Climate Change and Adaptation in Agriculture for East Asia and the Pacific Region: Issues & Options
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Prioritizing water management investment at basin level

Thierry Facon, RAP-NRE
and
Chen Zhijun, TCIO

Outline

- Promoting the basin level for prioritizing water management investment
- Some problems and questions with the basin level
- The piloting of water investment frameworks in East Asia and the Pacific
- Towards an improved framework to prioritize water management investment at basin level
- Promoting sustainable water saving irrigation

Promoting the basin level for prioritizing water management investment

The basin level: a promoted, necessary but elusive unit for management and planning

- Promoted: IWRM
- Necessary: additional reasons
  - much of the conversation on adaptation strategies in agriculture is at field or community levels then discussed for upscaling in "agro-ecosystem" level: zones
  - Afforestation/reforestation
  - Watersheds
- Elusive
  - Not much evidence (Southeast Asia) of success with RBOs or that focus on river basins has changed much in practice or has been based on better understanding of the hydrological cycle

Promoting the basin level for prioritizing water management investment

Water management investment for adaptation in agriculture at basin level: current ideas on main objectives and options: more of the same?

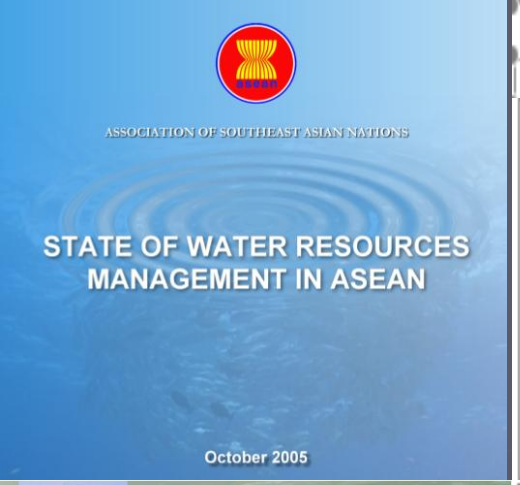
- Mostly yes but:
  - Renewed interest in groundwater
  - Increased focus on drought management
  - Some discussion on flood and drainage design
  - The new (but not new) issue of sea level rise, particularly for deltas
  - Energy intensity of irrigation (mitigation but adaptation too)
  - Much debate on whether climate change is a red herring

conjunctive mgt?

- Food crisis, energy, economic crises, then climate change are as many justifications to try and obtain finance for second-rate projects
- Adaptation programmes (and the water content of mitigation programmes) have more or less the same content. Rice an example
- As IWRM is the solution, implementing IWRM is also the plan to adapt to climate change

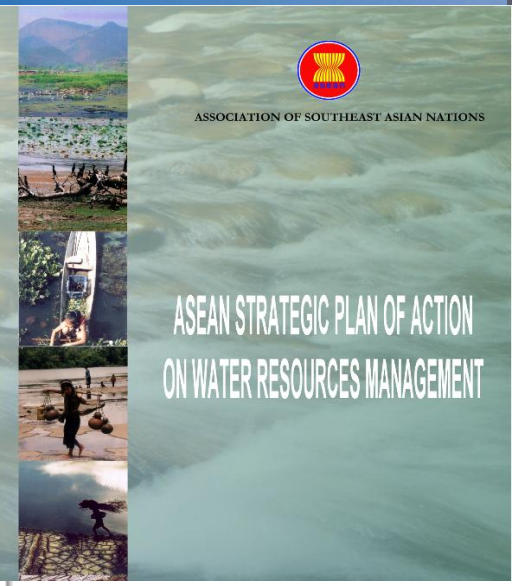
Some problems and questions with the basin level

- IWRM
- A disconnect between management and investment
- Water and land
- Informal and formal water economies
- RBOs, watersheds, myths
- Old and new dynamics: the problem of closure
- Balancing water accounts
- The vision thing: visions are very woolly



Appendix 1: Major Water Supply and Demand Issues

	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam
Demand mgmt	Plans to minimise losses in supply	Nil other than some environmental flow management schemes in W. Cambodia	No, except for plans to increase irrigation efficiency from 35% to 60% Plus town water supply and unaccounted for water decrease from 39% to 34%	Nil	Yes. For industry Efficiency programmes Market based indicators incl full cost recovery Non-revenue water reduction programmes 30% savings expected	None at present, though concept included in national water vision.	Yes. For agriculture – volume water pricing + efficiency hope for 20-30% already achieved in trials For Dom – education, tariffs, recycling, enforcement, pop growth management	Significant industry conservation programme Mandatory water conservation devices, water eff buildings, recycling (NEWater), water auditing etc Coupled with dom programme incl	Yes. Industry recycling. Irrigation. Efficiency, participatory irrigation mngt (but plan on +36 mill rai extra irrigation in future) Domestic UFW mgmt plus ed. Save 5%	Nil, but are into regional and river basin planning, including water demand/allocation.



Challenge	Action	Description
Challenge 1		**Improve access to safe drinking water and sanitation**
	1.1	Reduce by 50% inadequate access to safe drinking water by 2015
	1.2	Reduce by 50% inadequate access to sanitation by 2015
Challenge 2		**Managing water resources efficiently and effectively**
	2.1	Review of water policies and legislation
	2.2	Institute demand and supply management techniques in water supply
	2.3	Institute demand and supply management techniques in irrigation
	2.4	Undertake research and development programmes
Challenge 3		**Moving towards integrated river basin management**
	3.1	Establish river basin management organisations
	3.2	Develop decision support systems
	3.3	Promote equitable sharing among water users and the environment
	3.4	Mitigate water related hasards and maintain ecological balance
Challenge 4		**Translating awareness to political will and capacities**
	4.1	Improve governance
	4.2	Encourage multiple stakeholder participation in water resources development and management
	4.3	Mainstreaming gender concerns in the framework for action
	4.4	Develop, enhance and strengthen institutions on a decentralised and participatory manner
	4.5	Build individual capacities
Challenge 5		**Moving towards adequate and affordable water services**
	5.1	Enhance public-private partnerships
	5.2	Recognise that water is a natural asset and has social, cultural and economic functions and values

All countries have examples of localised water stress, and most are also characterised by heavy use of water in the irrigation sector. In terms of cost effectiveness, a policy of implementing demand management in the irrigation sector will release major quantities of water for re-allocation to environmental, urban and industrial uses. (In approximate terms, one hectare of paddy rice uses as much water as 80-100 households. Or looked at in another way, if irrigation uses 90 percent of all water use, then a 5 percent gain in irrigation water use efficiency frees up as much water as a 45 percent gain across every other water use sector.)

2. Project Objectives

To capitalise on the presence in the ASEAN region of examples of world's best practice in urban water demand management and to apply similar principles and practices to the irrigation sector.

A Handbook for Integrated Water Resources Management in Basins

Global Water Partnership

9.1 Organising collaborative basin information systems

9.1.1 Establishing basin information systems for good governance

In order to manage water resources at the basin level, it is important for decision makers to have easy access to comprehensive, representative and reliable information, at all relevant levels, on:

- the quality and quantity of both surface and groundwater resources, as well as seasonal and yearly fluctuations;
- biotopes and aquatic environments, and their degrees of sensitivity;
- water use (withdrawals), particularly for irrigation, industry and drinking water, and pollution sources (discharges), whether point or non-point;
- the risks of recurrent extreme phenomena, such as floods, droughts and accidental pollution; and
- social and economic indicators, for example costs, prices, taxes.

Box 8.A. Design principles and main components of a basin management plan

Design principles

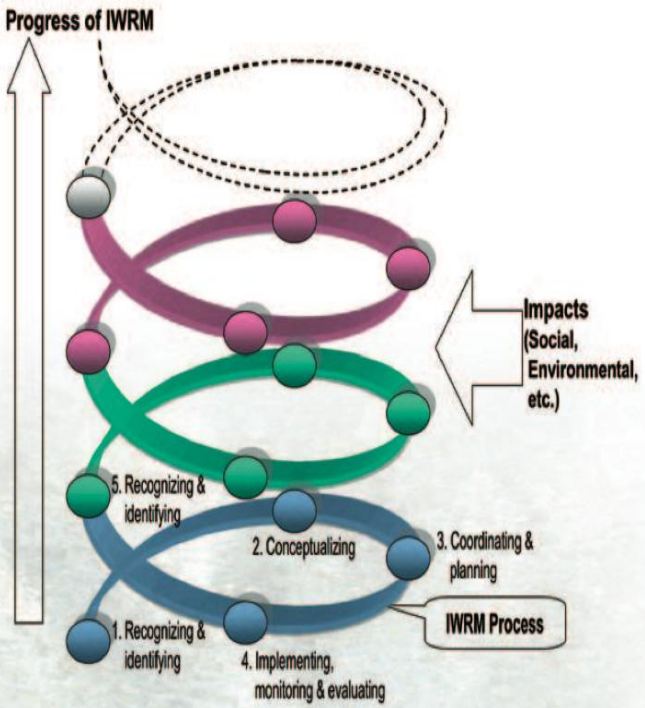
- Define the boundaries of the basin (river basins or sub-basins, aquifers, lake basins; national or transboundary).
- Establish operational rules which reflect the technical and biophysical characteristics of water ecosystems.
- Ensure collective-choice arrangements that engage village and district stakeholders as well as neutral government water policy people in decision making.
- Monitor the outcomes of planning and policies through water audits.
- Employ graduated sanctions.
- Build in conflict resolution mechanisms.
- Develop clearly defined property rights.
- Separate the role of water provider from that of the regulator, to avoid conflicts.
- Develop both demand management and supply management options, and encourage water-use efficiency through non-regulatory and regulatory mechanisms, particularly to increase efficiency in irrigated and dryland areas.

United Nations Educational, Scientific and Cultural Organization · International Hydrological Programme of UNESCO · World Water Assessment Programme · A contribution to the United Nations World Water Assessment Programme · NARBO

IWRM GUIDELINES at River Basin Level

PART I

PRINCIPLES



Quantifying water response to land-use changes

It will become vital to account for accelerated urbanization and changes in land use as the population increases (due to changes in demographics and social and economic activities within the basin) and their impact on the river basin management. They will result in changes in runoff patterns, water use patterns and water quality. Excessive urbanization and population growth will also constrain options for water management, such as limiting land available for water controlling facilities. Such changes can increase flood risks, reduce freshwater ecosystems, reduce river flow, deplete springs, and aggravate water quality or ground subsidence due to over-abstraction. Disaster management requires coordination of housing and urban policy with the water sector.

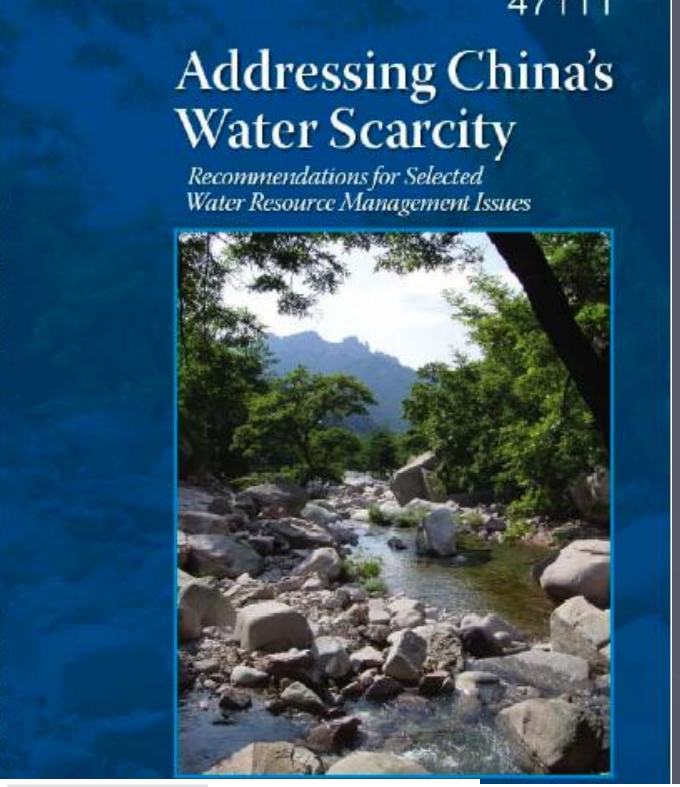
Water scarcity is often constructed by planning:

The planning/closure spiral:

1. develop a dam with an irrigation system that can only irrigate a portion of the command area in the dry season
2. create water scarcity which justifies building an other dam
3. Which comes with its own command area upstream, and will absorb and water you try to send down
4. Back to step 2

IWRM: any water you want to send down for environmental flows, water quality or salinity control will be absorbed on the way

- Many irrigation agencies still function this way
- Vested interests



Issues for the future

Water efficiency, food security, and rural development

Our case studies have revealed a big variation in the economic value of water by sector and by region, low economic efficiency of agricultural water use, and poor cost-effectiveness of underground water withdrawal in North China. Although the general direction of improving water-use efficiency by reducing demand for water by the agricultural sector is supported, **the issue is complicated by and associated with various issues involving the rights and well-being of the rural population, national food security, agricultural sector protection, and poverty alleviation. The central issue is how to reduce rural poverty and secure the nation's food supply while at the same time improving the efficiency of water use. Any further policy recommendations have to address these concerns and will require further study.**

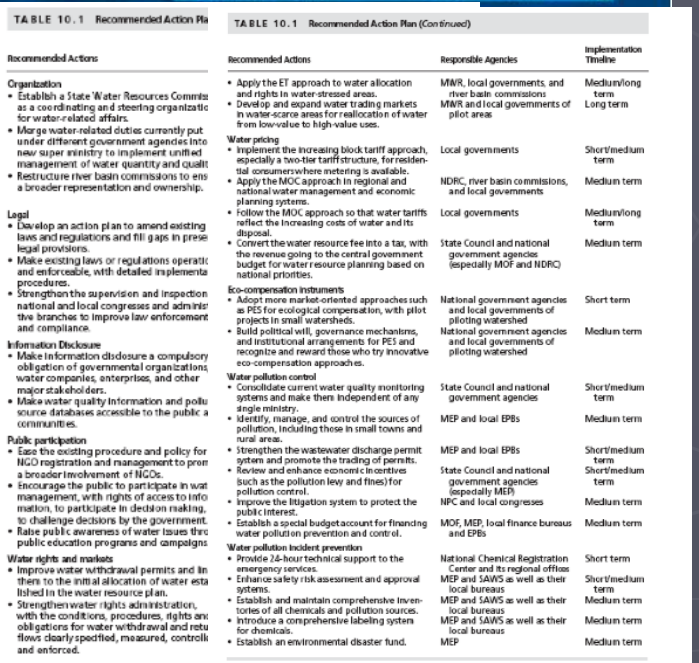


TABLE 10.1 Recommended Action Pla

Recommended Actions
Organization
• Establish a State Water Resources Commis as a coordinating and steering organizatio for water-related affairs.
• Merge water-related duties currently put under different government agencies into new super ministry to implement unified management of water quantity and qualit
• Restructure river basin commissions to ens a broader representation and ownership.
Legal
• Develop an action plan to amend existing laws and regulations and fill gaps in prese legal provisions.
• Make existing laws or regulations operati and enforceable, with detailed implementa procedures.
• Strengthen the supervision and inspection national and local congresses and adminis tive branches to improve law enforcement and compliance.
Information Disclosure
• Make information disclosure a compulsory obligation of governmental organizations water companies, enterprises, and other major stakeholders.
• Make water quality information and pollu source databases accessible to the public a communities.
Public participation
• Ease the existing procedure and policy for NGO registration and management to prom a broader involvement of NGOs.
• Encourage the public to participate in wat management, with rights of access to info mation, to participate in decision making, to challenge decisions by the government.
• Raise public awareness of water issues thro public education programs and campaigns
Water rights and markets
• Improve water withdrawal permits and lin them to the initial allocation of water esta lished in the water resource plan.
• Strengthen water rights administration, with the conditions, procedures, rights an obligations for water withdrawal and retu flows clearly specified, measured, controll and enforced.

TABLE 10.1 Recommended Action Plan (*Continued*)

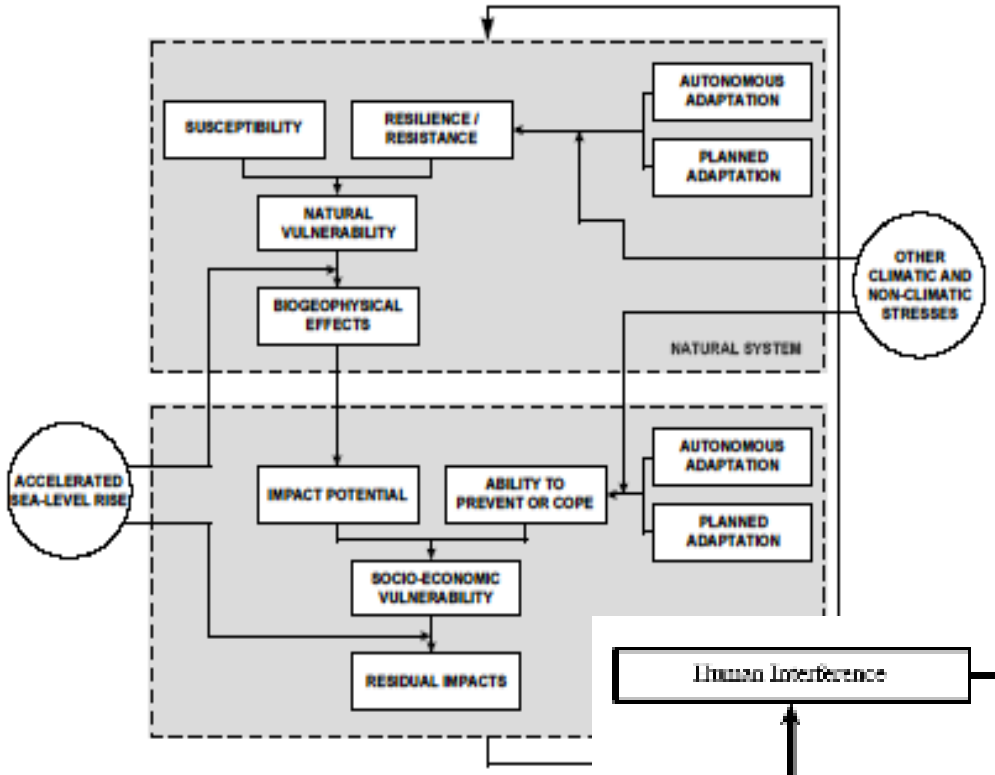
Recommended Actions	Responsible Agencies	Implementation Timeline
• Apply the ET approach to water allocation and rights in water-stressed areas.	MWR, local governments, and river basin commissions	Medium/long term
• Develop and expand water trading markets in water-scarce areas for reallocation of water from low-value to high-value uses.	MWR and local governments of pilot areas	Long term
Water pricing		
• Implement the increasing block tariff approach, especially a two-tier tariff structure, for residential consumers where metering is available.	Local governments	Short/medium term
• Apply the MOC approach in regional and national water management and economic planning systems.	NDRC, river basin commissions, and local governments	Medium term
• Follow the MOC approach so that water tariffs reflect the increasing costs of water and its disposal.	Local governments	Medium/long term
• Convert the water resource fee into a tax, with the revenue going to the central government budget for water resource planning based on national priorities.	State Council and national government agencies (especially MOF and NDRC)	Medium term
Eco-compensation instruments		
• Adopt more market-oriented approaches such as PES for ecological compensation, with pilot projects in small watersheds.	National government agencies and local governments of piloting watershed	Short term
• Build political will, governance mechanisms, and institutional arrangements for PES and recognize and reward those who try innovative eco-compensation approaches.	National government agencies and local governments of piloting watershed	Medium term
Water pollution control		
• Consolidate current water quality monitoring systems and make them independent of any single ministry.	State Council and national government agencies	Short/medium term
• Identify, manage, and control the sources of pollution, including those in small towns and rural areas.	MEP and local EPBs	Medium term
• Strengthen the wastewater discharge permit system and promote the trading of permits.	MEP and local EPBs	Short/medium term
• Review and enhance economic incentives (such as the pollution levy and fines) for pollution control.	State Council and national government agencies (especially MEP)	Short/medium term
• Improve the litigation system to protect the public interest.	NPC and local congresses	Medium term
• Establish a special budget account for financing water pollution prevention and control.	MOF, MEP, local finance bureaus and EPBs	Medium term
Water pollution incident prevention		
• Provide 24-hour technical support to the emergency services.	National Chemical Registration Center and its regional offices	Short term
• Enhance safety risk assessment and approval systems.	MEP and SAWS as well as their local bureaus	Short/medium term
• Establish and maintain comprehensive inventories of all chemicals and pollution sources.	MEP and SAWS as well as their local bureaus	Medium term
• Introduce a comprehensive labeling system for chemicals.	MEP and SAWS as well as their local bureaus	Medium term
• Establish an environmental disaster fund.	MEP	Medium term

China is the place to watch

- Water saving society
- River Basin Conservancy Commissions
- Efficiency vs equity: attempts, experiments and problems
- New Socialist Countryside
- Water saving irrigation
- Interesting reforms and service-orientation experiences
- Ecosystem restoration projects
- ET management
- Policy monitoring
- **No1 document** of 2011 on water conservancy

Some problems and questions with the basin level

- Who will invest, at what level, for what and when?
- Autonomous vs planned adaptation
- New investors
- Investment in water management and water footprint of investment in mitigation and adaptation;
- The basin vs other levels: above, across and below
- Not necessarily the most pertinent or effective unit

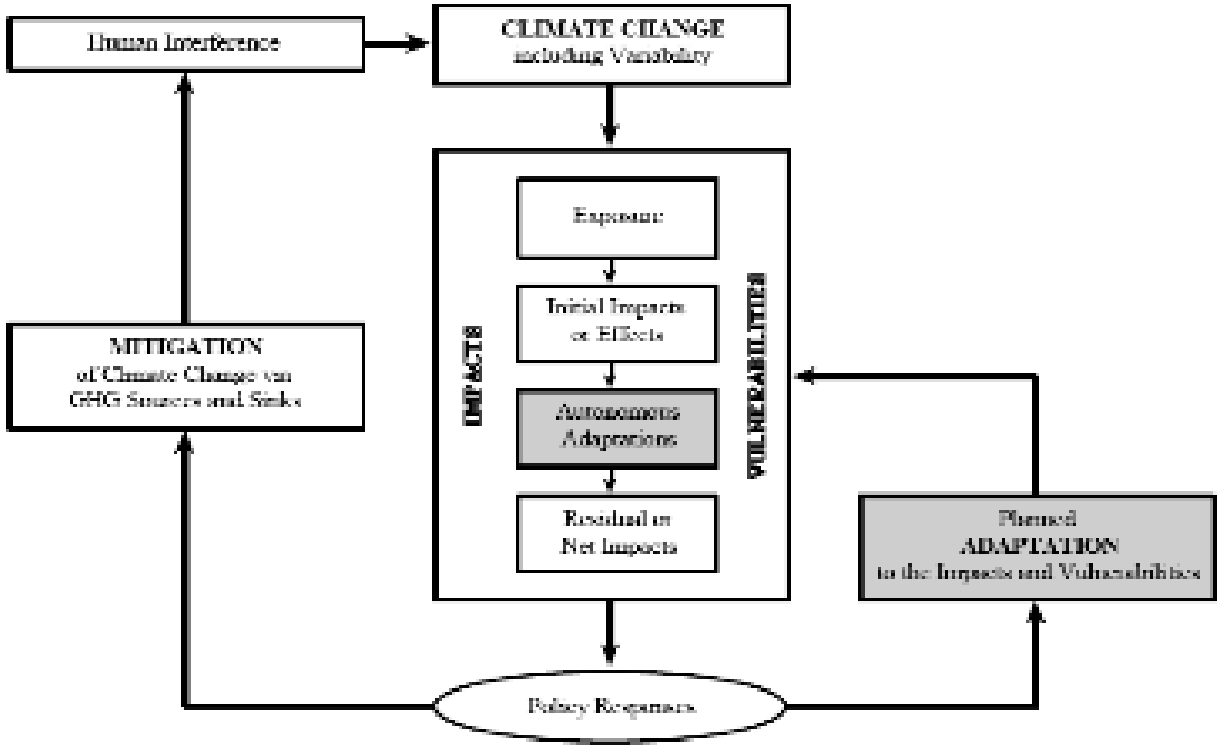


Definition of vulnerability of natural and socio-economic systems
(Klein and Nicholls, 1999)

Residual and net impacts?

Adaptation and mitigation

(IPCC 2001)

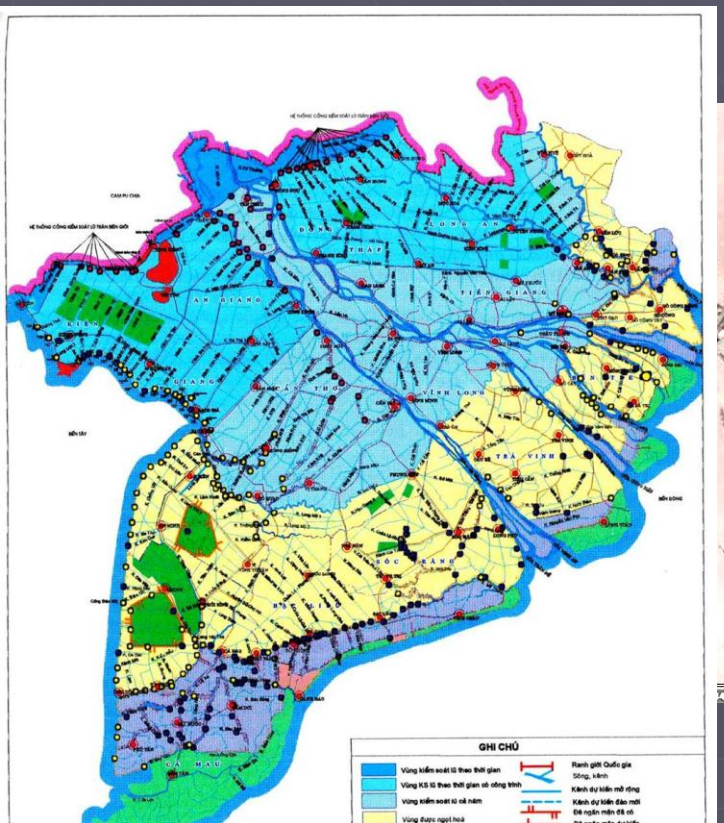


Roles of mitigation and adaptation in the climate change issue (from IPCC 2001; after Smit et al. 1999)

Some rare exceptions where impact of adaptation is analyzed: Cantho University / Mekong Delta

Upstream provinces' flood management (e.g. increase of polder area, improper WM system operation):

- increase and prolong the flood level and flood duration in downstream provinces → affect to agriculture practices of the downstream provinces
- Increase and change the flood flow → river bank erosion



- Improving crop productivity
- Climate-proofing crops:
  - field levelling, field bund construction, soil water conservation measures, farm ponds
  - increased abstraction and use of groundwater for irrigation
- The increase in areas under horticulture and forestry (e.g. REDD +)

Will contribute to increasing water depletion

New planning approaches are required which:

(1) take account of changed flow conditions

(2) take account of all externalities (not just positive: PES ….)

(3) contribute to the maintenance of agreed minimum downstream flows for environmental and other purposes.

Informal and formal natures of water economies

Informal	Formal
Self-supply predominates	Service providers dominate
Vast numbers of tiny, primary water diverters from nature	Very few, but large primary diverters of water from rivers, lakes
Water institutions: local, fragmented, informal	Water institutions: few, formal, legal bodies
Intermediation in water services low or absent	Very high degree of intermediation in water provision
Even if water is scarce its free…	Even if water is plentiful, it costs money…

Source: Tushaar Shah

Irresponsive institutions
Autonomous adaptation
Planned adaptation
Mitigation

Socio-economic development, IWRM
Planned adaptation

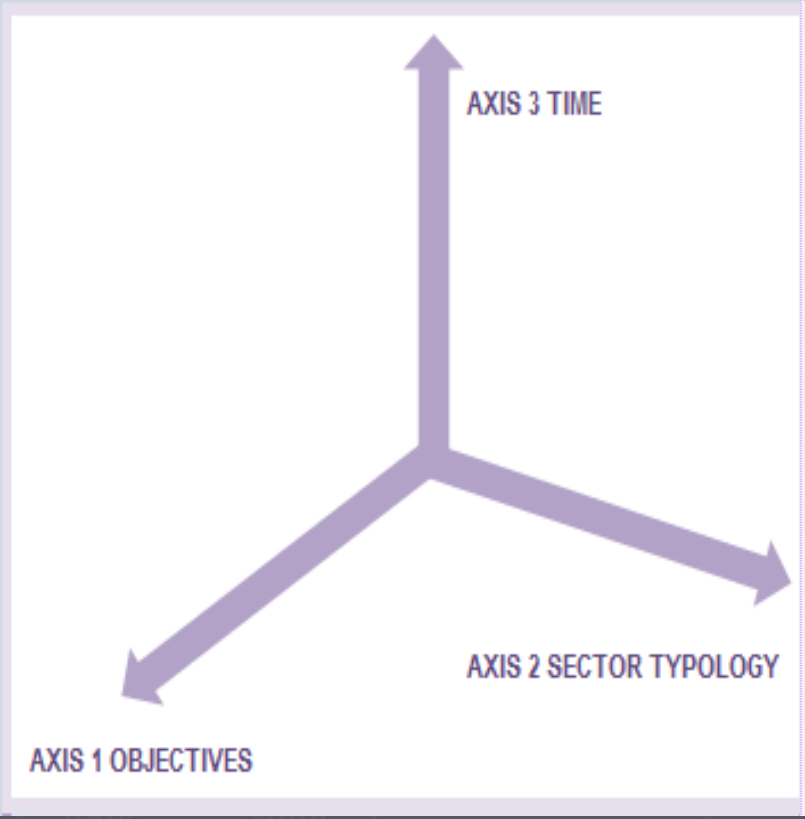
- Formalize land use planning/management to formalize ET Mgt?
- Governance-based approaches
- Policy, incentives
- Lateral approaches: example: irrigation-energy
- Multi-scale: just local level focus cannot work

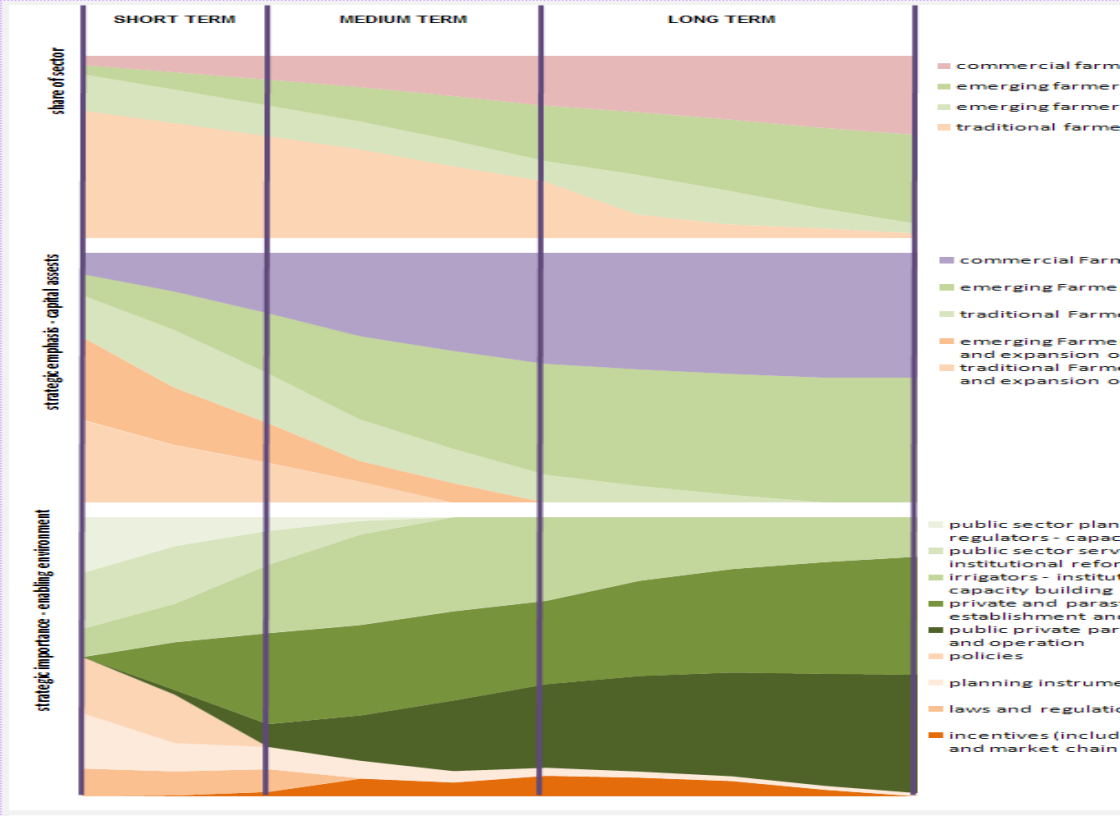
The piloting of water investment frameworks in East Asia and the Pacific

- Pilot Development and Evaluation of the Generic Water Investment Framework at The River Basin Level in:
  - The Bang Pakong River Basin - Thailand
  - The Cau River Basin - Viet Nam
  - The Muda/Kedah River Basins - Malaysia

The piloting of water investment frameworks in East Asia and the Pacific

- A method for combining sectoral typologies, development objectives and time slices in a way that facilitates planning;
- The establishment of cost envelopes and the monitoring of investment and capacity building programmes.
- Can be applied:
  - at any hierarchical level within a sector (ie regional, river basin, district, catchment or community etc.)
  - at any level of detail.
  - nestable
  - providing the space within which investment decision making is both responsive to local needs and subject to cross-sectoral regulation, including with respect to natural resource management and environmental impact.





- Adapted to dynamic environment
- Broadened from irrigation to water including water quality
- At the river basin level, attempt to clarify and link water-related objectives (quality/quantity), socio-economic objectives, and investment in soft and hard institutions

Figure 6 First Draft Objectives Axis for the Muda/Kedah Basins

Malaysia becomes a high income country, inter alia by achieving/maximising					
Food security	Productivity and effectiveness			Linkages with other sectors	Sustainable u natural resou
Sustainable rice yields not less than 6,000kg/ha/season	Reduced flooding in flood prone areas	Water productivity levels not less than *tbc*	Non-revenue water not more 35%	Sufficient and timely quantities of good quality water for n agricultural use, including the environment	

Figure 7 First Draft Typology Axis for the Muda/Kedah Basins

USERS							INSTITUTIONS								
							hard institutions							soft	
Paddy Production	Non-paddy Agriculture	Industry	Water Supply and Sanitation	Watersheds	Urban Areas	Aquaculture	Farmers	Non-agricultural private sector users	MARDI	NCIA	MADA	DID	Regulators (LUAN/ SPAN)	Laws and Polices	Guic a Ma

OBJECTIVES			INDICATORS	
National	Sector Objectives	Target	Impact	activity
Malaysia becomes a high income country	Food security	Sustainable rice yields not less than 6,000kg/ha/season	rice yield/hectare	snail population
				N° of farmers trained
				volume stores
				length of tertiary canal/km2
				Quantity of water re-used
				length of tunnel drilled
				N° of practising farmers
	Productivity and effectiveness	Reduced flooding in flood prone areas	Area flooded	status of design (immediate term)
				area protected (short term)
		Water productivity levels not less than *tbc*	output/volume of allocated	productivity defined in terms of criteria and value (immediate term)
		Non-revenue water not more 35%	% of non-revenue water	length of replaced pipework
		Sufficient and timely quantities of good quality water for non-agricultural use, including the environment	competition for water	No of conflicts
	Sustainable use of natural resources		water quality	quality measurements

The piloting of water investment frameworks in East Asia and the Pacific

Experience so far

- Interest in both those who pilot it and local water users/govt agencies/local gvts
- Difficult if present ways of doing things are ossified or hardwired
- Will require much support

Towards an improved framework to prioritize water management investment at basin level

EA and water:

Resource use efficiency means more resilience?

- Not so obvious wet/dry
- Don't you need to grow grain somewhere, even if economic productivity is low?

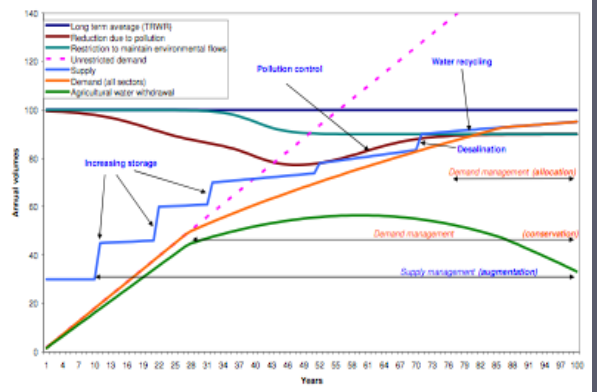


Figure 3: Coping with water scarcity: a dynamic model

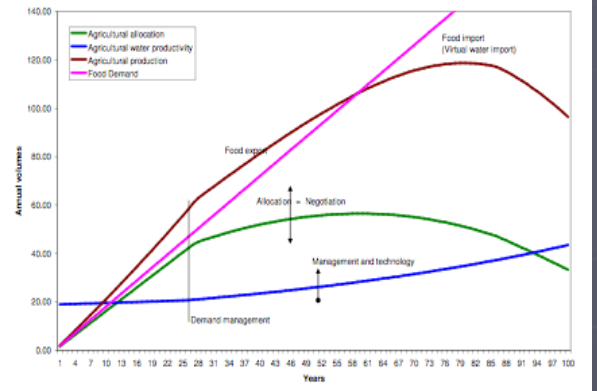


Figure 6: Dynamics of agricultural response

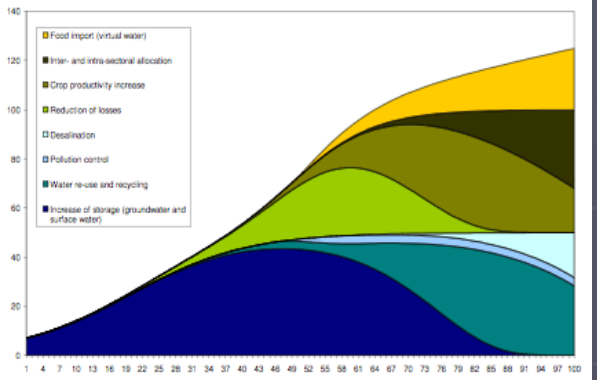
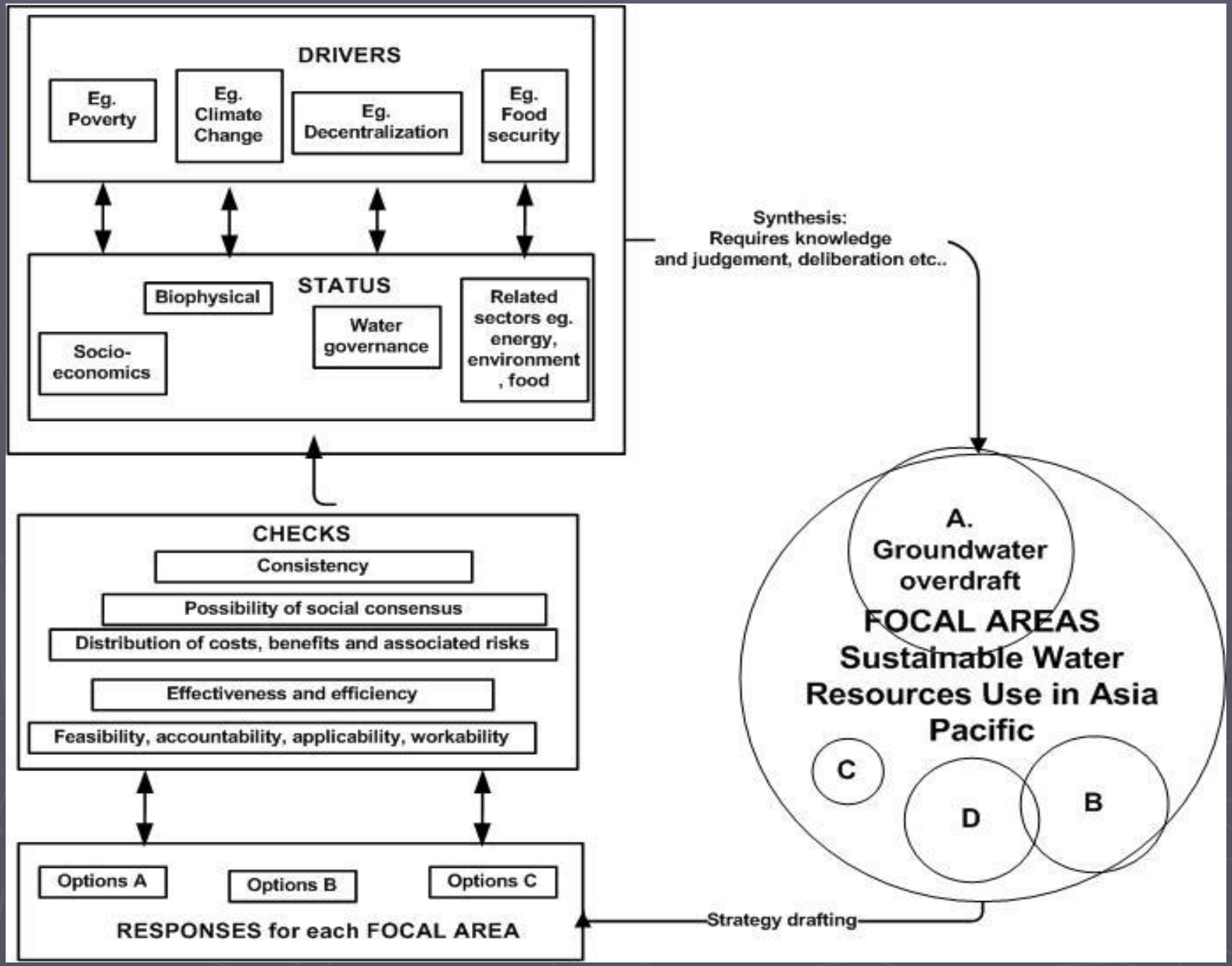


Figure 7: A schematic representation of different options over time

- The transition problem:
  - Many things are happening in the basins
  - All for resilience?
  - Facilitate exit strategies?
  - Magnitude of CC uncertainties vs other changes?
- A more deliberately multi-sectoral multi-objective approach is needed
- A water accounting/auditing foundation

Economic trajectories
River basin trajectories
Autonomous trajectories
Local trajectories
Irrigation system trajectories

  - More food with less water= how much food?
  - Policy coherence
  - Risk management strategies
  - Coherence of actions across levels
  - Quality of investment


DRIVERS
Eg. Poverty
Eg. Climate Change
Eg. Decentralization
Eg. Food security
STATUS
Biophysical
Water governance
Related sectors eg. energy, environment, food
Socio-economics
Synthesis:
Requires knowledge and judgement, deliberation etc..
CHECKS
Consistency
Possibility of social consensus
Distribution of costs, benefits and associated risks
Effectiveness and efficiency
Feasibility, accountability, applicability, workability
A. Groundwater overdraft
FOCAL AREAS
Sustainable Water Resources Use in Asia Pacific
C
D
B
Options A
Options B
Options C
RESPONSES for each FOCAL AREA
Strategy drafting

Where?

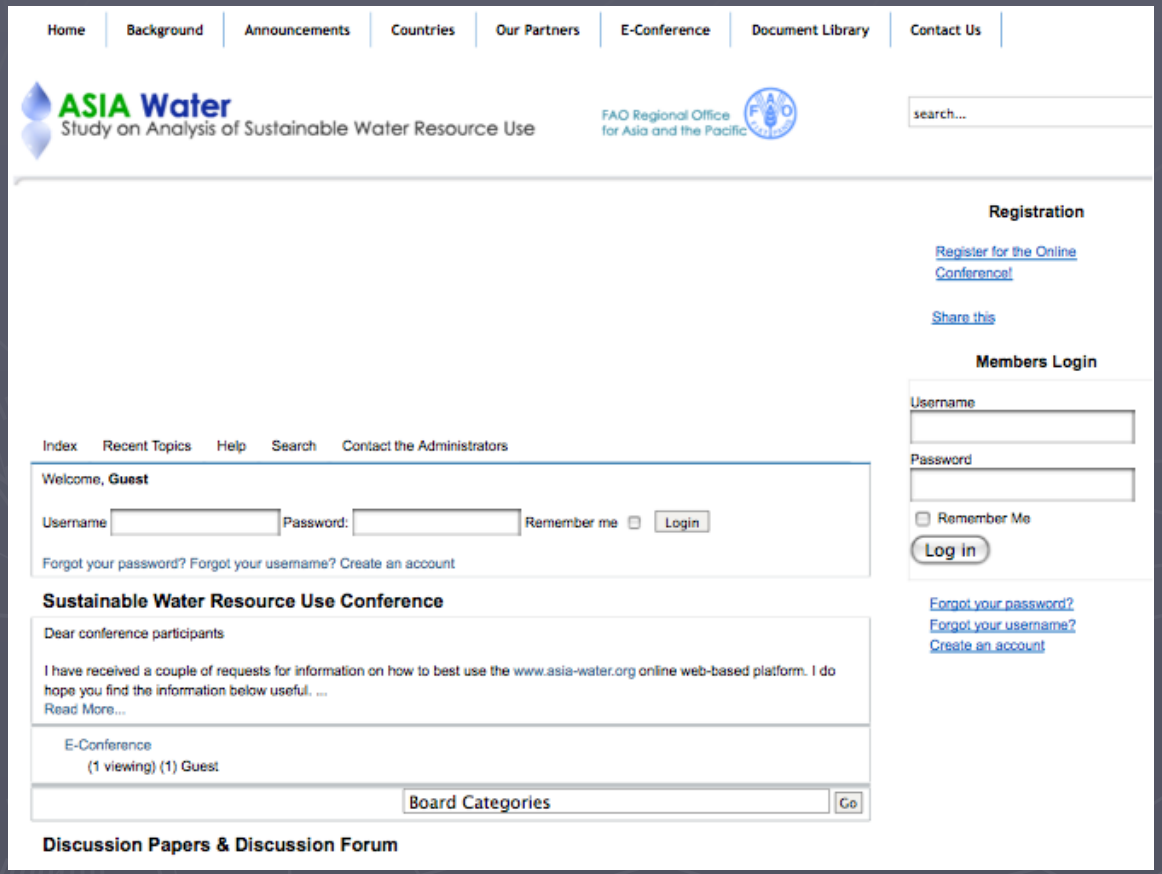
- Thailand, Viet Nam, Malaysia, Shanxi (China)

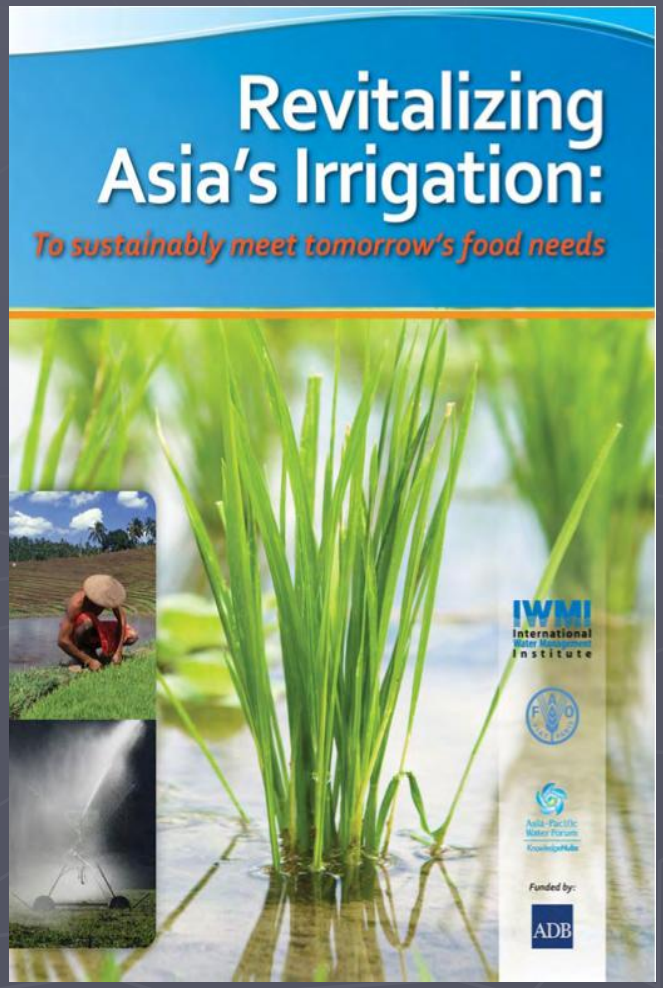
  Regional project on sustainable water resources use
- +: Indonesia, India, Pakistan

  Regional initiative to revitalize irrigation and agricultural water governance
- Regional capacity building in irrigation modernization project

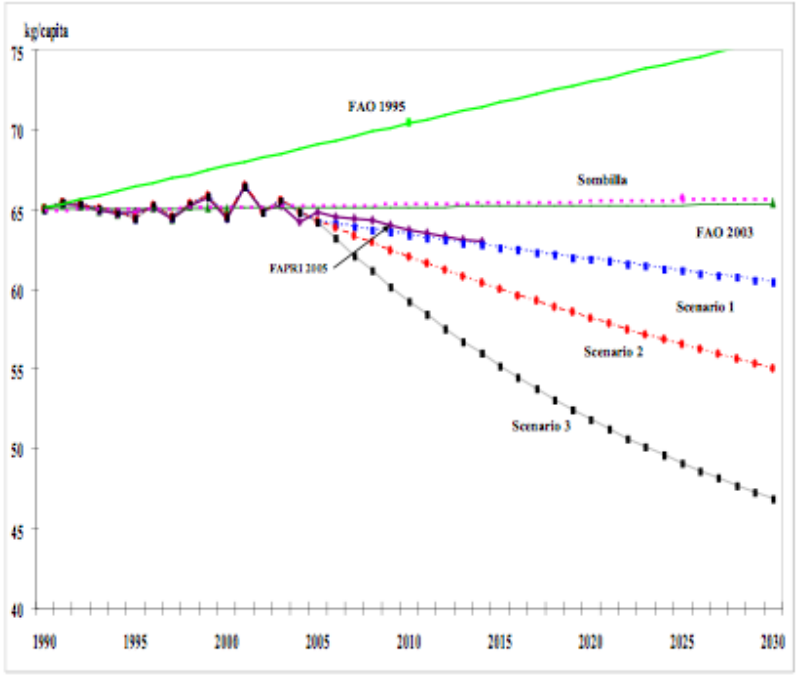
E-conference on

www.asia-water.org

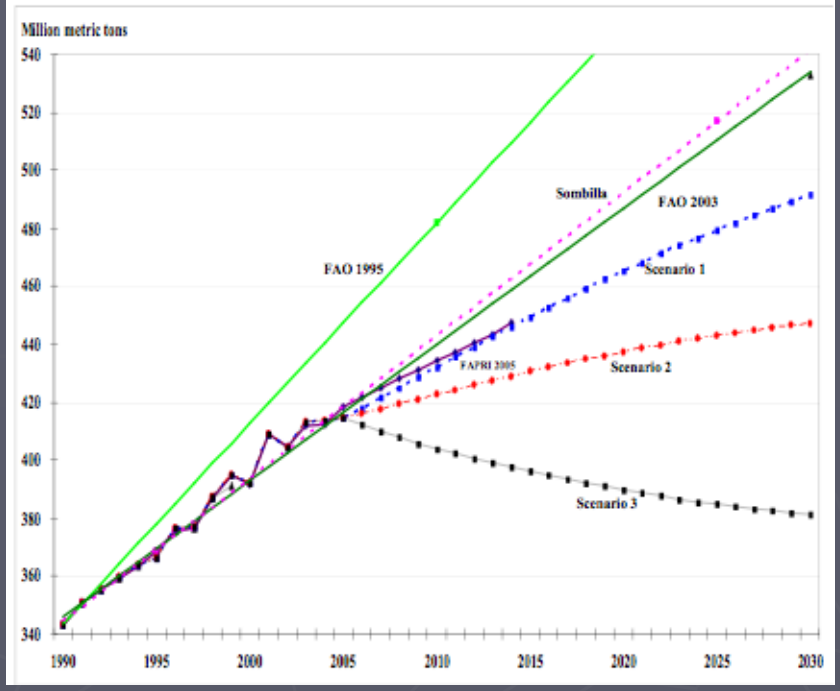


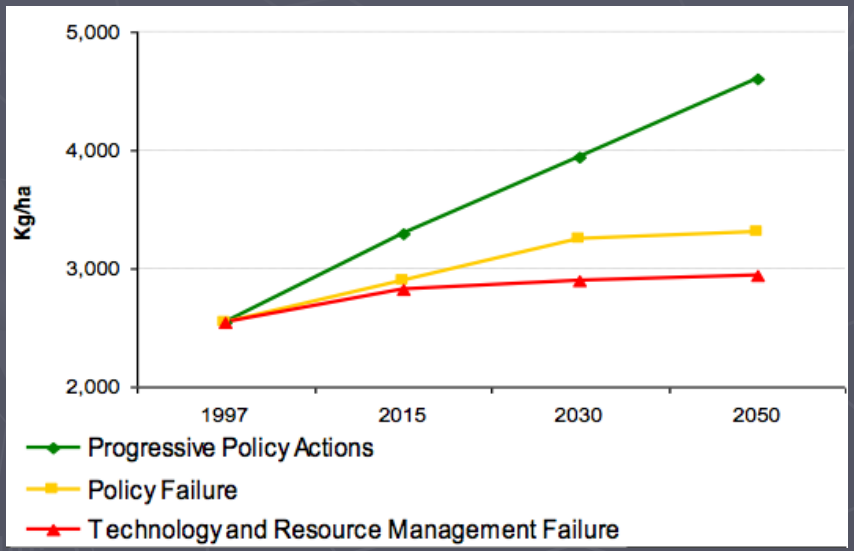


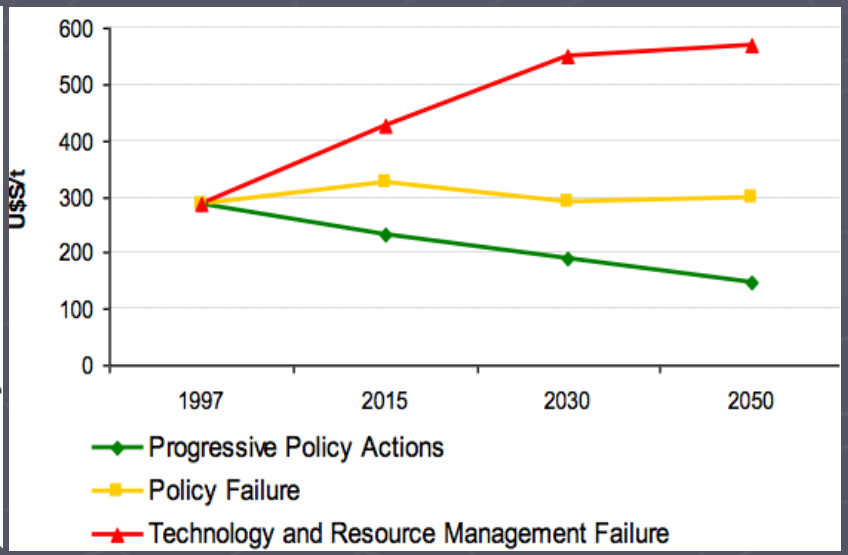
Comparison between projections for world rice per capita consumption



Comparison between projections for world total rice consumption







Promoting Sustainable WSI Development

Sustainability of WSI

- WSI-basin level priority issue
- Current movement on WSI
- Things to be discussed:
  - the notion of WSI
  - multiple functions
  - the scale matter
  - resilience to CC

Promoting Sustainable WSI Development

Options at Basin Level

- Water accounting and auditing-planning and assessing real water saving
- Participatory decision making-addressing scale mater
- Payment to environment services-conserving multiple functions
- Water governance and planning-mainstreaming climate change considerations
- Policy, institutional & technical innovations-serving the above purposes

Promoting Sustainable WSI Development

FAO Initiatives

- Case studies in Paddy areas
- Regional workshop for AP
- Framework for Sustainability Appraisal
  - 6 assessment areas
  - 43 indicators (33 quantifiable+10 descriptive)
  - 7 major steps