Water-Energy-Food Security Nexus

in the Asia Pacific Region: Preliminary Findings



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Presentation outline

1. Sustainability and green economy strategies
2. Global resource scramble and the W-E-F nexus
3. Nexus flashpoints in the Asia Pacific region
4. Applications of the nexus approach
5. Redefining resource scarcity + future work
6. Concluding remarks

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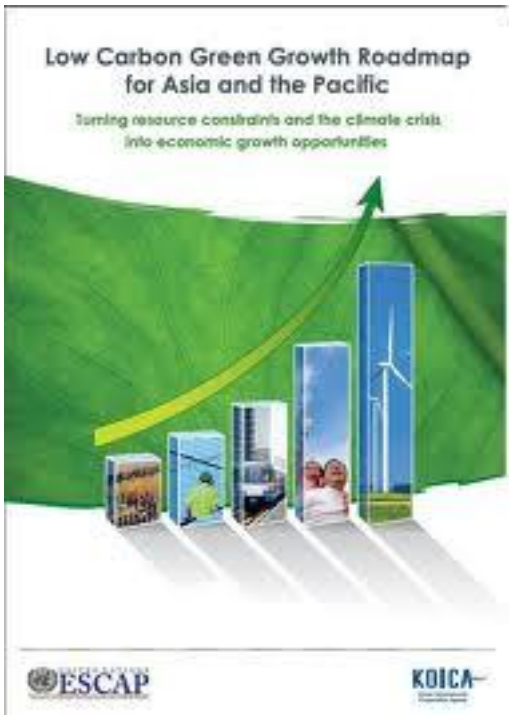
Section 1: Background

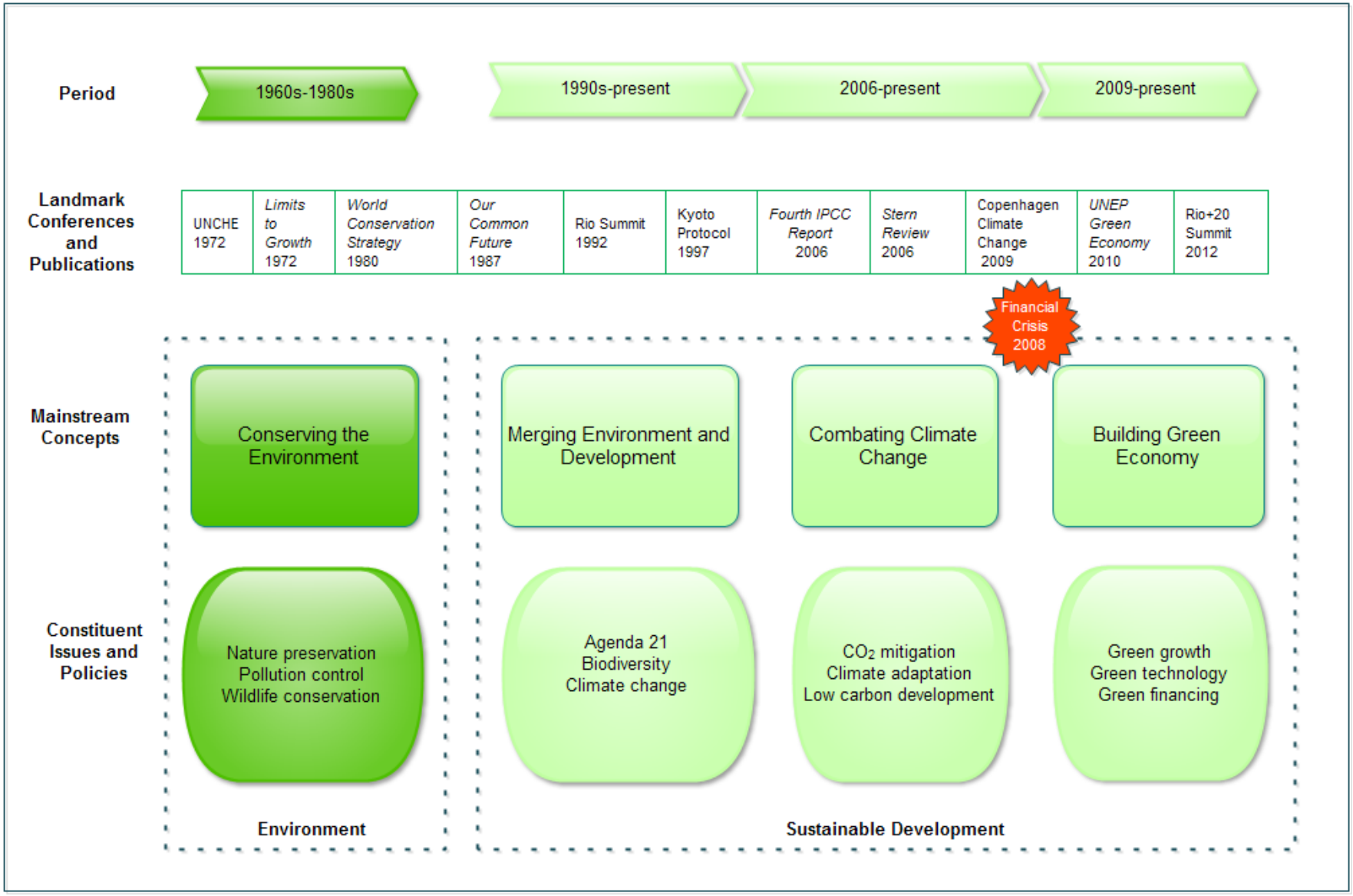
SUSTAINABLE DEVELOPMENT AND GREEN ECONOMY STRATEGIES

UNESCAP Green Growth

Low Carbon Green Growth Roadmap for Asia and the Pacific

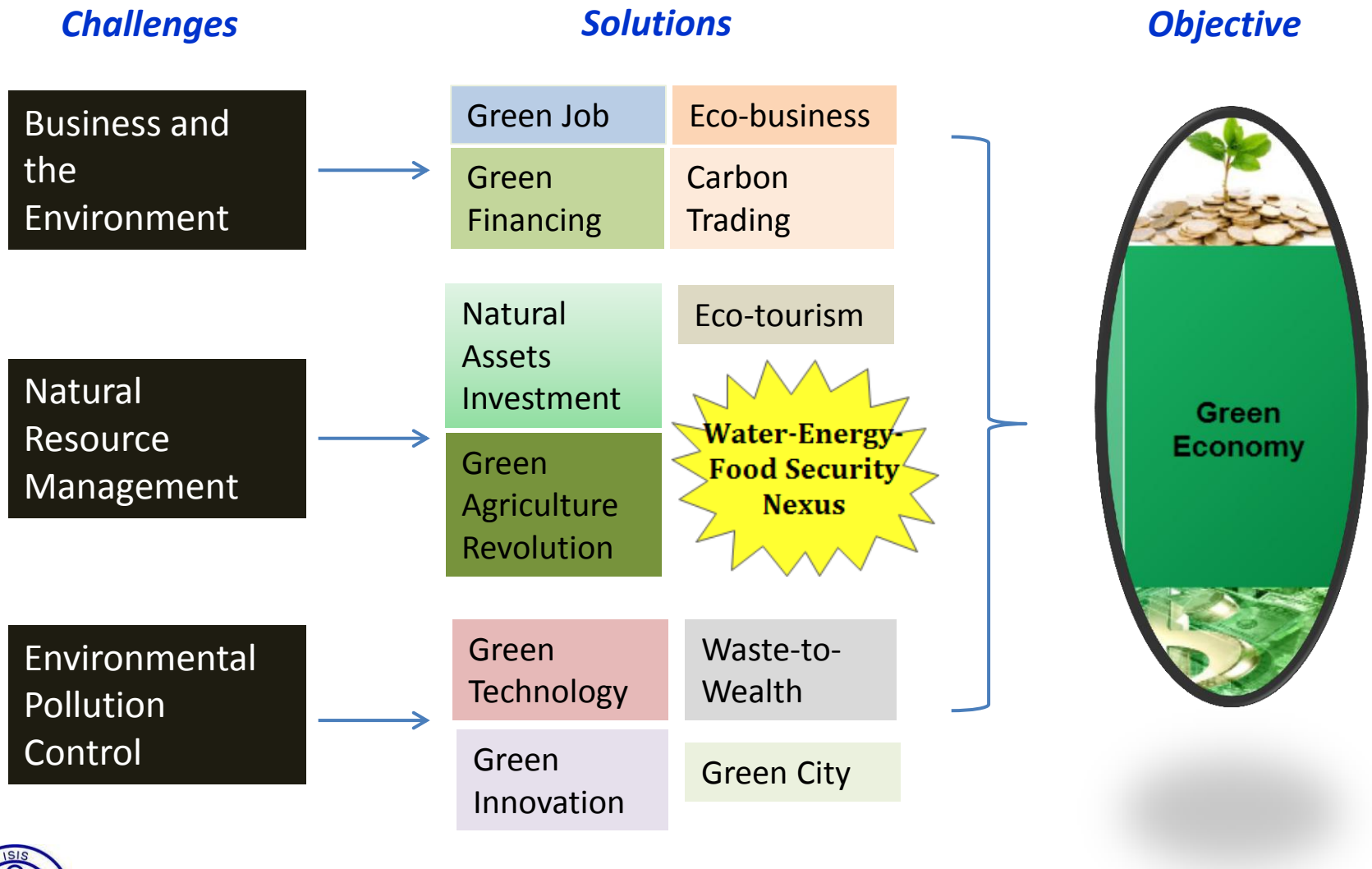
- Launched by UNESCAP in May 2012
- A smart strategy for sustainable development and a process for arriving at a green economy
- “Policy option and practical strategies must take into account resource constraints and the climate crisis, to convert crisis of shrinking natural resources and climate change to a driver of sustainable and inclusive economic growth”





Evolution of sustainable development

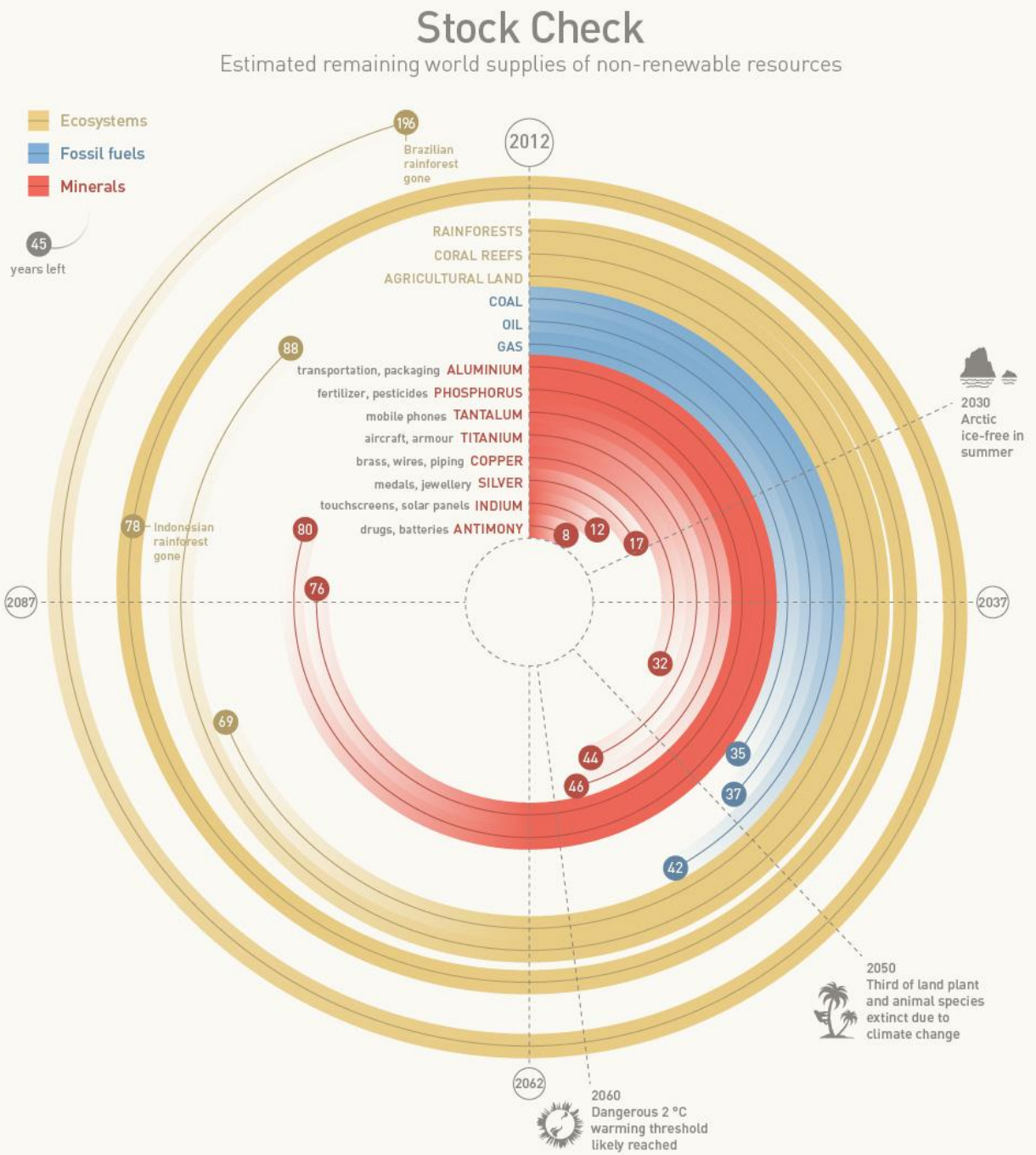
Green economy strategies for sustainability



Securitization of natural resources management?

Section 2: The Global Resource Scramble and

THE WATER-ENERGY-FOOD SECURITY NEXUS



Resources running out? Again?

Today, resources are high priority concerns in all levels of government, corporate boardrooms, and local communities.

3F crisis - fears about resources prices and access are back in vogue.

Beyond the physical scarcity of single natural resources

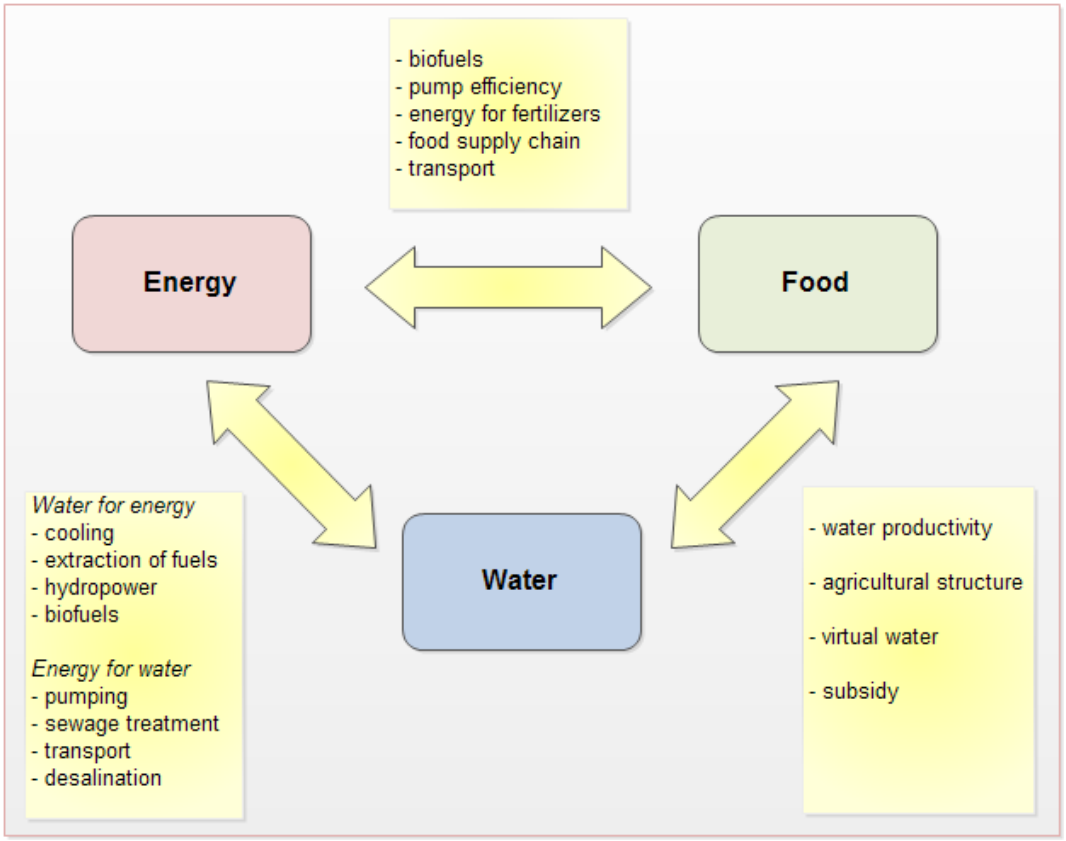
Multiple resources, multiple scarcities? Connections?

The ‘new’ resource scramble?

- Combination of factors causing the new resource scramble:
  - a lack of unexplored resource preserves beyond those now being used for development;
  - the sudden emergence of rapacious new consumers
  - technical and environmental limitations on the exploitation of new deposits;
  - rising resource nationalism; and
  - the devastating effects of climate change.

Energy, water and food resources

Energy, water and food are inextricably linked



- Water for energy currently amounts to about 8% of global water withdrawals (45% in industrialized countries, e.g. in Europe).

- Food production and supply chain is responsible for around 30% of total global energy demand

- Food production is the largest user of water at the global level, responsible for 80–90% of consumptive blue water use

The Nexus Approach

Recognizes interconnectedness of water, energy, and food across space and time. Its objectives are:

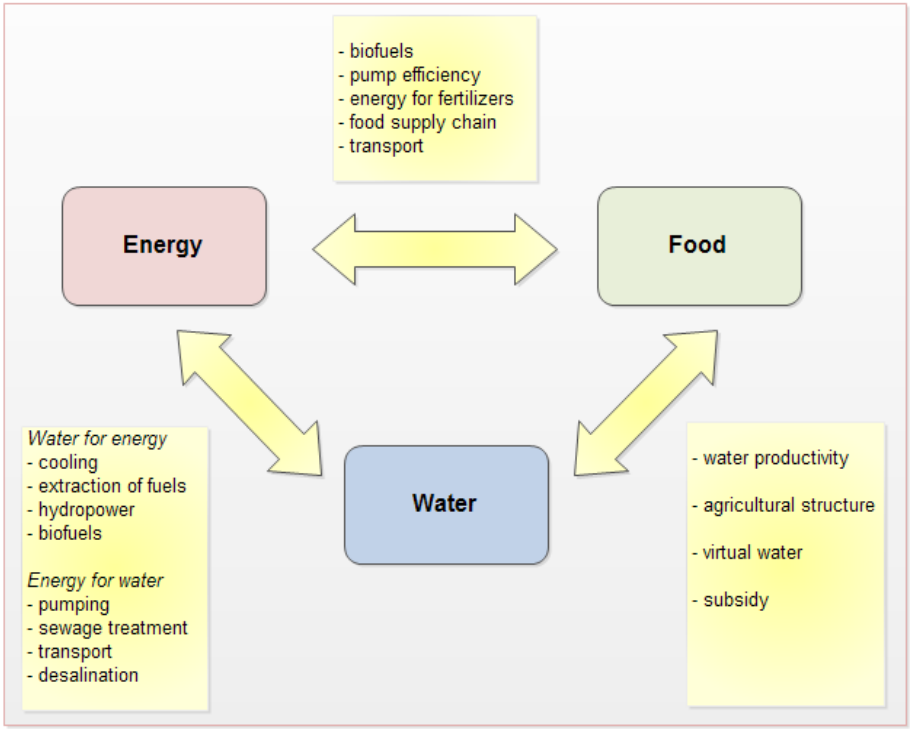
- Improve energy, water, and food security
- Address externality across sectors, and decision-making at the nexus
- Support transition to sustainability

Projections for 2050 with 9.2 billion people:

- 70% increase in agricultural demand for food by 2050

- 40% energy demand increase by 2050

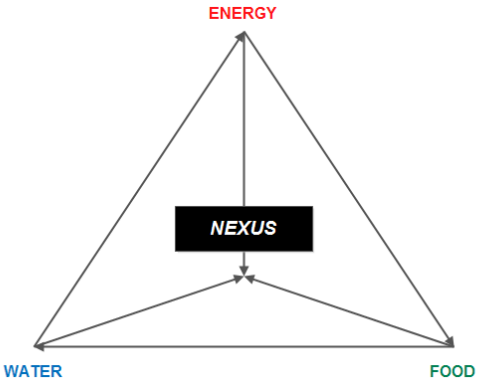
- But by 2030: confronting water supply shortage of ~ 40%



Why these three resources?

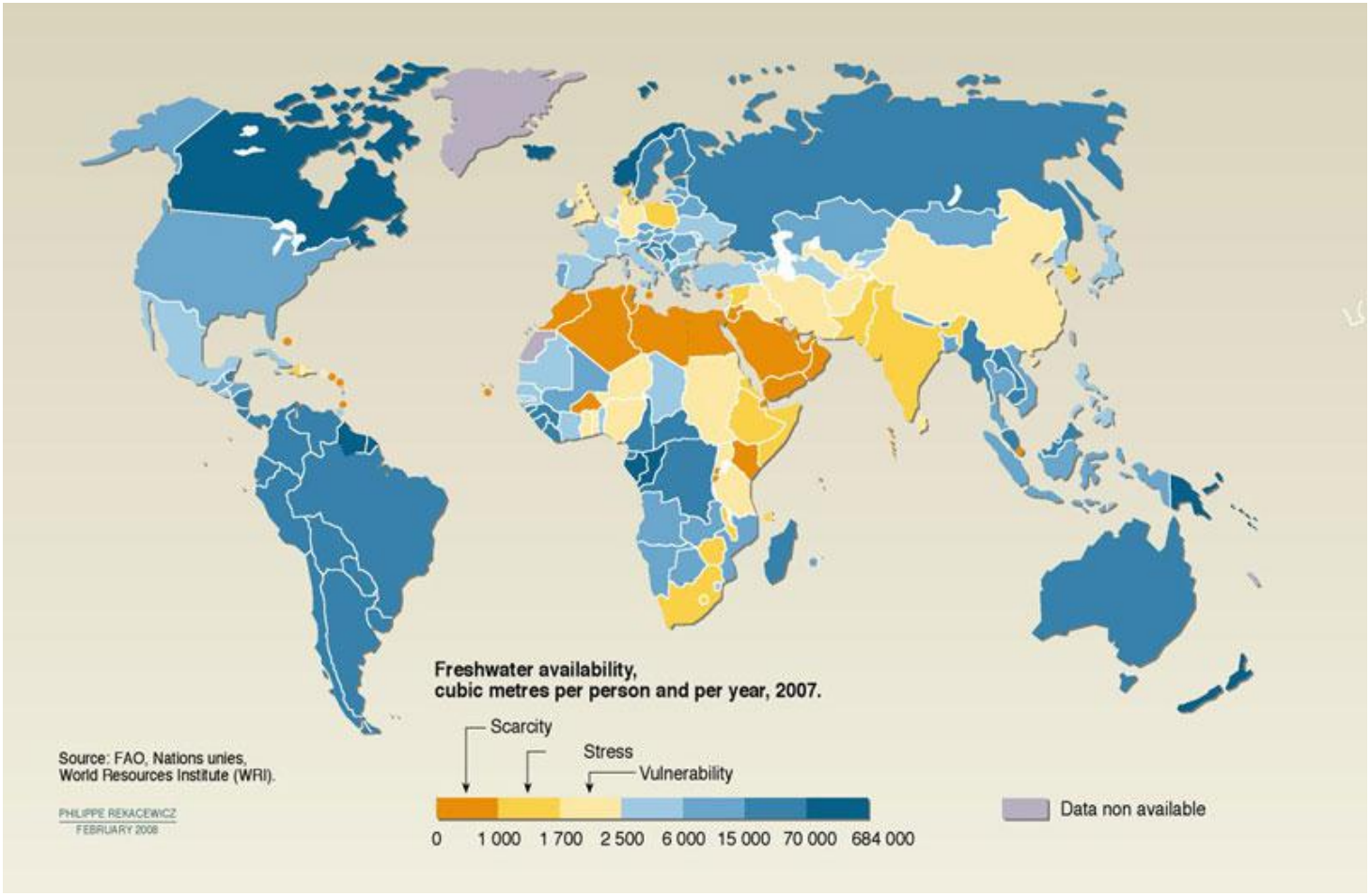
Source: Adapted from Bazilian et al 2011

…unsustainable pressures on these 3 **strategic** resources



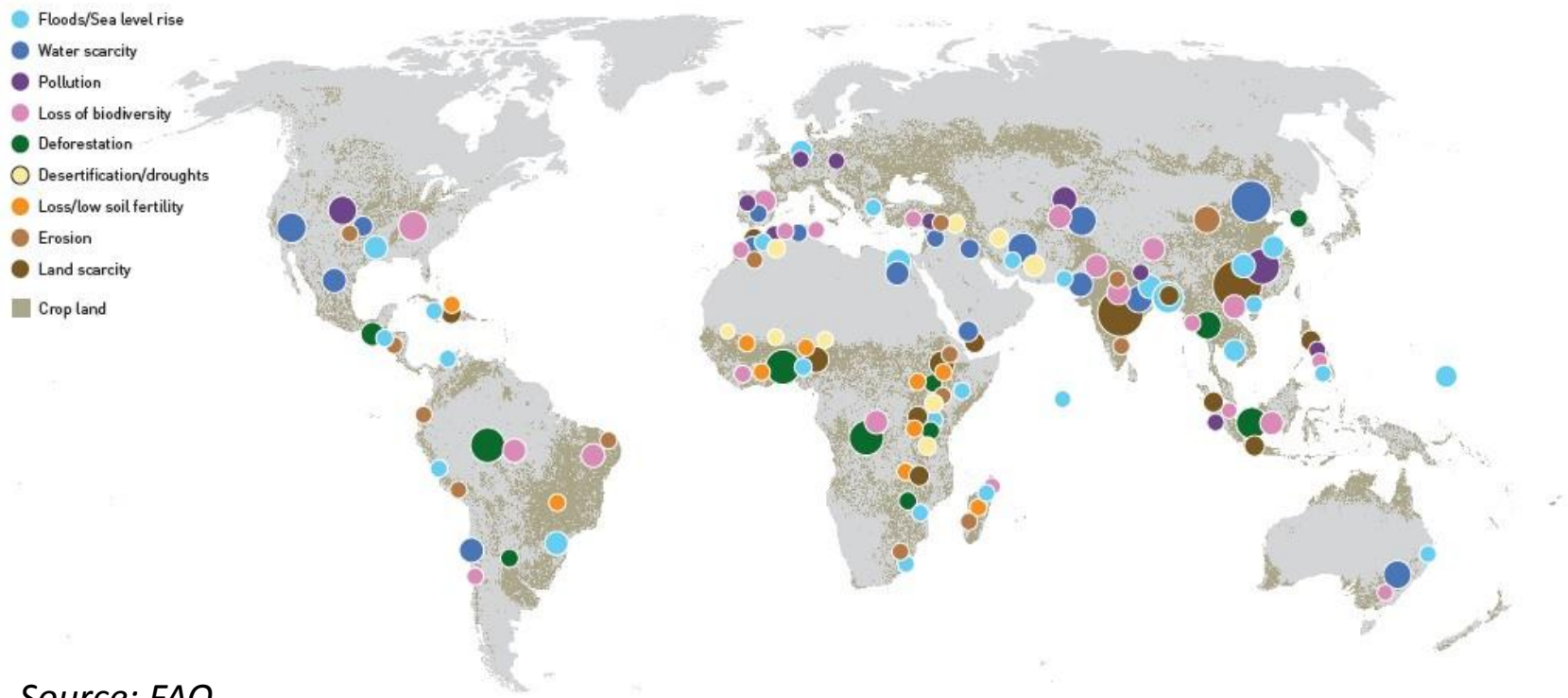
Recognize the consequences of one sector on another to achieve efficiency using systems thinking

Water stress around the globe



A single resource analysis – productivity and availability of water vary between regions

Geographical hot spots for water-food nexus



Source: FAO

Highlighting risks associated with main agricultural production systems and interactions across the nexus (i.e. interdependence between water & food)

International attention on Nexus

Policy conferences

- 2011 World Economic Forum, Davos
- The Bonn Perspective on Rio+20, 2011
- Ministerial Roundtable 'W-E-F Security Nexus, Marseilles
- Water Summit 2013 Abu Dhabi: Bringing WEF Nexus to Life

Academic conferences

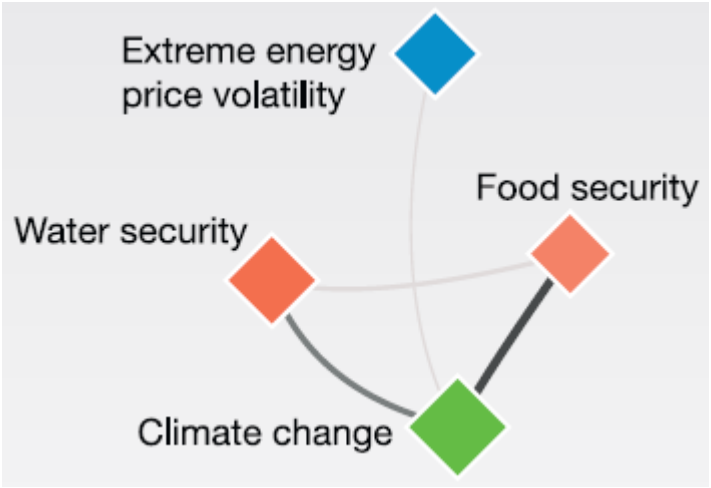
- ReISource: Food-Energy-Water for All, 2012
- Planet Under Pressure: Climate-Energy-Water, 2012

Key publications

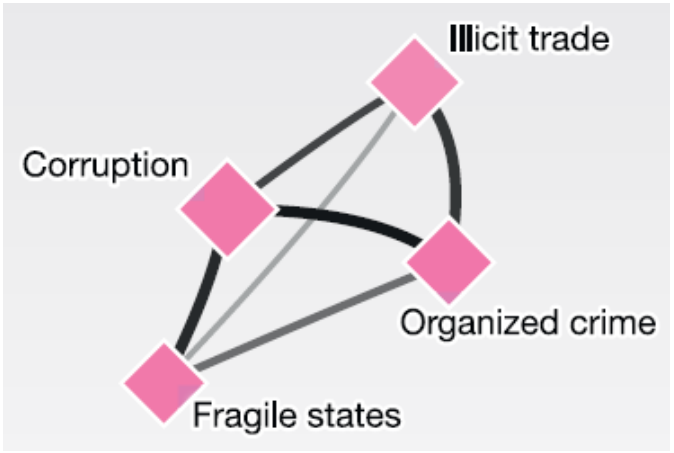
- WEF's 'Water Security'; McKinsey Global Institute's 'Resource Revolution'
- Michael T. Klare *The Race for What's Left; Bringenzu's 'Sustainable Resource Management: Global Trends'*

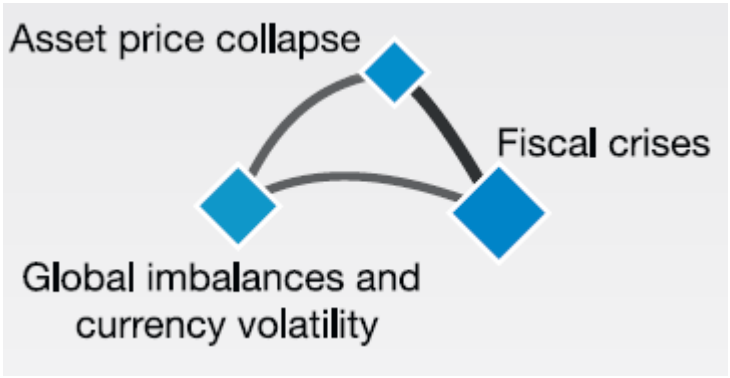
Cross-cutting global risks

Water-food-energy nexus



Illegal economy nexus





Macroeconomic imbalances nexus

WEF 2011

ReISource 2012

"…we are nowhere near realizing the full impact of this yet. We have seen the first indications – rising food prices, pressure on water supplies, a land grab by some countries for mining rights and fertile agricultural land, and rising prices for energy and for key resources such as metals."

Sir David King

U.K. Former Chief Scientific Adviser

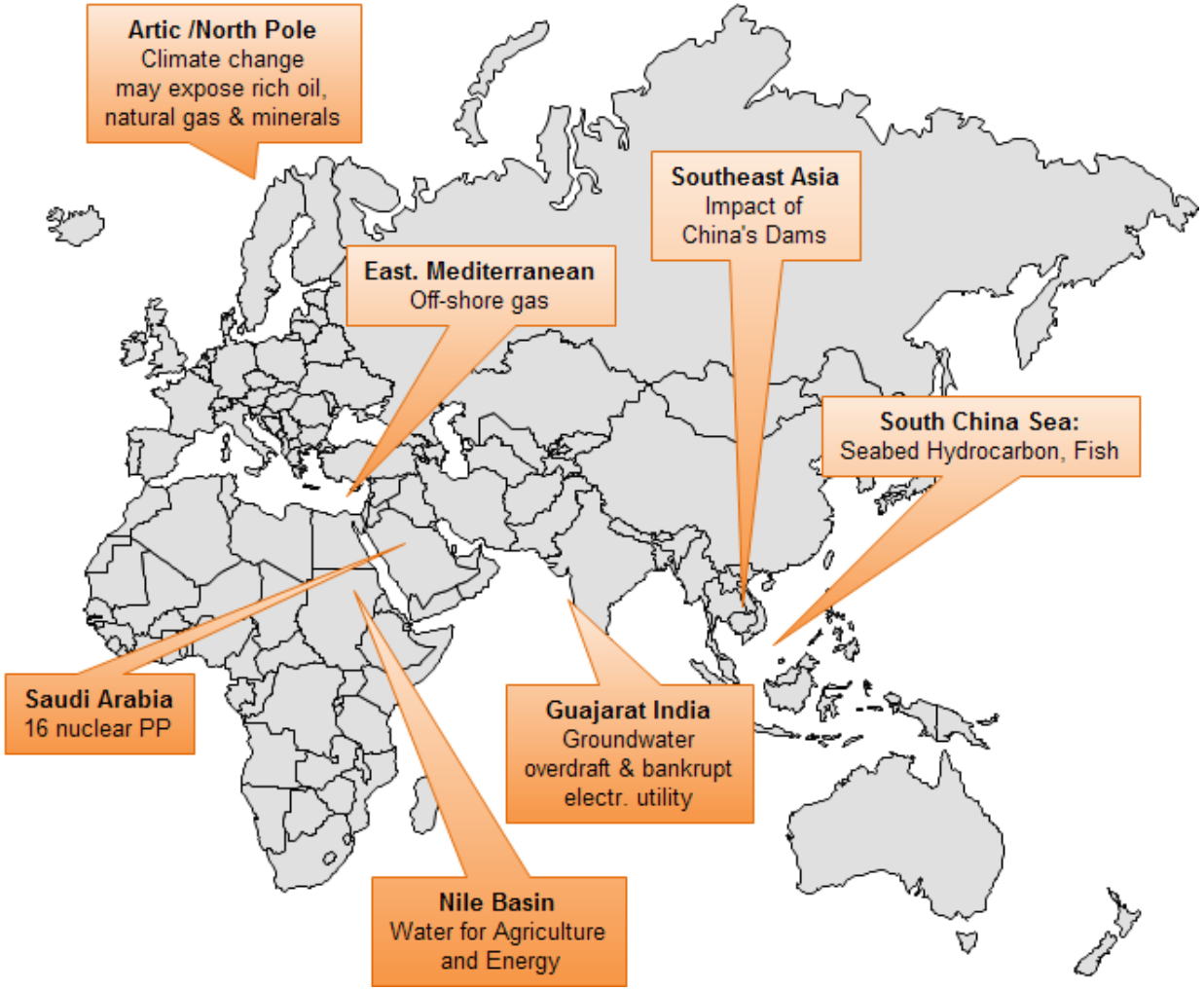
Global fight for natural resources has only just begun

The Guardian

Section 3: The Global Resource Scramble and

NEXUS FLASHPOINTS IN ASIA PACIFIC

Nexus redefining geopolitics?



Inter-state and intra-state tension

New resource geopolitics caused by governance failures not distribution?

Resource challenge in Asia and the Pacific

Since the 1990s, the region has been characterized by rapid urbanization, large investments in infrastructure development, and by the emergence of new consumers

Water security

- 635 million people lack access to safe water & 1.9 billion lack access to effective sanitation

Energy security

- Growth of energy use in the Asia-Pacific region, particularly in China, will have major consequences for geopolitics, financial and energy markets and pollution both regionally and globally

Food insecurity

- The global economic crisis and the food crisis in 2006-08, have deprived an additional 100 million people of access to adequate food

Nexus interdependence

Biofuel	Hydropower	Irrigation
• Cultivation of biomass led to increased usage of freshwater • Increase in water stress in countries that are already facing water shortages • Areal requirements	• Hydropower generation meets 16% of the world's electricity needs • construction of 45,000 large dams • Social and environmental issues abound	• Irrigation accounts for about 15–20% total electricity use (India) • Pumping aquifers faster than they can be replenished, taxing the electricity grid

Nexus Flashpoints

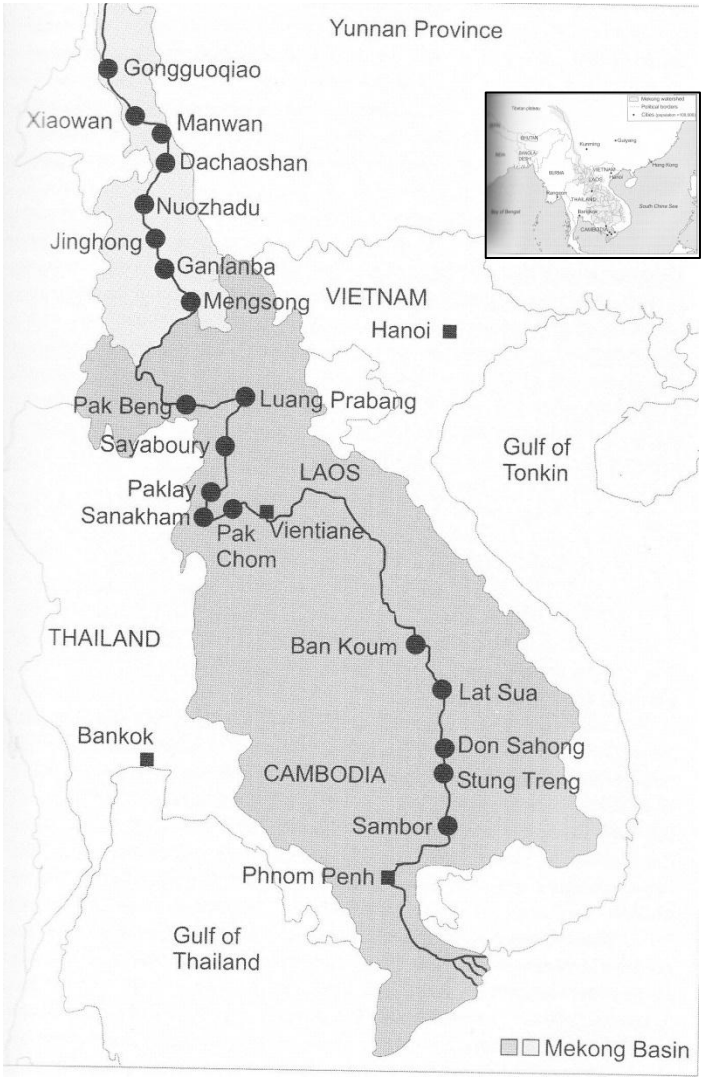
Water resources, irrigation and hydro energy in Central Asia

- Overexploitation of the Syr Darya and Amu Darya rivers over the past half-century has led to the drying out of the Aral
- Conflicts between hydropower and downstream uses, including irrigation (cotton, rice, wheat), ecosystems protection and sustainable fishing
- Kyrgyz Republic releases water in the winter time to generate electricity
- Uzbekistan, Turkmenistan and South Kazakhstan need water in the summer for their irrigation schemes.

Nexus Flashpoints

Energy and food security in the Greater Mekong sub-region

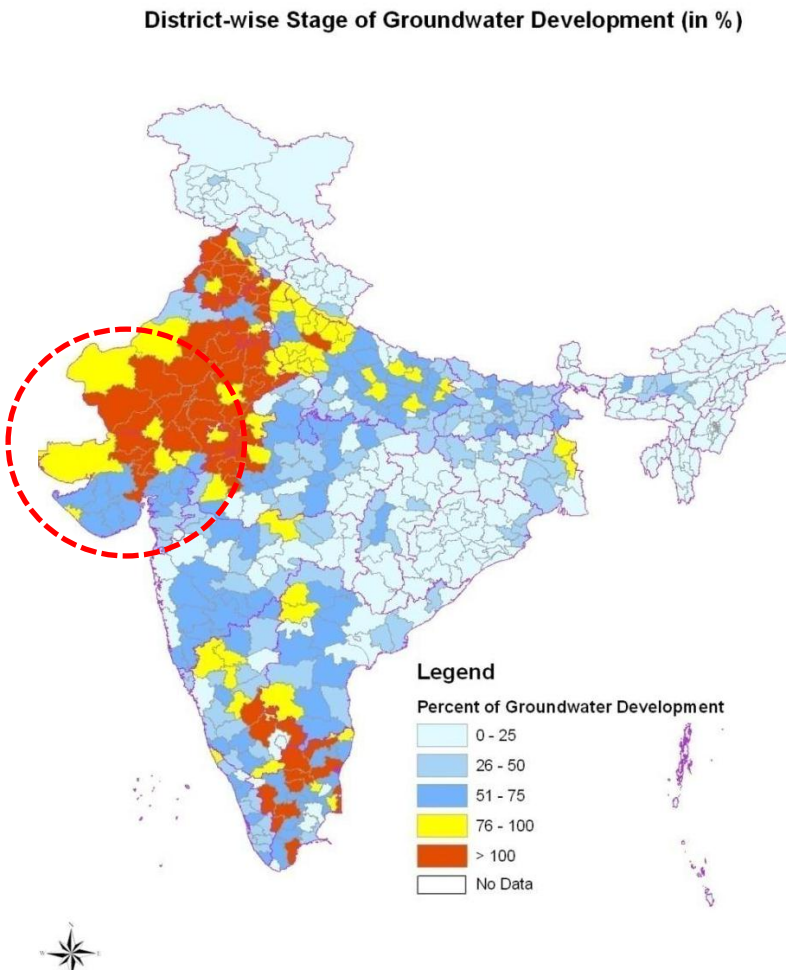
- Cambodia, China, Laos, Myanmar, Thailand and Vietnam aim to enhance sub- regional energy-economic cooperation
- 11 hydropower dams on the free flowing main stem of the lower Mekong River and 77 other dams in the Mekong Basin as a whole
- will reduce fish catch and place heightened demands on the resources necessary to replace lost protein and calories



Nexus Flashpoints

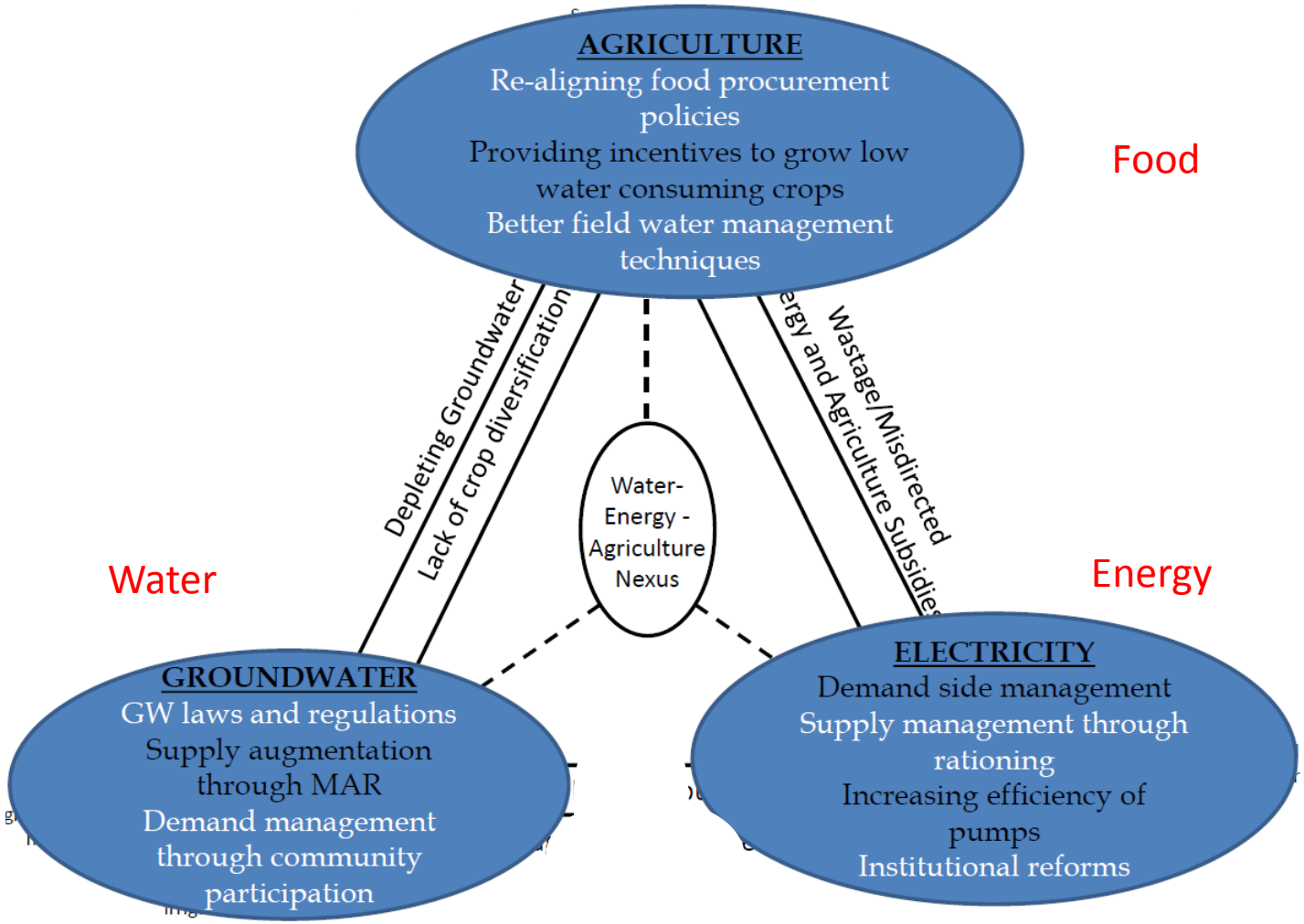
India's Gujarat groundwater overdraft impacting on energy generation

- India's irrigation sector is dependent on groundwater
- Much of this groundwater is pumped using electricity
- Groundwater use is more than sustainable recharge leading to groundwater over-exploitation
- Energy subsidies caused groundwater overdraft for irrigation , causing a nexus
- bankrupted GCB electricity utility and depleted aquifers especially since the late 1980s



Districts depicted in red and yellow are the districts with over-exploitation problems

Nexus Flashpoints → integrated solutions

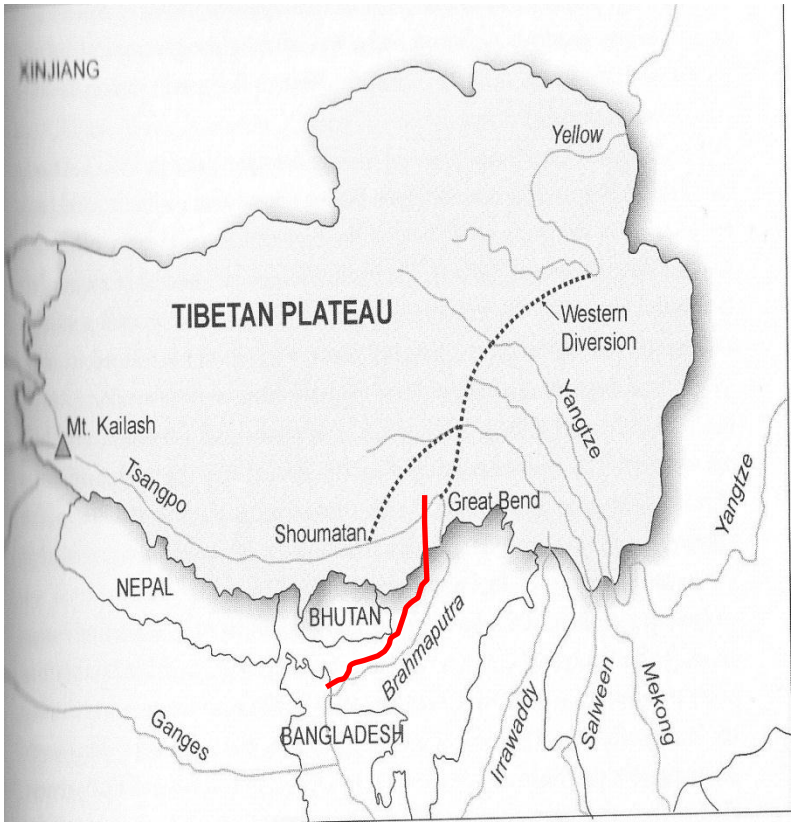


Source: **Aditi Mukherjee, 2012**

Nexus Flashpoints

China's 'Great South-North Water Diversion Project' to dam Brahmaputra river and channel it North

- Likely to dry up several streams in NE India and Bangladesh
- Will affecs rice paddy cultivation on the Assam floodplain
- May worsen Bangladesh's food insecurity problem
- Increase salinity in the delta will impact the Forest of Sundari Trees (UNESCO Heritage)



China plans to construct at the Great Bend a dam twice the size of the Three Gorges Dam

Nexus Flashpoints

Dam development in Papua New Guinea

- Purari Development Association acquired a land lease of 650,000 ha
- Construct giant 1800 MW that would flood much of the valley of River Purari, a sacred ancestral land and sago planting area
- Send power by 500km cable across the Coral Sea to Weipa, Mt Isa and Townsville in Queensland, Australia

South Korea's foreign agricultural investment

- One of the world's biggest food importers
- 2009, Korea Times reported 73 Korean companies were growing grain on 23,000 ha in 18 countries
- Food giant Daesang grows 13,000 ha of maize in Cambodia for shipping back to Korea

Nexus Flashpoints

AUSTRALIA - Droughts in the past decade have left big players bankrupt and selling up. 45 million ha of Australian land ceased production. New acquisition include:

- Australian Agricultural Company sold controlling interest to Dubai's food & fat giant IFFCO and Malaysia's FELDA
- Consolidated Pastures 5.7 million ha of NT grassland was sold to British Terra Firma, a private equity firm
- Canadian company Agrium owns the Australian Wheat Board now named Agrium Asia Pacific limited
- Singapore's Wilmar is buying into Queensland sugar; Olam bought 9,000 ha almond orchards , delivering half of Australia's almond harvest
- San Diego's Summit Global Management spent $20 million buying up water licences in Murray Basin

NEW ZEALAND

- Shanghai Pengxin Group bought 16 farms on North Island from Crafar Farms

Responses

- Sydney Morning Herald – "Australians are in danger of becoming servants and not masters of their own food resources"
- a sense of siege reflected in public outcry

Section 4:

APPLICATIONS OF THE NEXUS PERSPECTIVE

What nexus literature tells (1)

1. *Input output relationship accounting* : nexus characterized in resource efficiency terms
   - China's wind energy consumes 0.64l/kWh of water and produces 69.9g/kWhh of CO2 emission. Wind power could contribute to 23% of carbon intensity reduction, saving 800 million m3, sufficient for use by 11.2 million households (Li et al, 2012)
   - Quantitative information about water withdrawal, consumption and wastewater drainage at each stage of coal supply chain in China (Pan et al 2011)
   - In Texas, 595000 megalitres of water annually (enough for 3 million people for a year) consumed by cooling thermoelectric power plants (Stillwell et al, 2011).

What nexus literature tells (2)

2. *Analysis of institutional and policy dimensions of resource-coupling* – cost, price, polycentric governance
   - Dramatic increase in costs of energy led to decreased domestic water access in Alaska's Northwest, with adverse effects on household hygiene practices (Eichelberger 2010)
   - Low increase in diesel prices over the last few years has resulted in economic scarcity of groundwater, causing negative impacts on crop production and farm incomes in the eastern Indo-Gangetic basin, West Bengal (Mukherje, 2007)
   - Multi-tiered institutional arrangements and resource governance – laws, policies and organizations that operate across jurisdictional levels for management of resources (Scott et al 2011)

What nexus literature tells (3)

3. *Nexus policy options* – target synergies and avoid potential tensions
   - Create institutions to administer and research nexus issues and share the findings
     - Energy and Water Research Integration Act, USA (formulated but not approved)
     - Opportunities for synergy – carbon sequestration through wetlands conservation; energy generation from sewage; EE in water services; restoration of floodplains
   - Develop technologies to build water, energy, and food infrastructure
     - Promote technologies that exploit the potential for more efficient, cost-effective, and local close-loop solutions based on lifecycle analysis
   - Create incentives (and sanctions) to private, public, and civil society to accelerate theses goals
     - increase agricultural power tariffs; limit new power connections for groundwater wells

Section 5:

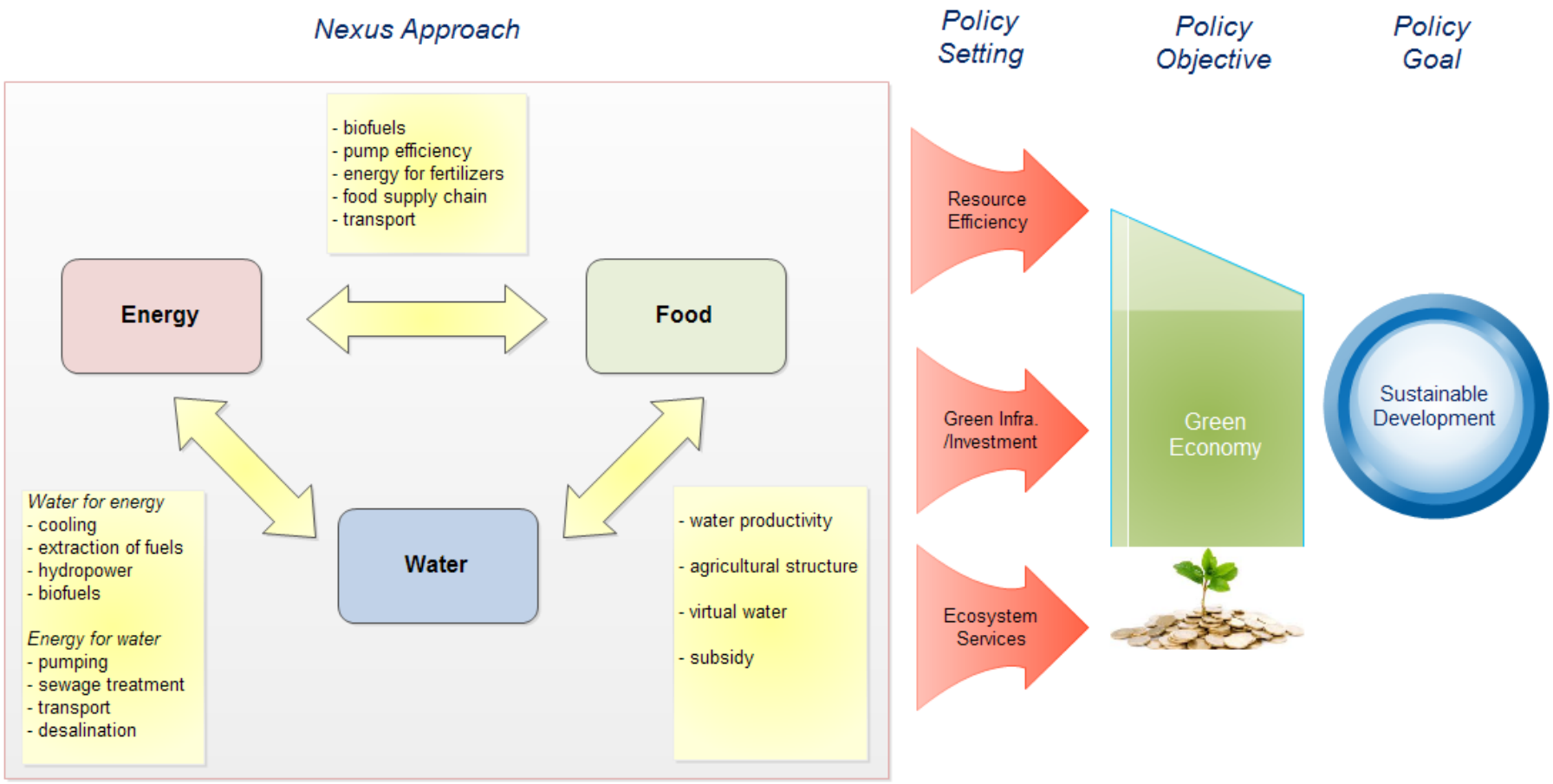
REDEFINING RESOURCES SCARCITY WITH THE NEXUS

New resource realism?

- Problem redefinition guided by the nexus thinking:
  - Resource problem was mainly a local (or national), but in recent years, problems crossing boundary had scaled up, involving supply-chain concerns
  - Scarcity-conflict thesis is gaining currency, but this time at systemic level (supply-chain; polycentric governance)
  - Focusing on the interdependence – understanding the challenges and finding opportunities
  - Countries without supply of virtual water will be vulnerable to market forces

- Ongoing work for UNESCAP:
  - Identify supply-chain shocks and the ensuing policy responses
  - Highlight not only inter-state tension but also intra-state nexus issues

Situating the nexus approach



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- Support transition to sustainability

Concluding remarks

Nexus as a new resource framing

- Resource securitization involving supply chain concerns
- Current nexus framing focuses on input-output analysis, less on solutions; a good understanding of what the problems are
- Asia needs preventive diplomacy to avert conflicts

Moving forward: beyond nexus accounting

- Adopt green economy + growth
- Reorientate government policy framework
- Empower a policy process accommodating 'institutional' and systemic thinking