

AYUBOWAN, VANAKAM, GREETINGS

Meeting the challenges of climate change adaptation & SDG compliance in S. Asia using sustainable water resource management

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**Opening keynote speech given at the Regional Conference on
Climate Change Risks in Water Resources Management in S. Asia
organised by the International Water Management Institute
Colombo, 12-13 July 2016**



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Congratulations to IWMI for organising this timely meeting, and thanks for inviting me to speak. I hope to explore nexus of water, climate change and sustainable development goals in S. Asia & show how sustainable water resource management (SWARM) can solve problems.

The paper is in 3 parts:

1.ISSUES - SD, water, climate

2.FRAMEWORK - SWARM

3.SOLUTIONS - knowledge, policy, inst.



1. ISSUES: Risks of Global Breakdown due to Multiple Shocks

- Financial-economic crisis: Asset bubble
- Persistent poverty and growing inequity
- Resource shortages: water, food, energy
- Environmental harm, extreme events, conflict mass migrations, pandemics
- **Climate change: the ultimate threat amplifier**

**Multiple threats are inter-related and synergistic. Stakeholder interests divergent. Responses are uncoordinated & piecemeal – lack of leadership
Integrated & comprehensive approach needed.**

a) Ecol. Footprint of Humanity

**In 2012 we needed 1.5 earths;
and by 2030 almost 2 Earths**

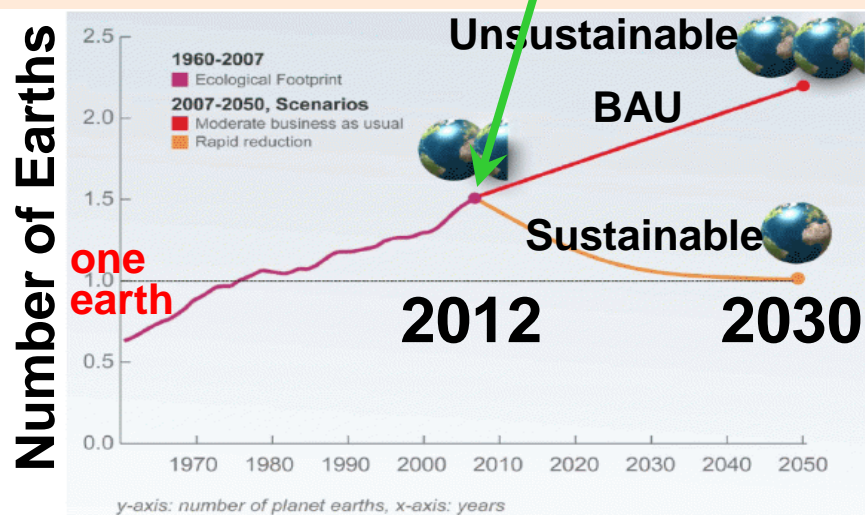
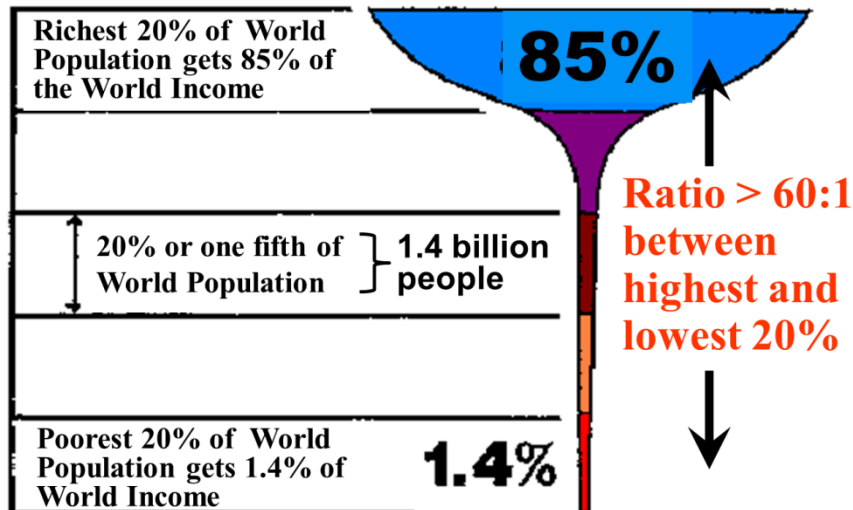


Figure 1: pathways into the future. How long can overshoot be sustained? What's the cost and benefit of each path?

b) Unfair World Consumption Pattern 2010

Pattern 2010

Champagne Glass



2014 Wealth distribution: 85 richest > 3.5 billion poorest (50% pop.)

1% richest > 99% of remaining population

c) 8 Millennium Development Goals (MDG)

United Nations Millennium Declaration, 2000

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality & empowerment
4. Reduce child mortality
5. Combat HIV/AIDS, malaria & other diseases
6. Improve maternal health
7. Ensure environmental sustainability
8. Global partnership for development

Worthy targets, but if the rich consume more than one planet worth, where are the resources to feed the poor, esp. after CC.

World Water – Some Facts & Issues

Multiple resource crises & human survival times – **water is critical:**

- **Water - days**
- **Food - weeks**
- **Energy - months/years**
- **Climate - decades/centuries**

Daily, a person drinks 2-3 litres of water, but eats 2-5000 litres of VIRTUAL water embedded in food.

- **2.5 billion lack access to improved sanitation**
- **About 800 million lack access to improved drinking water**
- **6-8 million die from water related diseases and disasters a year.**
- **By 2025, 1.8 billion people will live in countries with absolute water scarcity, & 2/3 of the world's population will live under water stressed conditions**
- **85% of the world population lives in the driest half of the planet**
- **Water availability will decrease in many regions, but future global agricultural water consumption alone will increase almost 20% by 2050. Agriculture accounts for ~70% of global freshwater withdrawals.**
- **About 66% of Africa is arid or semi-arid and more than 300 of the 800 million people in sub-Saharan Africa live in a water-scarce environment – meaning that they have less than 1,000 m³ per capita (NEPAD, 2006).**
- **With the existing CC scenario, half the world's population will experience high water stress by 2030, displacing millions and creating environmental refugees.**

The Emerging World of Sustainable Water Resources Management (SWARM)

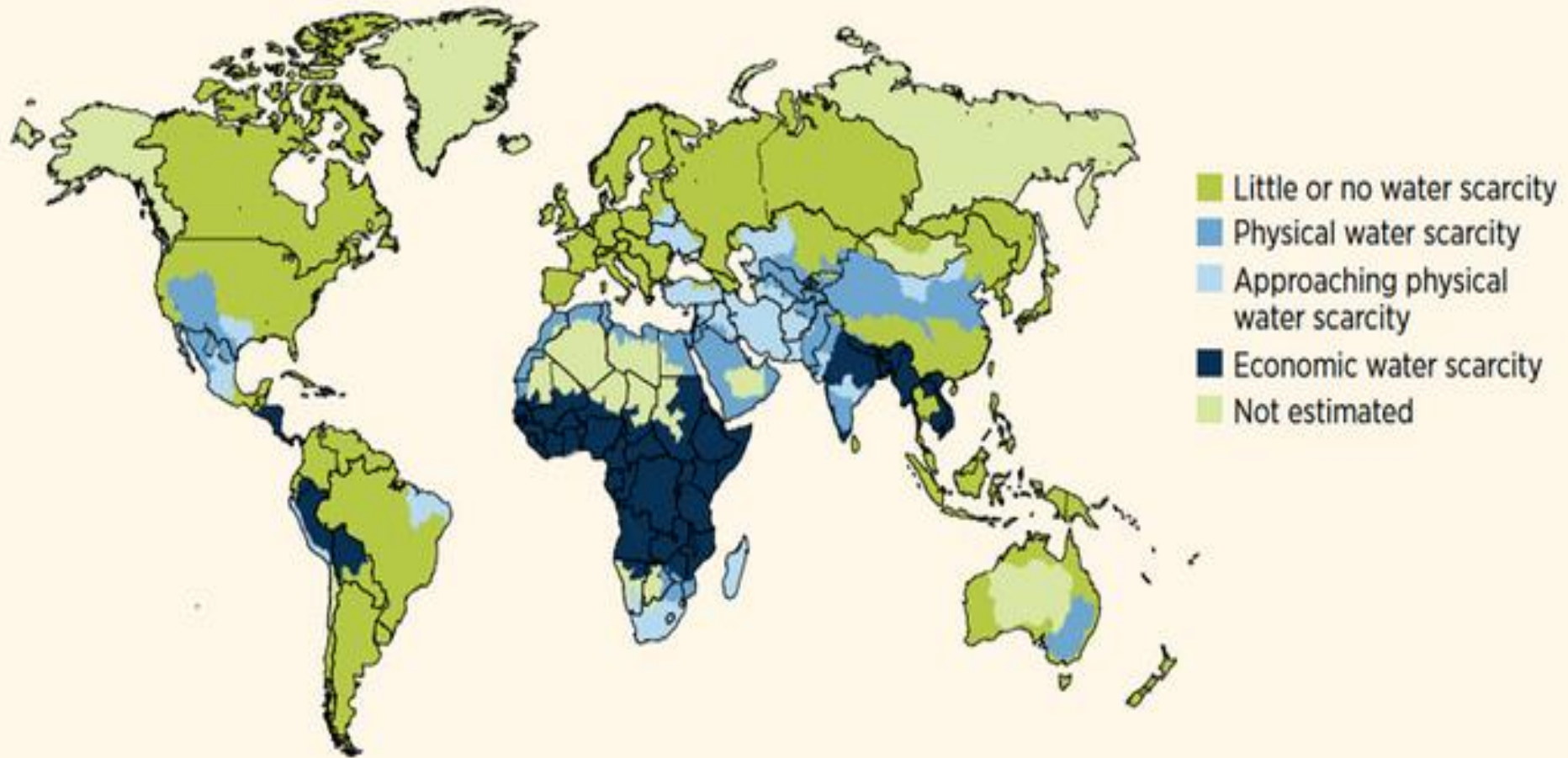
- Challenges and Opportunities

- **Meet growing water needs for development**
- **Maintain cost effectiveness and financial viability**
- **Ensure secure and diverse water supply**
- **Provide affordable and reliable water services**
- **Protect the environment and the planet**
- **Balance competing water uses and avoid conflict**
- **Address governance/privatisation issues**

Freshwater supply costs are rising rapidly due to:

- **Water scarcity and conflict**
- **Mismanagement**
- **Increasing distance of water sources from users**

Global Water Scarcity

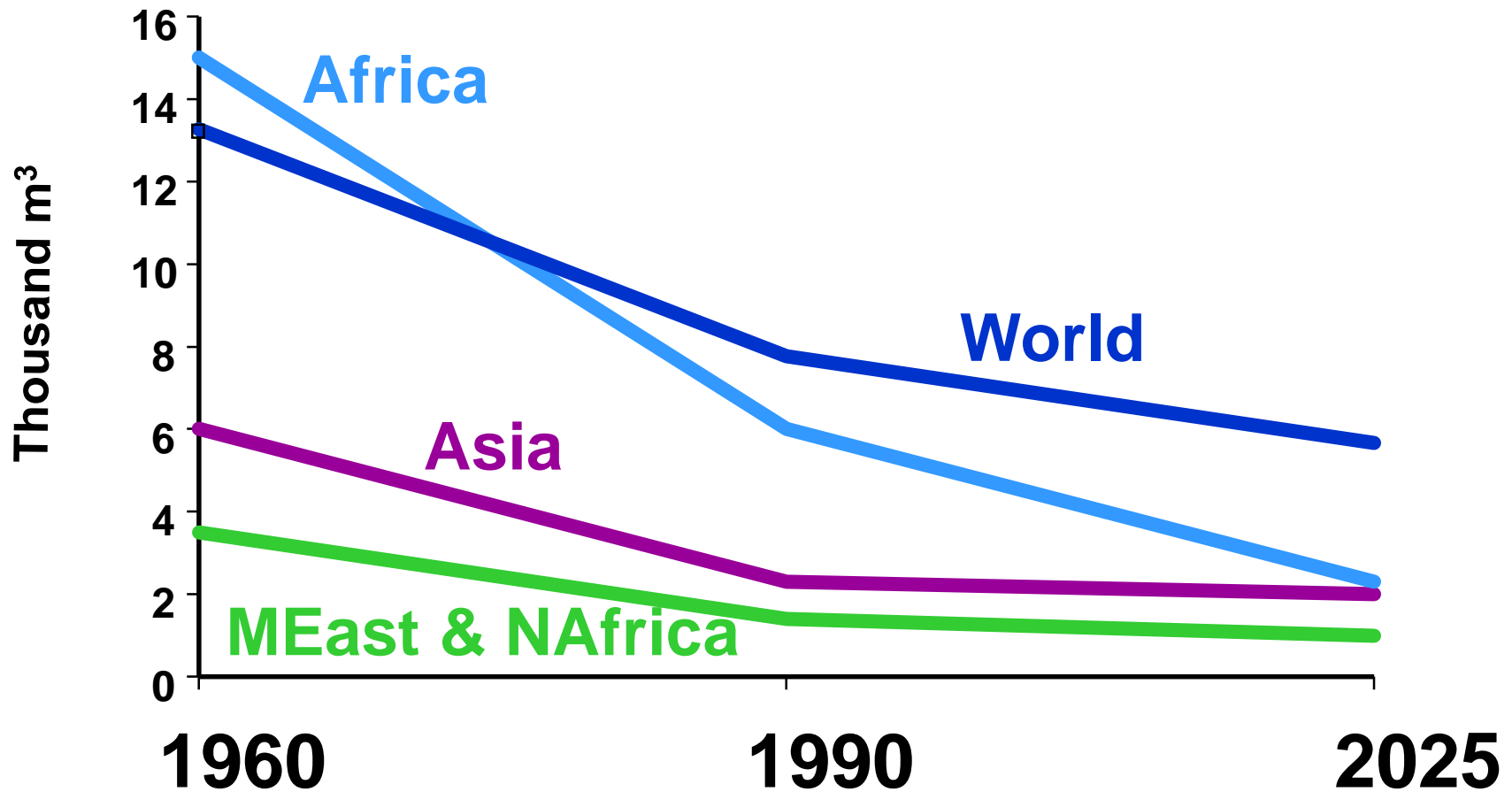


Water sector problems worsen sharply below 2500 cu.m/capita/yr.
Water stress ensues at ~2000 cu.m & water scarcity at ~1000 cu.m

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Source: [World Water Development Report 4](#).
World Water Assessment Programme (WWAP),
March 2012.

Falling per capita water availability



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Fresh water resources (examples)

| | Total Water Resources (Cu. M per capita per year) |
|--------------|--|
| Sri Lanka | 2,634 |
| India | 1,913 |
| Pakistan | 1,892 |
| Saudi Arabia | 119 |
| Brazil | 32,256 |

Water sector problems worsen sharply below 2500 cu.m/capita/yr.
Water stress ensues at ~2000 cu.m & water scarcity at ~1000 cu.m



Water Resources – Many Uses, Many Users

Sustainable Water Resources Management

Infrastructure for
management of
floods and
droughts,
multipurpose
storage, water
quality and source
protection

Institutional
framework

Management
instruments

Political economy
of water
management

Water
supply &
sanitation

Irrigation
&
drainage

Energy

Environ-
mental
services

Other
uses
including
industry
and
navigation

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Competition among sector - recent relative water withdrawals

| | Water Use as share of total use (%) | | |
|---------------|-------------------------------------|-------------|-----------|
| | Domestic | Agriculture | Industry |
| Low Income | 4 | 91 | 5 |
| Middle Income | 13 | 69 | 18 |
| High Income | 14 | 39 | 47 |
| World | 8 | 70 | 22 |

Example: water extraction and bottling is causing increasing problems for the poor in accessing water



Food Scarcity – Main causes

~1billion hungry people in the world: many children

Water Related Natural Disasters

(eg., severe droughts & floods in poor countries)

Conflict

(eg., Sub Saharan Africa since 1960s)

Climate Change

(floods, droughts, changing weather patterns)

Mis-governance & Misuse of State Power

Access to Clean Water

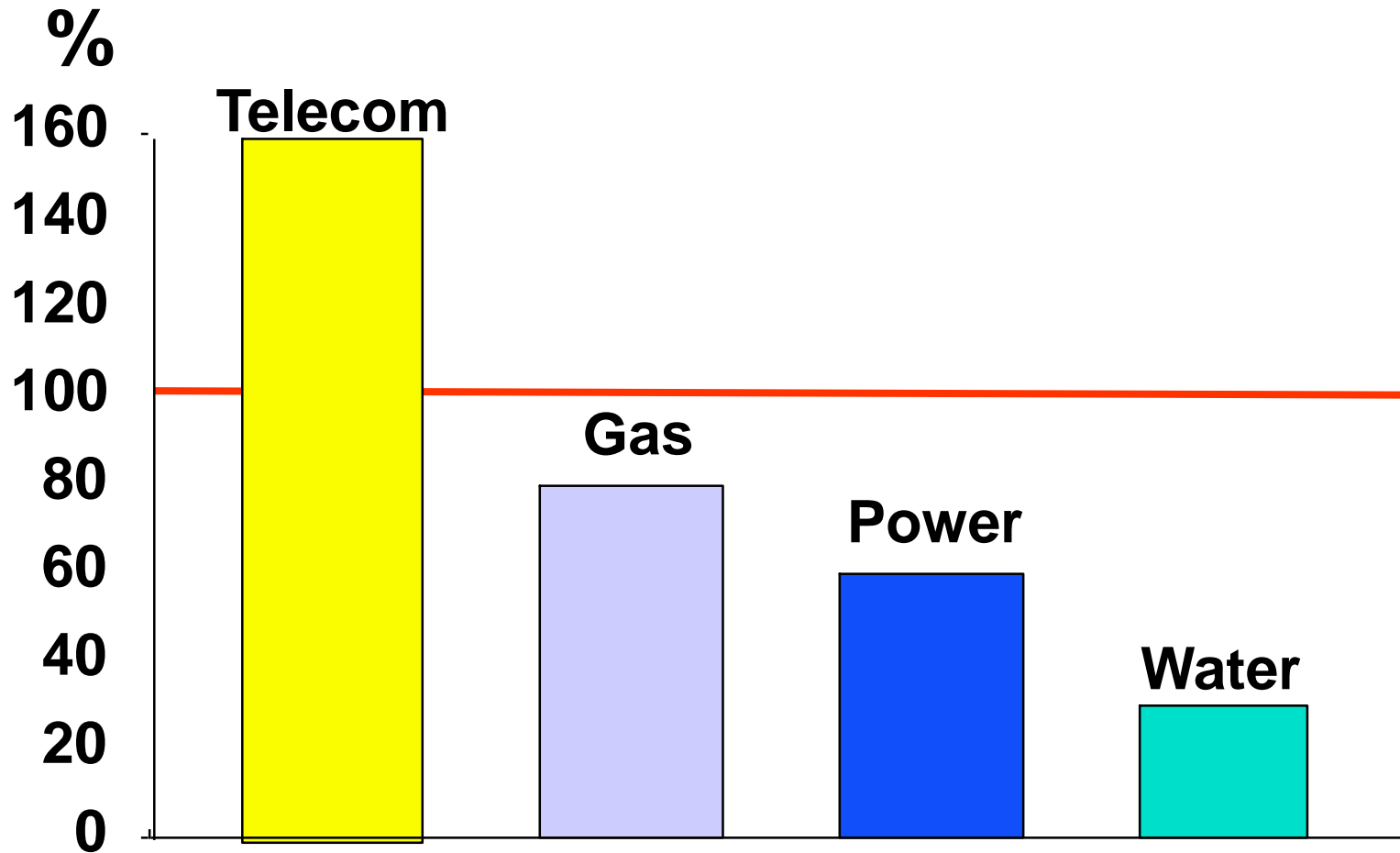
- +** The number of people with access to clean water has **doubled** in the last 20 years.
- **Over 1 billion** people in the world still do not have access to safe water. This is **~15%** of the population. The UN estimates that by 2025, **75%** of the world population **will lack** reliable, clean water.

Water & Health

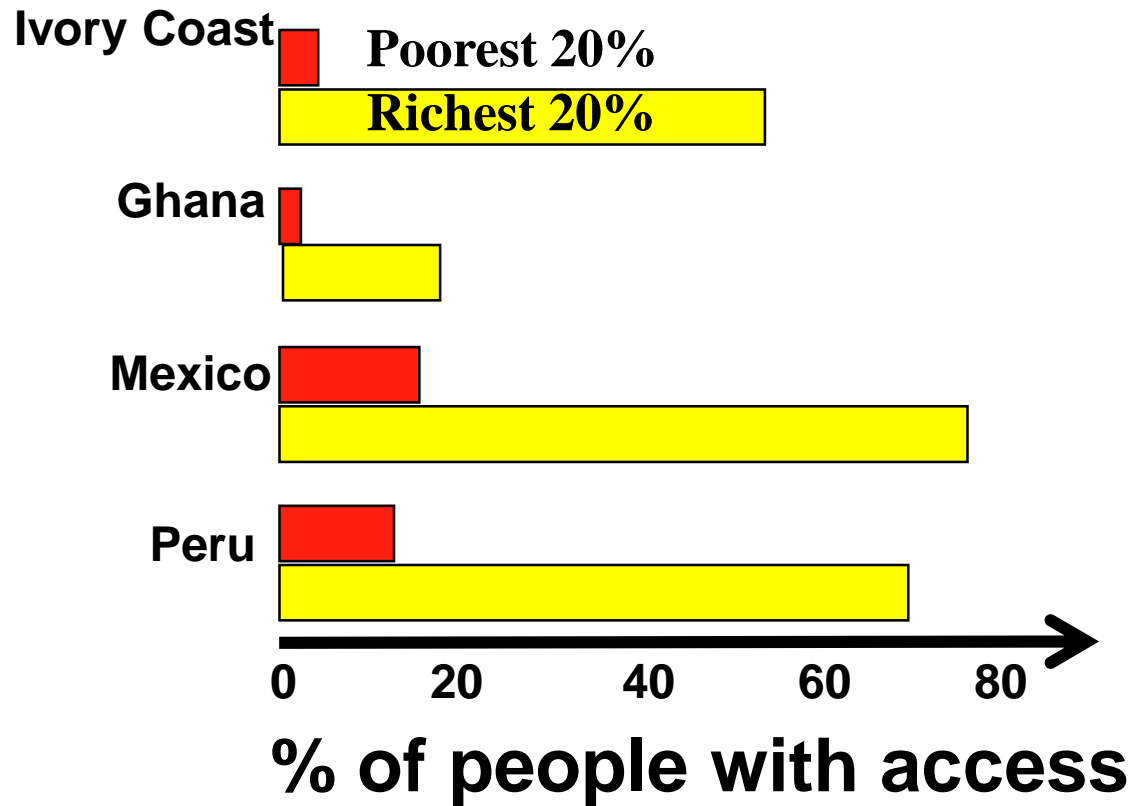
80% of all illness in developing countries is caused by water related diseases.

90% of wastewater in developing countries is discharged directly into rivers and streams without treatment.

Poor cost recovery in water and sanitation sector constrains financing in developing countries



Equity: when services are rationed, the poor get rationed out



S. Asia: Key Water Related Areas at Stake 1

Multiple threats due to: CC, demographic pressures, environmental degradation, unplanned use, political boundaries & mismanagement

1. Monsoon & Food Security

- Important culturally, to livelihoods and food security of the region - “Finance Minister” of the region
- Agriculture in South Asia – all countries get affected by a transformation of the monsoons
- Climate change - now enough evidence that the monsoons are being affected by CC.
- Greater frequency of extreme events, Ex: prolonged drought and high intensity rainfall
- The degree of unpredictability has increased.
- most climate models are unable to cope with these changing patterns, since they are based on trends with more regular and constant monsoon phenomena

2. Bio-Diversity

- Rich biodiversity is integral to the region’s productivity and economic wellbeing
- Being impacted by demographic pressures, environmental degradation and CC

3. Mountains and the Oceans

- Region contains world’s highest mountains,
- Vast expanse of deep oceans
- Glaciers - livelihood of hundreds of millions depends on
 - The great river systems of the northern plains
 - The glaciers and standing ice of the Himalaya literally constitute the water reservoir for much of South Asia

S. Asia: Key Water Related Areas at Stake 2

4. Sustainable Development of Hydropower

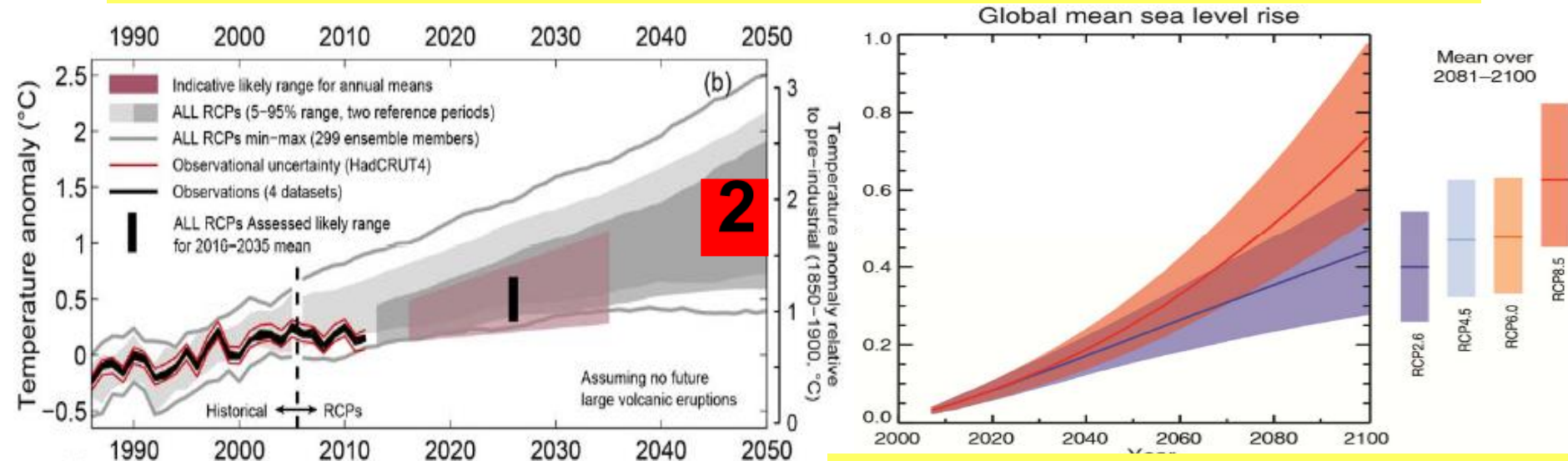
- Climate change and hydropower are inextricably linked; contributes to climate change mitigation
- CC impacts on hydropower
 - Alteration to river flow patterns
 - impacts on glaciers
 - excessive sediment in water – affect efficiency and sustainability of hydropower plants
 - abrasive sediment particles in high concentrations are transported cause severe damage to the equipment, reducing the availability of the plant.
 - Sediment inflow also reduce the capacity of reservoirs, leading to lower peak capacity. The relative young mountain ranges of South Asia are particularly vulnerable to erosion (natural and man-made), negatively impacting the viability of hydropower investments.
- Environmentally-sustainable and climate-resilient hydropower development is a common goal for S.Asia, and one that can be supported through regional cooperation

5. Blue Economy: Ensure Ocean Health & Ocean-Based Wealth - Key areas

- Regional cooperation would help to better achieve the blue economy aspirations of individual South Asian countries and for the region as a whole
- Economic development;
- Security (national & regional);
- Ecological functions in maintaining and driving ocean-based wealth;
- Access rights;
- Fish stocks & Illegal Unregulated and Unreported (IUU) activities

IPCC: Predicting the Global Climate of 2100

GHG conc. trends: 2-3 times pre-ind. level (280 ppmv)



Temp. rise ~2C (2050), ~3C (2100)

Sea level rise ~ 40 to 70+cm

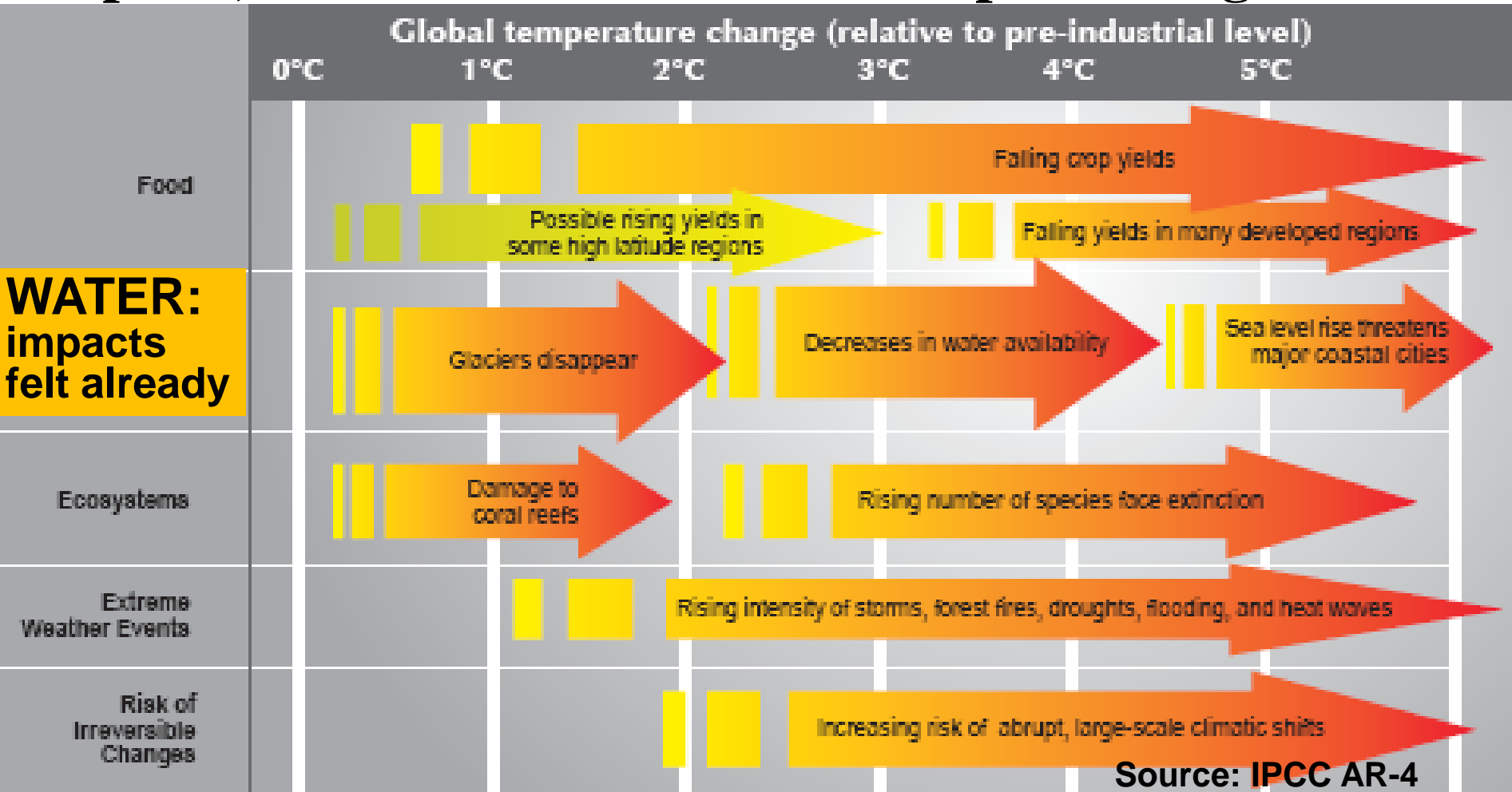
Agreed dangerous limit is +2C (Paris COP21 accords). BUT
MITIGATION: Post-Paris pledges mean we still face 2+C temp. rise

ADAPTATION: WE CAN PROTECT THE MOST VULNERABLE

- **People:** Poor, Children, Elderly.
- **Regions:** Small Islands, Asian megadeltas, Sub-saharan Africa, Arctic.
- **Sectors & Ecosystems:** Coral reefs, sea-ice regions, tundra, boreal forests, mountain and Mediterranean regions, low-lying coasts, mangroves & salt marshes; Water resources in mid-latitudes & dry tropics; Low-latitude agriculture; Human health where adaptive capacity is low.

Global Impacts of Climate Change

At 2C, Food & Water impacts are severe. Ecosystem impacts, extreme events and catastrophic changes worsen



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Global Mean Precipitation Change

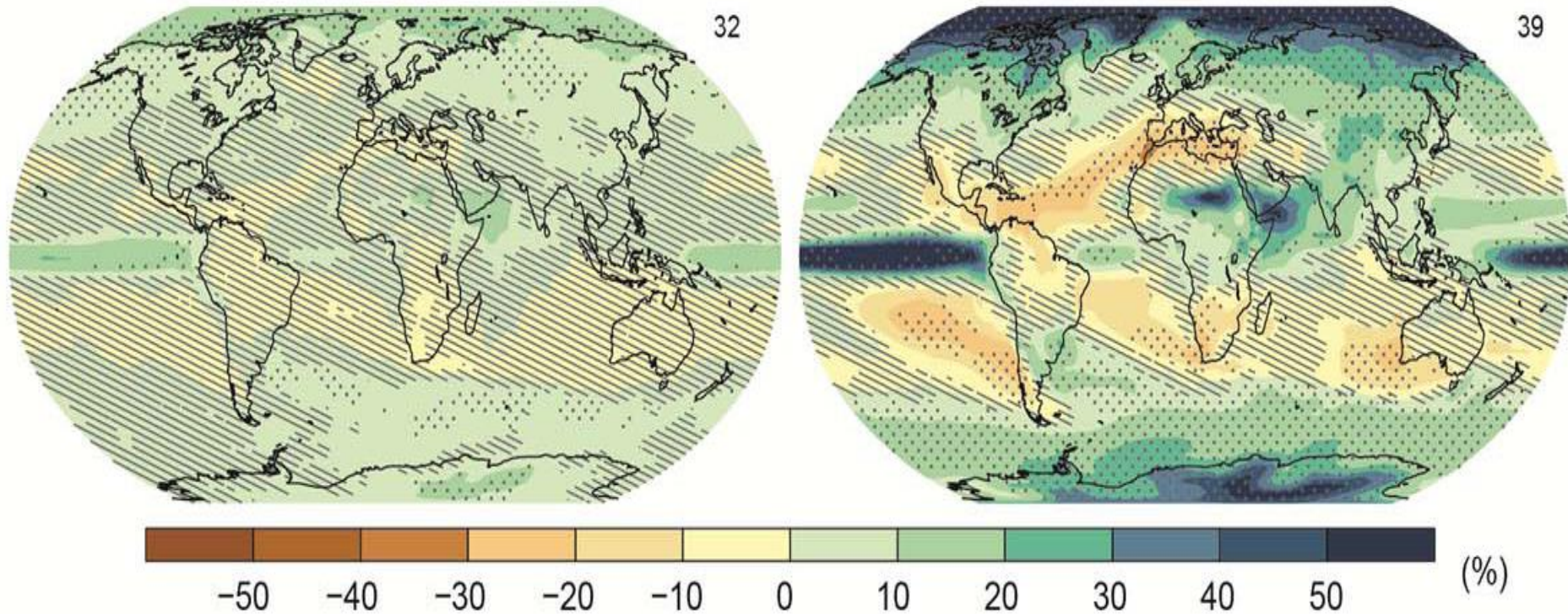
1995-2090: Dry areas get dryer & wet areas get wetter

Best Case RCP2.6

Worst Case RCP8.5

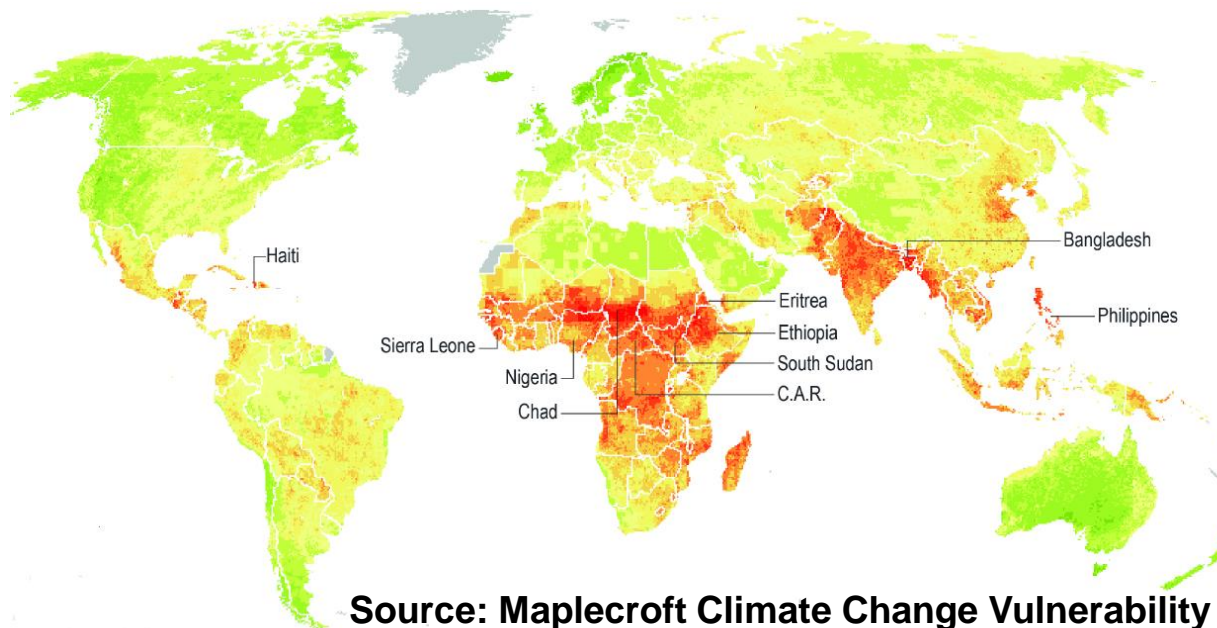
(b)

Change in average precipitation (1986-2005 to 2081-2100)



South Asia is highly vulnerable to climate change impacts on water resources

- **Climate Change** -Impacts of the changing climatic conditions are greater in S. Asia
- **High dependence on water resources** - which controls the performance of many important economic sectors like agriculture, energy, industry, rural & urban dev.
- **High population** -nearly 1.7 billion people spanning 8 countries
- **Weak infrastructure** - associated with high poverty levels,
- **Poor irrigation schemes** in drought-prone areas, especially in semi-arid zones,
- **Diverse topography** - variety of mountains, plateaus, dry regions, beaches, etc.
- **Diverse ecosystems** - include glaciers and snow-capped mountains (the Himalayan range), low-lying areas (Sunderbans, the Maldives), deserts (in Afghanistan, India, and Pakistan), and dense forests (Nepal, India, Bhutan in particular).
- **Ecologically integrated**- one of the most integrated regions of the world



| Rank | Country | Category |
|------|--------------|----------|
| 1 | Bangladesh | Extreme |
| 2 | Sierra Leone | Extreme |
| 3 | South Sudan | Extreme |
| 3 | Nigeria | Extreme |
| 5 | Chad | Extreme |
| 6 | Haiti | Extreme |
| 7 | Ethiopia | Extreme |
| 8 | Philippines | Extreme |
| 9 | C.A.R. | Extreme |
| 9 | Eritrea | Extreme |

Legend

Low Risk

Extreme Risk



Source: Maplecroft Climate Change Vulnerability Index 2015

Climate-Water Risks in South Asia

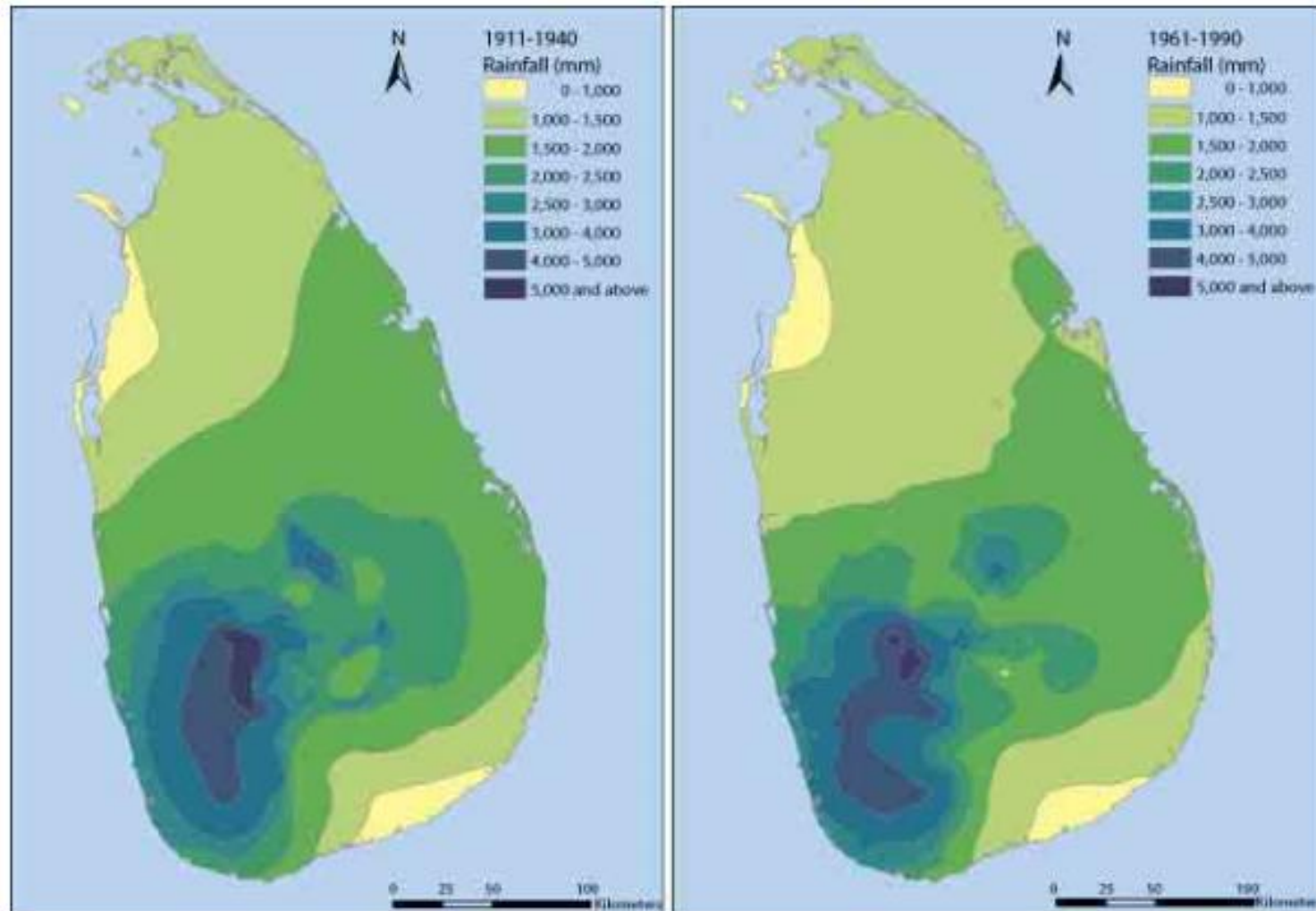
- **Floods:**
 - High intensity of monsoonal rains causes flooding of the large rivers
 - 2007: Ganges and Brahmaputra rivers affected over 13 mn people in Bangladesh;
 - 2010 flooding in Pakistan severely affected 20 mn people
 - 2015, heavy rains caused severe flooding in Chennai.
 - Storms and cyclones cause flooding across coastal regions of Bangladesh, India, Pakistan and Sri Lanka.
 - Excess rainfall can cause local flash flooding, mostly in mountainous areas.
 - Glacial lake outburst floods (GLOF) cause flash floods in the HKH mountains when unstable terminal lakes, formed by retreating glaciers, breach their walls.
- **Droughts**
 - greatest number of deaths and economic losses.
 - reduce surface water availability but also reduce groundwater recharge.
 - declining groundwater levels lead to saltwater intrusion into aquifers.
- **Erosion and landslides**
 - particularly in the foothills of the HKH.
 - high riverine sediment causes siltation of dams reservoirs and channels

Climate risks are Water related: by Country

| | Afghanistan | Bangladesh | Bhutan | India | Nepal | Pakistan | Sri Lanka |
|------------------------|---|--------------------------|---|--------------------------|---|--------------------------|--------------------------|
| High risk level | Landslide | Riverine flood | GLOF | Drought | GLOF | Drought | Drought |
| | Drought | Groundwater salinization | Flash flood | Groundwater depletion | Flash flood | Groundwater depletion | Storm/cyclone |
| | Groundwater depletion | Storm/cyclone | Landslide | Riverine flood | Landslide | Landslide | Groundwater salinization |
| | | | | Landslide | | | |
| Medium risk level | Riverine flood | Coastal flood | Drought | Storm/cyclone | Drought | Flash flood | Riverine flood |
| | Erosion/siltation | Drought | Erosion/siltation | Groundwater salinization | Erosion/siltation | Groundwater salinization | Groundwater depletion |
| | Flash flood | Groundwater depletion | Storm/cyclone | Flash flood | | Erosion/siltation | Flash flood |
| | | | | | | Coastal flood | |
| Low risk level | GLOF | Erosion/siltation | Riverine flood | GLOF | Riverine flood | Storm/cyclone | Erosion/siltation |
| | Storm/cyclone | Flash flood | Groundwater depletion | Coastal flood | Storm/cyclone | GLOF | Landslide |
| | | Landslide | | Erosion/siltation | Groundwater depletion | Riverine flood | Coastal flood |
| Risks are non-existent | Coastal flood | GLOF | Coastal flood | | Coastal flood | | GLOF |
| | Groundwater salinization (caused by sea-level rise) | | Groundwater salinization (caused by sea-level rise) | | Groundwater salinization (caused by sea-level rise) | | |

Example: Sri Lanka Expansion of the dry zone: 1911-1990

Comparison of average precipitation from (a) 1911-40 to (b) 1961-90



MIND

(Source: Imbulana et al. 2006)

Impacts of Climate Change on South Asian Water Resources

- **Increase in temperatures with droughts occurring more often**
- **Changes in precipitation**
 - increase in annual precipitation across the Himalayan region, Nepal and Sri Lanka with smaller increases in Bhutan.
 - reduction in precipitation in lower parts of Afghanistan and India, Bangladesh and Pakistan.
 - increase in extreme rainfall
- **Change in seasonal flows**
 - in Indus Basin due to high reliance on ice melt,
 - in the Ganges and Brahmaputra Rivers could lead to increased flooding.
- **Increased demand for water for irrigation due to temperature rise**
- **Increased frequency and intensity of droughts and floods.**
- **Groundwater recharge affected**
- **Sea-level rise (from ocean warming and melting ice-caps) and cyclones and storms, leads to salt water intrusion in estuaries and coastal aquifers**
 - Bangladesh highly vulnerable to rising sea-levels,
 - Coastal regions of Pakistan, India and Sri Lanka will also be affected.

S. Asia: Transboundary Impacts of Climate Change

IMPACTS

1. TEMPERATURE

- Warming above the global mean in central Asia, the Tibetan Plateau, northern, eastern and southern Asia.
- Fewer very cold days in South Asia.

2. PRECIPITATION, SNOW AND ICE

- Increase in precipitation in most of Asia. Decrease in precipitation in central Asia in Summer.
- Increase in the frequency of intense precipitation events in parts of South Asia.
- Increasing reduction in snow and ice in Himalayan and Tibetan Plateau glaciers

3. EXTREME EVENTS

- Increasing frequency and intensity of extreme
 - droughts during the summer months and El Niño events;
 - increase in extreme rainfall and winds associated with tropical cyclones in East Asia, Southeast Asia and South Asia;
 - intense rainfall events causing landslides and severe floods;
 - heat waves/hot spells in summer of longer duration, more intense and more frequent, particularly in East Asia.

SECTORAL VULNERABILITIES

A. WATER

- water stress due to decrease of freshwater availability
- Increase in the severity of glacial melt-related floods, slope destabilization & decrease in river flows as glaciers disappear.

B. AGRICULTURE AND FOOD SECURITY

- Decreases in crop yield for many parts of Asia ; risk from hunger.
- Reduced soil moisture, evapotranspiration; increase land degradation desertification
- Agriculture may expand in productivity in northern areas.

C. HEALTH

- Heat stress
- changing patterns in the occurrence of disease vectors
- Increases in endemic morbidity and mortality due to diarrhoeal disease
- Increase in the abundance and/or toxicity of cholera in south Asia.

D. TERRESTRIAL ECOSYSTEMS

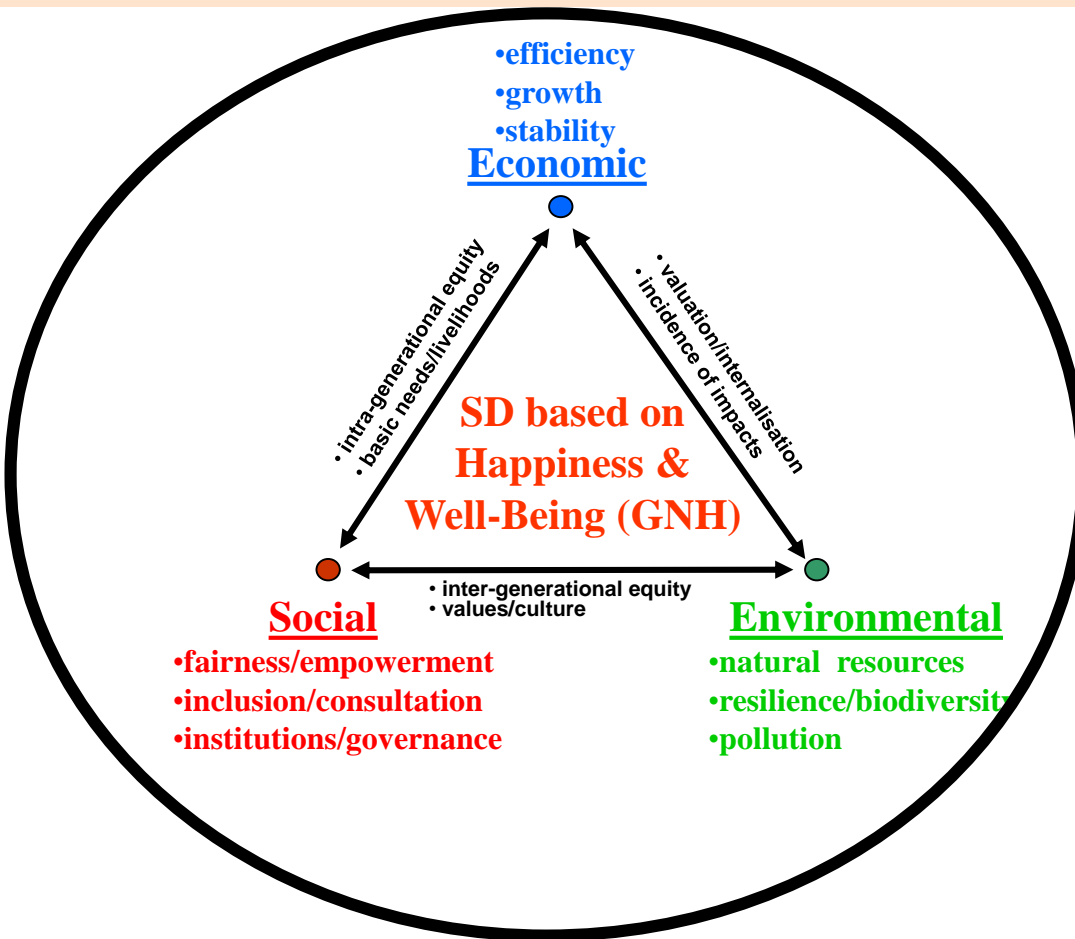
- Increased risk of extinction
- Northward shift in the extent of boreal forest in north Asia
- likely increase in frequency and extent of forest fires

E. COASTAL ZONES

- low-lying coastal areas will be affected by sea level rise and an increase in the intensity of tropical cyclones.
- Coastal inundation will affect the aquaculture industry and infrastructure particularly in heavily-populated megadeltas.
- Stability of wetlands, mangroves, and coral reefs increasingly threatened.

2. FRAMEWORK: World Eco-Civilization of 21st

Century focusing on Happiness & Well-Being (GNH)
- depending not only on material consumption (GNP)



Global Vision 2030: SDG

Social: meet basic needs of all human beings especially the poor & vulnerable, ensuring peace, harmony, social justice & security.

Environmental: respect nature & reduce humanity's global ecological footprint to less than one planet earth.

Economic: build a sustainable economy that is prosperous and resource-efficient, but respects critical environmental and social sustainability constraints.

21st Century Global Eco-Civilization

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- **17 Sustainable Development Goals (SDG) - key element of UN 2030 Agenda for SD approved at UNGA, Sept. 2015 by all nations for 15 years: 2016-2030**
- **Goes beyond MDG to include and better integrate all three elements of SD: economy, society & environment**

**Last Chance before
Multiple Global
Crises Converge**

THE GLOBAL GOALS For Sustainable Development

**Universal-Complete
Integrated-Holistic
Fair to everyone**

**1 NO
POVERTY**



**2 NO
HUNGER**



**3 GOOD
HEALTH**



**4 QUALITY
EDUCATION**



**5 GENDER
EQUALITY**



**6 CLEAN WATER
AND SANITATION**



**7 RENEWABLE
ENERGY**



**8 GOOD JOBS AND
ECONOMIC GROWTH**



**9 INNOVATION AND
INFRASTRUCTURE**



**10 REDUCED
INEQUALITIES**



**11 SUSTAINABLE CITIES
AND COMMUNITIES**



**12 RESPONSIBLE
CONSUMPTION**



**13 CLIMATE
ACTION**



**14 LIFE BELOW
WATER**



**15 LIFE
ON LAND**



**16 PEACE AND
JUSTICE**



**17 PARTNERSHIPS
FOR THE GOALS**



THE GLOBAL GOALS
For Sustainable Development

ANALYTICAL FRAMEWORK:

Key Concepts of Sustainable Water Resources Management (SWARM)

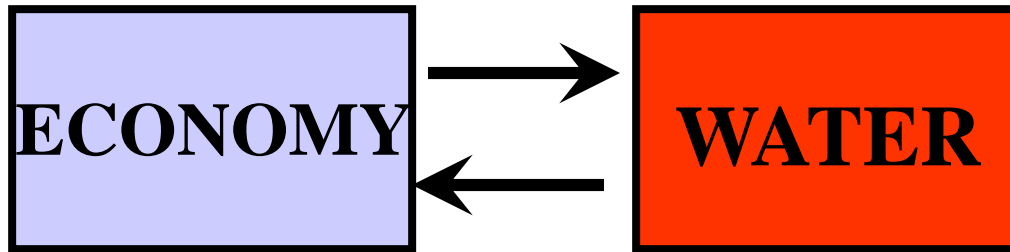
**Integrating Water Policies into overall
Sustainable Development Strategy using
the **SUSTAINOMICS** Transdisciplinary
Framework**

**First presented at 1992 Earth Summit in Rio de Janeiro,
and subsequently taught & practically applied worldwide.**

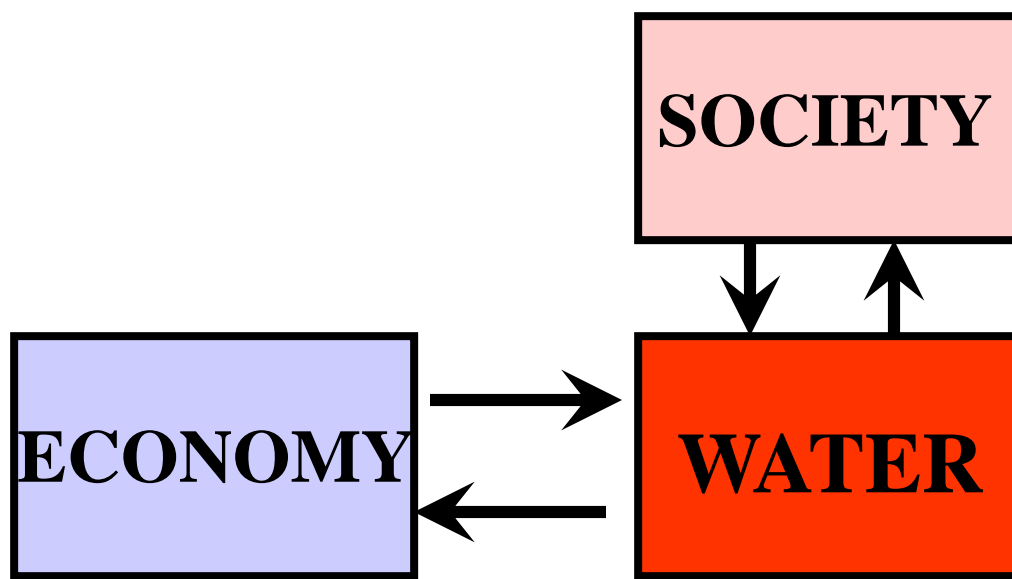


WATER

Supply technology, hydrology, hydro-dynamics, tech. efficiency, etc.

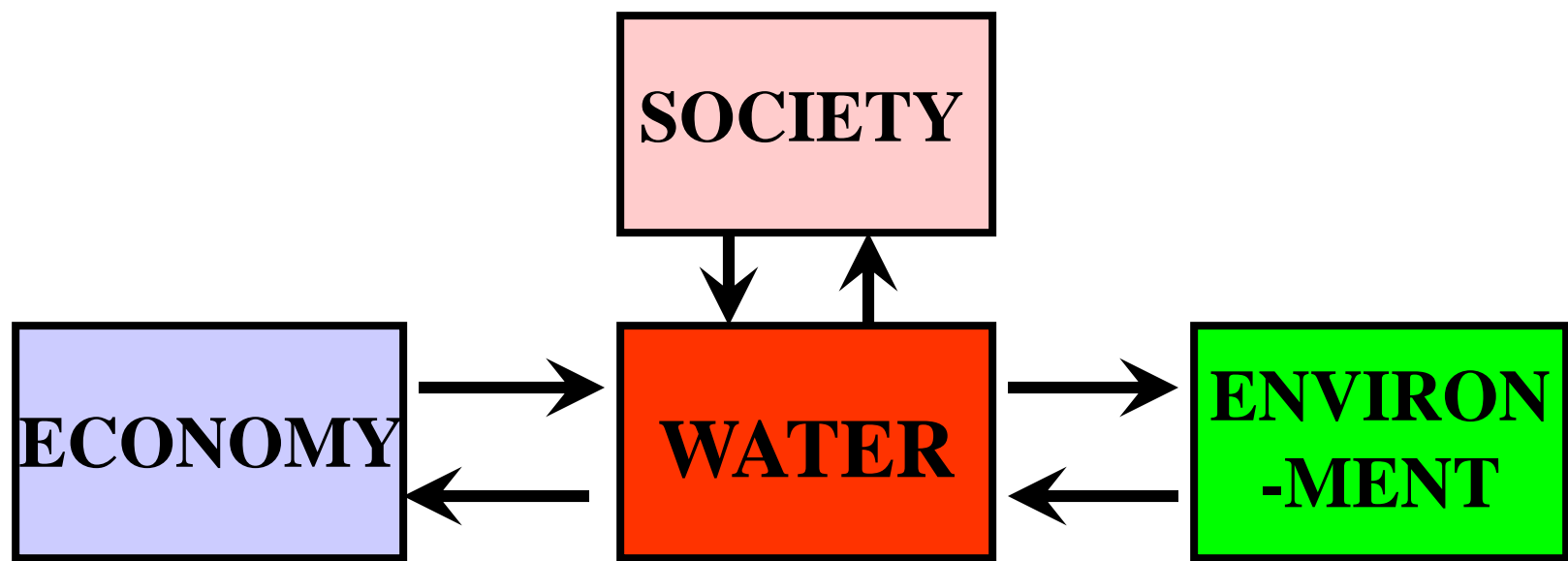


Supply technology, hydrology, hydro-dynamics, tech. efficiency, etc.
Supply-demand balance, price and income elasticity of demand,
cost-benefit analysis, least cost investment planning, demand
management, long run marginal cost pricing, etc.



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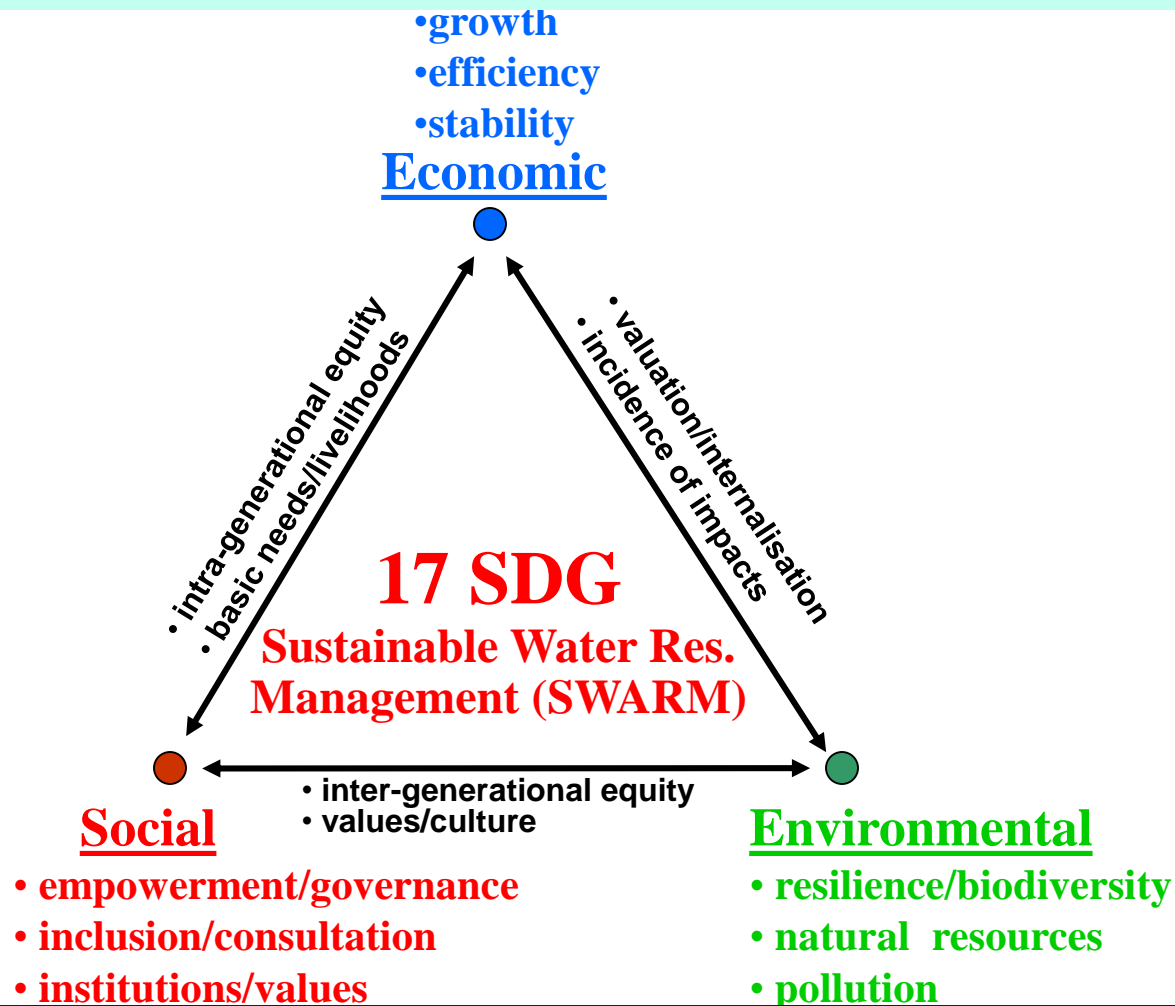
Poverty, equity, basic water needs, affordability, social assessment



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Supply-demand balance, price and income elasticity of demand,
cost-benefit analysis, least cost investment planning, demand
management, long run marginal cost pricing, etc.**

**Poverty, equity, basic water needs, affordability, social assessment
Environmental assessment and valuation, extended CBA, multi-
criteria analysis, integrated national water planning and pricing,
multi-sector macro-models, etc.**

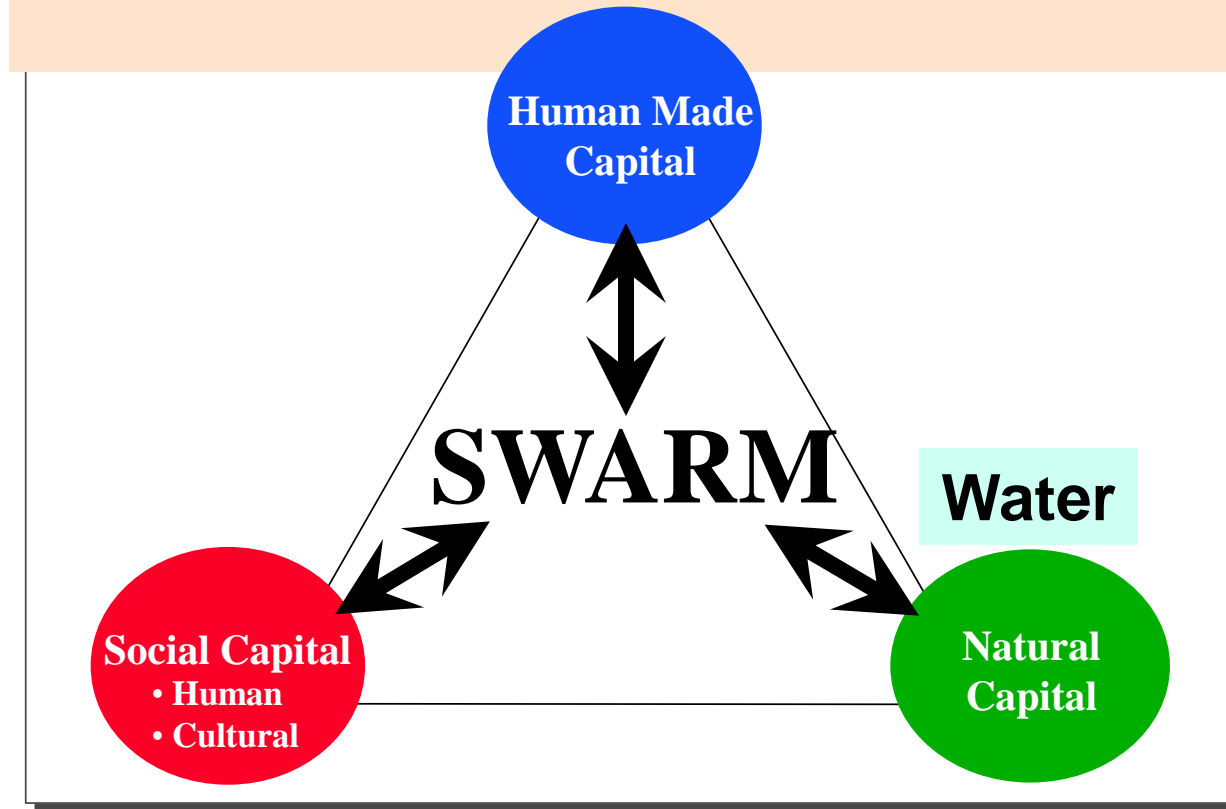
Core Concept 1: Harmonise the SD Triangle for BALANCE & INTEGRATION - 2



Sustainable Development Triangle – harmonising key elements and interconnections (corners, sides and centre) Source: Munasinghe [1992], Rio Earth Summit

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Assets for Sustainable Water Res. Mgt



Source: Munasinghe (1992), Rio Earth Summit

Core Concept 2: Climb the mountain - Make Development More Sustainable with EMPOWERMENT, ACTION & FORESIGHT

Sustainable Development Peak – including climate change (covered by clouds)



Lets move forward NOW!! If we climb uphill, we will reach the peak eventually

EMPOWERED to Make Development More Sustainable (MDMS) – BEST PRACTICE

We cannot see the peak!!
Let's stop to discuss & analyze how to reach it.



ANALYSING SD and CC – NEXT PRACTICE

Many obviously unsustainable practices exist today. MDMS encourages us to eliminate them NOW! Examples include water & energy saving and afforestation.

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Core Concept 3: Transcend Boundaries of SD **with INNOVATION & FRESH IDEAS**

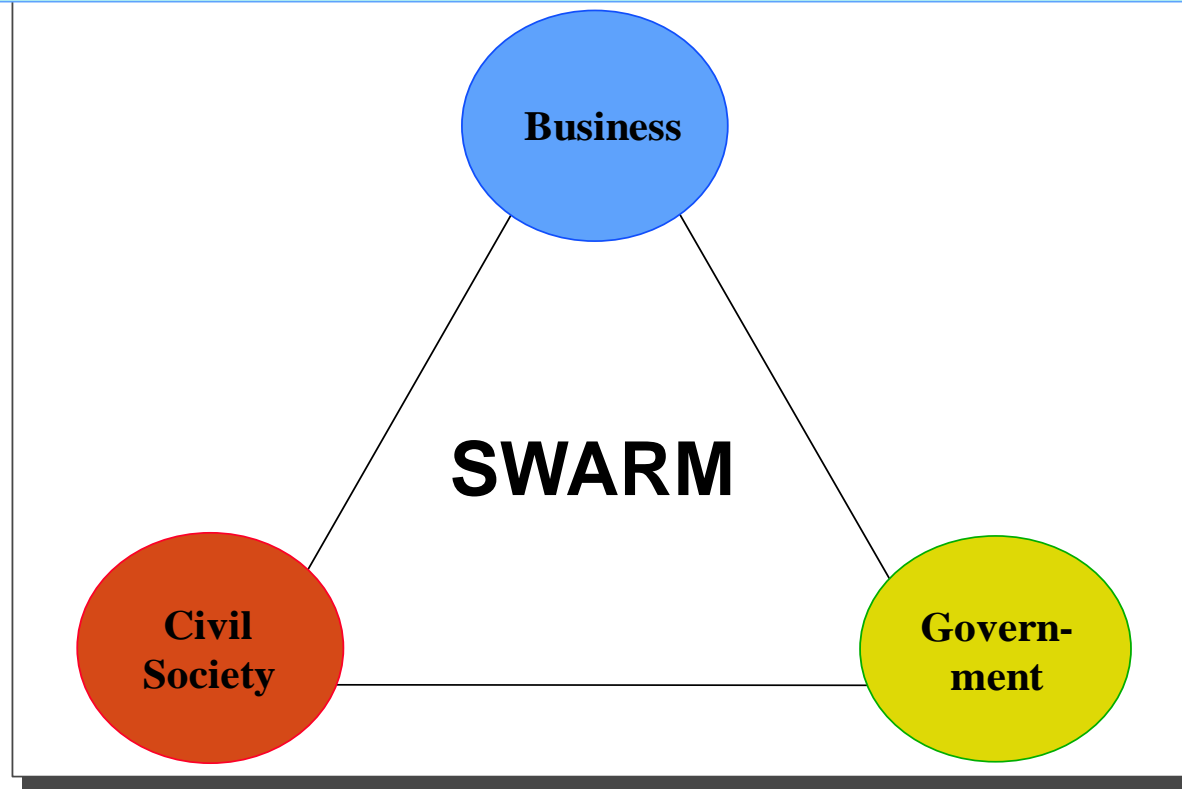
- Values – replace unsustainable, unethical values
- Disciplinary – complex issues need all disciplines
- Space – spans local to global scales
- Time – spans days to centuries
- Stakeholder – need to include all stakeholders
- Operational – full cycle from data to application

Transcend Unsustainable Values - Build essential ethical and moral values especially among YOUTH

- Greed, selfishness and violence are unsustainable
- Selflessness, altruism, enlightened self-interest, and respect for other humans and nature will make development more sustainable

Examples: Ethical Dimensions of Climate Change 2006
Interfaith Declaration on Climate Change 2009

Transcending Stakeholder Boundaries to Ensure Cooperation for Sustainable Development



Need to catalyse interactions among **government**, **civil society** and **business** to strengthen local, national and global governance

Source: Munasinghe (1992), Rio Earth Summit



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Core Concept 4: Full cycle application of integrative tools, from data gathering to practical policy IMPLEMENTATION

Many practical analytical tools and policy options exist, to build integrated SD strategy (global to local levels)

Many case studies and best practice examples are available, involving sustainomics applications

Full Cycle - Operations

ACTION

Observations and Data
Concepts and Ideas
Models & Analyses
Interpretation of Results
Plans & Policies
Practical Applications
Impacts (SD triangle)



ACTOR

Observers
Thinkers & Philosophers
Scientists & Analysts
Translators & Communicators
Decision Makers
Implementing Agents
Assessment Experts

Each stage of activity has a tendency to become compartmentalised

Source: Munasinghe (2002), Int. J. of Sust. Dev.

Choosing Appropriate SD Indicators

- Social**
- Environmental**
- Economic**
- Institutional**

**many indicators are available;
thus correct choice is critical for
specific task at hand**

Sustainable Water Pricing: incorporates Economic, Environmental and Social Goals

1. **Economic efficiency**: prices based on long-run incremental cost to reflect scarcity
e.g., rising water supply, high opportunity costs etc.



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e.g., rising water supply, high opportunity costs etc.
2. **Environmental protection**: prices incorporate (internalise) externalities
e.g., add pollution taxes, wastewater disposal costs etc.
3. **Social equity**: subsidised prices to meet basic water needs of the poor
e.g., reduced or lifeline prices for minimum use by poor

Raising water prices meets economic and environmental goals, but favour the rich and deprive poor of water. Social-equity goal ensures basic water needs are affordable to poor.

Growing Potential for Water Conflicts (especially over transboundary water resources)

ISSUES

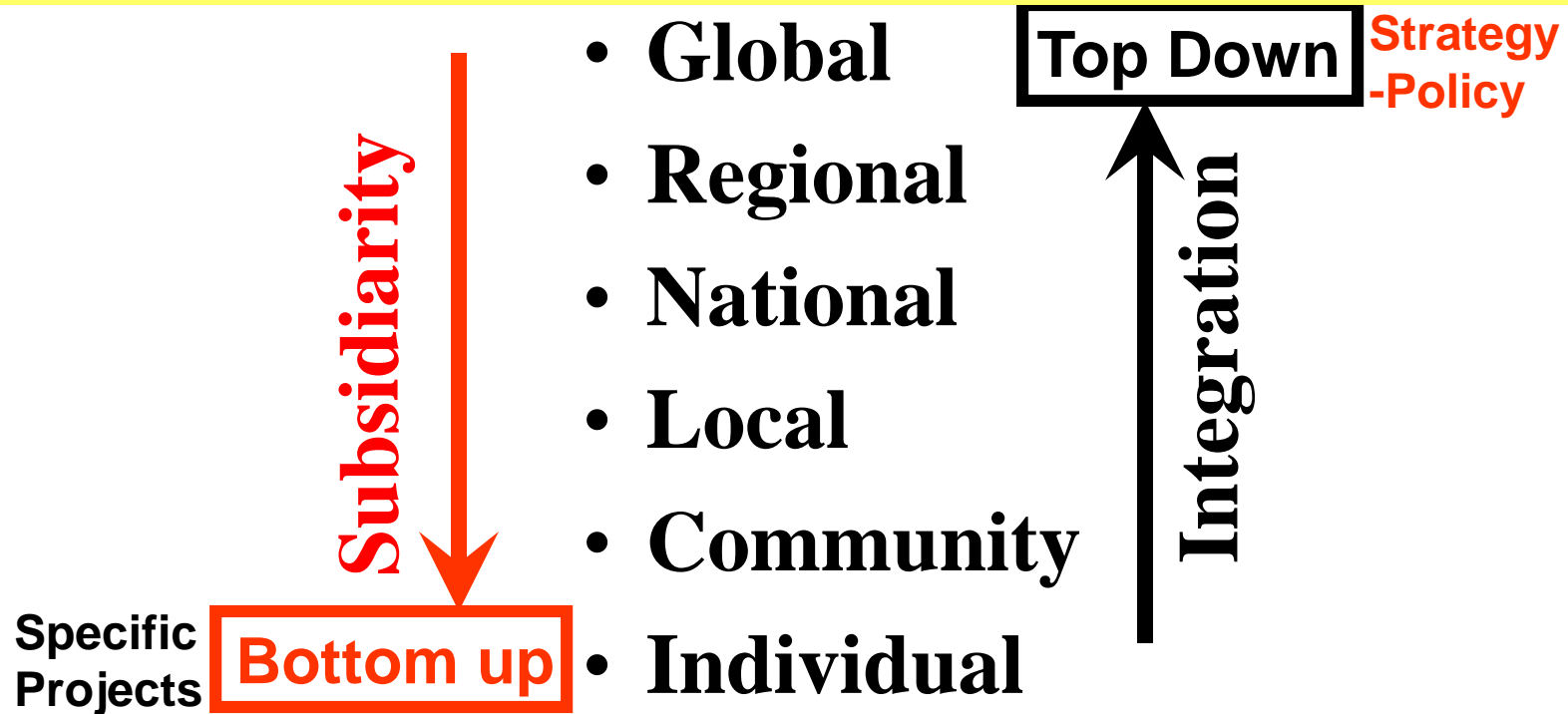
- Freshwater quantity and quality declining in the 21st century
- Rising tensions at international, national and local levels
- Increasing concern over potential for conflicts
- Need for more cooperation and wise resource management

OPTIONS

- Move from competition & conflict to cooperation & sharing
- Think strategically - reduce emphasis on ad hoc arbitration of individual disputes
- Establish frameworks for sustainable water resources management
- Focus on WIN-WIN solutions through sharing, VERSUS resource DESTRUCTION due to conflict

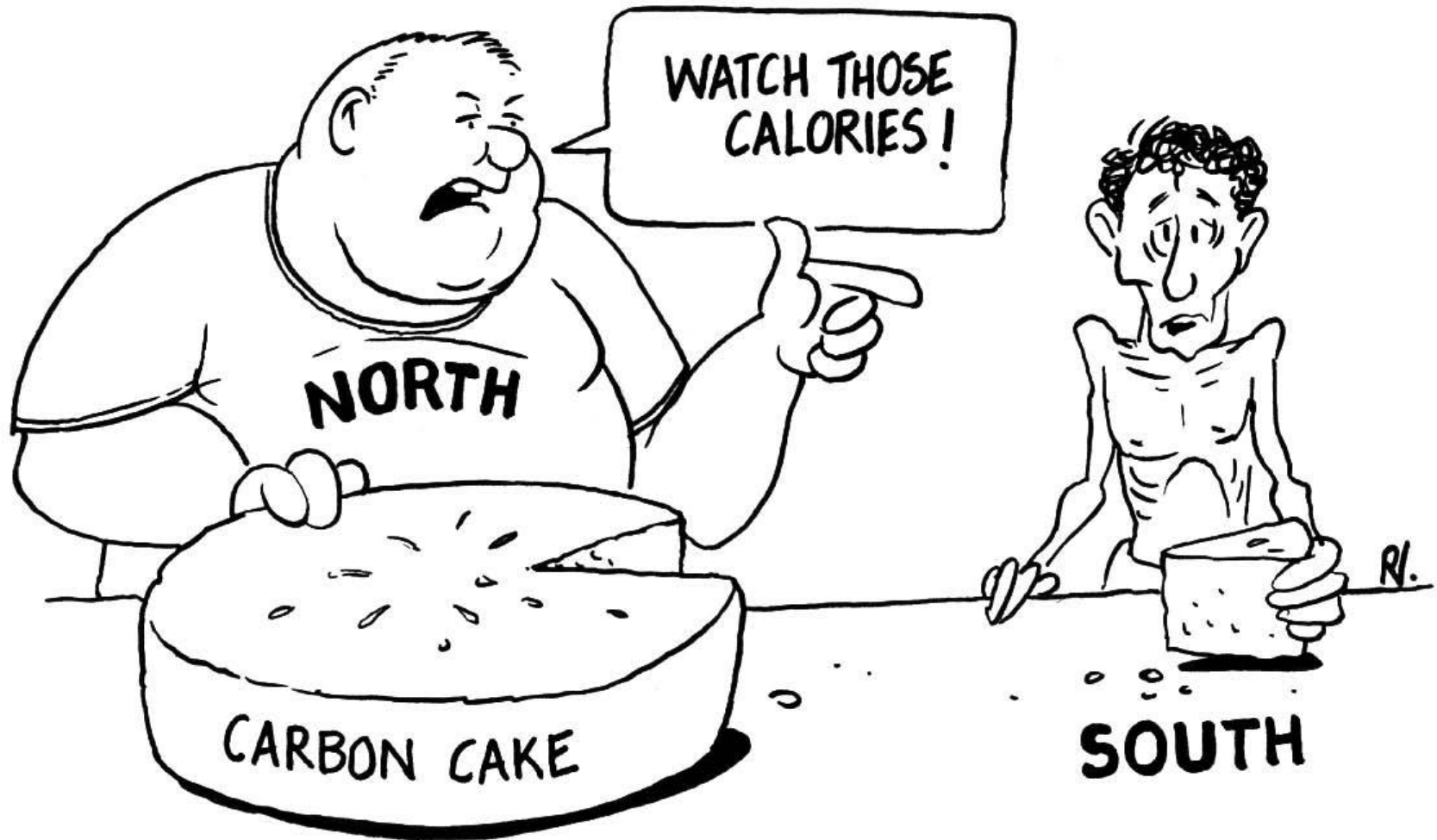


Need for Better Cooperation and Partnerships (especially in managing transboundary resources)



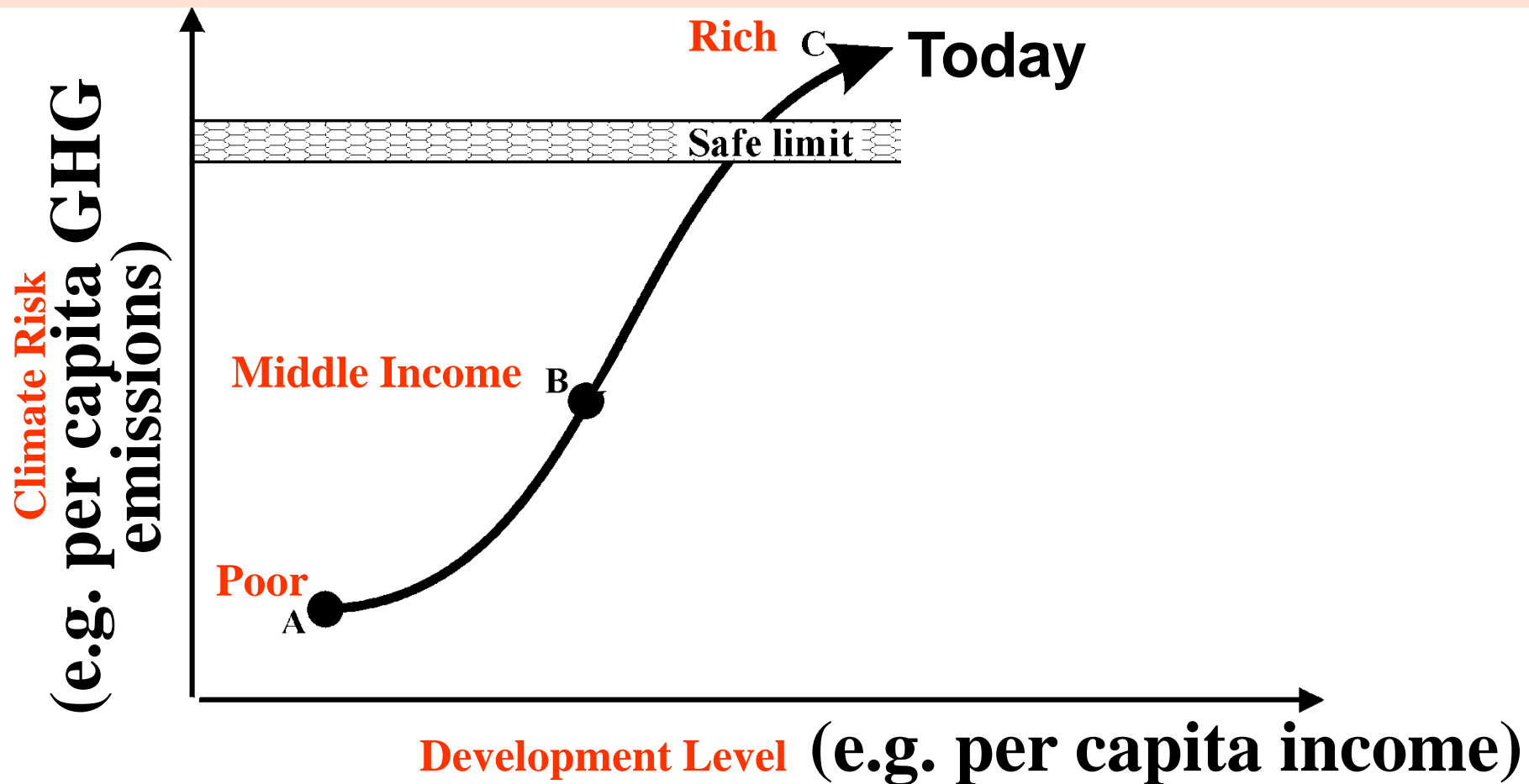
Pragmatic balance between subsidiarity and integration is essential

Climate Justice – Equitable Allocation of Per Capita Carbon Emissions



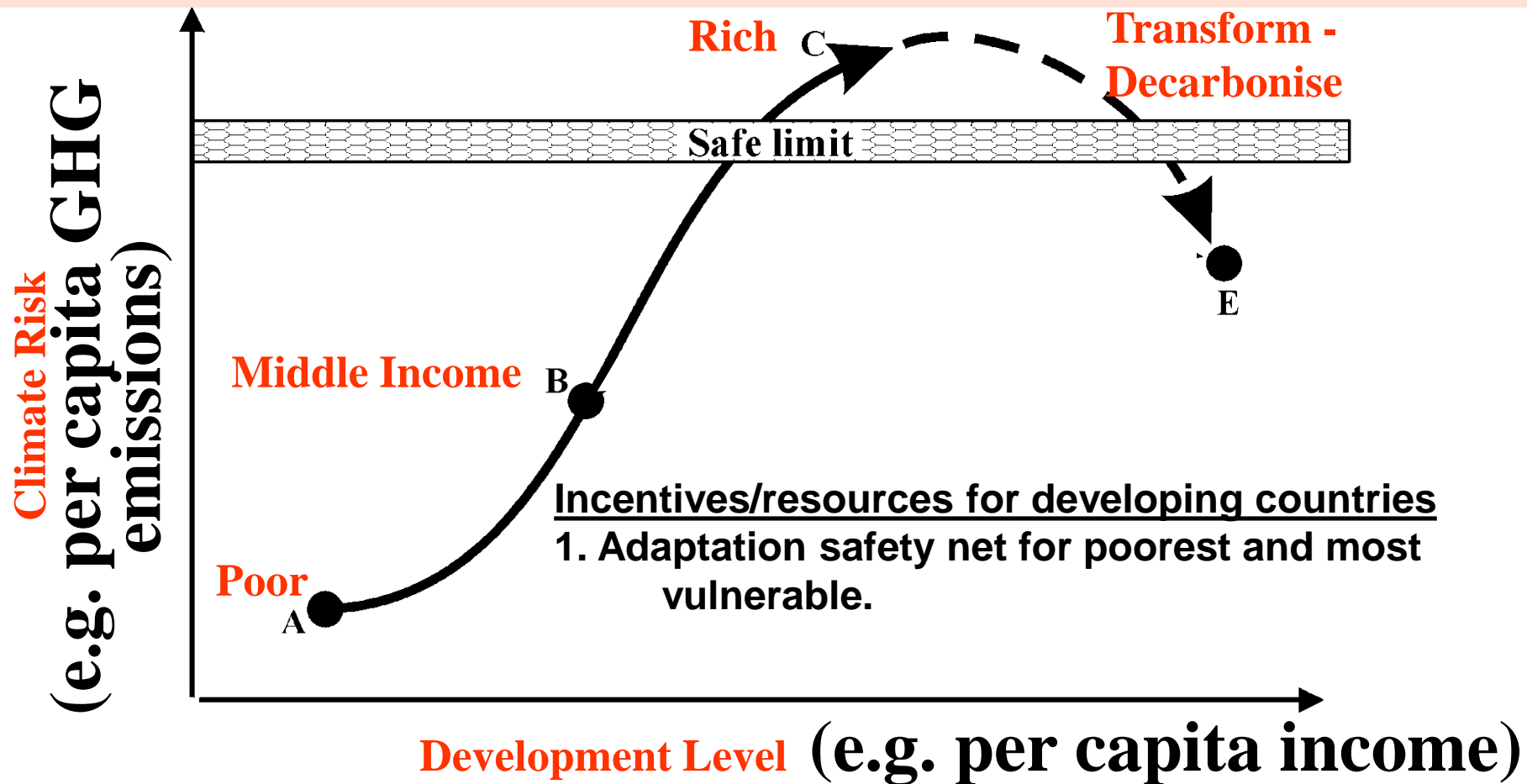
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MDMS via “Tunneling”: global cooperation to manage Climate Risk & Right to Develop - 1



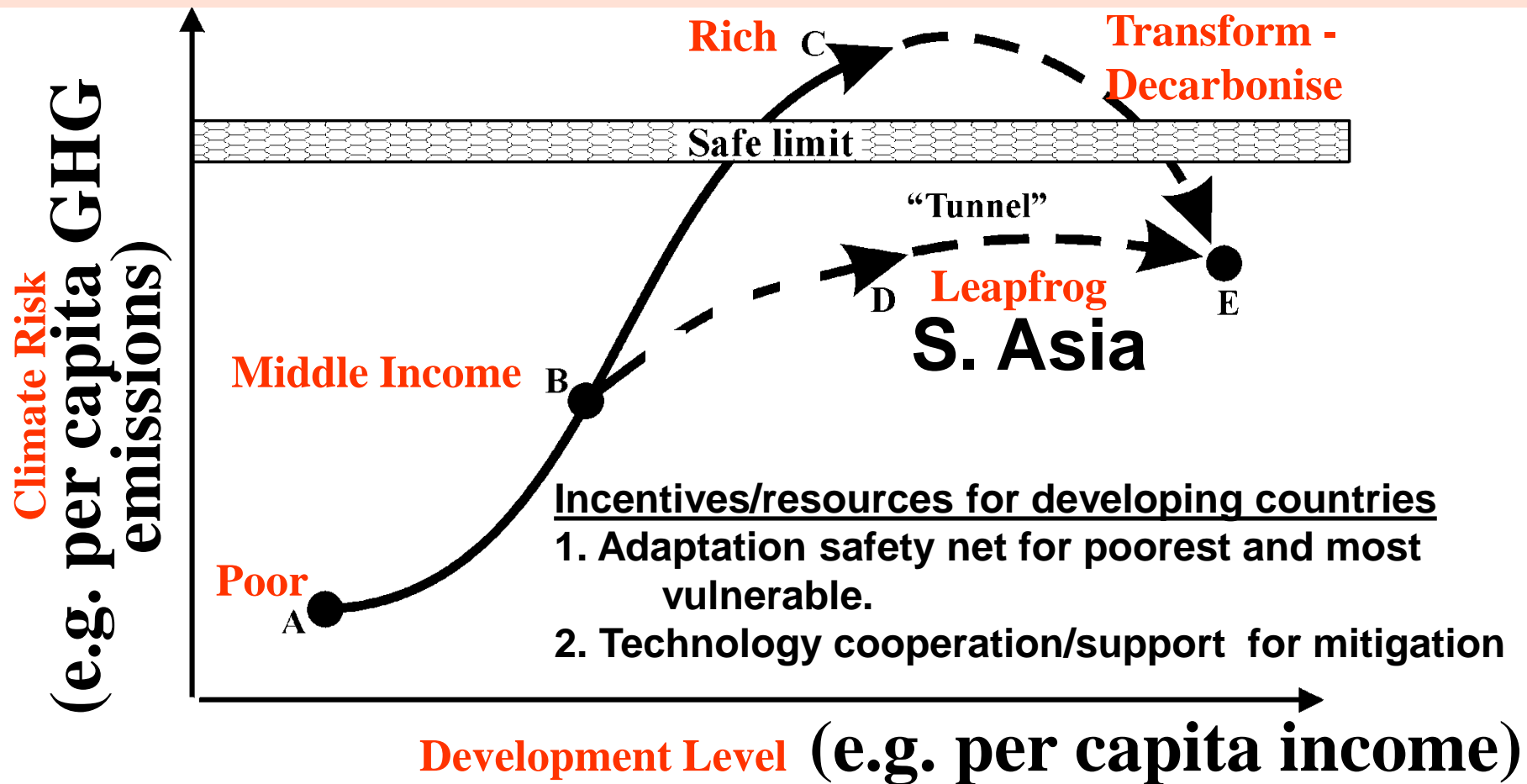
Source: M. Munasinghe (1995) "Making Growth More Sustainable," *Ecological Economics*, 15:121-4.

MDMS via “Tunneling”: global cooperation to manage Climate Risk & Right to Develop - 2



Source: M. Munasinghe (1995) "Making Growth More Sustainable," *Ecological Economics*, 15:121-4.

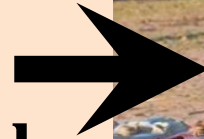
MDMS via “Tunneling”: global cooperation to manage Climate Risk & Right to Develop - 3



**Is S. Asia well placed to leapfrog-tunnel?
Same analysis can be applied to all resources**

Food for a Week: Poor Family

Unsustainable/Unethical –
must leapfrog/tunnel to
prosperity: SDG1 Poverty



TCHAD 230 000 réfugiés de guerre soudanais vivent dans les camps de l'Onu. Chacun a droit à 2100 Cal par jour: céréales, sucre, sel, huile, légumes secs et farine vitaminée.

Food for a Week: Affluent Family

Unsustainable – must
transform/decarbonize
towards sustainability:
SDG12 SCP



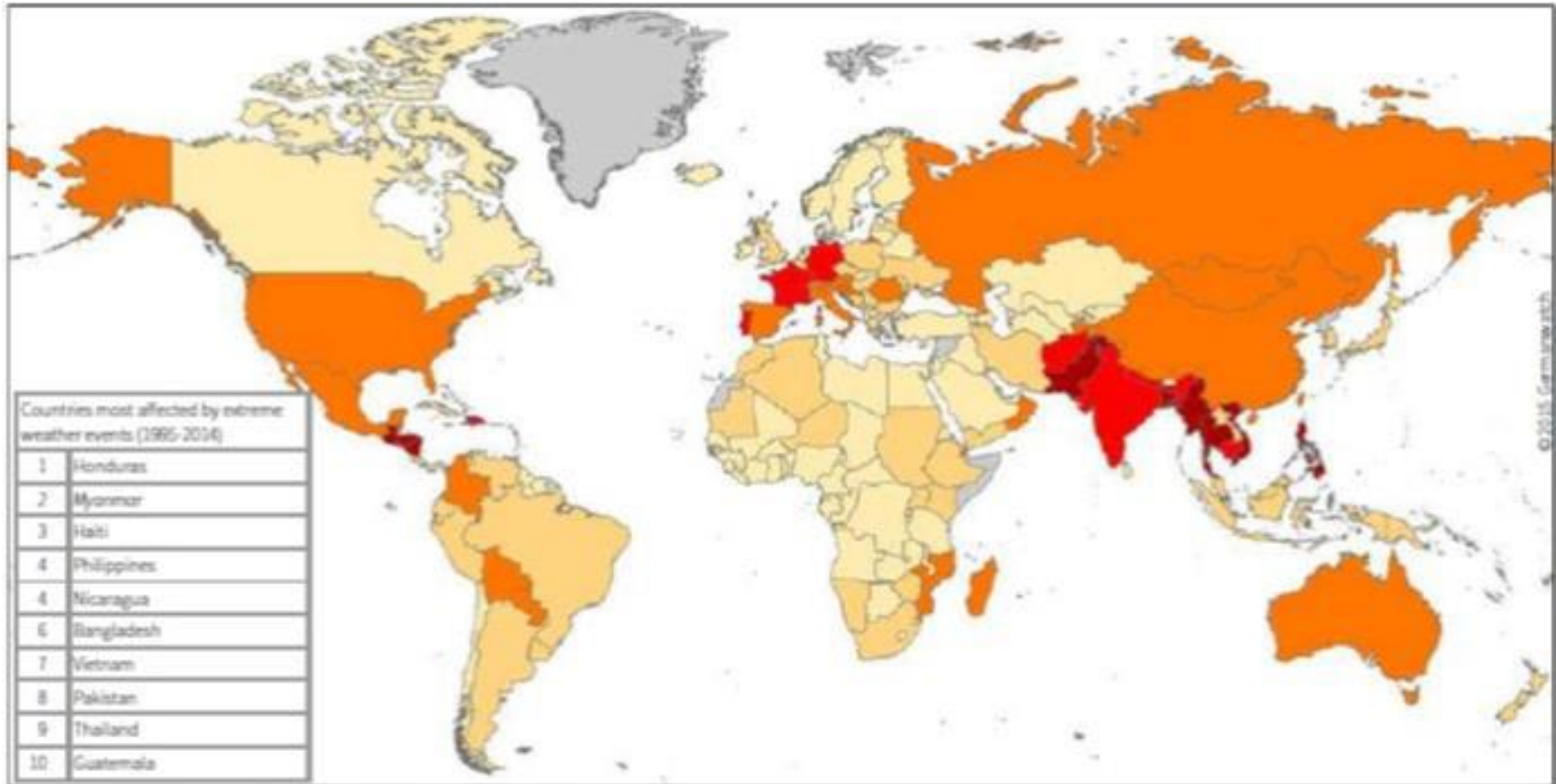
ALLEMAGNE 1500 sortes de saucisses, 1200 restaurants McDonald's, 750 millions de kebabs avalés chaque année... Plus de la moitié des Allemands sont en surpoids ou obèses.

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Source: Menzel, 2005

Climate change vulnerability ranking index.

Source: Kreft et al. 2016



Climate Risk Index: Ranking 1995 – 2014



Figure 1: World Map of the Global Climate Risk Index 1995–2014

Source: Germanwatch and Munich Re NatCatSERVICE

CC Adaptation: Strategic Options for Water

- **Need SWARM as water resources are a fundamental driver of economic development and well-being across the region.**
- **Need cross sectoral coordination for more integrated adaptation responses**
- **Need for greater regional cooperation due to transboundary nature of climatic risks – Paris Accords offer platform**
- **Need to understand costs of climate risks in the context of specific geographies and populations to identify adaptation priorities, key stakeholders and financing needs.**
- **Need to alter institutional frameworks to promote calculated decision making capable of achieving informed, inclusive and accountable climate adaptation.**

Adaptation measures to respond to climate change

In areas of water stress: Adaptation interventions could consist of:

- ☐ **Water pricing;**
- ☐ **Seasonal water rationing during times of shortage;**
- ☐ **Adapt industrial and agricultural production to reduce water wastage;**
- ☐ **Increase capture and storage of surface run-off;**
- ☐ **Reuse or recycle wastewater after treatment;**
- ☐ **Desalination of salty or brackish water;**
- ☐ **Better use of groundwater resources; and**
- ☐ **Rainwater harvesting.**

In areas where water quality is affected, possible measures are:

- ☐ **Improvements to drainage systems;**
- ☐ **Upgrading or standardizing of water treatment;**
- ☐ **Better monitoring; and**
- ☐ **Special measures during high precipitation seasons**

Source: CAPNET, 2009

S. Asian Regional Cooperation Options

- **Transboundary nature of water resources in SA requires cooperation.**
 - Glacial retreat in Himalayas affects water availability for agriculture, domestic use, hydropower & industry, in Indo-Gangetic and Brahmaputra basins in Nepal, India & Bangladesh
 - 97% of Bangladesh's freshwater flows come through
- **Existing water sharing agreements need to constantly be renegotiated**
 - Indus Waters Treaty between India and Pakistan (1960), the treaties between India and Nepal on the Kosi (1954), Gandaki (1959) and the Mahakali (1996) rivers, and Ganges Water Sharing treaty between India and Bangladesh (1996).
- **SAARC has initiated many regional cooperation agreements but there is a financing gap,**
 - Eg: Dhaka Declaration and SAARC Action Plan on Climate Change (2008) and the Thimphu Statement on Climate Change (2010) are considered to be two important milestones in the Association's response to climate change.
- **There is still no clear pathway for scaling existing bilateral approaches to a truly regional platform for cooperation**

Some important SAARC actions on climate change and environment

- **1991: Regional Study on the “Consequences of Natural Disasters and the Protection and Preservation of the Environment.”**
- **1992: A joint study on the “Greenhouse Effect and its Impact on the Region”**
- **1997: Adoption of “SAARC Environment Action Plan”**
- **2006: Disaster Management in South Asia: A Comprehensive Regional Framework for Action 2006-2015**
- **2008: Dhaka Declaration and SAARC Action Plan on Climate Change (2008)**
- **2009: South Asia Environment Outlook (Study done by UNEP, SAARC, and Development Alternatives)**
- **2010: Thimphu Statement on Climate Change (2010)**
- **2010: SAARC Convention on Cooperation on Environment (2010), entered into effect in October 2013**
- **2011: SAARC Agreement on Rapid Response to Natural Disasters (2011)**

Positive final message for S. Asia & World

Multiple global problems pose a serious challenge to us all – poverty, energy, water, hunger, climate change, economic crises, resource scarcities, ecosystem harm, etc. are interlinked.

Water, SD and CC issues are complex and serious, but these problems can be solved together, provided we begin now.

We know enough already to take the first steps towards making development more sustainable (MDMS) by using the integrated SWARM framework, that will transform the risky “business-as-usual” scenario into a safer & better future.

Governance systems (at all levels) must be transformed to deal with multiple crises in an integrated way.

Business and civil society can help governments worldwide in identifying issues, changing values and implementing solutions.

Water sector can play a lead role in devising new sustainable development models for 21st century Global Eco-Civilization.

Ancient Pali Blessing (Sri Lanka)

**“DEVO VASSATU KALENA
SASSA SAMPATTI HETU CA
PHITO BHAVATU LOKO CA
RAJA BHAVATU DHAMMIKO”**

Environmental: “May the rains come in time,
Economic: May the harvests be bountiful
Social: May the people be happy & contented
May the king be righteous”

**Even in ancient times, a favourable environment,
economic prosperity, social stability (and good
governance), were clearly identified as key pre-requisites
for making development more sustainable.**



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270 Senior Chinese Officials

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MIND SD Course, Delhi, Feb. 2007
25 Senior Indian Civil Service Officers

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Mohan Munasinghe
Shared the 2007 Nobel Prize for Peace

Making Development More Sustainable: Sustainomics Framework and Practical Applications

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Prof. Thomas Schelling, 2005 Nobel Laureate in Economics

WEALTH



PEOPLE

NATURE

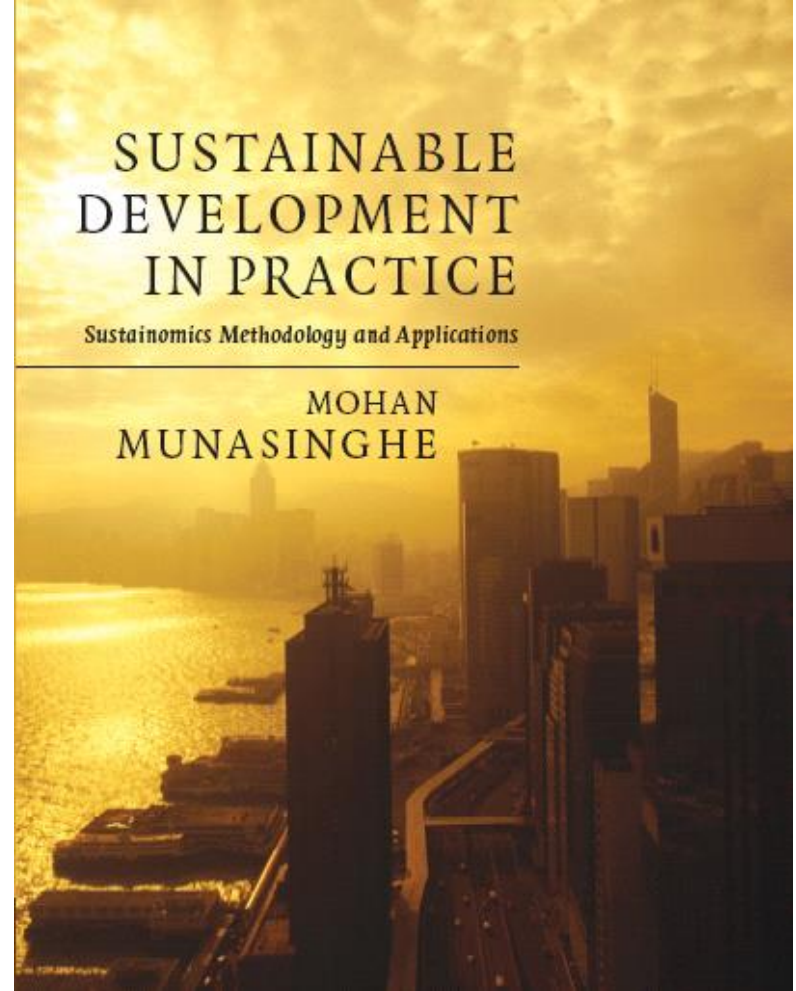


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STHUTHI NANDRI THANK YOU