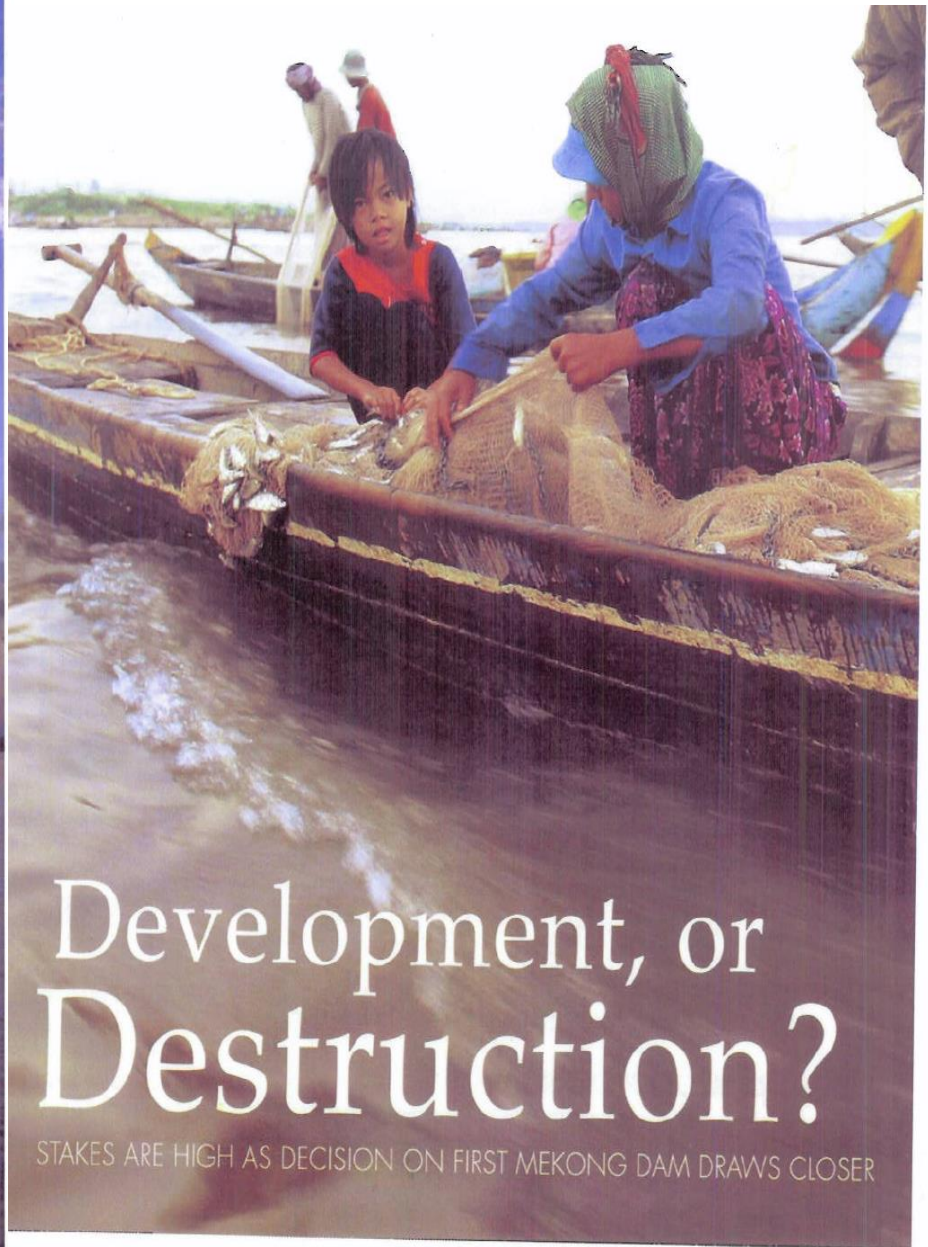


The CAMBODIA DAILY
WEEKEND

Issue Number 674, 1,000 riel/30 cents
Saturday and Sunday, February 12-13, 2011



THE MEKONG IN PERIL
Concerns mount as decision on first dam project nears



Development, or Destruction?

STAKES ARE HIGH AS DECISION ON FIRST MEKONG DAM DRAWS CLOSER

FEBRUARY 12-13, 2011

Dams - How Many?

40,000 over 15m since 1950

- One every 2 days

Trans-boundary Rivers

Currently 261

- Covering: 145 nations
45.3% land surface of earth

60% available freshwater

The Basins – Murray-Darling / Africa & Asia

The clash of
PERCEPTION vs FACT

The Murray-Darling Basin



Driving Philosophy:

You can't manage what you can't measure and describe



Must move from **perceptions to fact**



“Sufficient certainty”

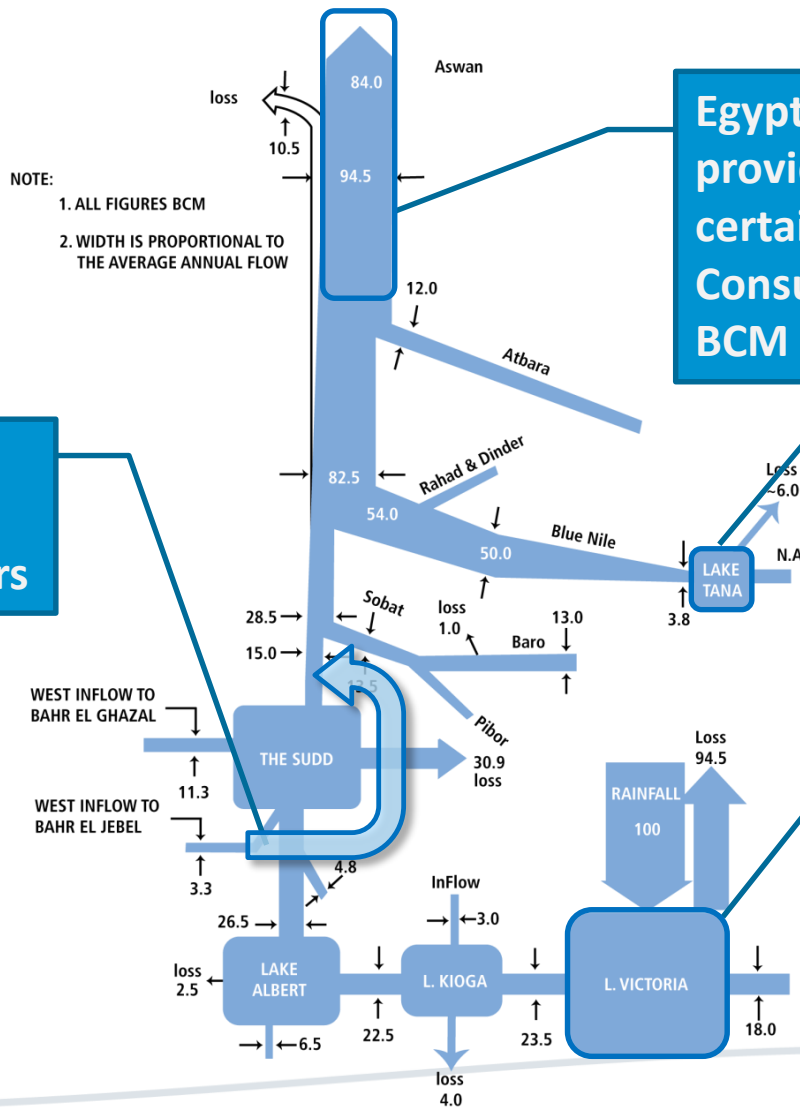
enables the hard questions and tradeoffs to be tackled

The Nile River Basin





Understanding the current status



Egypt – Aswan has provided supply certainty
 Consumption 60 BCM

Ethiopia – 580 BCM of rainfall—make it work harder

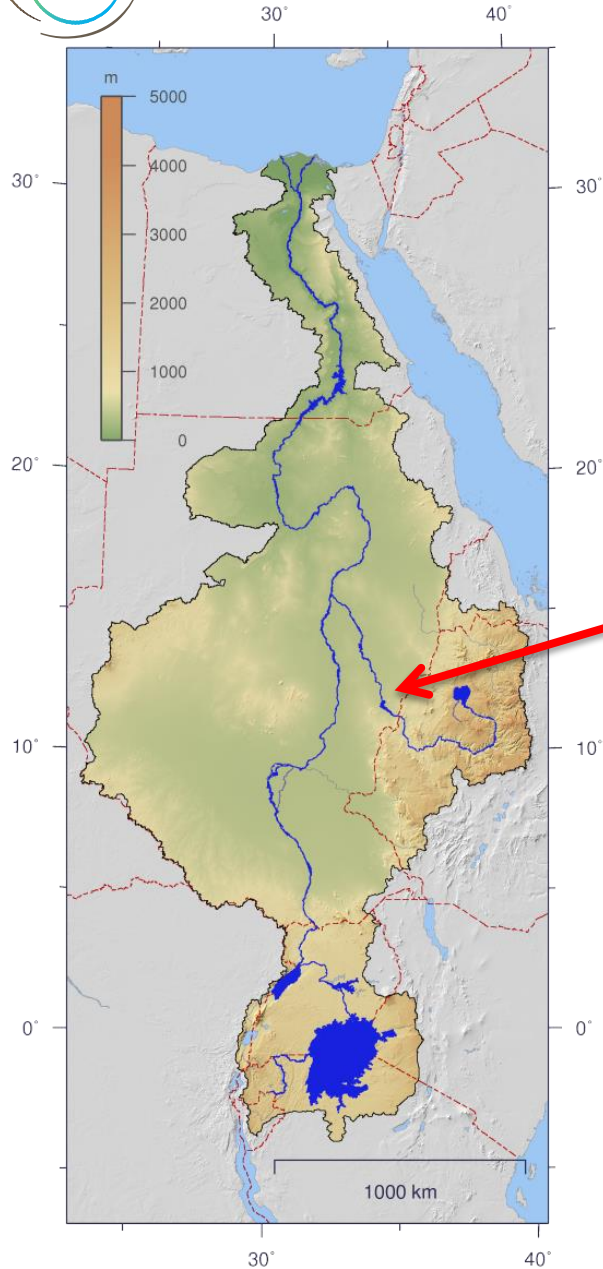
Jonglei canal – center of conflict for the last 20 years

Equatorial Lakes Evaporation 130BCM Plus Demand 10BCM Maximum



Grand Ethiopian Renaissance Dam Expert Workshop at MIT

13-14 November 2014



The Nile with GERD (MIT Assessment)

Issues

- 💧 Co-ordinated operation of GERD and AHD-How?
- 💧 Technical issues with the design of the low level outlets and saddle dam
- 💧 Agreement on the sale of hydropower from GERD
- 💧 Rapid Salinity build up in the lower Nile

Response to Date

- 💧 Countries have agreed to cooperate
- 💧 Dam continues to be built
- 💧 No shared knowledge base that is agreed
- 💧 No framework Agreement in place that can be populated as information evolves
- 💧 No **“honest and trusted”** partner in place to assist when the **“going gets rough”** as it inevitability will.

Indus



The Treaty (1960)

Indus – The Region



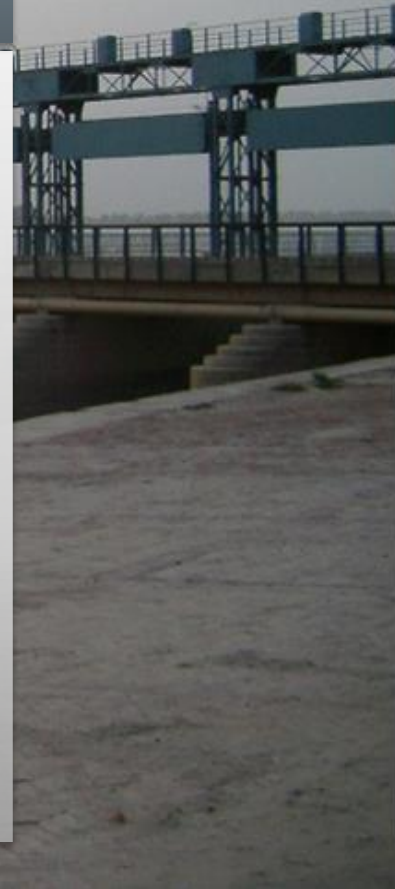
Indus

Perception

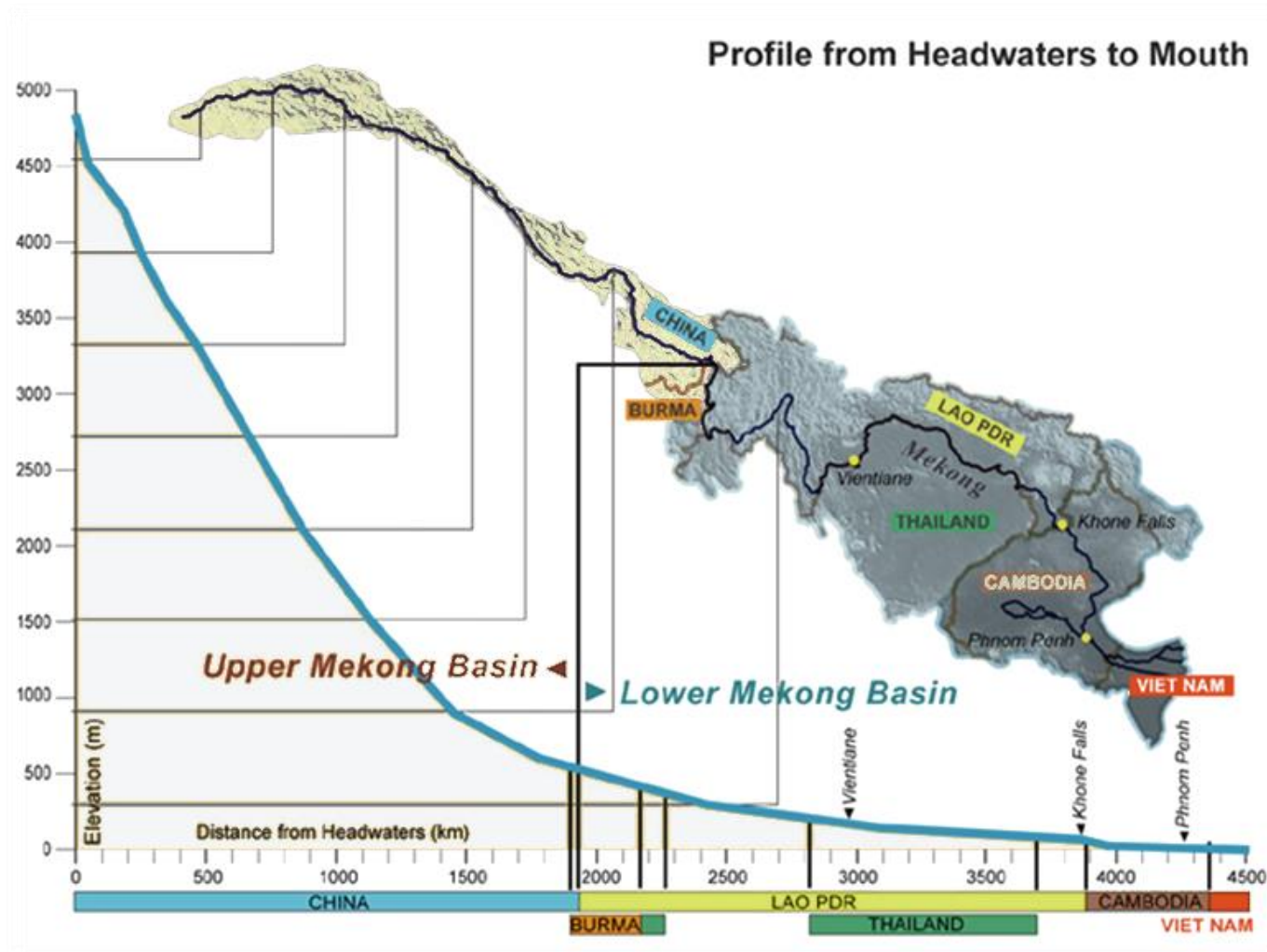
- 💧 You only need to manage surface water
- 💧 More surface water storage will result in more water yield
- 💧 Climate change is a long way off

Fact

- 💧 Groundwater dominates production and is threatened by lack of management (1-3% change in annual availability)
- 💧 The next major dam (\$12B) will yield less than 1.5% increase in regulated flow
- 💧 24 million tons of salt stored each year in groundwater system
- 💧 Western end of the Himalayas is likely to see a significant (up to 30%) reduction in flows in the next 30 years



The Mekong



Mekong Region



Mekong Basin Hydropower



Villagers held after dam protest ends in violence

Shanghai Daily, 17 January 2011

New dam in China disrupts river trade at major Burma border crossing

Shan Herald, 14 December 2010

Chinese dams not to blame for low Mekong levels: Cambodia PM

AFP, 18 November 2010

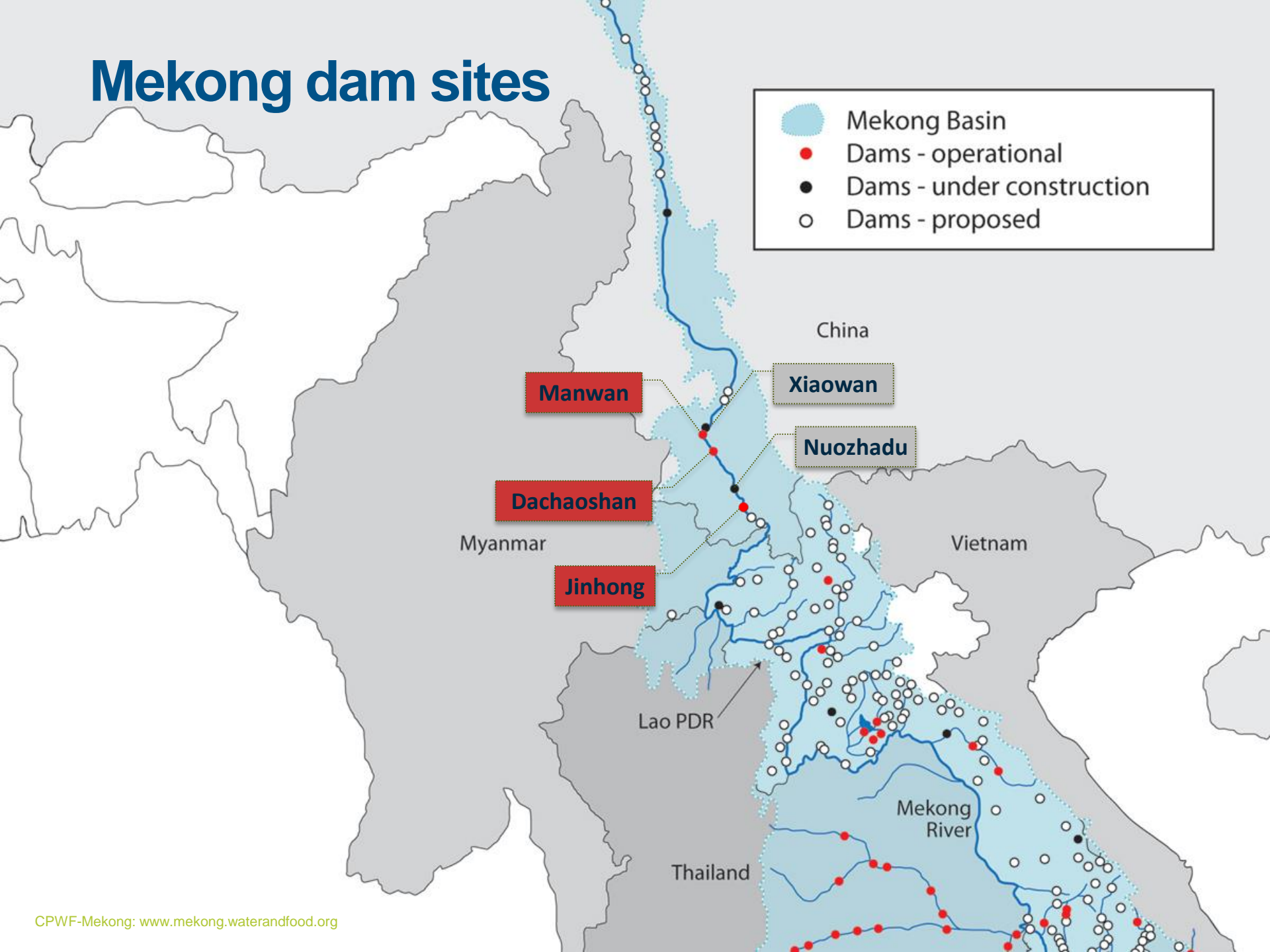
Dams across the Mekong could trigger a 'Water War'

Inter Press Service, 25 June 2009

The China story

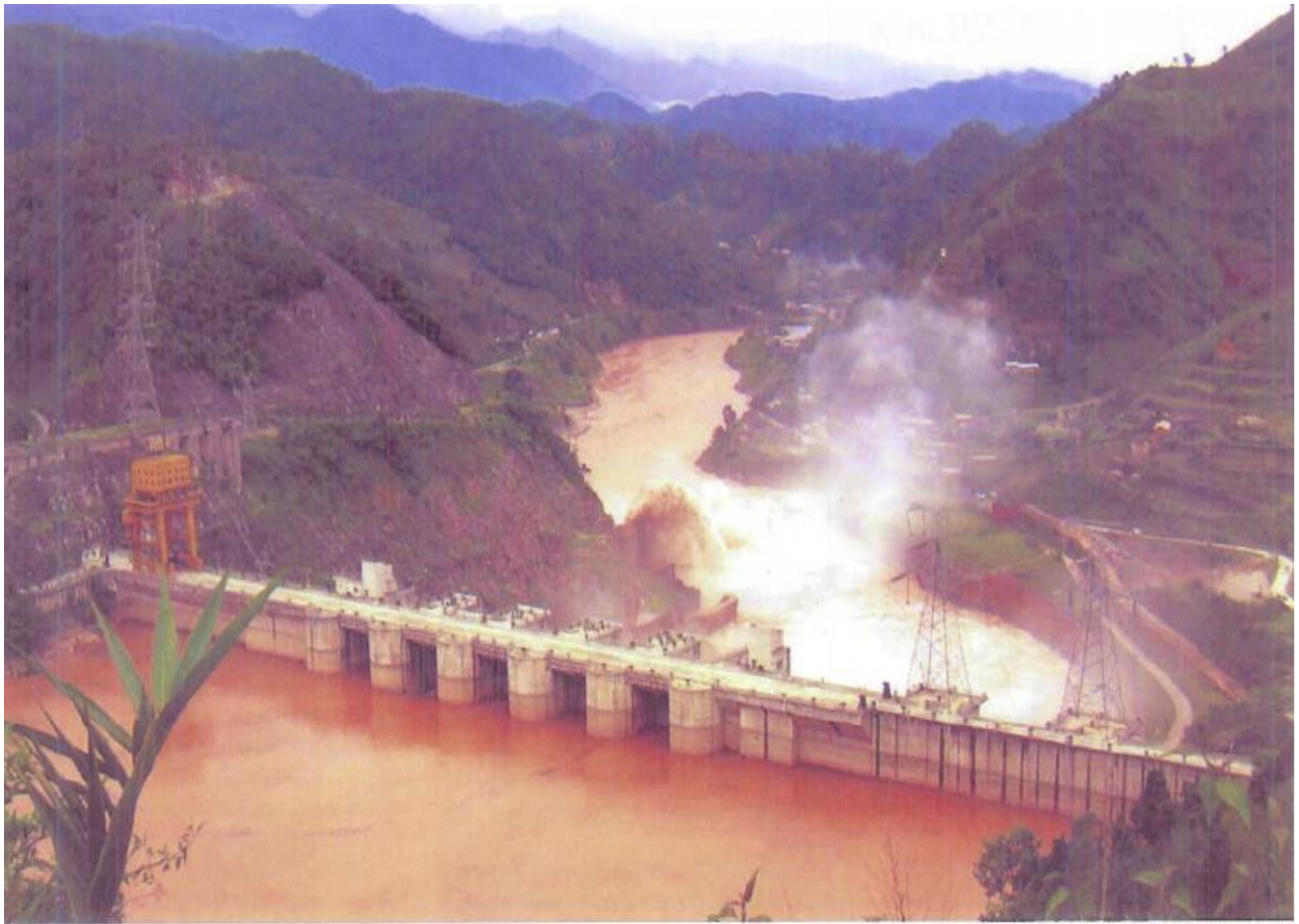


Mekong dam sites







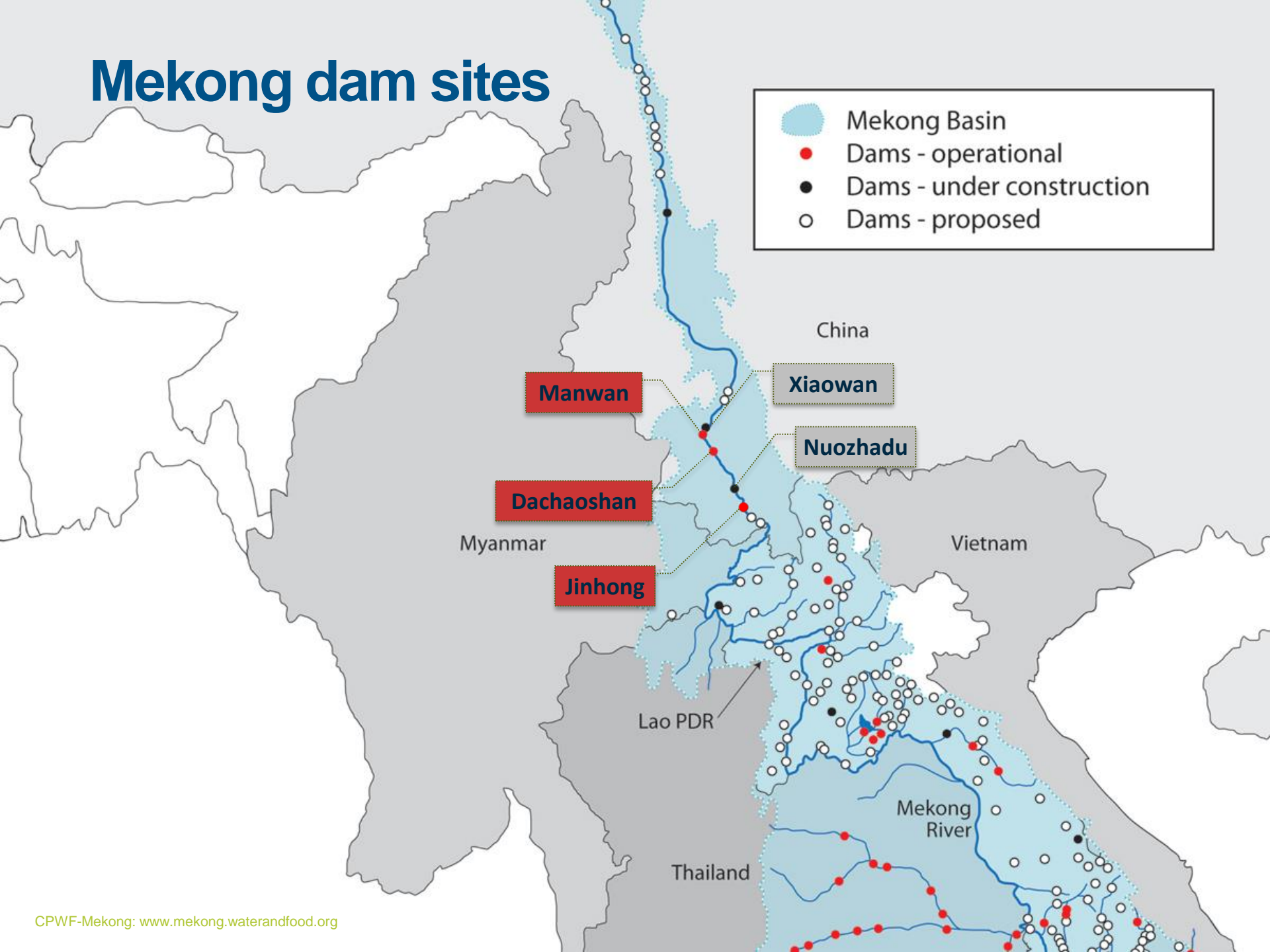


INTERNATIONAL RIVERS

The LOA Story

The Battery of Asia

Mekong dam sites

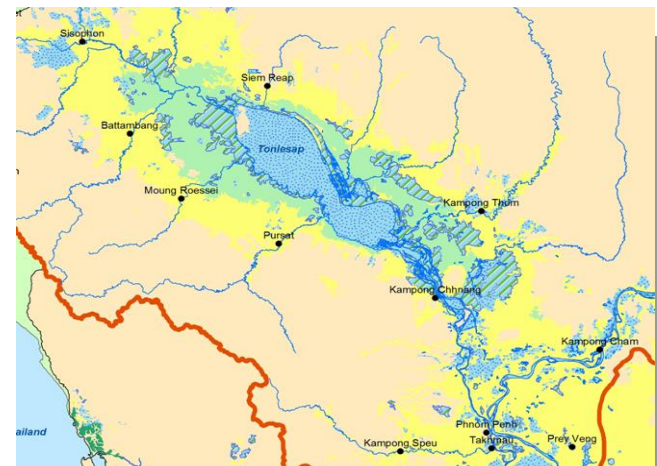


The Cambodian Story



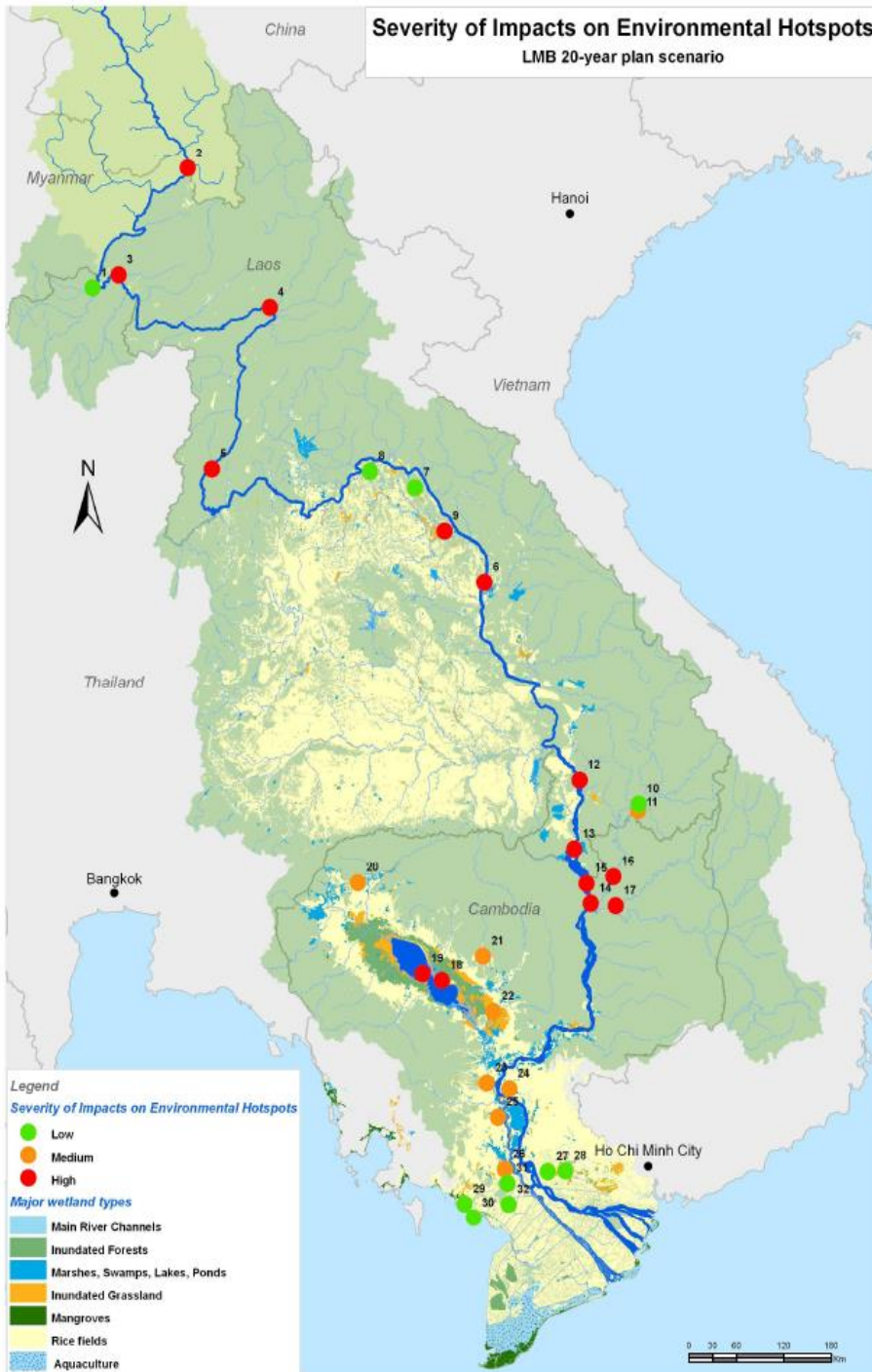
Change in integrity of Tonle Sap (TLS) system

- ❑ The decrease in reverse flow volume to the Tonle Sap Lake
- ❑ A reduction in sediment inflow into the lake
- ❑ blockage of fish migration paths by mainstream dams



Severity of Impacts on Environmental Hotspots

LMB 20-year plan scenario



The Thailand Story

How to develop the North East and maintain
community support

Thai greens step up campaign against Laos's Xayaburi dam

Bangkok Post, 17 February 2011

Dams will unleash untold misery

Bangkok Post, 5 January 2011

Chiang Mai red-shirts to join UDD rally

Bangkok Post, 12 February 2011

Red masses unsettle government

Bangkok Post, 10 January 2011

Thailand faces flak for backing Mekong Dams

Inter Press Service, 29 July 2010

The Vietnam Story

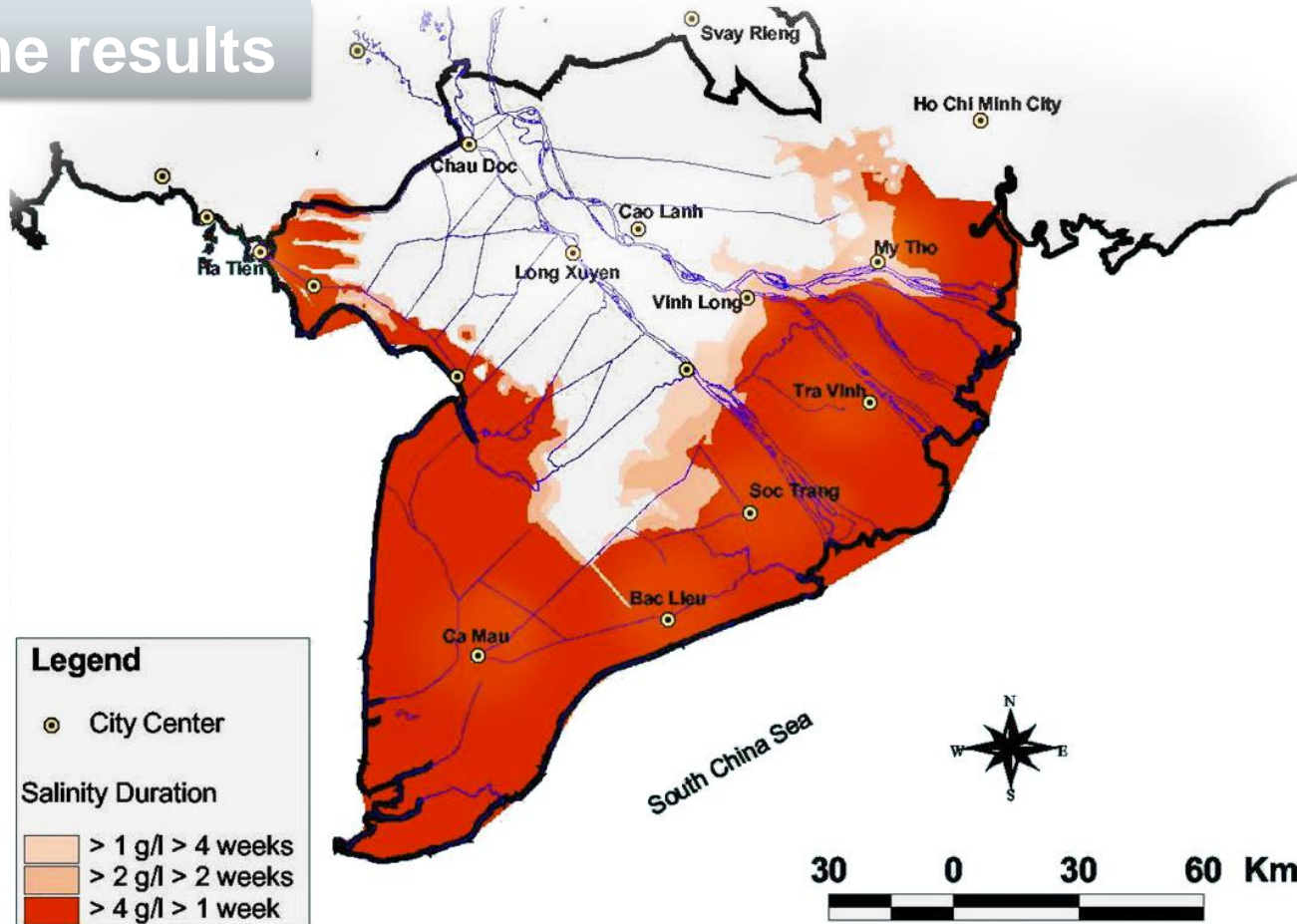
How to protect the Delta (noting the floodplain has been largely annexed for production)?

Low flows and Salinity Intrusion

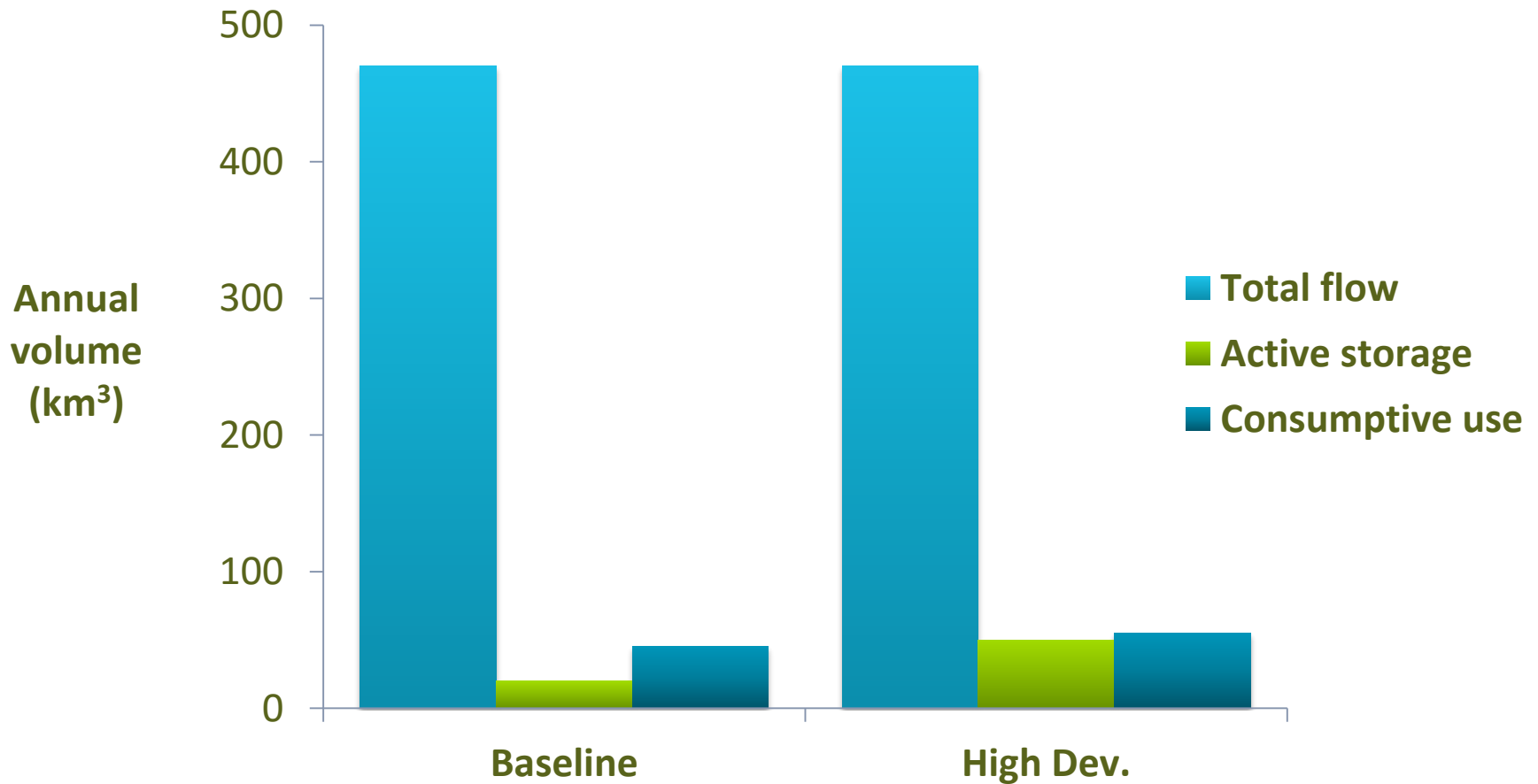
High Flows and extreme Flood risk

Areas affected by salinity intrusion

Baseline results



Mekong Water Balance



Mekong

Perception

- 💧 Hydro electric dams in China will have a negative effect on lower riparians
- 💧 There is little space for development without significant environmental tradeoffs

Fact

- 💧 China dams deliver a much needed increase in low flow and mitigate salinity intrusion in the delta. They also provide scope increase irrigation diversion with little impact on fisheries-
- 💧 China needs to commit to a release pattern from its Dams to increase confidence—discussions underway-
- 💧 There is significant scope in energy and irrigation development provided they meet international standards

Mekong River Commission

Potential

- 💧 Agreement in place with sufficient powers to promote cooperation
- 💧 \$250m plus spent on knowledge and process over 20 years.

Outcome 20 years on--

- 💧 Some data sharing arrangements in place
- 💧 No agreed set of specific objectives for the Basin
- 💧 No agreement on either high or low flow water sharing even though the data and models exists
- 💧 China's formal participation????

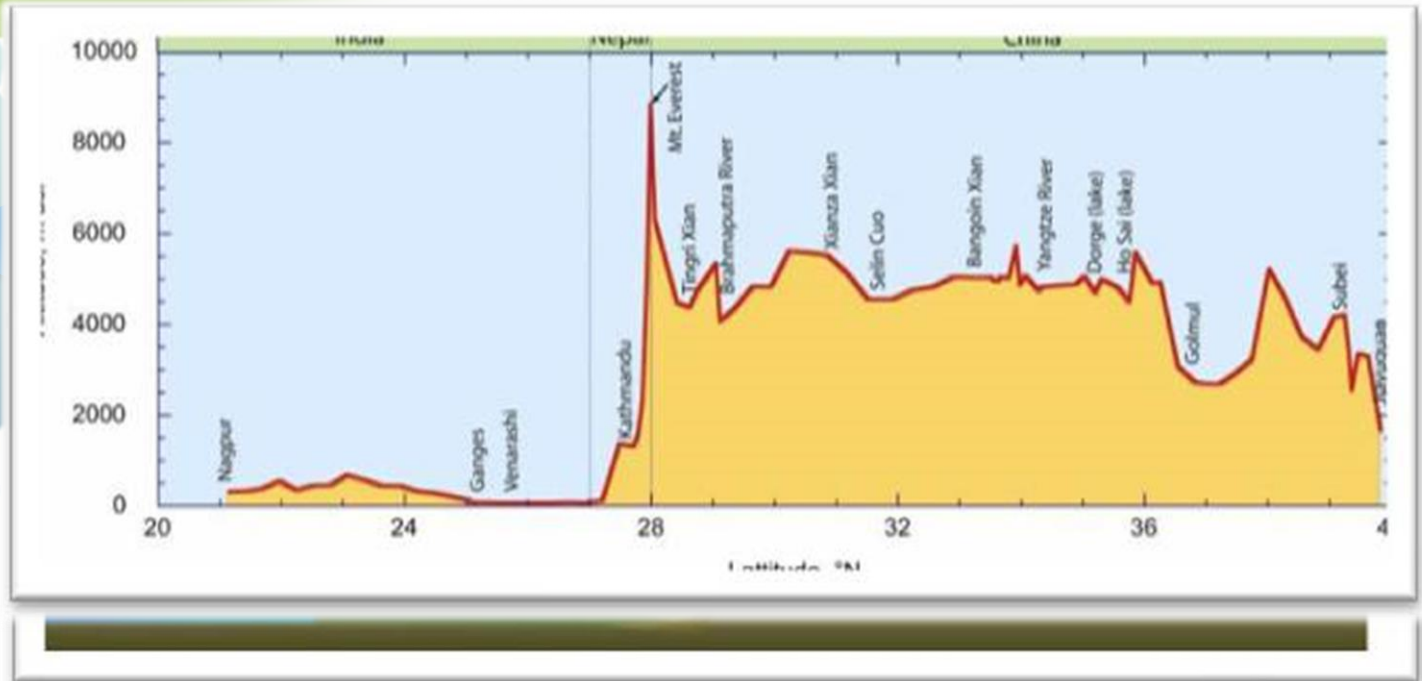
Ganges River Basin



Ganges Region

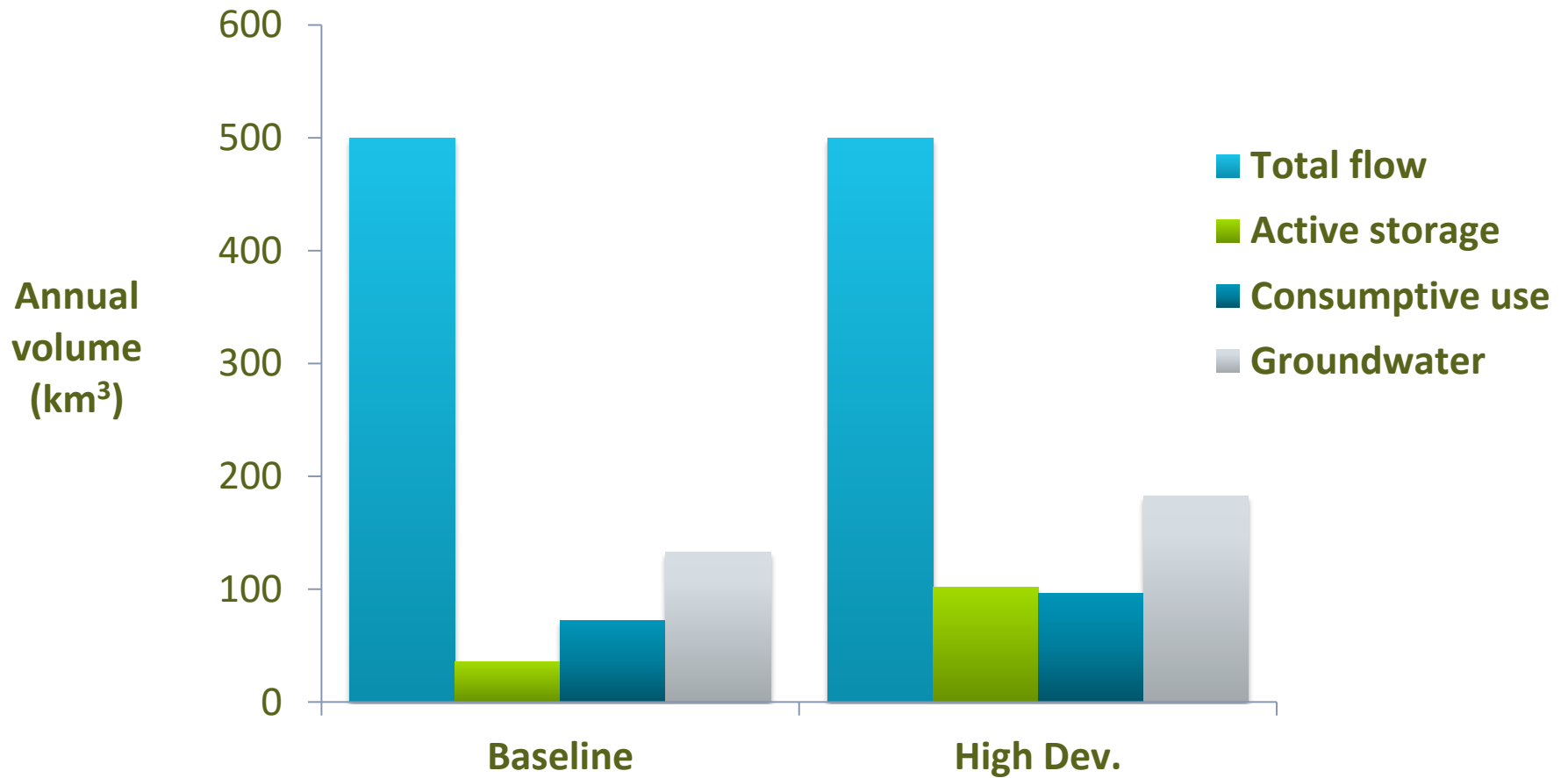


The River – South Asia Monsoons



- 💧 A highly variable hydrology
- 💧 Difficult to manage
- 💧 Prone to drought and flood

Ganges Water Balance



Ganges

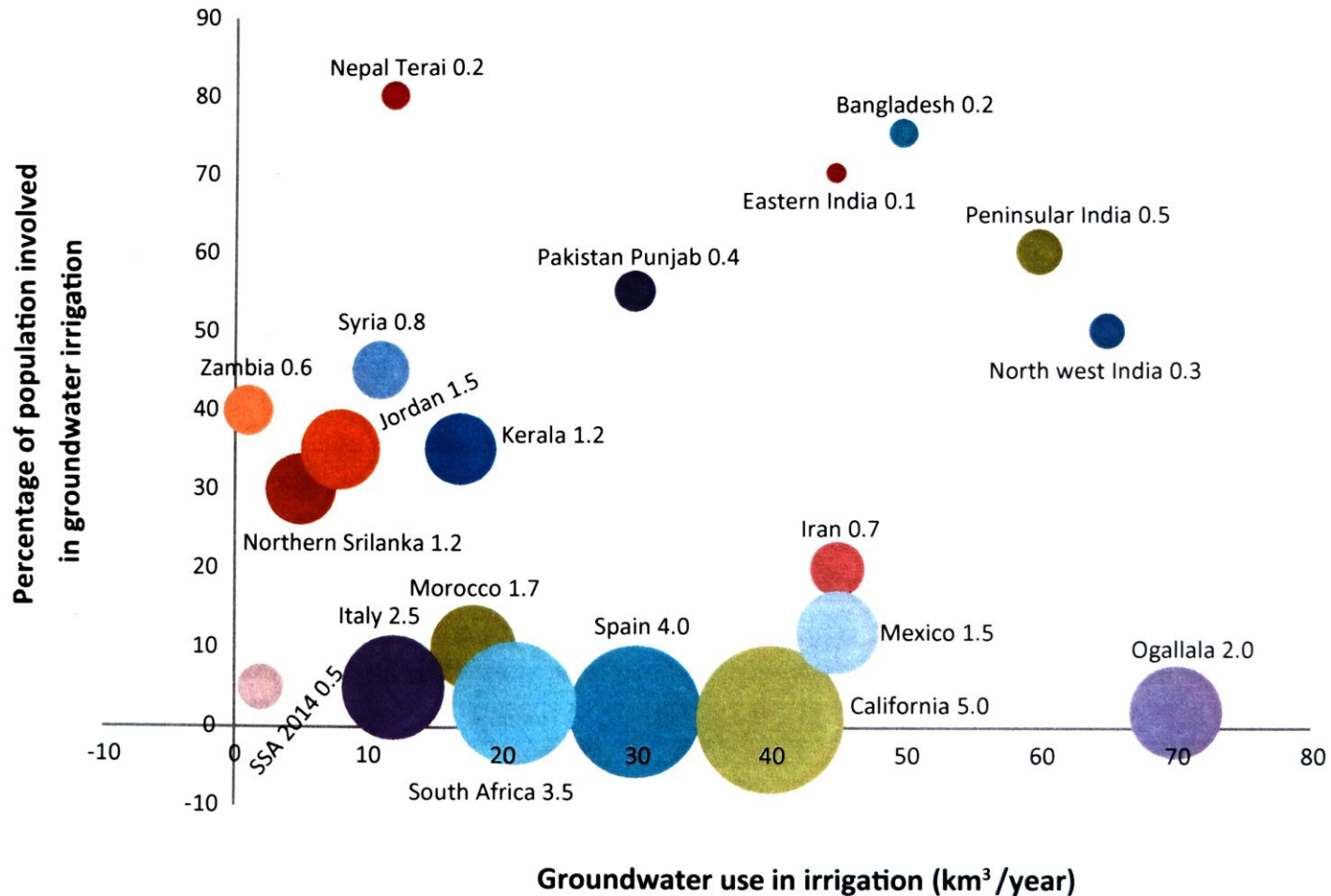
Perception

- 💧 Major dams will deliver multiple benefits, including the control of Ganges floods
- 💧 More surface water for irrigation is good
- 💧 Climate change will have a catastrophic impact

Fact

- 💧 The next 20+ major dams will have little impact on mainstream Ganges floods
- 💧 Surface irrigation is of low value
- 💧 Conjunctive water use—huge opportunity—can be delivered now, a.k.a. the Ganges water machine
- 💧 Global Circulation Models have not agreed on the outcome of climate change

Global groundwater development and usage.....



Prominent groundwater-irrigation economies: Volume of groundwater use (billion m³/year), proportion of the population dependent on groundwater-irrigation (%), and value of groundwater-irrigated farm output (US\$/m³)

Smart solar pumping – water, food and energy nexus

Addressing the energy crisis in India

- India on cusp of solar boom moving 80 gigawatts in next 5 years
- Energy subsidies of \$6 billion annually driven groundwater depletion.
- Solar power as cash crop with a guaranteed market at attractive price.





憧憬之殿



OUR ULTIMATE CHALLENGE
IS TO MAKE OUR RIVERS AND LAKES
THE 'REPORT CARD' OF
OUR CIVILISATION





The Basins – Murray-Darling / Africa & Asia

The clash of
PERCEPTION vs FACT

The Euphrates

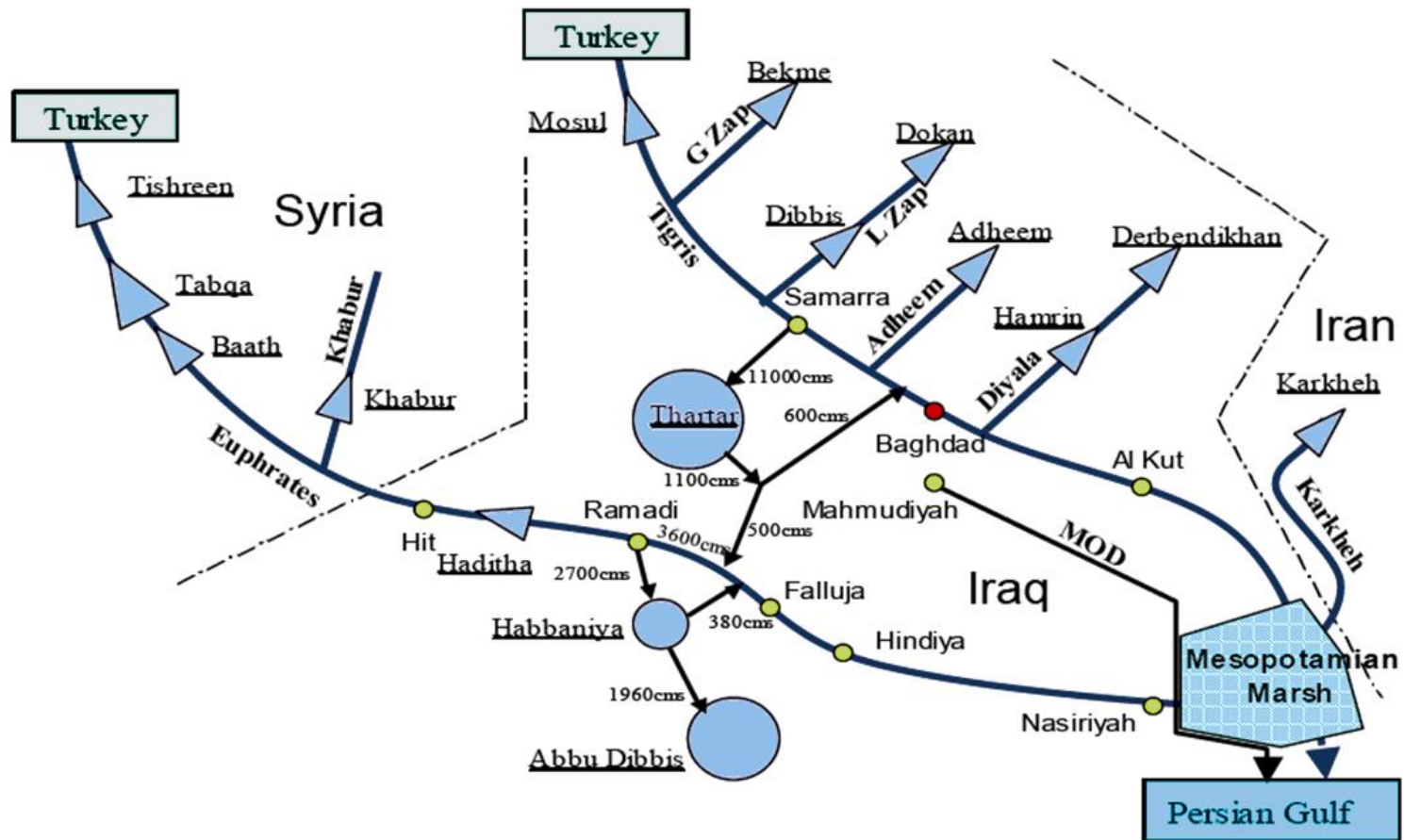
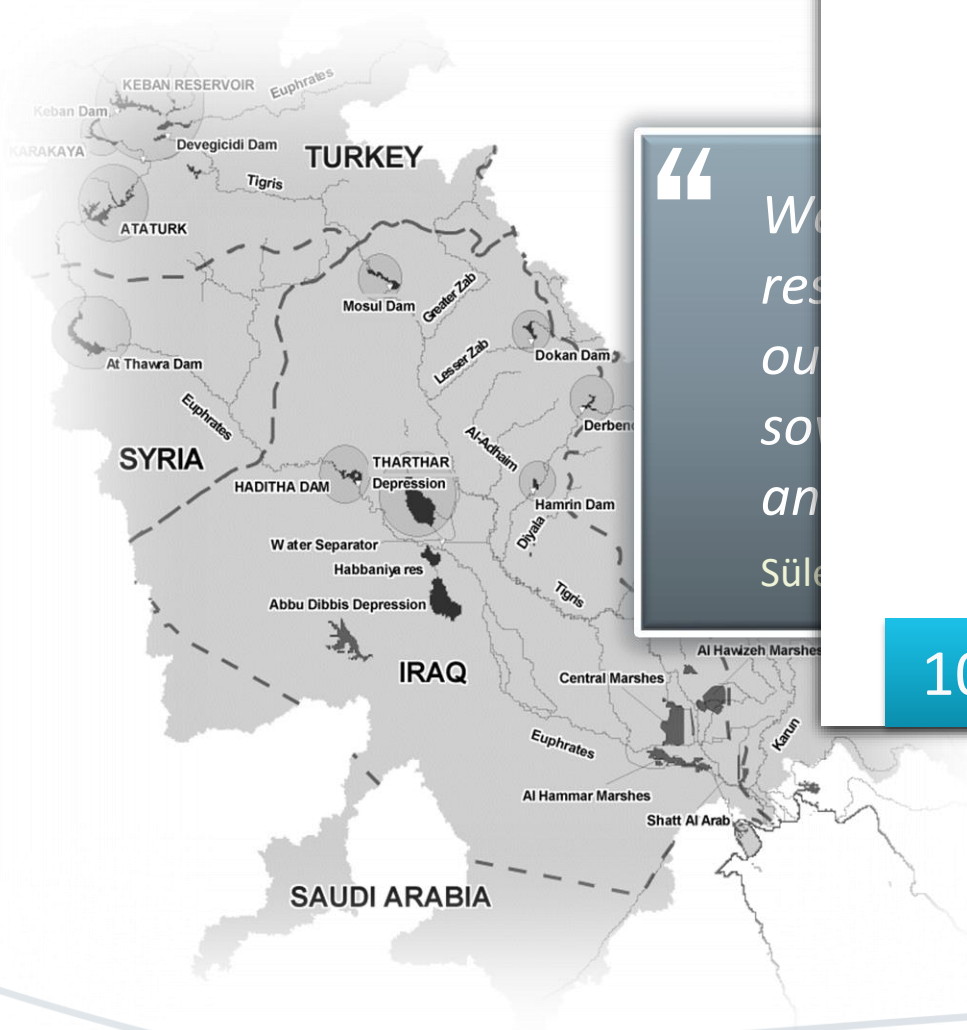
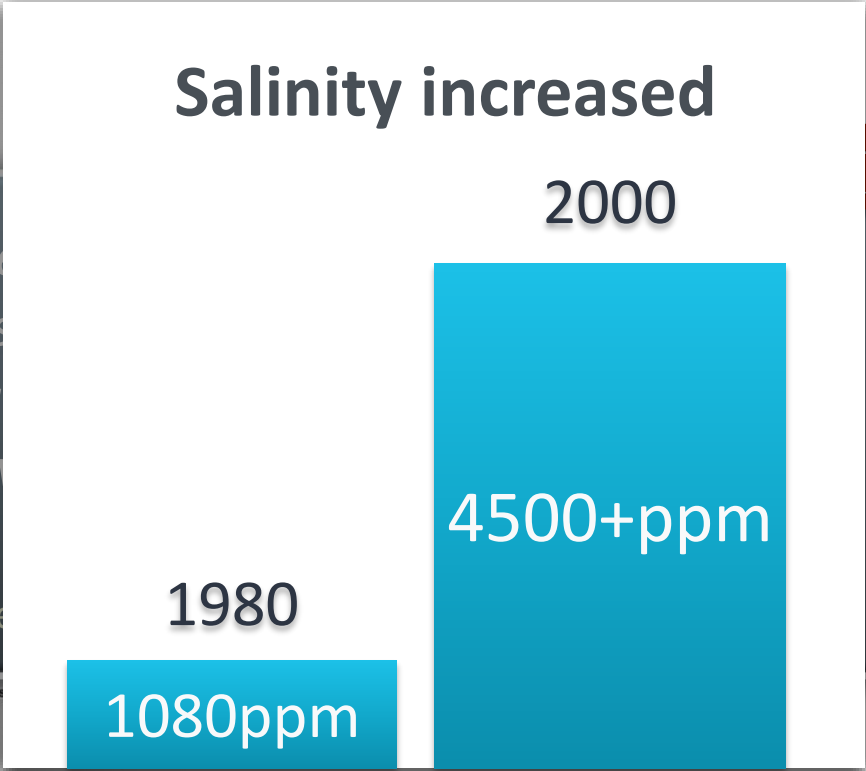


Figure 5. Major reservoir systems in the Tigris- Euphrates watershed

The Euphrates



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The Euphrates

Perception



Iraq must solve its own problem without help from neighbors

Fact



The salinity problem can be managed with help from neighbors and does not need a water tradeoff



How is this possible in the current environment!!!!



Ratio of maximum annual flow to minimum annual flow for selected rivers

COUNTRY	RIVER	RATIO BETWEEN THE MAXIMUM and the MINIMUM ANNUAL FLOWS
BRAZIL	AMAZON	1.3
SWITZERLAND	RHINE	1.9
CHINA	YANGTZE	2.0
SUDAN	WHITE NILE	2.4
USA	POTOMAC	3.9
SOUTH AFRICA	ORANGE	16.9
AUSTRALIA	MURRAY	15.5
AUSTRALIA	HUNTER	54.3
AUSTRALIA	DARLING	4705.2



Water Treaties

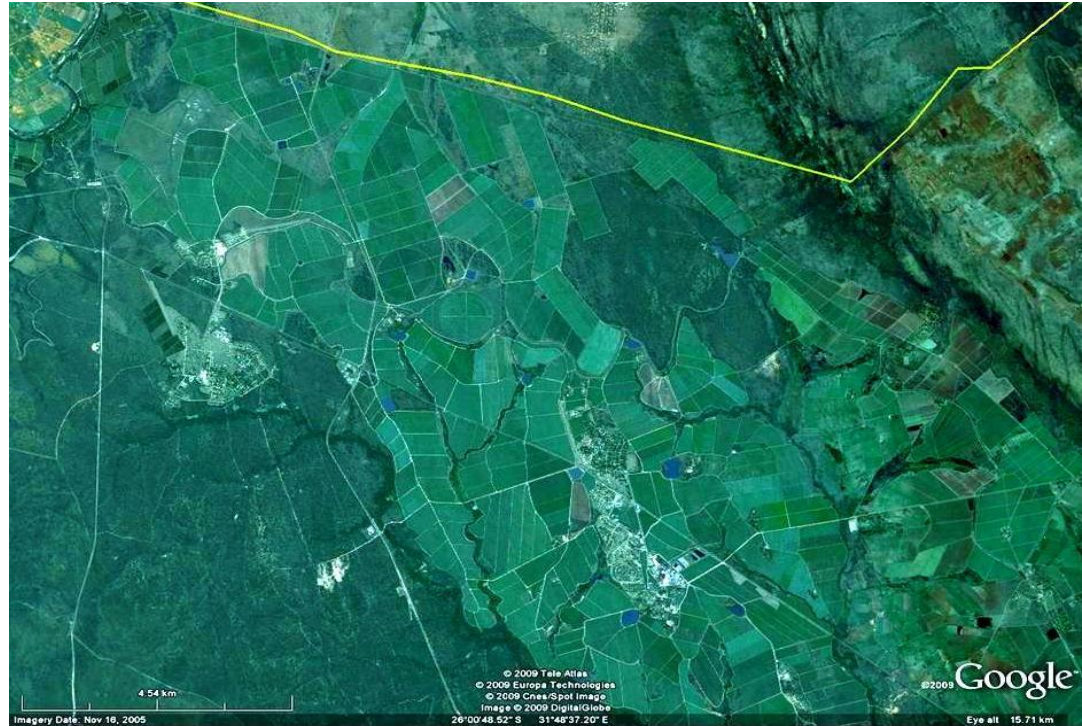
3600 Water related treaties since AD 805

6 minor water related skirmishes

1 major conflict

Large Scale Irrigation Systems are big business.....

- ✦ Total turnover provided by 115 million ha of LSIS is estimated at 288 billion US dollars/yr.
- ✦ LSIS would be 7th ranked by revenue (above Volkswagen, Samsung and Toyota but below PetroChina and BP (Forbes Global 2000 for May 2014).



- ✦ The turnover of 150 to 250 million dollars for a single large irrigation system of 100,000 hectares is about twice the size of a SME, defined by EC.

Issues

The existing stock of irrigation will dominate food production for the foreseeable future

A large proportion is under performing

We have no repeatable benchmarks or processes (IWMI and FAO have made a start)

We know that the classical training of “irrigation professionals” is flawed