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Water demand management in a changing world: a global overview

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CHALLENGES

ADDRESSING THE CHALLENGES

WAY FORWARD

THE SECTORS

CONCLUDING COMMENTS

Growth brings new challenges

Asia - a region with challenges…

- 1/6 world population
- 2/3 global population growth
- Increase in urban population by 60% by 2025

Improved well-being

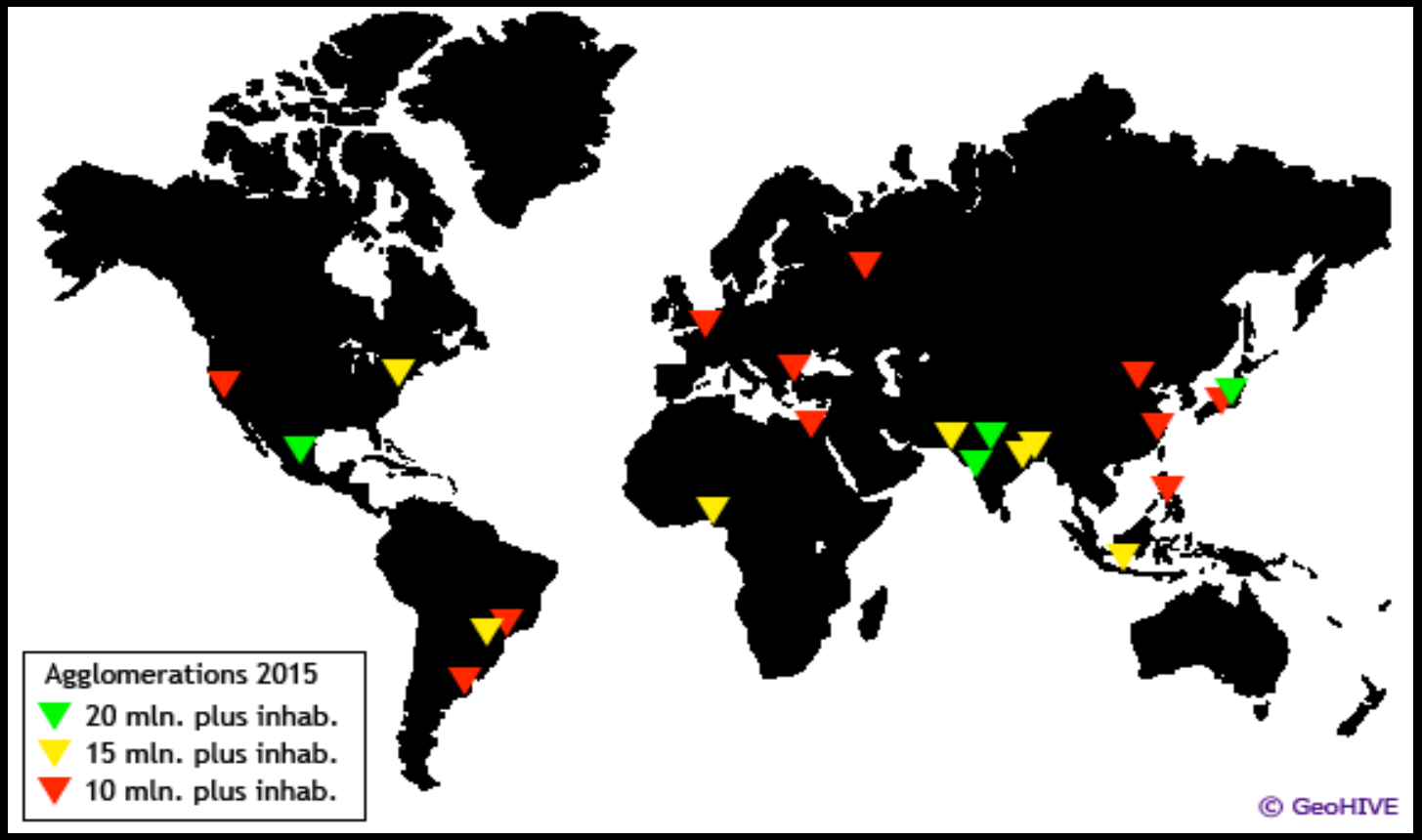
Serious water challenges to sustain population and economic growth, such as:

- Water for basic needs (domestic water and sanitation)
- Water for the growing cities
- Water for food
- Water for energy

People and water – uneven!

Asia: 60% of world population, 36% of world's water

The urban water challenge
Growing - and thirsty - mega cities



Large cities 2015

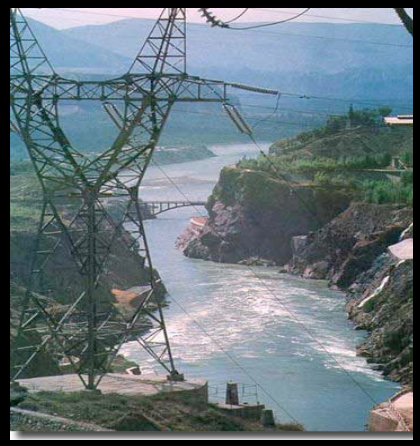
The food challenge
- a serious water problem

Securing basic water needs takes 50 l/cap/day
=> *a political will problem!*
Securing our basic diet takes 2500 l/cap/day
=> *A water problem !*

Particularly with

- ***More people with 1 to 2 meals per day***
- ***Wealthier people more protein/meat diets***

The energy challenge - shifting towards more hydro and biomass?



- 5-8% annual growth in electricity consumption in most Asian countries
- Climate change => more focus on renewable energy:
- Biomass and hydropower 96% of renewable energy => pressure on water
  - *ex. Mekong mainstream hydropower dams*
- Bio-fuel production as an energy solution, but with a significant water bill
  - *1000-2000 l water per 1 l bio-ethanol*

The environment challenge
- ecosystems paying the price ?

- 50% of all freshwater species disappeared in the 20th century
- Big rivers not reaching the sea (ex. Yellow river)
- Lakes disappearing (ex. Aral Sea)

The added challenge

Water and climate change:

The overall picture

Key impacts of Climate change will "hit through water":

- Through climate change and the effects of e.g…
  - changes in the hydrological cycle and water balance
  - sea level rise
  - increased water temperatures

- Through increased climate variability in the
  - more serious and frequent extremes (floods, droughts, typhoons)

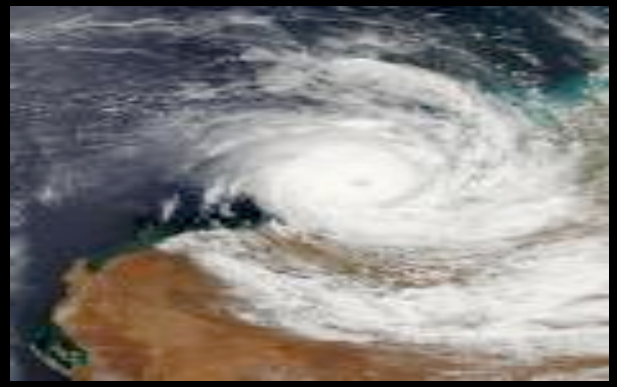
IPCC WG 2
Fourth Assessment Report, 2007

A message to take from the IPPC report

Energy is the focus for mitigation

Water must become the focus of adaptation

IPCC, 2007: ***it can be expected that the paradigm of Integrated Water Resources Management will be increasingly followed around the world .. which will move water, as a resource and a habitat, into the centre of policy making."***



Addressing the challenges

1. Traditional (Hard) solutions:

- dams : storage to bridge the gap!!

  * *5000 cum/cap storage in Australia and the US*

  * *10-20 cum/cap in many Asian countries*

  => *dams are still needed but social/ environment problems*

- dikes, levees, sewer networks, drainage canals

- eco-sanitation : de-coupling water and sanitation

- desalination : but ….

  > CO_2 for > H_2O = unsustainable

2. Smart (soft) solutions

- demand management!

- efficiency and reuse (more crop per drop, more produce per drop)

- salt and drought resistant crops

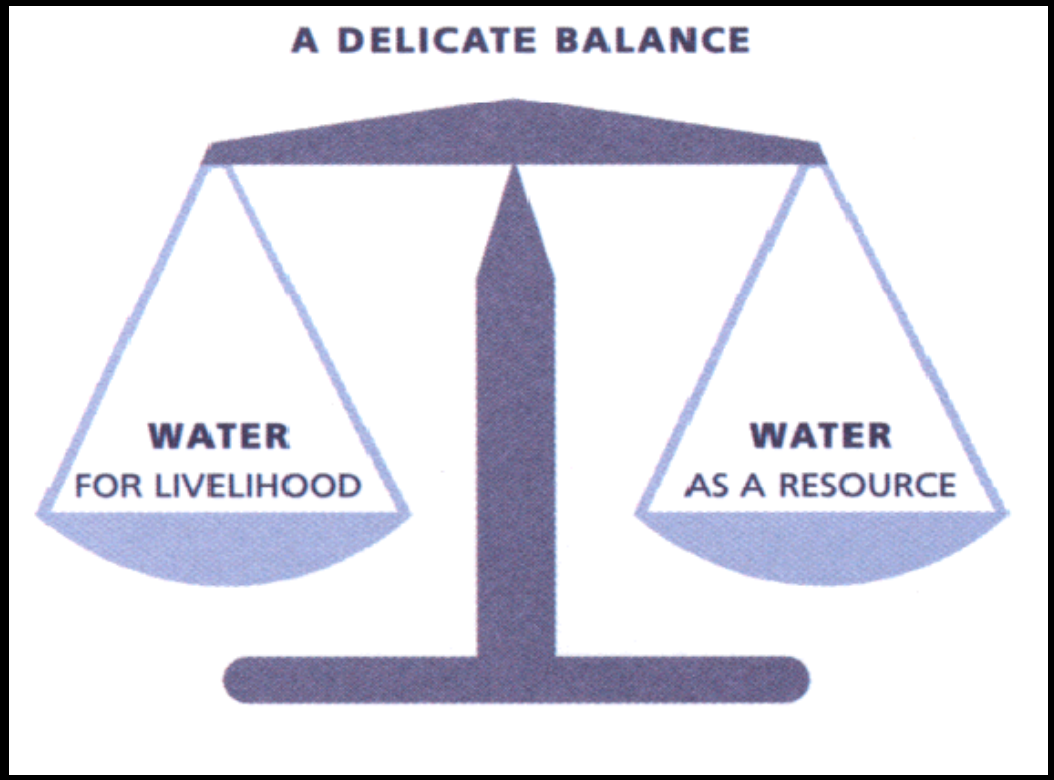
- watershed management

- groundwater recharge

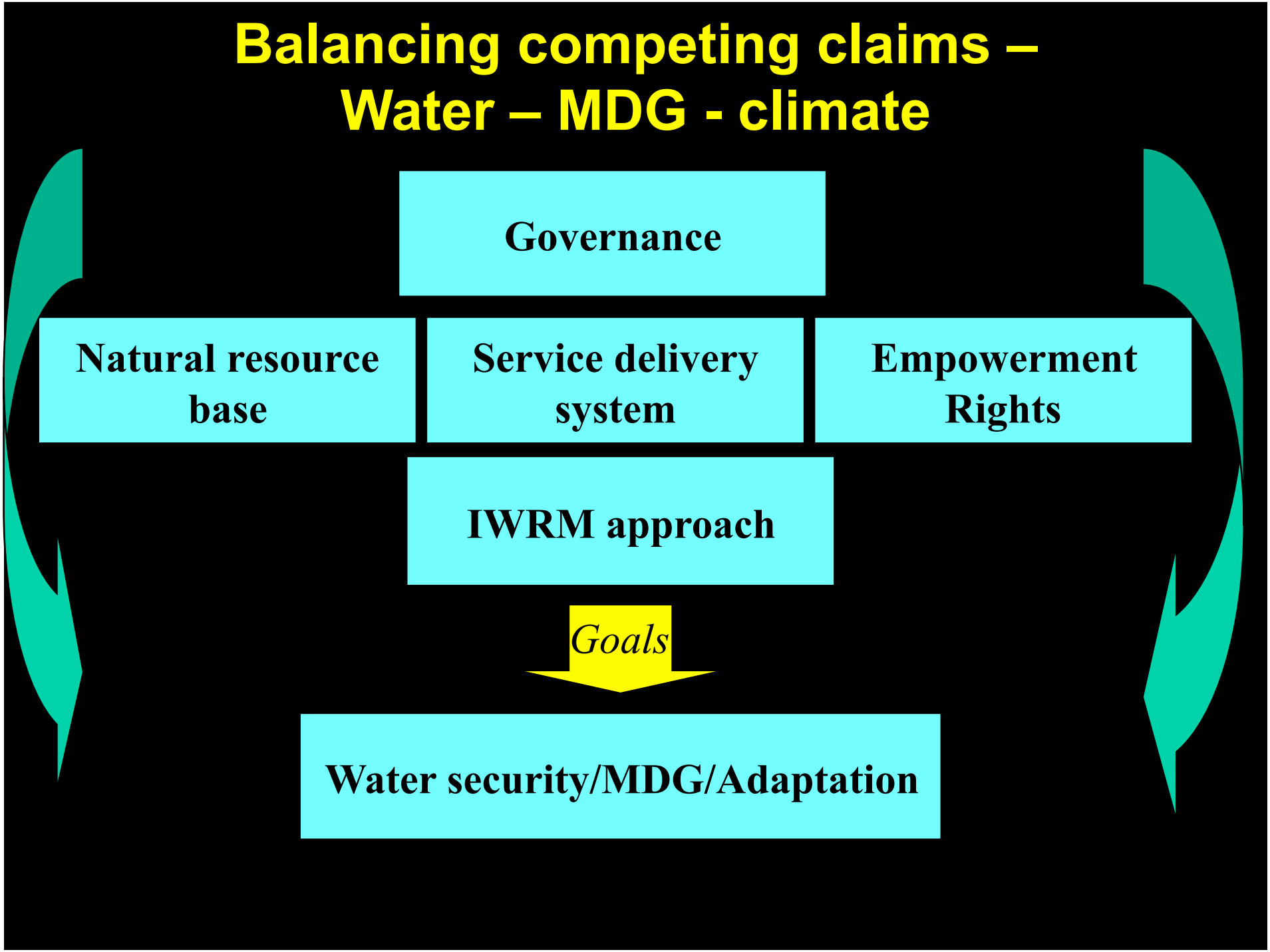
- global trade / virtual water

- flood proofing, flood retention, insurance.

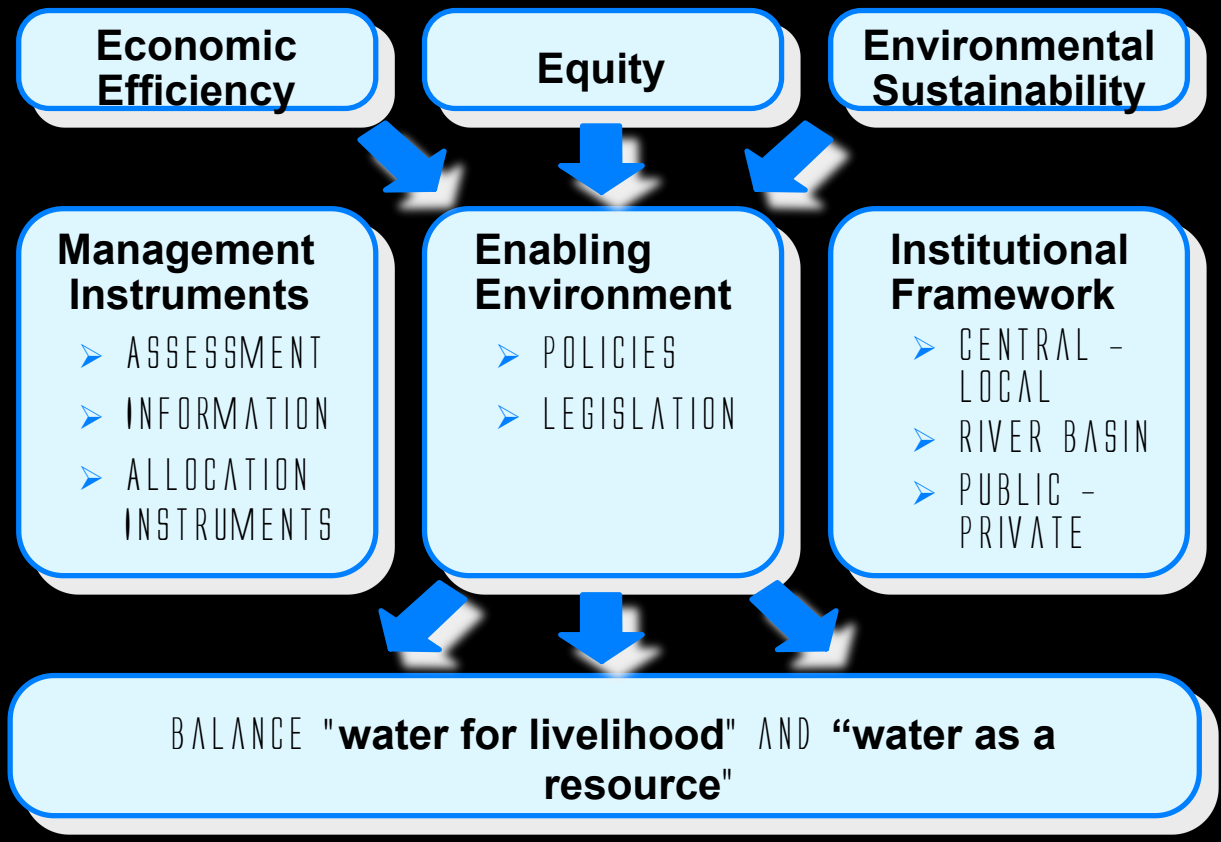
3. IWRM – integration and balance



Balancing competing claims – Water – MDG - climate

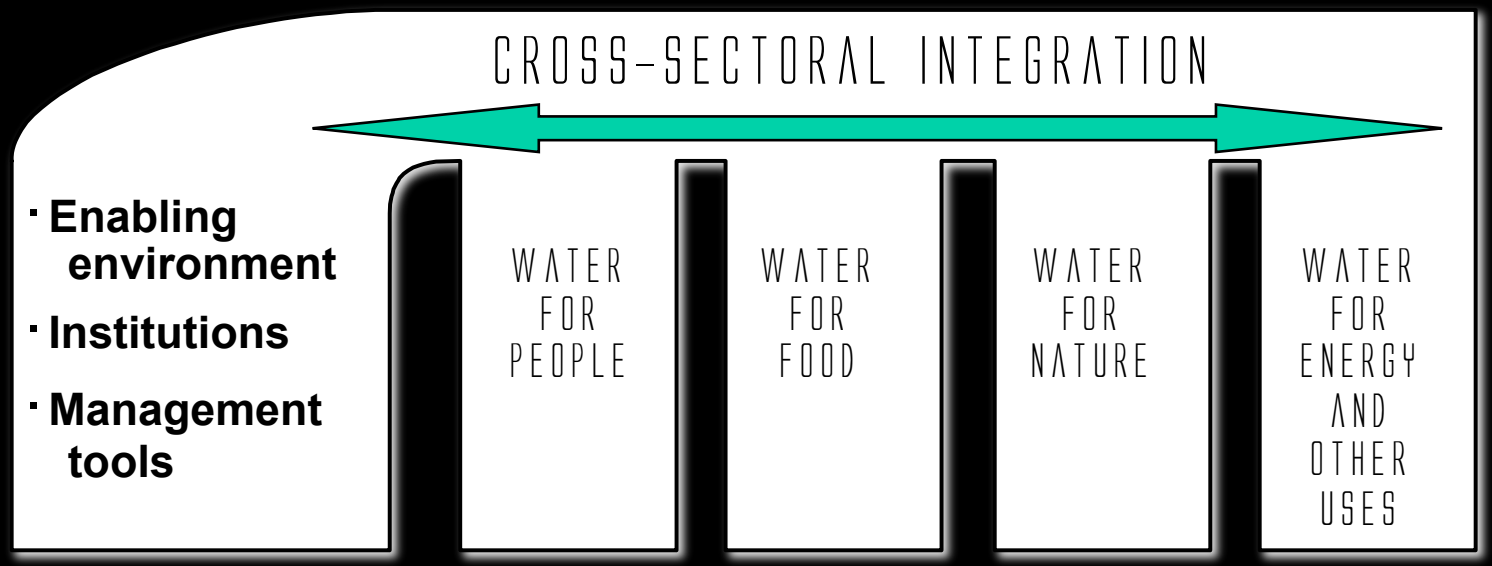


Balancing development goals



The three "E"s
The three pillars of IWRM

Balancing competing sector uses:



Need for emphasis on *"multi-disciplinary and multi-sector perspectives around the region"*

(Asian Water Development Outlook 2007)

Way Forward

Demand Management

Defining Water Demand Management

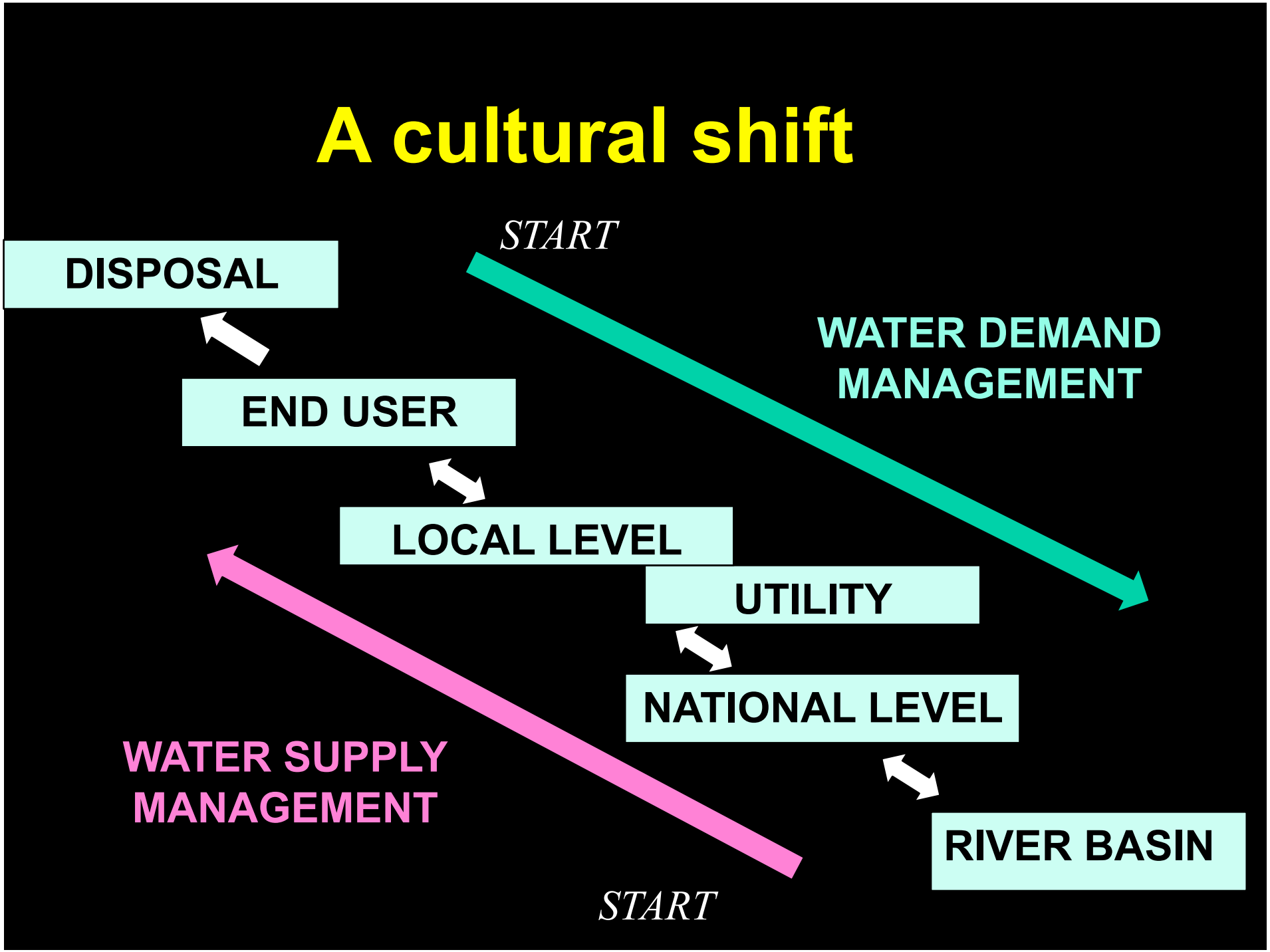
Water Demand Management - A critical element of the IWRM approach.

WDM - ”Any measure or initiative that will result in the reduction of the expected water use or water demand”

Or simply

“… making the most of the available water”
“ ... living within ones means”
“ … a no-regret adaptive strategy to climate change and variability”

A cultural shift



A Middle East perspective on Demand Management

- Using less or lower quality water for a given task
- Adjust the nature of a task to be undertaken with less water or lower quality water
- Shift the timing of use from peak to off-peak
- Increase the ability of the water system to serve society during times of water in short supply
- Ensuring equity in costs and benefits associated with WDM

“Narrow” and “Broad” approach to WDM

The “narrow” definition:

WDM influencing water demand only

The “broad” definition:

WDM includes increased supply from non-traditional water sources:

- ✓ Recharge, Recycling, Reuse (the 3 R’s)
- ✓Leakage control
- ✓Rainwater harvesting
- ✓ Desalination
- ✓Other

The South African experience

General findings on water demand management:

- WDM discussed but not easily implemented
- Existing cultures within public, engineering, economics and politics have to change to implement WDM
- Different people use different definitions of WDM
  -- *need for a common definition?*
- A delicate balance between maximizing benefits, minimizing costs and mitigating risks

THE SECTORS

Agriculture:
Big user – Big potential gains

Some statistics

- 16% irrigated => 40% global food production
- Global "demand": from 7,130 cu.km => 12,000 cu.km
  (70-90% increase, not including bio-fuels!)
- 37% only abstracted water used by plants

Some significant WDM perspectives:

- 75% of additional "demand" reached if 80% farmers move from low to high yields with same water use!

- 35% increase in productivity => reduction of additional "demand" from 80% to 20% (mainly rain-fed)

Agriculture:
How to make the change

Getting the water to the plant

- more crop per drop
- Changing cropping patterns and practices

by changing mind-sets in the sector

- Upgrading rain-fed agriculture
- Reforming irrigation

by mechanisms such as

- Realistic water pricing
- Investing in better technologies
- Improving farm water management
- Trade and water markets

Agriculture:
Food Trade a viable demand management measure?

Virtual water, or "water footprint": the amount of water embedded in products:

- **Maize : 900 cum/ton**
- **Brown rice: 3,000 cum/ton**
- **Beef : 15,500 cum/ton**

Total global virtual water flows:

- **Total global water use : 7,450 cu.km/yr**
- **Total virtual water trade: 1,650 cu.km/yr , i.e. 16%**
  - **-- 61% crops and crop products**
  - **-- 17% livestock**
  - **-- 22% industrial**

Trade and water demand management

Example:

- Mexico imports grains from the USA which requires 7.1 cu.km to produce in USA
- Same amount produced in Mexico would have required 15.6 cu.km
- I.e. a water saving of 8.5 cu.km results from this trade.

Globally:

Agricultural water savings from "efficient exporters" to "inefficient importers"

- 5% of global agricultural water use

- i.e. significant gains from trade!

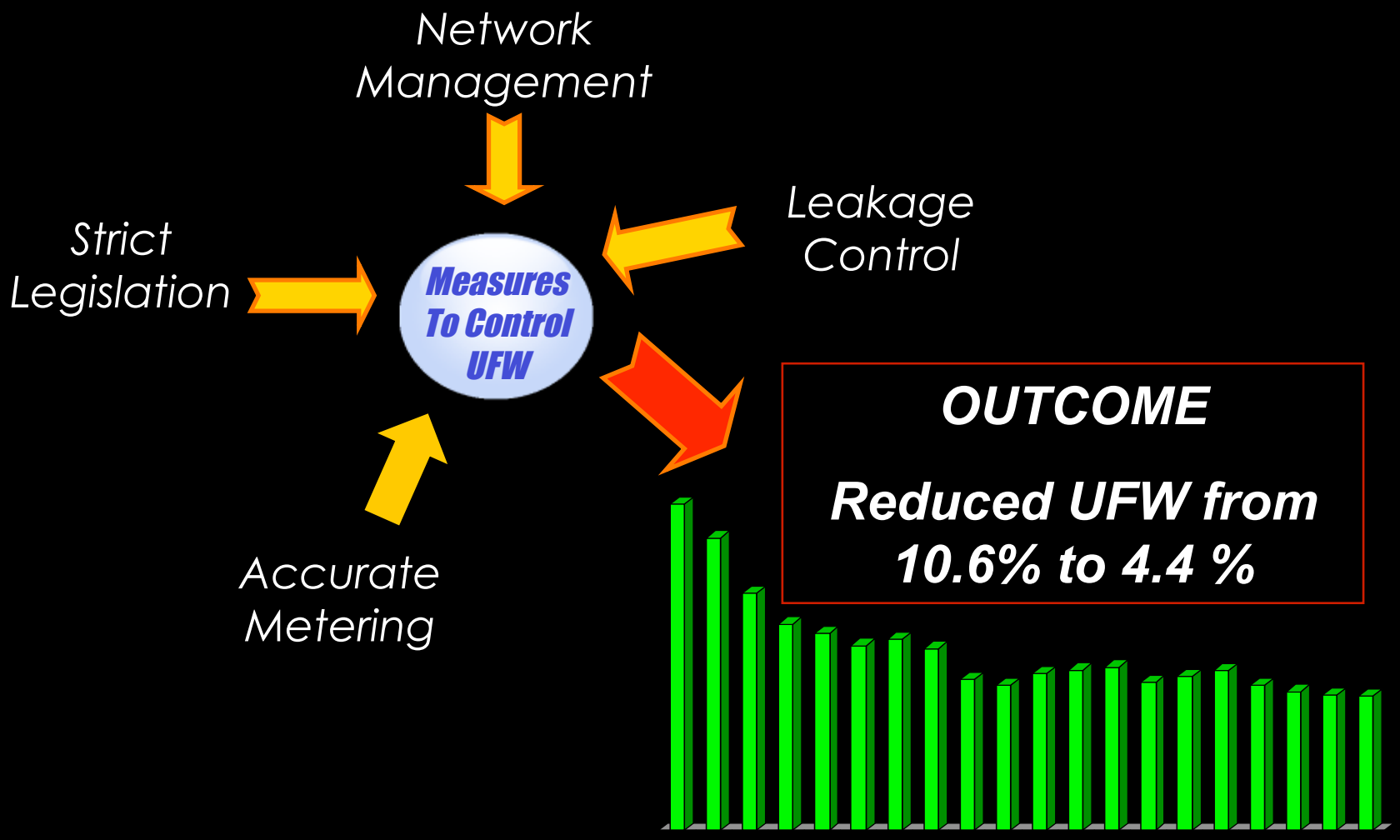
Domestic water demand management

A telling example: Brisbane Australia:

Goal 30% saving - 18% reduction already achieved by:

- **Metering and associated pricing**
- **Introduction of water efficient devices**
- **Restrictions in garden watering**
- **Better plumbing**
- **Educational campaigns**
- **Lowering water pressures**

SINGAPORE: REDUCING UNACCOUNTED FOR WATER



Courtesy: PUB

Domestic water demand management -some European experiences

Metering:

- Savings from revenue-neutral metering: 10-25%
  (- more when combined with pricing!)

Drivers of savings:

Drop in per capita water use in Copenhagen:

- 40% due to pricing
- 60% due to education

Leakage (non revenue water) :

- Ex. France 30% -> Albania 75% - (Malaysia?)
  - an obvious place to start saving – both litres and $!

Joint domestic and agricultural water demand management

An example: Israel:

Policy since 1990's to increasingly replace irrigation water with treated wastewater effluents

- 65% reuse by 2003

Shared costs:

- sewerage costs borne by city
- reuse costs borne by agriculture

Industry

The potential:

- The good old "Factor 4":
  Double production with half the amount of water
- Potential 90% saving by recycling/recirculation

Partnerships: The European "Water Stewardship" programme:

- Collaboration NGO, European Parliament, Industry

.. Good business sense -> $
.. Corporate Social Responsibility (CSR) -> water
.. possible water labeling or ISO standard

WDM PRACTISED BY INDUSTRY

Service delivery is not just for domestic water supply, but covers agriculture and industry:

- **In Germany, policy changes, education, environmental campaigns, pollution laws and charges led to reduced average water use by pulp and paper mills from 47 to 18 l/kg in 15 yrs.**
- **In USA, INTEL, reduced water withdrawals from 7.7 to 2.5 mgd using DM techniques such as recycling.**
- **DM applies across the supply chain and business can influence their suppliers.**

<u>BUT Government has to send the right signals</u>

Water and energy are inextricably linked

Water for energy

Energy and power production requires water:

- ***Thermoelectric cooling***
- ***Hydropower***
- ***Minerals extraction and mining***
- ***Fuel production (fossil, non-fossil)***
- ***Bio-fuels (-fuelling food crisis!)***

Energy for water

Water production, processing, distribution, and end-use requires energy:

- ***Pumping***
- *Transport*
- *Treatment*
- *Raw water (GW,SW)*
- ***Desalination***

Water footprints
FOR ENERGY DEVELOPMENT

Energy footprints
FOR WATER DEVELOPMENT

Water footprints for energy production

USA examples

Energy type	Water per energy unit (cum/Mwh)
Solar	0.001
Wind	0.001
Gas	1
Coal	2
Nuclear	2.5
Oil/Petrol	4
Hydropower	(70)
Bio-fuel (1st gen)	240

- *Energy is a water demand issue?*

Environment – the silent sector

Environmental flows to sustain ecosystems livelihoods and biodiversity:

- **A legitimate demand without a voice?**

WDM thinking could have saved the Aral Sea.. !

CONCLUDING COMMENTS

Demand and Supply

Supply and infrastructure :

- Still required …… but
  …… costly, risky, and with social and environmental consequences
  …… and consumes energy

Demand management :

- Enormous potential – water, energy and finance
- A "no regret" approach, not least considering climate change

=> an obvious "low hanging fruit" to pick first

WDM IS ABOUT SUSTAINABLE DEVELOPMENT

Simply supplying more water is often the default reaction but is no longer sufficient – high economic, environmental and social cost?

Need to live within our means, looking for savings before going to the (natural resources) bank.

WDM is not just about water supply, also energy, industry, agriculture etc (as well as budgets) - need to engage with the sectors.

IWRM and WDM

WDM has to be explicitly included in IWRM planning and application and can be seen as

"A broad adaptive strategy and an integral part of the IWRM approach, that reduces the use of water and wastage by better management and reuse, rather than just providing more supply"

WDM is being practiced worldwide but is still in its infancy – there is no alternative

A helping hand from the Malaysian National Colloquium?

Thank you!

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