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Enhancing Water Management Capacity in a Changing World: *Science Academies Working together to Increase Global Access to Water and Sanitation*
Session 5 – 26 June 2012: Water for Economic growth and Development

Water and its *"wicked problem"*



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Economic and Social Commission for Asia and the Pacific

AKADEMI SAINS MALAYSIA

Ref: ESCAP/ASM Consultancy studies - Larry Wong, Lee Jin & KK Aw

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- Some Initiatives
- Wicked Problem

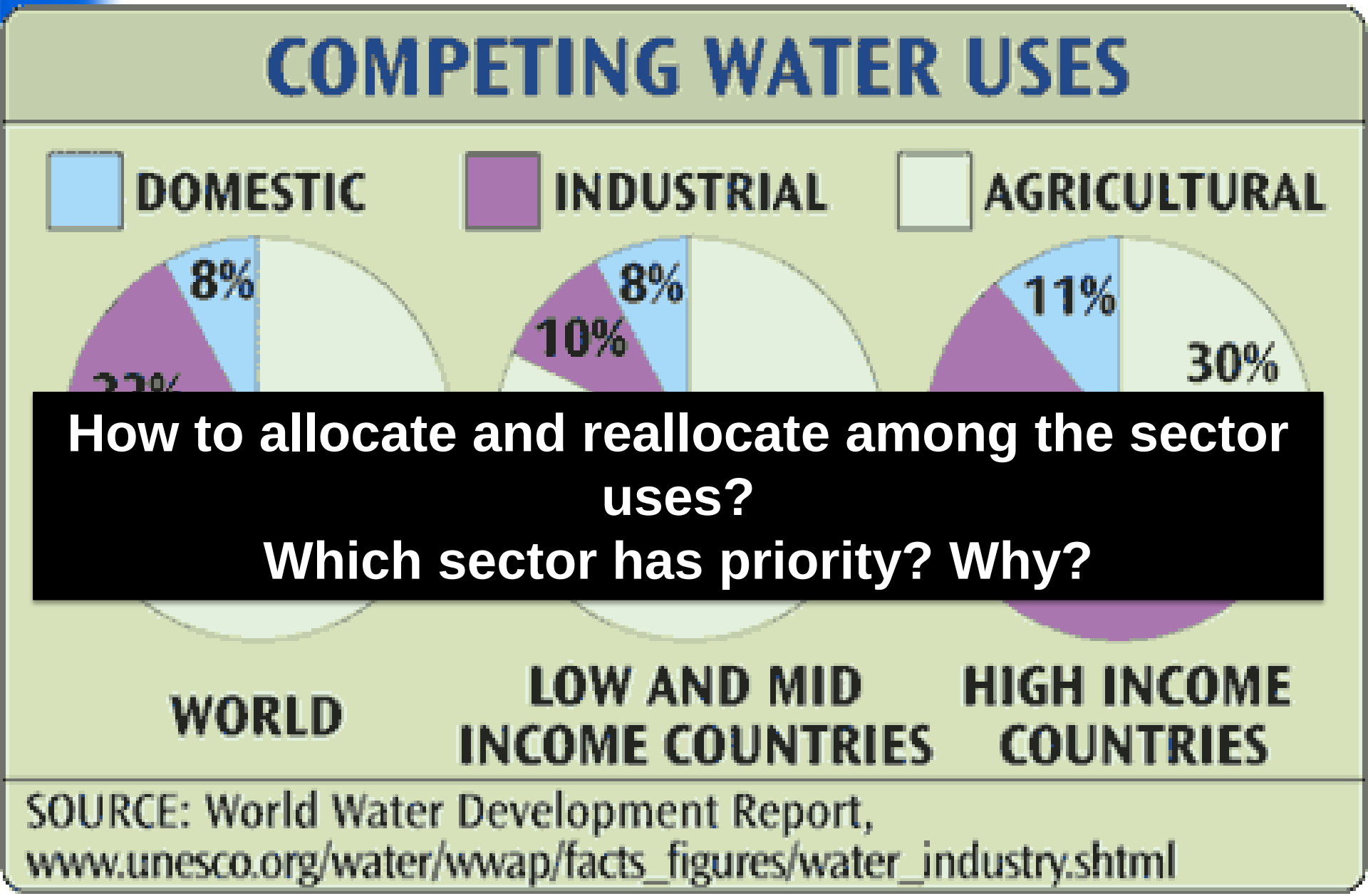


Background

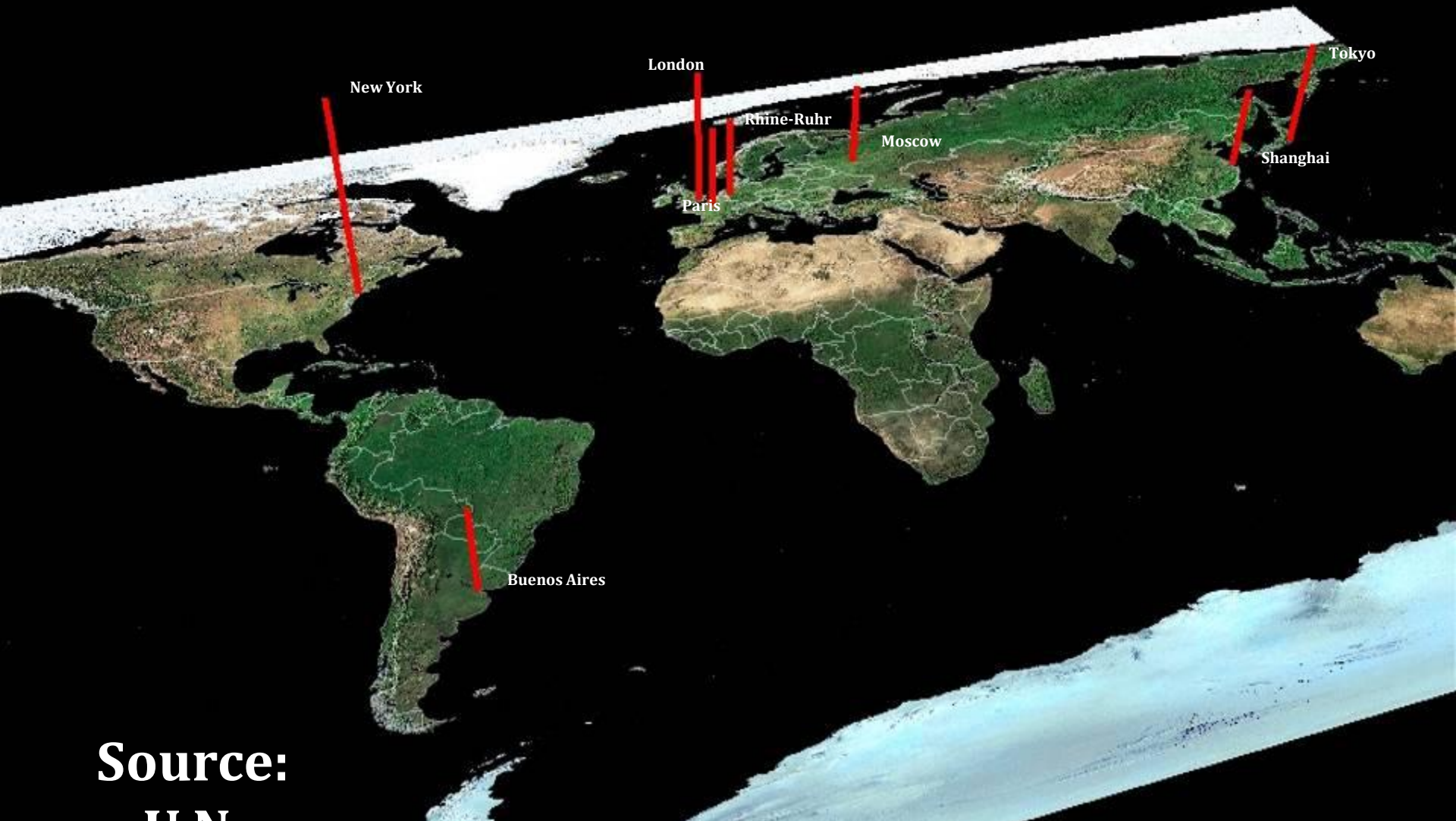
The water problems we faced

- *competing water use*
- *rapid urbanization*
- *global crises*
  - *fuel/energy*
  - *finance*
  - *food – virtual water*
  - *water security*
- *climate change, etc*

WATER In Perspective

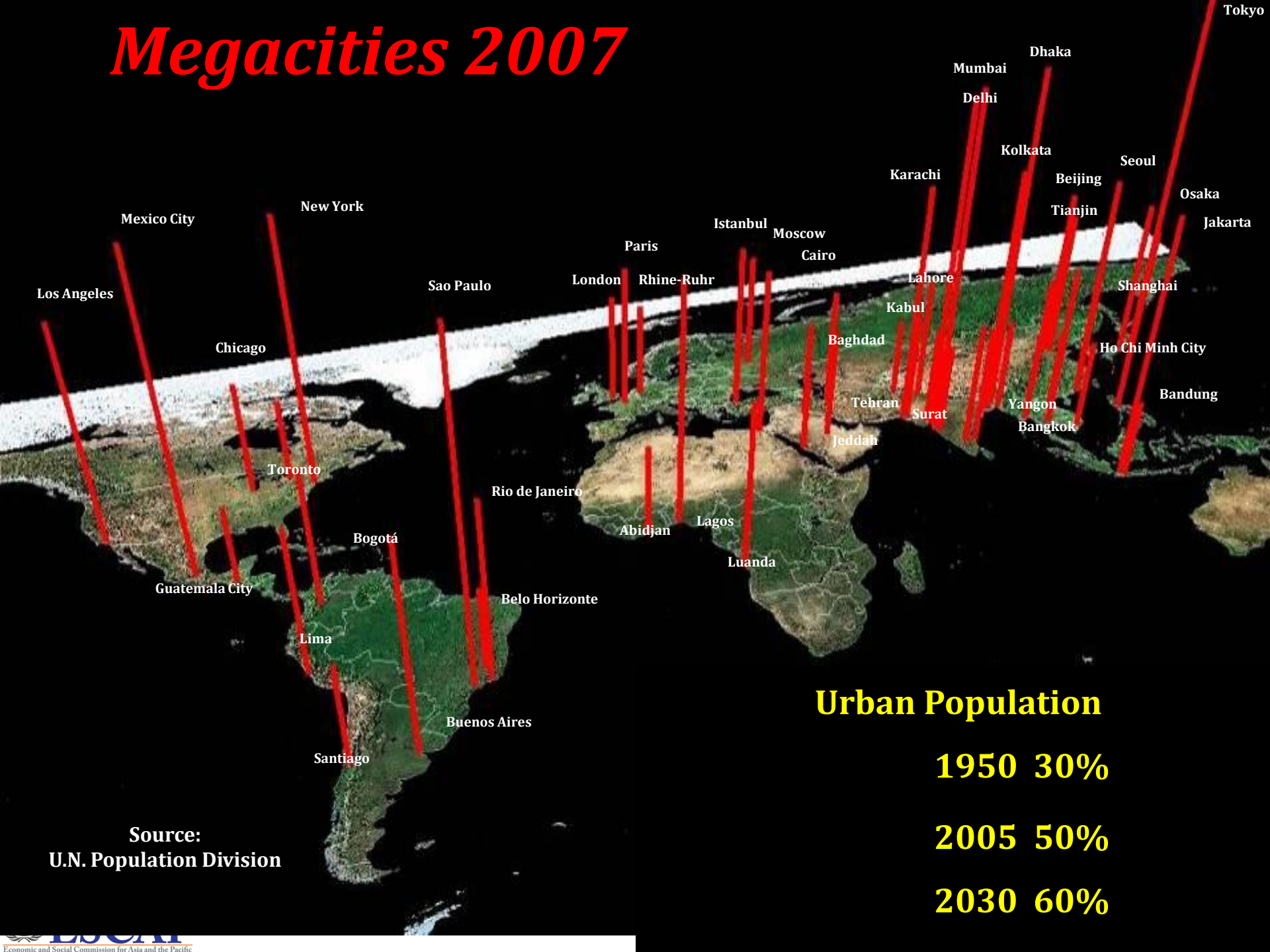


Megacities 1950 (Population > 5 million)



Source:

Megacities 2007



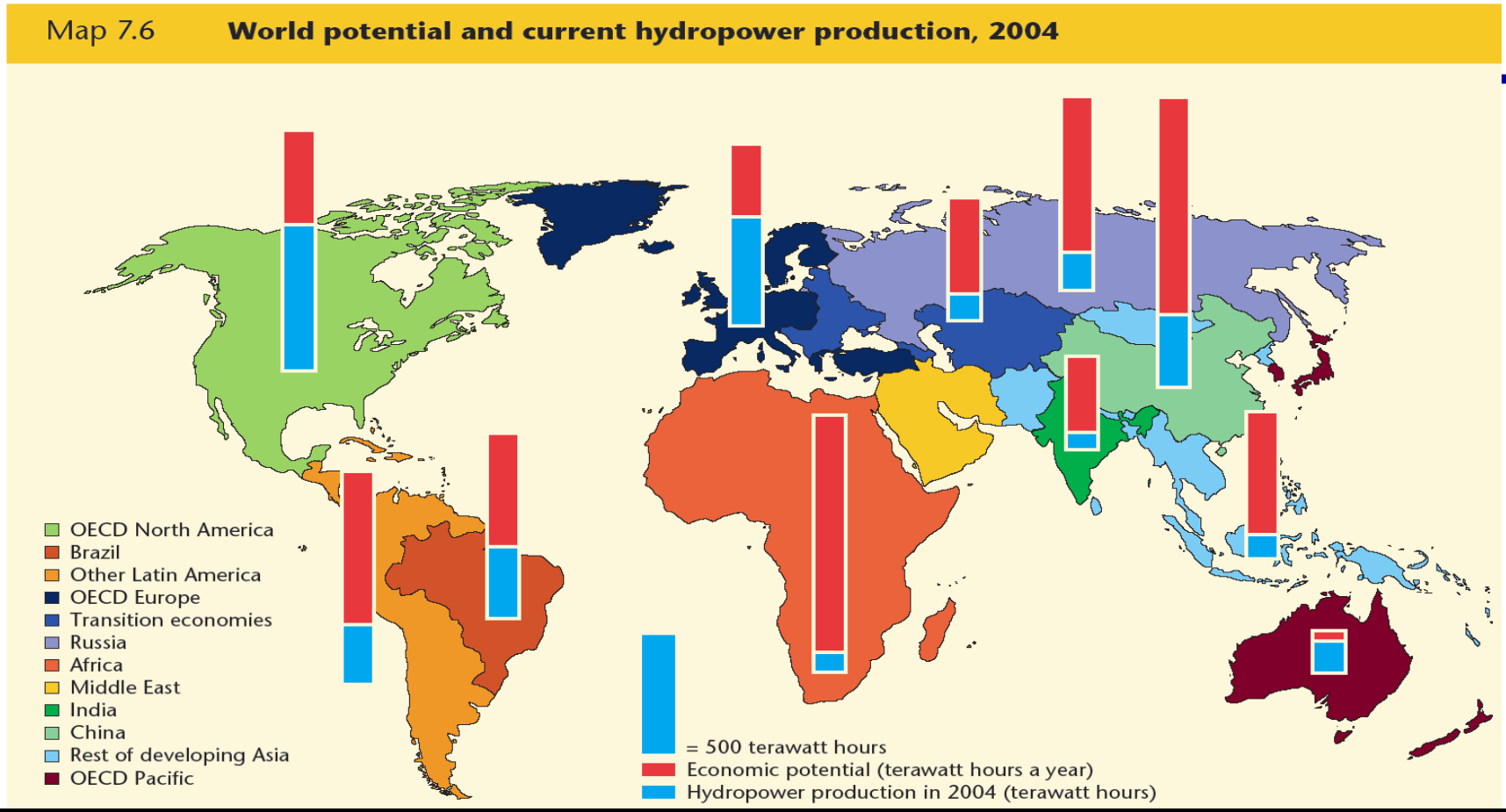
Source:
U.N. Population Division

Urban Population

1950 30%

2005 50%

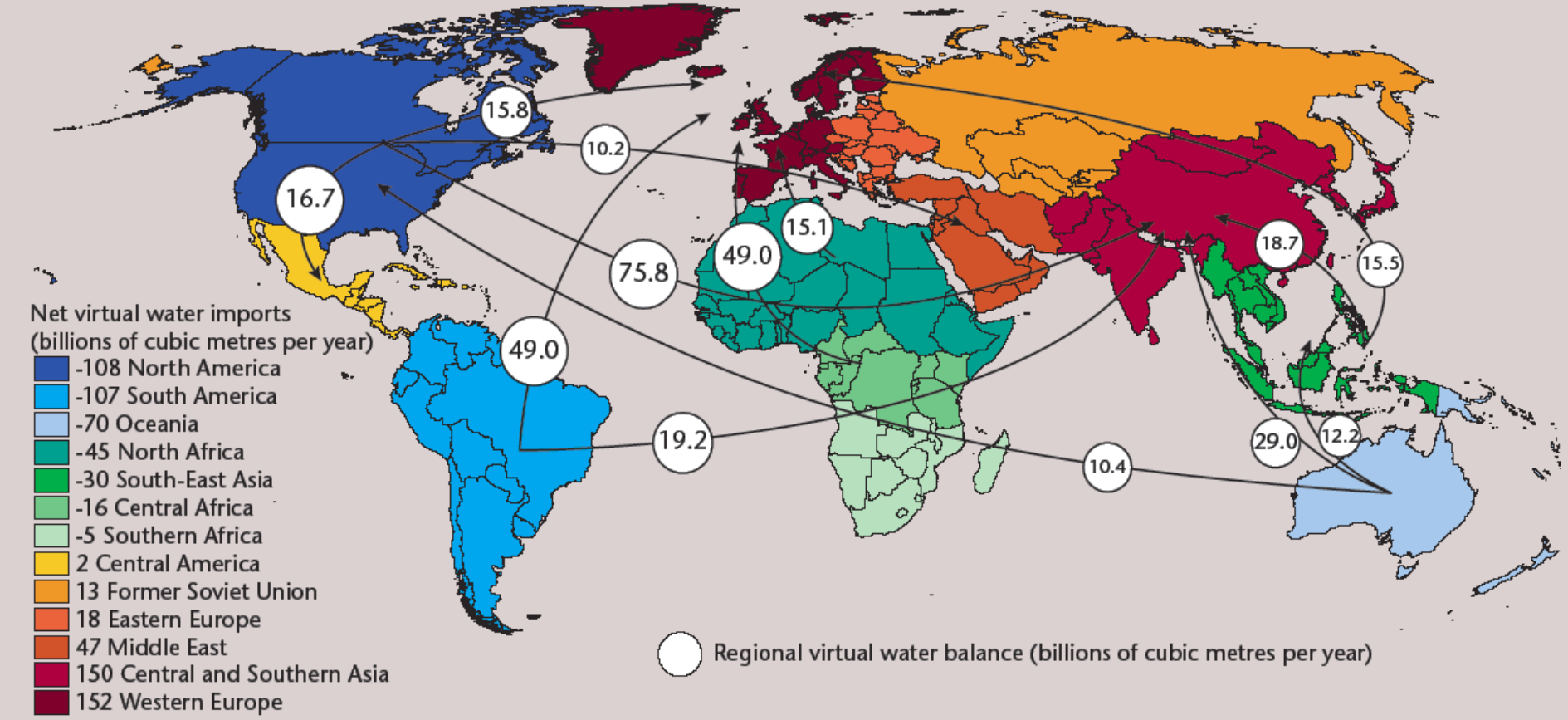
2030 60%



World Economic Forum 85%+ of renewable is Hydro

- **2 Billion People lack Electricity and electricity Demand is growing- Cheap Electricity a traditional key to economic development**
- **Hydro Potential Used: OECD countries 70%, LA 35%, Asia 20%, Africa 6%**

Regional virtual water balances and net interregional virtual water flows related to trade in agricultural products, 1997-2001



Virtual water trade in Asia could reduce water use for irrigation by 12%



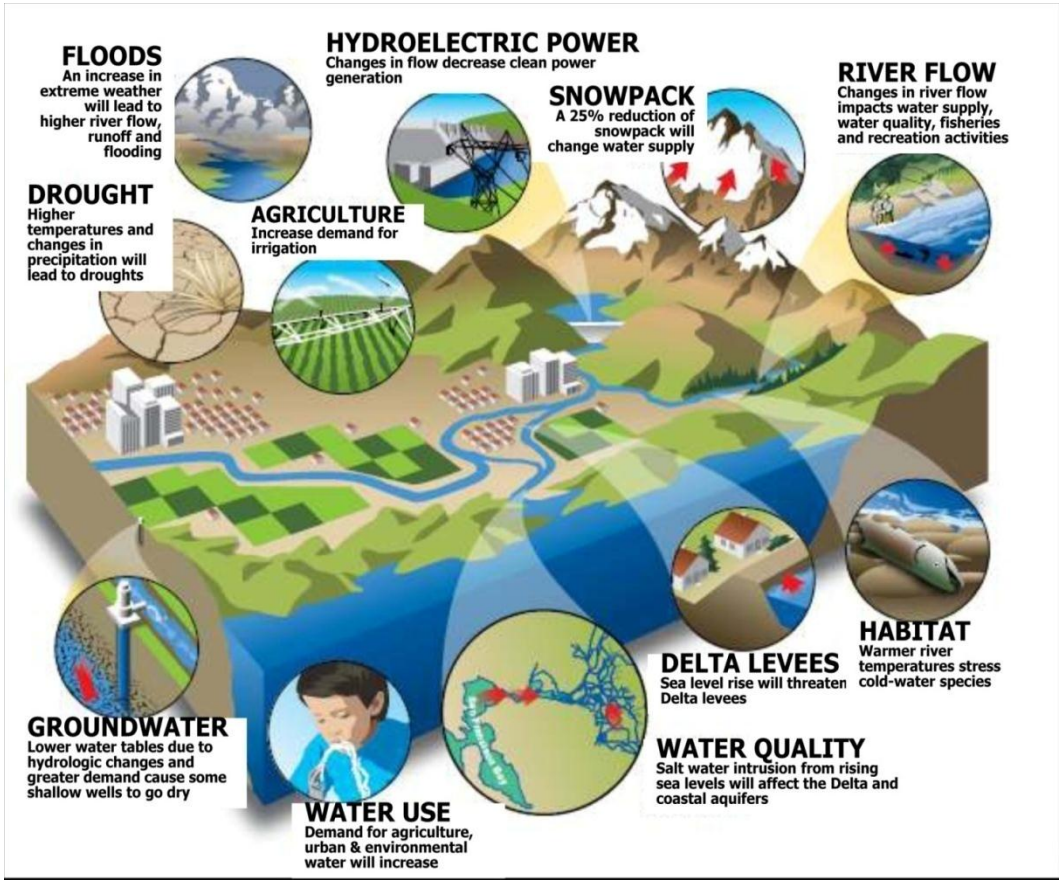
- VIRTUAL WATER
- INTER DEPENEDENCE
- WATER SECURITY

Many countries, including Japan, Mexico and most countries in Europe, the Middle East and North Africa, have net virtual water imports (see map). Water security in many countries thus strongly depends on external water resources (see chapter 7).

Climate Change Impact on Water

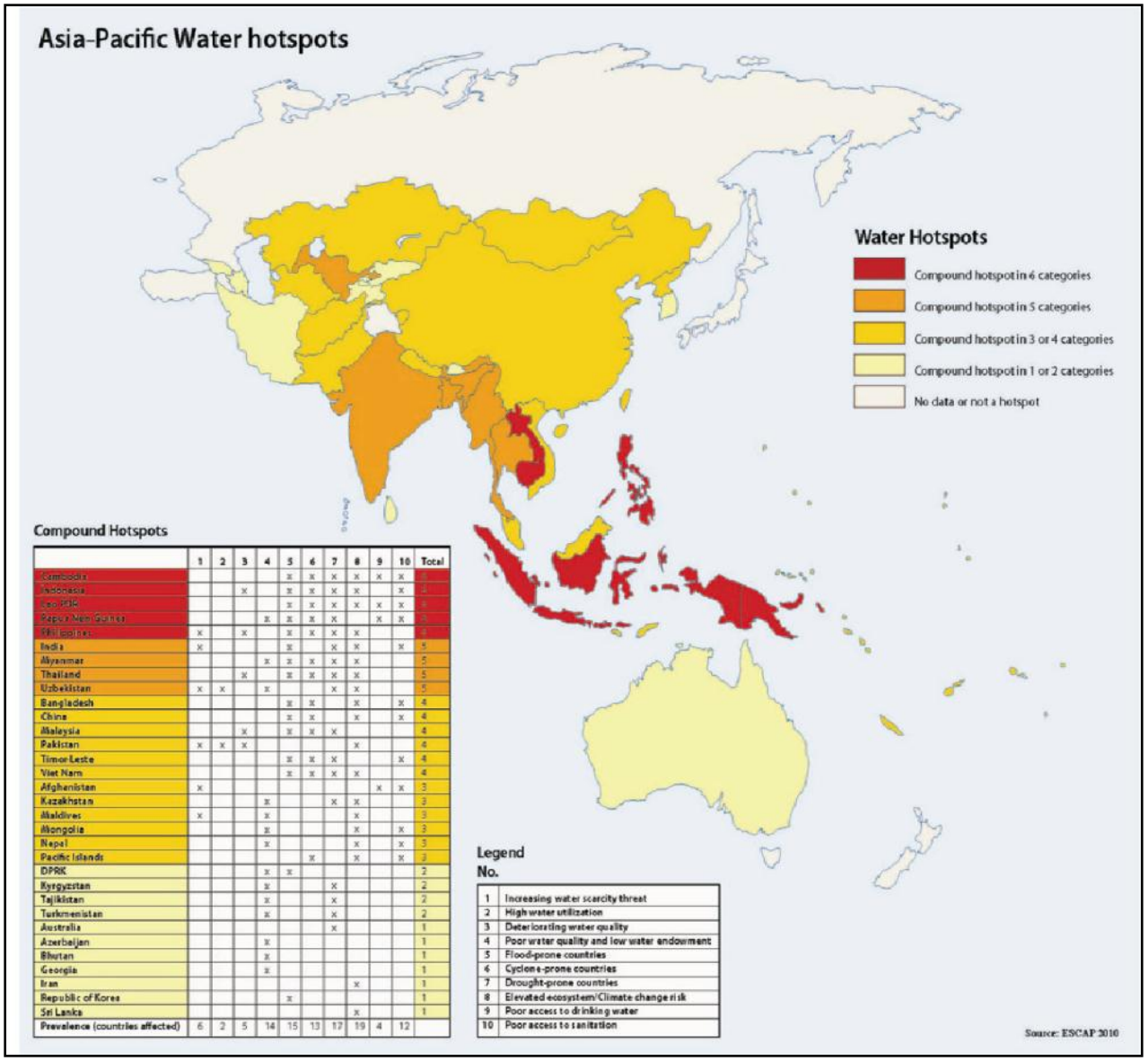
- a web of interconnected uses and values

- **Climate change affects all facets of the system and their interactions**
- **Some uses compete with one another**
- **Others are complementary**
- **Pervasive externalities exist**



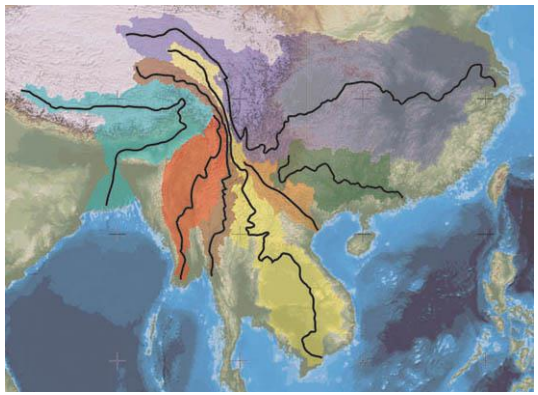
Asia Pacific Water Hot-spots – *affecting our Water Security*

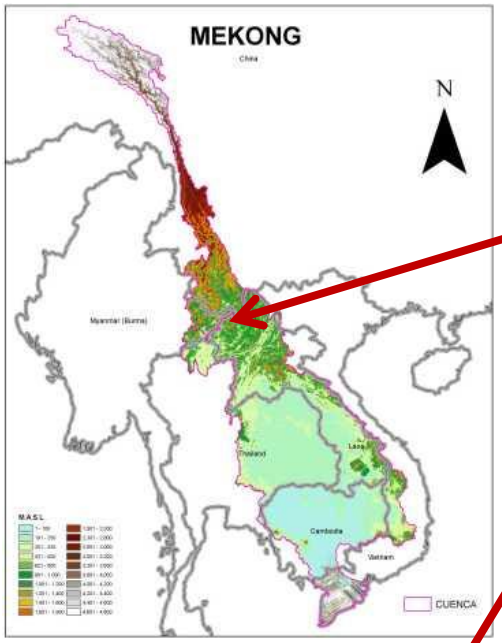
ESCAP 2011 Statistical Report

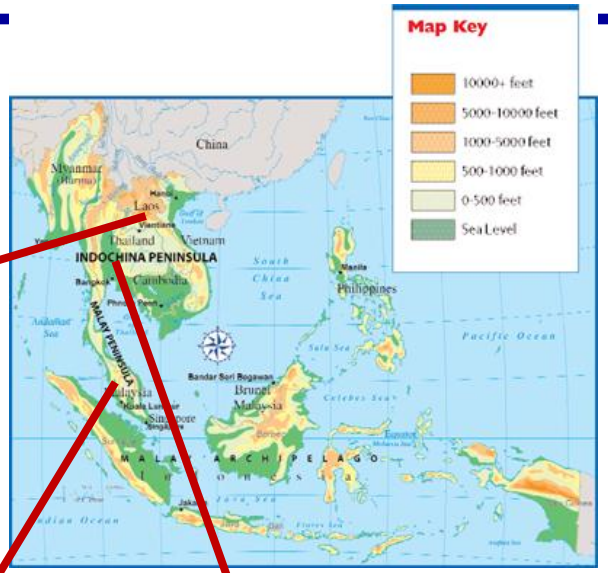


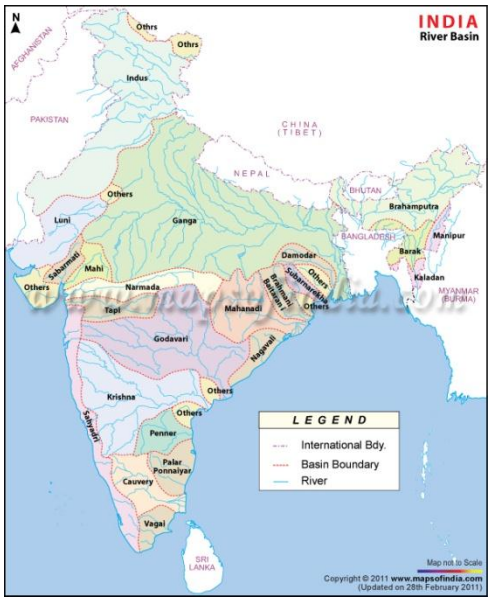
	1	2	3	4	5	6	7	8	9	10	Total
Cambodia					x	x	x	x	x	x	6
Indonesia			x		x	x	x	x		x	6
Lao PDR					x	x	x	x	x	x	6
Papua New Guinea				x	x	x	x		x	x	6
Philippines	x		x		x	x	x	x			6
India	x				x		x	x		x	5
Myanmar				x	x	x	x	x			5
Thailand			x		x	x	x	x			5
Uzbekistan	x	x		x			x	x			5
Bangladesh					x	x		x		x	4
China					x	x		x		x	4
Malaysia			x		x	x	x				4
Pakistan	x	x	x					x			4
Timor-Leste					x	x	x			x	4
Viet Nam					x	x	x	x			4
Afghanistan	x								x	x	3
Kazakhstan				x			x	x			3
Maldives	x			x				x			3
Mongolia				x				x		x	3
Nepal				x				x		x	3
Pacific Islands						x		x		x	3
DPRK				x	x						2
Kyrgyzstan				x			x				2
Tajikistan				x			x				2
Turkmenistan				x			x				2
Australia							x				1
Azerbaijan				x							1
Bhutan				x							1
Georgia				x							1
Iran								x			1
Republic of Korea					x						1
Sri Lanka								x			1
Prevalence (countries affected)	6	2	5	14	15	13	17	19	4	12	

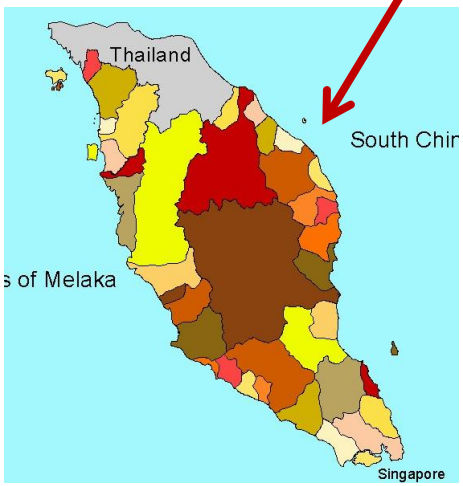
The World – a jigsaw puzzle of river basins & the Asia River Basins







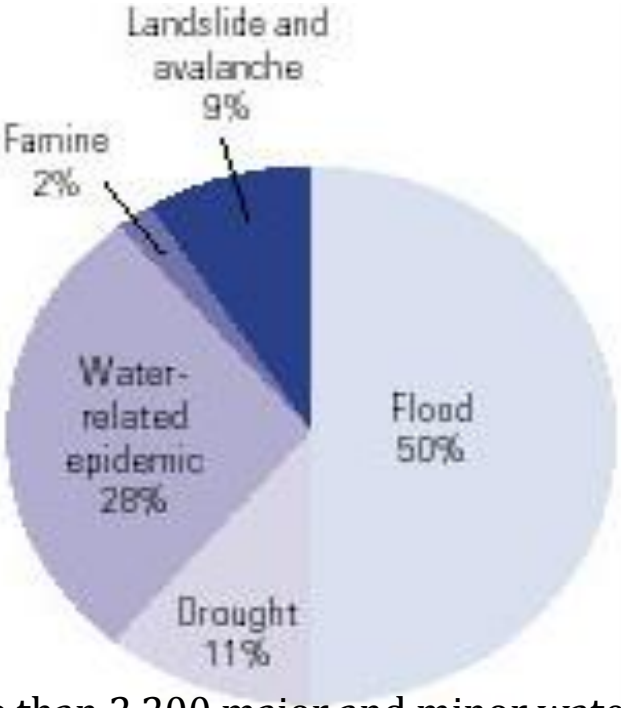




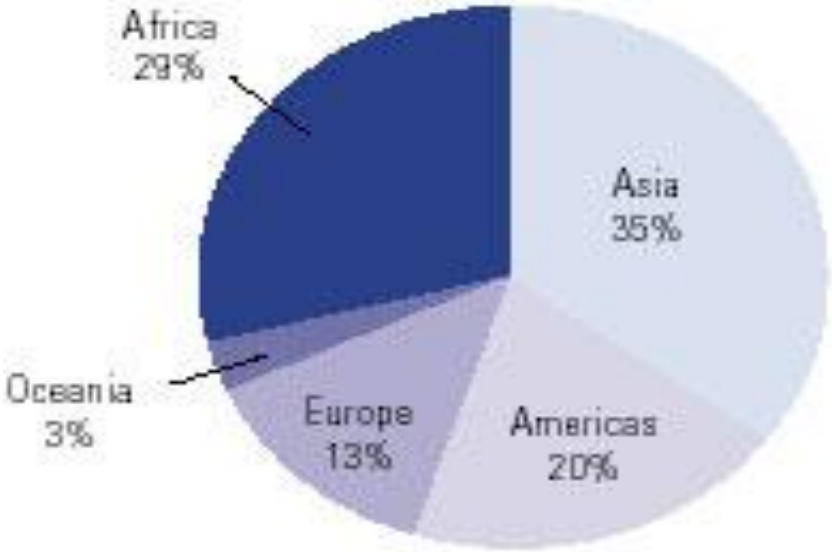


Water Disasters – impact our economy too

Type of water-related natural disasters, 1990-2001



Distribution of water-related disasters, 1990-2001



More than 2,200 major and minor water-related disasters occurred in the world between 1990 and 2001.

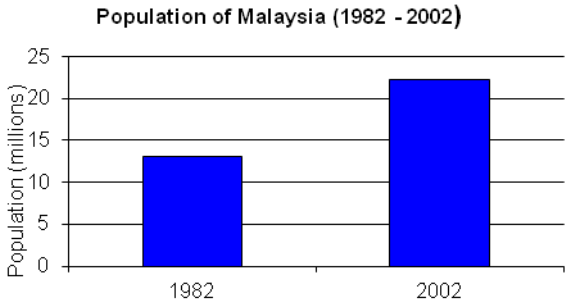
Asia and the Pacific, with 2/3 of the worlds land mass and population was the most affected continents, with floods accounting for half of these disasters *

*Extracted from the Executive Summary of the World Water Development report. CRED (Centre for Research on the Epidemiology of Disasters). 2002. The OFDA/CRED International Disaster Database. Brussels, Université Catholique de Louvain & *ESCAP 201Statiscal Report*

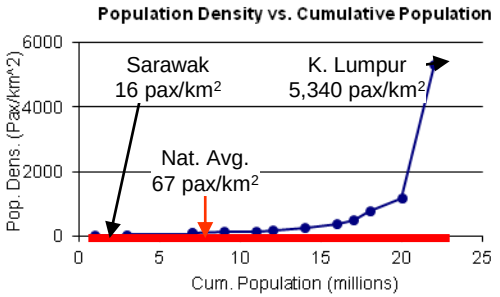
2003 Study – Annual Cost of floods in Malaysia = around USD 1 billion/yr

Kassim Chan Deloitte – DID Institutional Study 2003

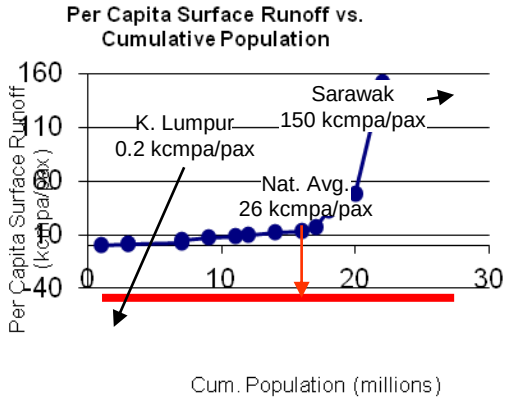
1) The rapidly increasing Malaysian population…



2) …Combined with increasing population *concentration*, especially in urban areas…



3) …Has led to certain areas suffering conditions of water stress…



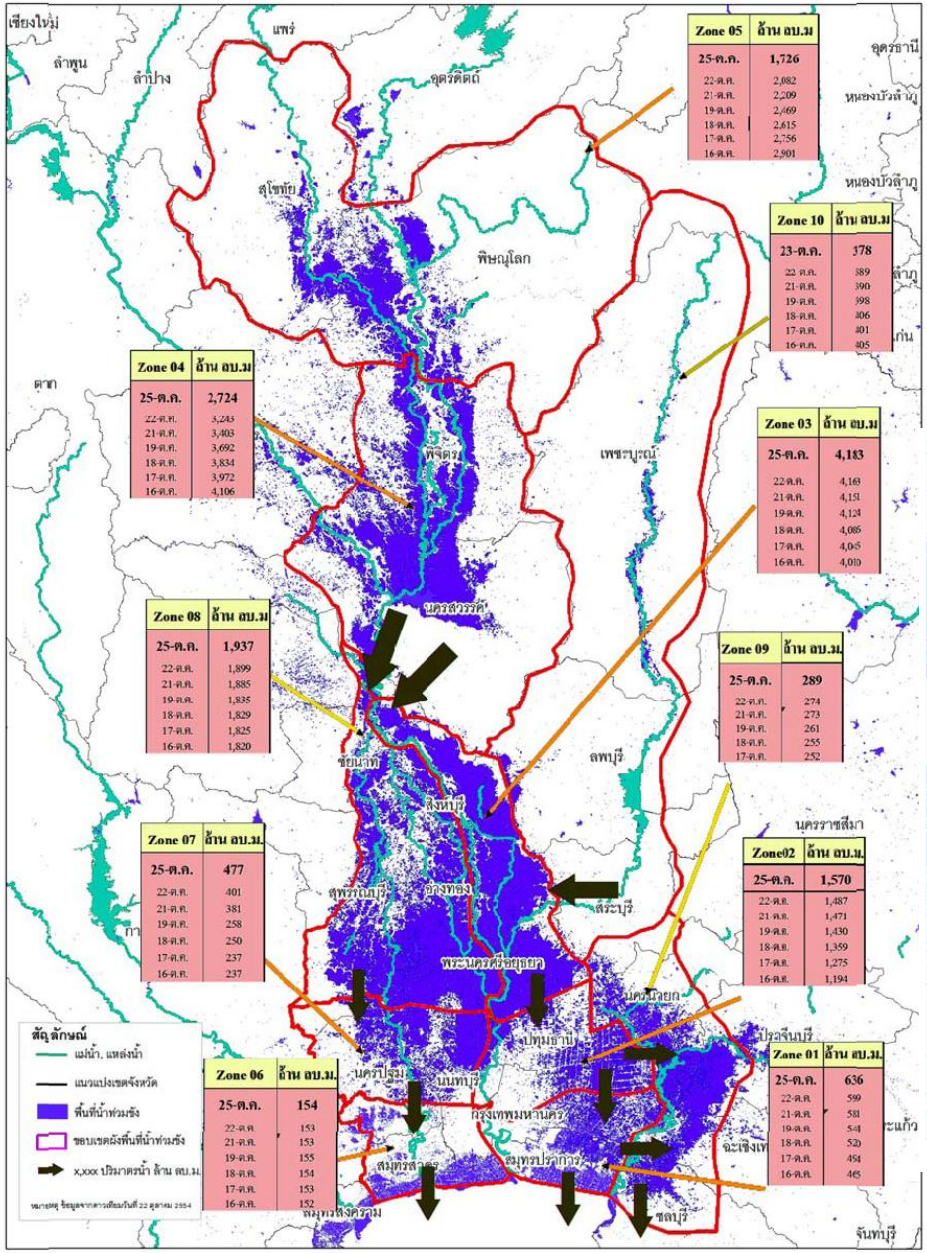
4) …Along with generalised water-related problems, flooding being the most evident

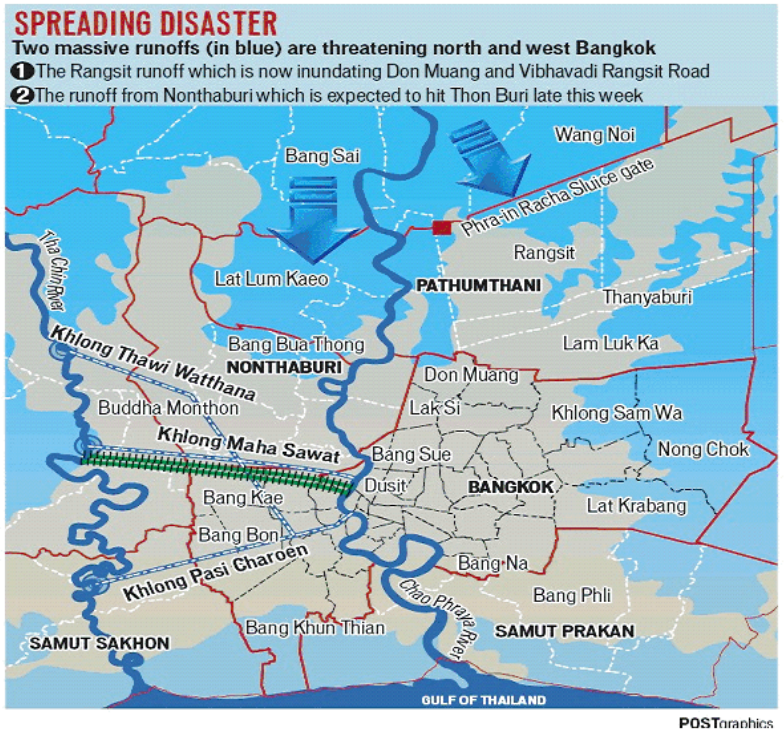
Estimated Costs of Flooding in 2000 in Malaysia

- RM850 million in direct losses
- RM 1.8 billion in lost GDP arising from lower investment over the previous 20 years
- Significant *but difficult to measure* losses due to disruption of day-to-day operations as a result of flooding
- **Resulting in a probable total economic loss of ~ RM 3 bln. annually from flood effect**

n.)

Thai Flood 2011





http://flood.gistda.or.th/

Thai Flood 2011– Damages and losses

Rapid assessment by WB, EU, JICA, ESCAP, Thai Govt, etc

Sub Sector	Ranking	Total (in MILLION USD)			
		Damage	Losses	Total	% of total D&L
Infrastructure					4.39 %
Water Resources	8	282.04	-	282.04 – **(0.28 bil)**	0.63 %
Transport	6	740.39	202.68	943.07 – **(0.94 bil)**	2.10 %
Telecommunication	13	41.72	65.37	107.09 – **(0.11 bil)**	0.24 %
Electricity	9	103.27	172.20	275.47 – **(0.28 bil)**	0.61 %
Water Supply and Sanitation	10	114.50	68.09	182.59 – **(0.18 bil)**	0.41 %
Cultural Heritage	11	82.90	99.04	181.94 – **(0.18 bil)**	0.40 %
Productive					87.11%
Agriculture, Livestock and Fishery	***5***	***1229.51***	***981.49***	***2211.00 – (2.21 bil)***	***4.92 %***
Manufacturing	***1***	***16630.45***	***13495.95***	***30126.40 – (30.13 bil)***	***67.06 %***
Tourism	4	166.15	2902.04	3068.19 – **(3.07 bil)**	6.83 %
Finance and Banking	2	-	3730.61	3730.61 – **(3.73 bil)**	8.30 %
Social					8.45 %
Health	12	54.50	68.87	123.37 – **(0.12 bil)**	0.27 %
Education	7	422.36	58.19	480.55 – **(0.48 bil)**	1.07 %
Housing	3	1485.70	1708.96	3194.66 – **(3.19 bil)**	7.11 %
Cross Cutting					0.04 %
Environment	14	12.13	5.70	17.83 **(0.02 bil)**	0.04 %
TOTAL		**21,365.66 (21.7 B)**	**23,559.22 (23.56 B)**	**44924.87(USD 44.92 B)**	**100**



Some Initiatives

- Sustainable Development
- IWRM/IRBM/ILBM
- Green Economy/Growth
-Water, Food and Water Nexus
-Sub-regional Initiatives

Green Growth and Water

Explore Existing and Innovative Solutions



Development Policy

- Agriculture focus
- Market interventions
- Technology and innovation

Trade Policy

- Virtual Water
- Trading Networks

Pricing Policy

- Water pollution taxes
- Quotas on consumption
- Subsidies
- Payment for Ecosystem Services

Institutional and legal Frameworks

- Integration and coordination of the food, water and energy sectors

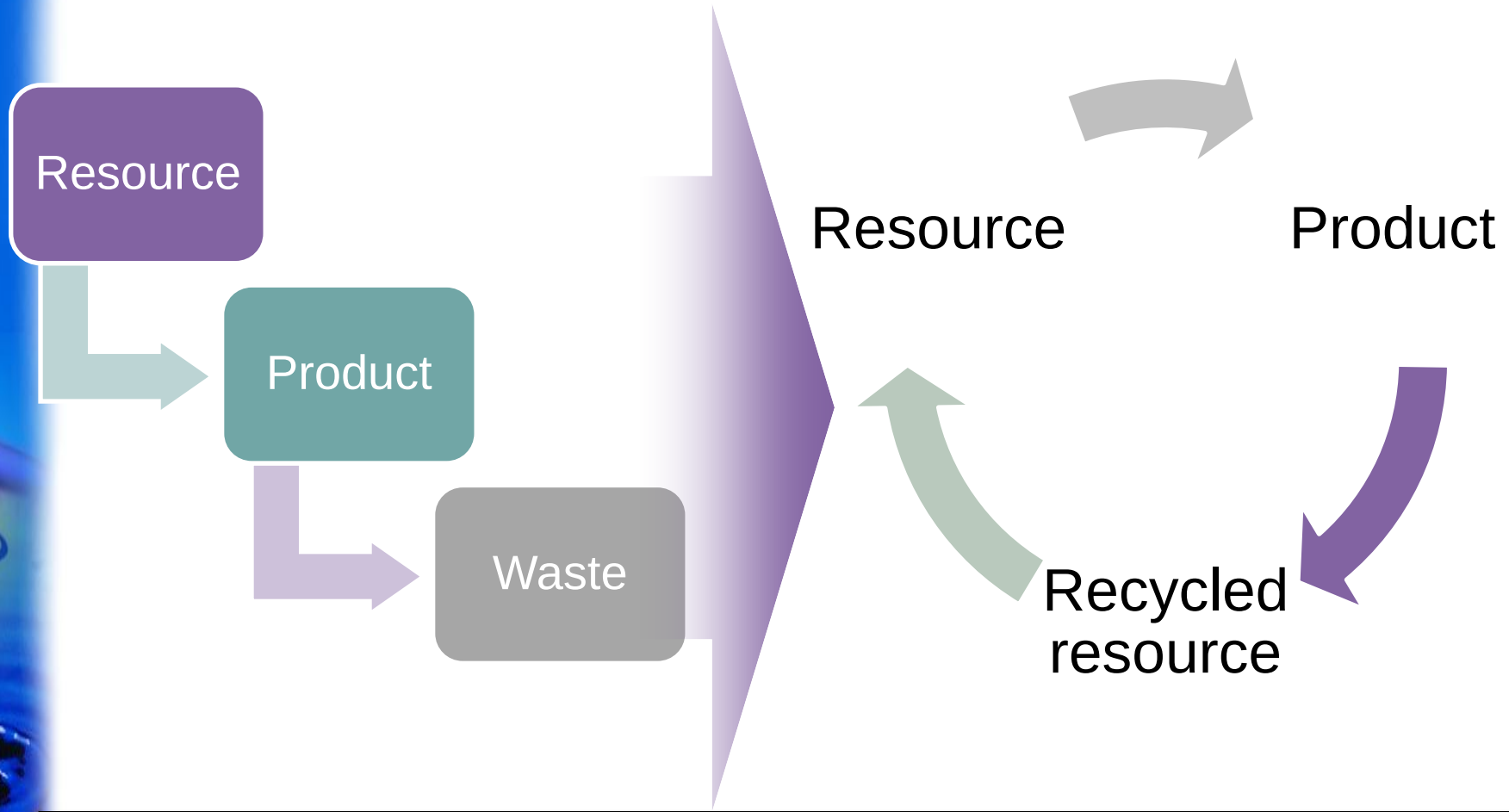
Moving Forward

5 Tracks of ESCAP Roadmap

- Quality of Growth
- Invisible Structure: Integrating Ecological and Economic efficiency: tax, fiscal, regulation, life-style, social value
- Visible Structure: Changing the design of Infra; transport, urban planning, energy, water, waste system
- Promotion of Green Business
- Institutionalizing Low Carbon Economics

Case study - China

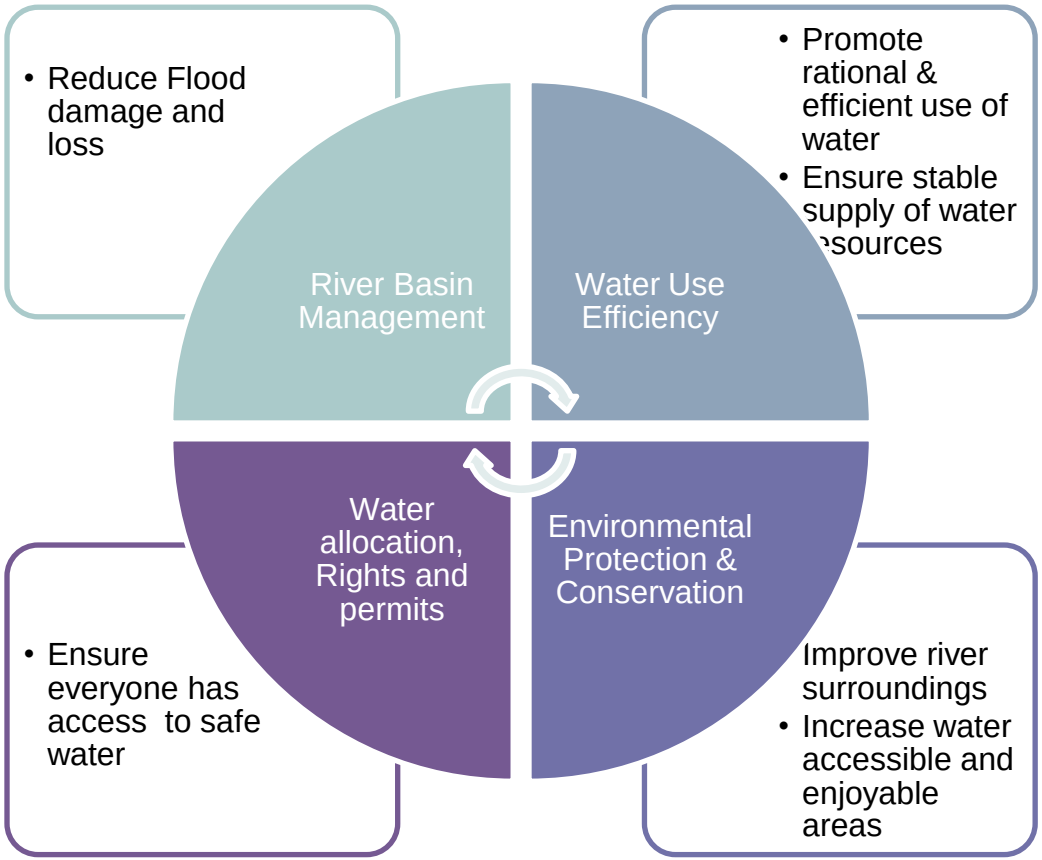
Policy Framework - Circular Economy (CE)



CE proposes a closed loop of resource development, production, consumption, waste generation, and recycling. The CE Promotion Law defines CE as —a general term covering activities that reduce, reuse, and recycle (3R) materials in production, distribution, and consumption processes. It builds on the industrial ecology tradition by combining economic development with resource conservation

Case study - China

Integrated Management – Integrated River Basin Management



Water shortage and flooding and pollution in rivers and lakes have created problems that constrain China's environment and development. The Water Law (revised 2002) reflects current thinking on integrated water resource and demand management. It enshrines the principles that everyone should have access to safe water and that water conservation and environmental protection are governmental priorities. The law focuses on four topics: water allocation, rights and permits; river basin management; water use efficiency, and conservation and environmental protection

Case study - Greater Mekong Subregion

Potential for Agri-food Production

Foreign Direct Investments (FDI)

- External savings
- Technology transfer
- Market access

Regional & Market Integration

- FDI can provide external savings
- Through FDI, contracting, and other local commitments, they can transfer technology to lower income agrofood producers.
- The foreign counterparts can use their own supply chains to link low-income producers to higher income markets and export platforms in neighboring countries.
- All three of these benefits of FDI can translate into higher rates of yield and income growth in the less productive, lower income parts of the GMS, promoting economic convergence through regional integration.

Case study – Malaysia

Biofuels – Challenges in meeting water, food and energy security



Water use

- Requires high intensity farming and high use of water for both crop production and biofuel production

Environmental concerns

- **Energy** and resource use required in biofuel production
- Water pollution
- Higher use of pesticides and fertilizers
- Soil erosion
- Biodiversity loss

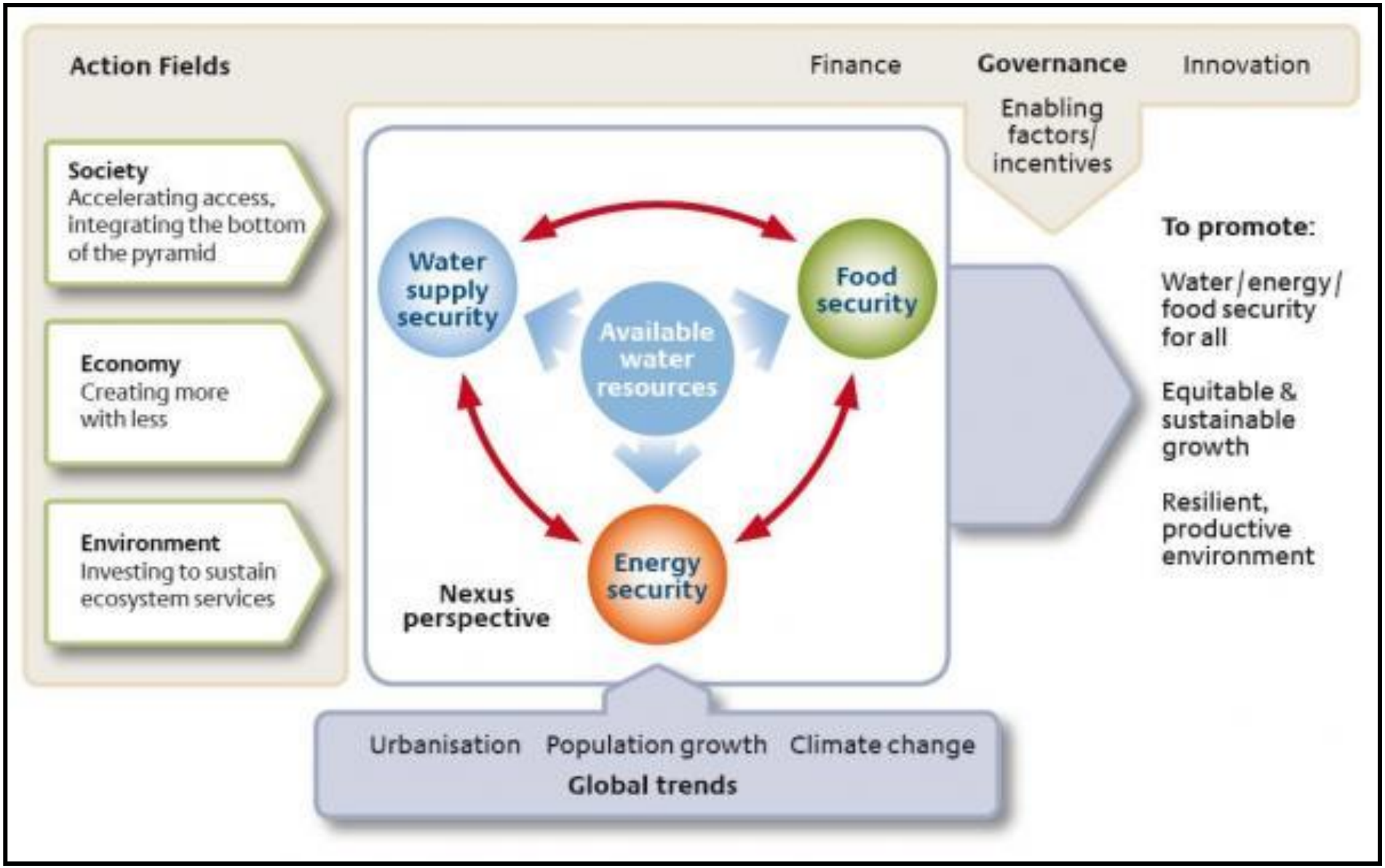
Institutional Fragmentation

- Under the Constitution , matters related to forest, land and water are delegated to the state. This serves as a major constraint to the effectiveness of federal level policy
- Malaysian Palm Oil Board (MPOB) is the implementation agency and not the Ministry of Energy, Green Technology and Water (MEGTW) who are usually responsible for inter-ministry coordination concerning the energy sector causing a silo institutional arrangement

Loss of Agricultural land

- Should the Malaysian Government institute its B5 mandate, 570 000 tonnes of palm oil would be required. This equates to approximately 130,000 hectares of land, or three per cent of the current 4.2 million hectares currently under cultivation

Overview of Water-Energy-Food Nexus



Moving Forward: Focus on Macro Societal Adaptation

Energy Water Nexus Debate

Political

- Positive outlet for politicians
- Do something which registers in generational memory



Ethical Dilemma of Climate Change Policy and Water

Climate, water and security debates are raising public anxiety

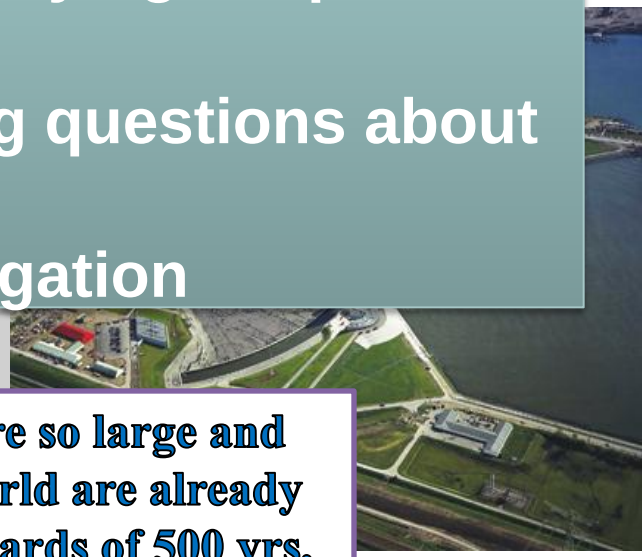
About Change while inadvertently denying adaptive means to

cope with projected events; thus raising questions about the

ethics of adaptation vs. mitigation

Econom

- Fraction of Mitigation costs



If the uncertainties of climate change are so large and water managers in many parts of the world are already characterizing risk and return rates upwards of 500 yrs, should we be telling decision makers to change?

MOVING FORWARD:

Finding the operational Nexus → Region Specific → Trade-offs

Patterns Change over time: Depend on:

Trade-offs are choices among water uses; Patterns of uses are prioritized values:

- Socio- Economic Development
- Political Culture
- Geography (wet, dry, variability)
- Available technology

Water is the constraint that forces choices; trade-offs – integrative

Integrative Processes = Political Messages = Reallocations of Political Power

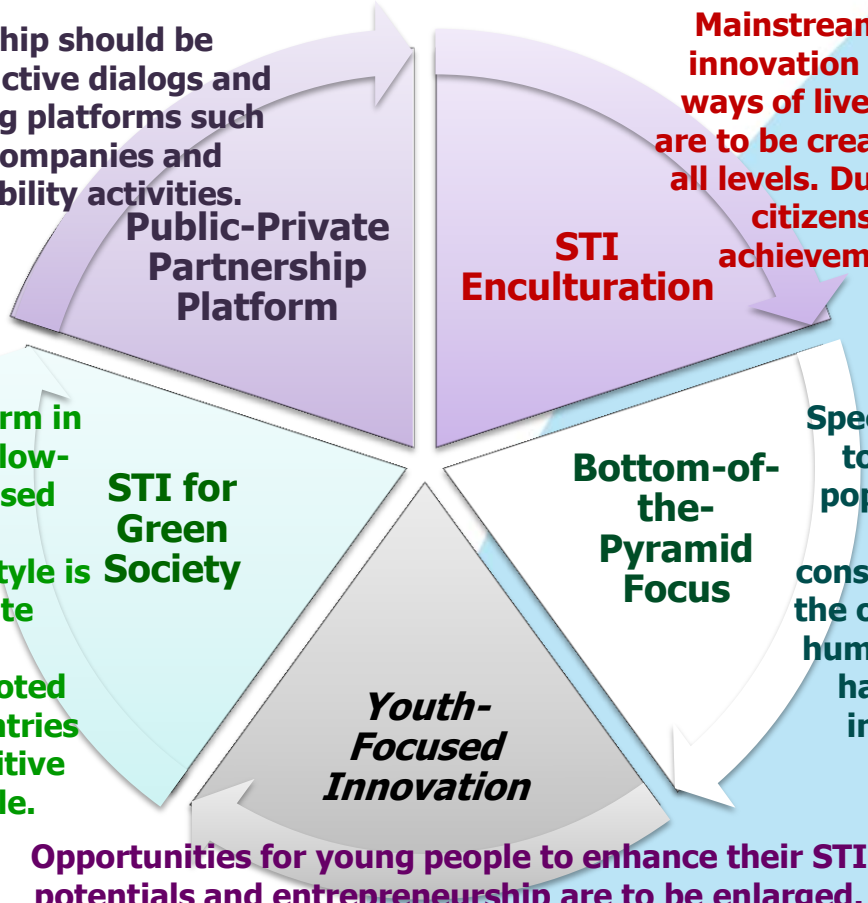
- Often defined as technical terms and political is left out
- BUT- Cannot achieve integration w/o political

Processes to allocate water are means to achieve NEXUS integration/success:

- Politics – Markets – water banking -RBO's - Infrastructure - Planning – Regulations – Defining Rights – trade – technology – others

ASEAN KRABI INITIATIVES
Paradigm Shifts

Public-Private Partnership should be strengthened through proactive dialogs and establishments of engaging platforms such as government-linked-companies and corporate social responsibility activities.



Mainstream science, technology and innovation (STI) into ASEAN citizens' ways of lives. Innovation eco-systems are to be created in ASEAN community at all levels. Due recognitions are given to citizens with outstanding STI achievements as the role models.

Special attention should be given to the majority of the ASEAN population_ the bottom-of-the-pyramid. In this regard, consideration must be accorded to the outcomes of STI addressing on human basic needs such as foods, habitat, health, and access to information and knowledge.

Opportunities for young people to enhance their STI potentials and entrepreneurship are to be enlarged. Examples of measures to be taken include Young ASEAN STI Awards, cross-country attachment program and seed funding to support youth-focused innovations.

Green STI integration platform in its transformation towards low-carbon society. Science-based public awareness on environmental-friendly life style is to be instilled. Appropriate technologies and green innovations are to be promoted among ASEAN member countries in order to become competitive and yet remain sustainable.



“Wicked Problem”

- *too much information?*
- *multiple and competing users?*
- *too complex?*
- *opaque? – politics, private, communities*
- *etc*

Water Security - Pressures



Water Security - Issues

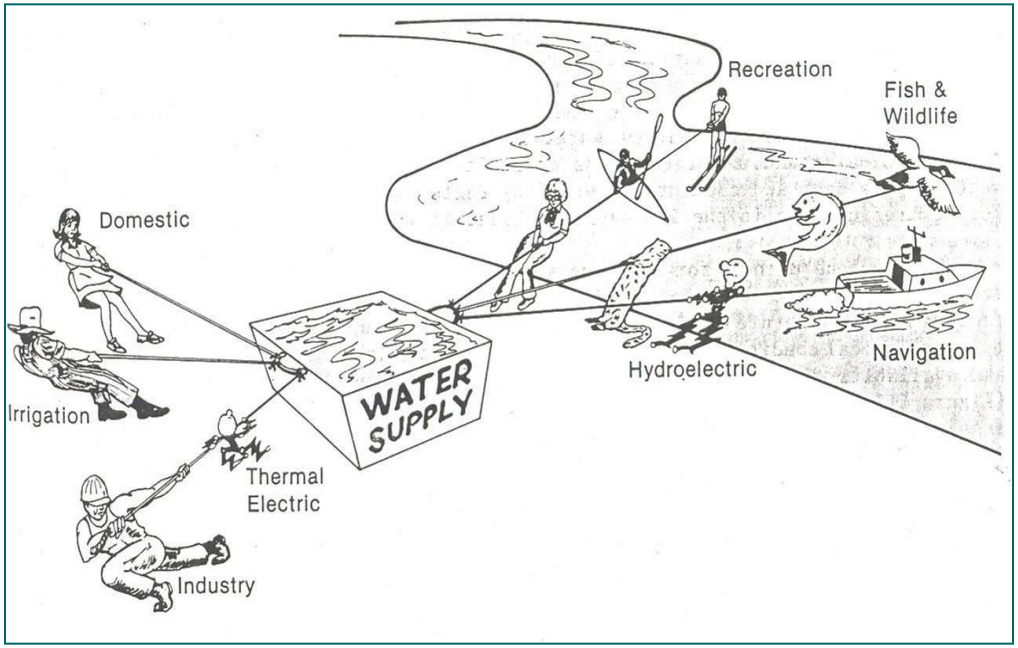


Water Security - Responses



Water Policy Process – Some Realities

View from the policy trenches



Competing interests + Confusing array of laws + Multiple agencies / overlapping jurisdictions =

Tug of war – or Gordian Knot?

"We are not all in this together" (Doug Kenney, CU Natural Resources Law Center)

- **Some interests have better (more senior) rights**
- **Any change can affect multiple users/values**
- **Policy discussions – often contentious**
- **Transparency & high quality information needed**

H.G. Wells, The Brain: Organization of the Modern World , 1940

- "An immense and ever-increasing wealth of knowledge is scattered about the world today;
  - knowledge that would probably suffice to solve all the mighty difficulties of our age, but it is dispersed and unorganised.
  - We need a sort of mental clearing house: a depot where knowledge and ideas are received, sorted, summarized, digested, clarified and compared."

Water Security – a Wicked problem?

- Wicked problem - is **ill-defined** and connected to other intractable problems. Common characteristics are problems that are **dynamic** (changing), **systemic** (interconnected) and **generative** (emergent issues and new dimensions).

- Therefore, there can be no final, optimal one-off solution to it and **solutions are not truly good or bad** but **"best that can be done"** on a continuing basis as new dimensions and inter-relationships emerge.

- Because of **inherent differences** in governance, cultural, motivation and attitudes among stakeholders surrounding the problem, **resolution will require a new approach**

Wicked problems (Cont'd)

- The persistent water insecurity caused by current practices and approaches thus constitute a complex problem with economic-social-environmental issues that had been termed "wicked problems" (Rittel and Webber 1973).

- Scientific solutions alone are unlikely to succeed in solving such "wicked problems" because of the nature of the problem as much as the economic, societal and policy complexity in which it has to be resolved.

- Scientific solutions can be developed for "tame" well defined problems that can be solved in isolation, can be broken down into parts which can be solved independently by different groups of people. Solutions to different parts of a larger problem can then be integrated into an overall solution. The same does not hold true for "wicked" policy problems.

If all you have is a hammer, then everything looks like a nail!





Handling Wicked Problems

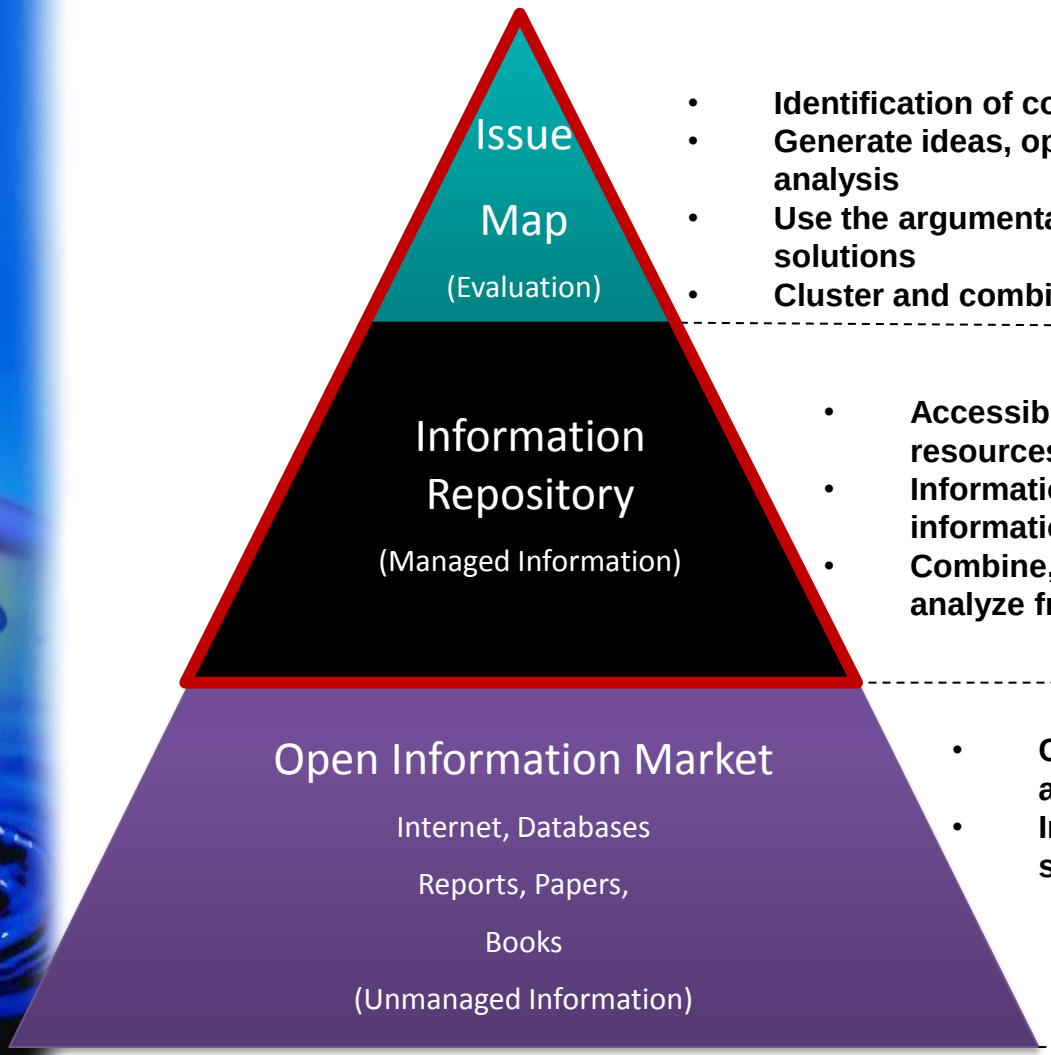
- One such approach is Kunz and Rittel's (1970) "Issues Based Information System (IBIS)" which is an argumentation-based approach designed 'to support coordination and planning of policy/political decision processes. IBIS is a framework that guides the identification, structuring, and settling of issues raised by problem-solving groups, and provides information pertinent to the discourse.'

- It involves an information management system to capture and manage information to make it easily accessible, usable and exploitable

- It also needs to capture tacit knowledge, the elusive element in knowledge management systems, for addressing the problem

- The system should allow updates of relevant new issues, facts and lessons learned as part of the learning cycle

Issues-Based Information System (IBIS)



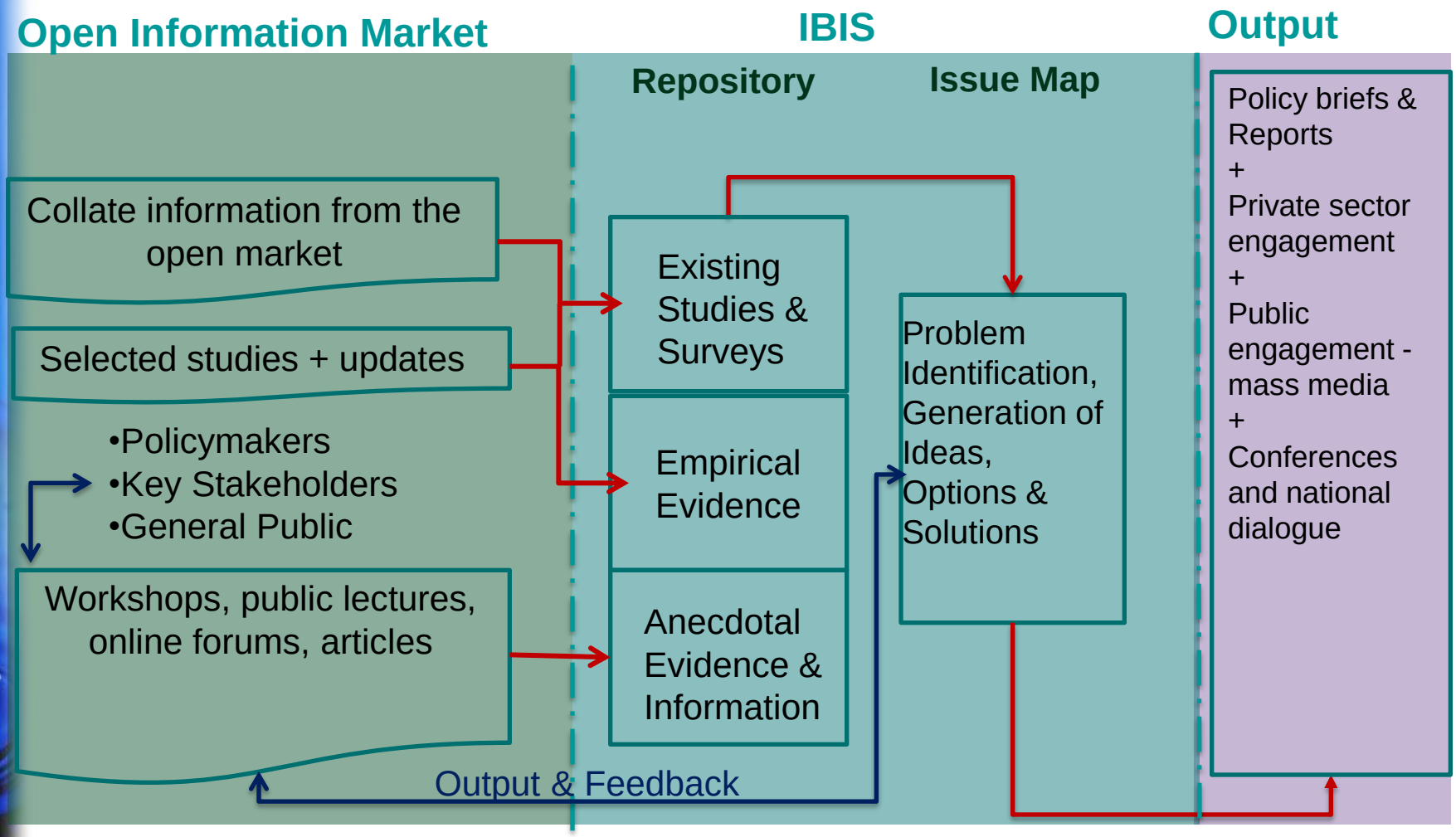
- Identification of core issues, current efforts and risks
- Generate ideas, options and solutions from synthesized analysis
- Use the argumentation process to evaluate these ideas and solutions
- Cluster and combine issues that are usually viewed in isolation

- Accessible, usable and exploitable information resources.
- Information *preprocessed* into smaller unit of information to match information architecture
- Combine, collate, and compare existing studies and analyze from multiple perspectives

- Covers information available in different media and format
- Includes policies, strategies, initiatives and studies on energy security

3-Tier Information Management Structure

Proposed Approach



Origin of IBIS:

- Introduced by **Horst Rittel**, a Professor in the Science of Design, in the early 70s.
  - IBIS is not and information system but a conceptual framework
- IBIS is designed for the tackling of wicked problems by **developing issue/dialogue maps.**
- The **elements** of the maps can include **issues, facts, positions, questions, ideas, argumentations (pros and cons) and solutions**.

Key Benefits

1. Wicked problems is **broken down into its elements**, i.e. Issues, Facts, Positions, Questions, Ideas, Solutions and Argumentations.

2. Allow the problems to be **viewed and analysed from many perspectives** – issues, entry types, subject headings and sources.

3. **All evidence** (facts, positions, etc.) must be **tabled**.

4. **Documentation** of our **thought processes**.

5. Above all, **facilitates comprehensive policy engagement**

Moving forward – ASM, Malaysia

- Academy Science of Malaysia (ASM)
  - set up to advise the Malaysian Government on policy issues in the sciences, including water
- ASM Task Force on CCA, and other national partners are piloting the use of MctIBIS
  - Merging the use of IBIS and Multi-Centric
  - working on analyzing the multiple issues emerging out of climate change impact and adaptation. This will utilise
    - a status paper on CC Impact for Malaysia which was discussed at a National Conference Nov 2011
    - Further details to be gathered in 2012, from issue-based workshops: climate change projection, water disaster risk analysis, water bodies management, health implication, land use management, R&D and information management, awareness, advocacy, governance & institutional development

The Multicentric Information Framework

- LinkedIn and Facebook are dedicated relationship management system for professional and social relationships.
- The “Multicentric Information Framework” is a *generic information relationship management system* that can be used to developed dedicated relationship based applications, in this case – Mct-IBIS
- Mct-IBIS – an implementation of the IBIS methodology using the Multicentric Information Framework developed by Multicentric Technology.
  - Website - *http://www.multicentric.com/wapi/mctweb.dll/getobject?objid=1&mid=MCT Website*

IBIS and MctIBIS

- Horst Rittel described IBIS as containing six sub-systems.
  - Most implementation of IBIS focus only on the Issue Maps, ignoring the other five
- Mct-IBIS provide facilities for
  - Issue, Positions, Ideas and solution banks (Rittel: issue bank)
  - Facts (Rittel: Evidence bank).
  - Subject headings tree (Rittel: topic list).
  - Multiple dialogues (Rittel: Handbook).
  - Web based system with entries, reference materials and web links (Rittel: Documentation system).
  - Issue map as hierarchical tree with description or mind map using FreeMind (Rittel: Issue Map).
  - Focus areas
  - Contributors.
  - FIF0 and LIFO listing of entries.

Moving forward - ESCAP

- ESCAP a UN regional Commission – similar to ECLAC for Latin America - support member countries in Asia Pacific in economic and social development
  - Focusing mainly on issues which have regional connectivity such as transport, trade (including illegal trades), sustainable development, energy, etc and working together with
    - Other UN organisations
    - Regional organizations –APWF, ADB
    - sub-regional organizations such as ASEAN, SARC, SOPAC etc
- In water issues, we focus on Sustainable Development/IWRM – currently on
  - Green Economy/Green Growth,
  - Economic-Food & Water Security (EFWS) & Monitoring of Investment and Results (MIR) in the Water Sector and
  - Water-Food-Energy Security (WFES) Nexus
  - Water supply and sanitation



Thank you