

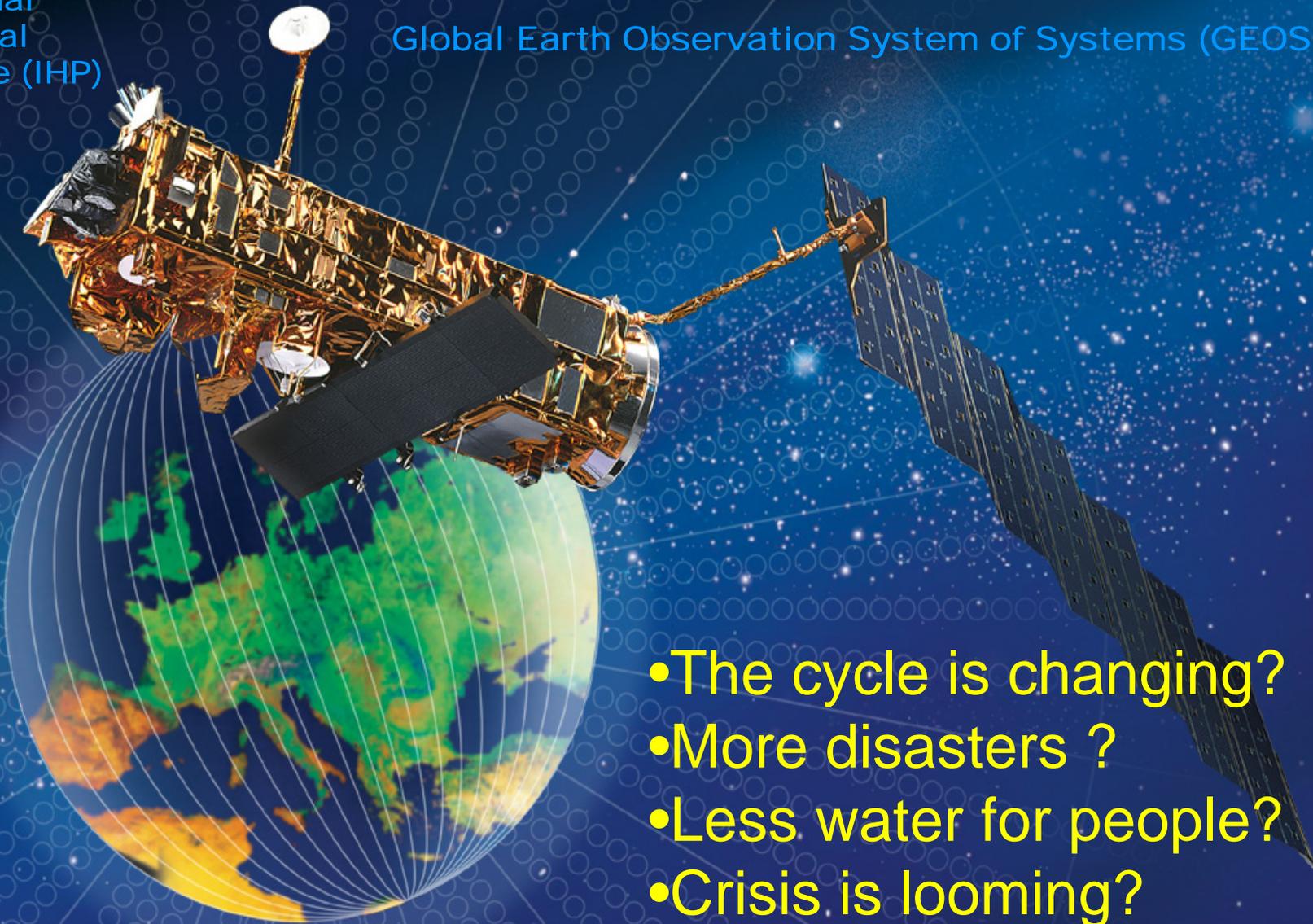
ICHARM Commemorative Symposium
"Allience for Localism"
UNU Tokyo 14 September 2006

Water for the Future and the Future of Water:
Global and Local Challenges

András Szöllösi-Nagy
Secretary, Deputy Assistant Director General
International Hydrological Programme
UNESCO

International
Hydrological
Programme (IHP)

Global Earth Observation System of Systems (GEOSS)



- The cycle is changing?
- More disasters ?
- Less water for people?
- Crisis is looming?
- Global or local?



CENTRAL TENET

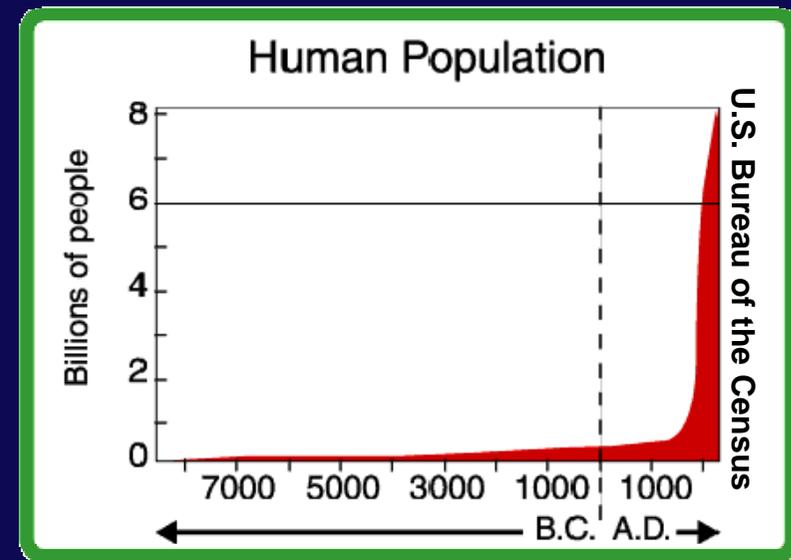
Humans are changing the global water system in a globally-significant way

without.....

adequate knowledge of the system and thus its response to change

Global change drivers

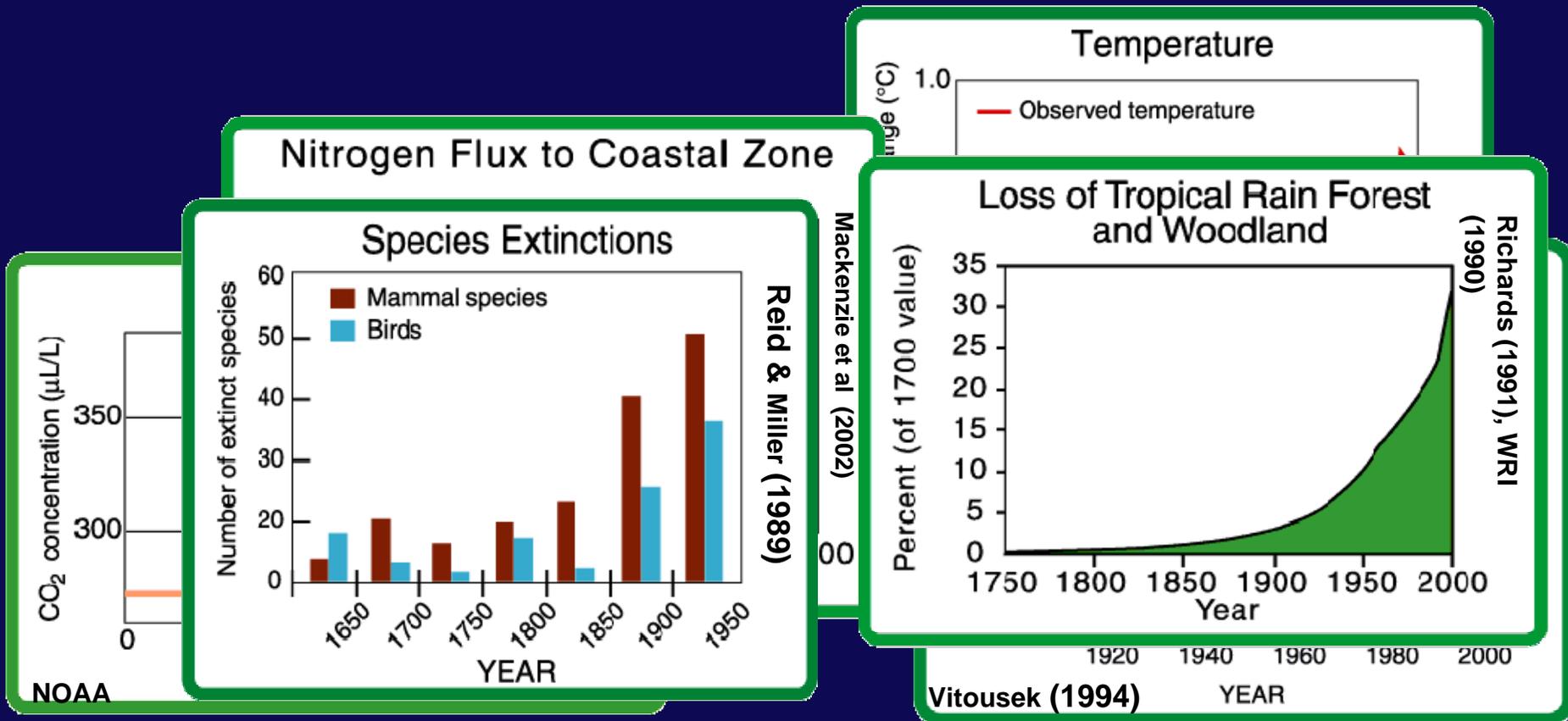
- Population growth, movement and age structures
- Geo-political changes and realignments
- Trade and subsidies
- Technological changes
- Climate change



Global change impacts

- Global change is more than global climate change
- It has natural PLUS human/social dimensions
- A constellation of changes, many global in domain

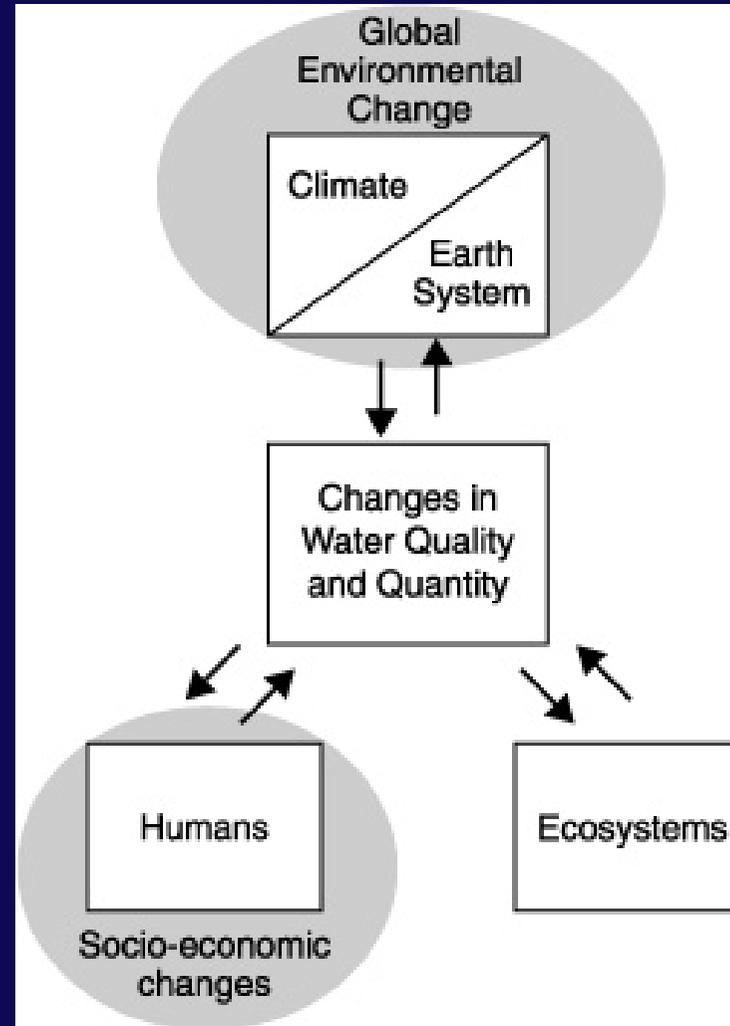
For example, we see large changes in:

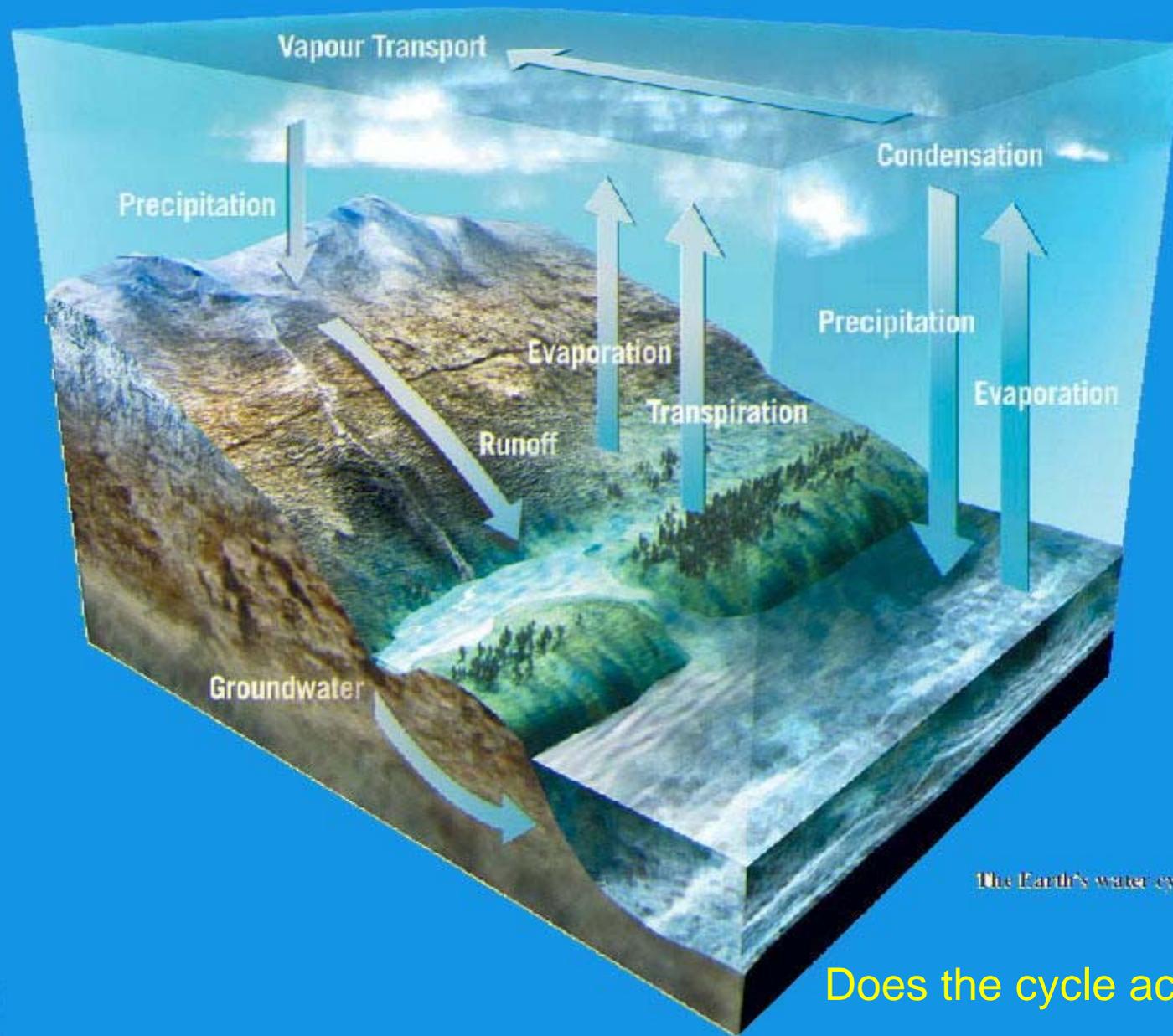


The Global Water System



- Water **Cycling**
Deeply Embedded
in Earth System
- Interconnections
are Strong
- Change to One
Part Reverberates
Throughout





The Earth's water cycle

Does the cycle accelerate?



Water hazard as a major challenge

- Intensifying and increasing occurrence of water related hazards in many parts of the world
- Serious concern on climate change such as extreme hydrologic events and sea level rising



Major floods and droughts worldwide in 2002



Flood



Drought



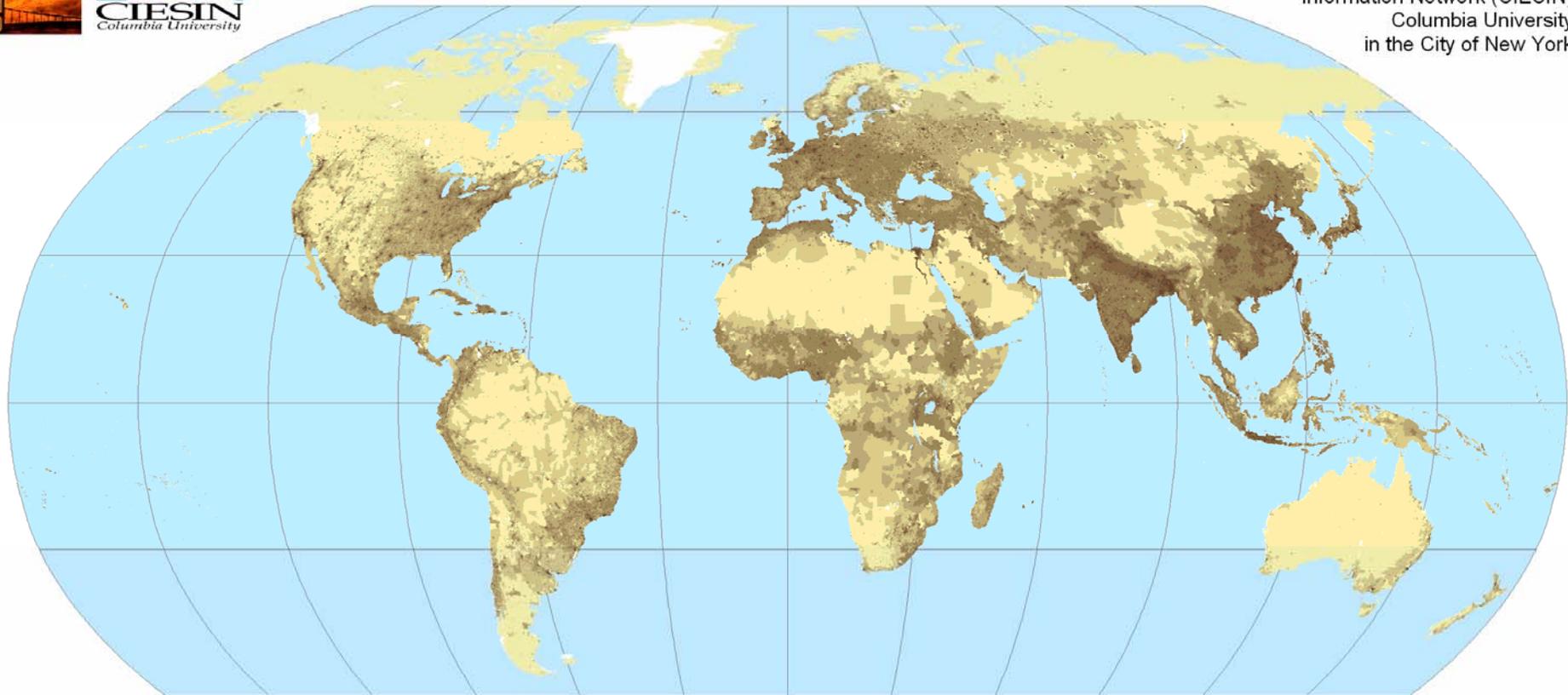
There is pressing need to develop advanced risk management on water hazard in order to secure human life and ensure sustainable socio-economic development and poverty alleviation.

Rural and Urban Population Density



Global Population Density, 2000

Global Rural Urban Mapping Project (GRUMP) alpha
Center for International Earth Science
Information Network (CIESIN)
Columbia University
in the City of New York



Persons
per square km

< 1	1 - 4	5 - 24	25 - 249	250 - 999	1000 +	no data
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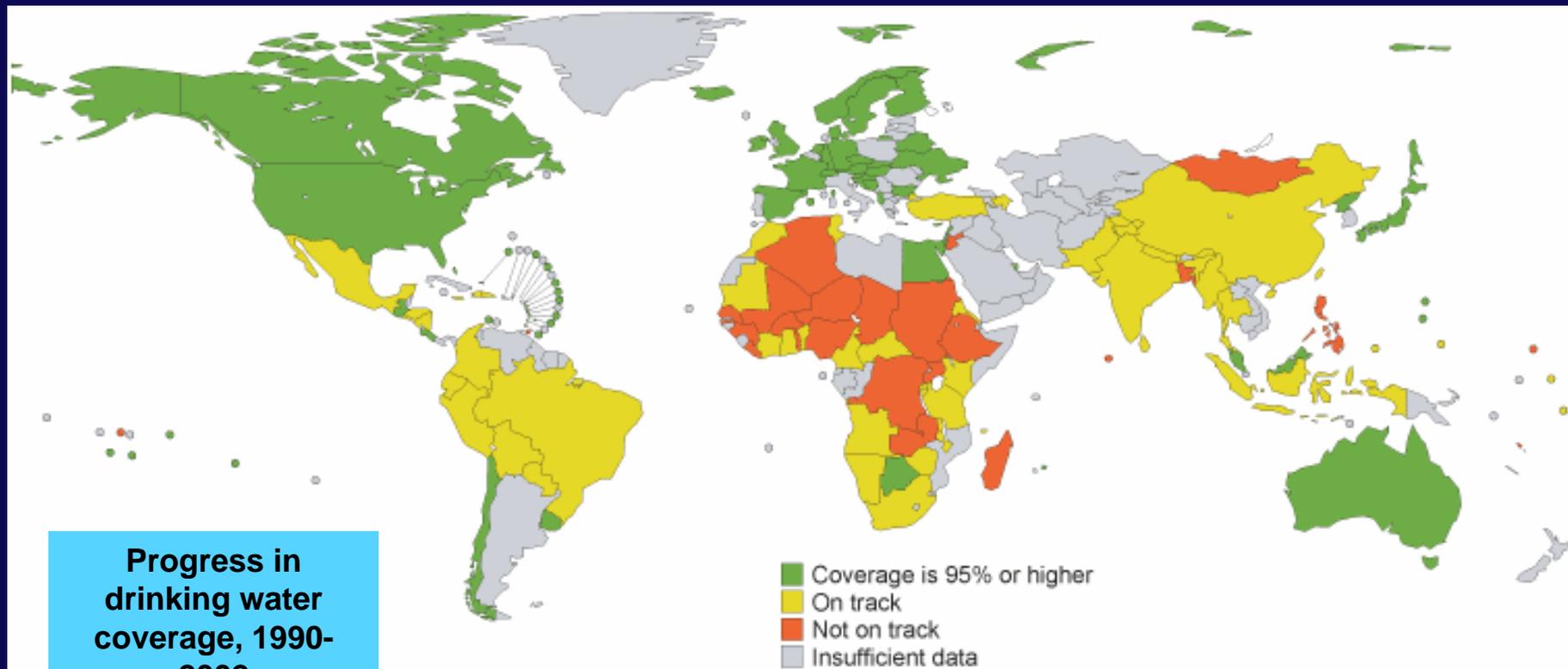
Robinson Projection
Map produced on 20 July, 2005

GLOBAL FRESHWATER RESOURCES

Relation between water availability and population



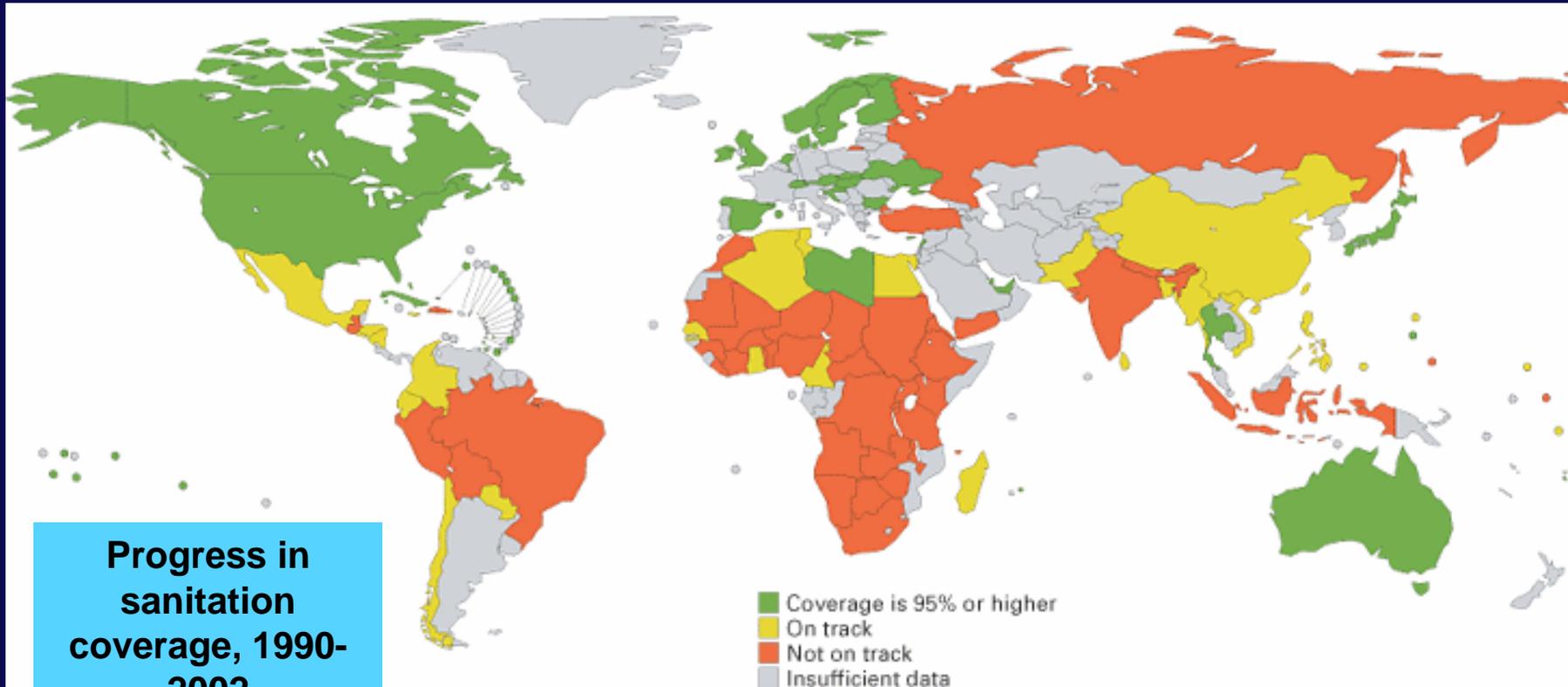
If the current trend continues, sub-Saharan Africa will not reach MDG water target



**Progress in
drinking water
coverage, 1990-
2002**

**(UNICEF/WHO
JMP)**

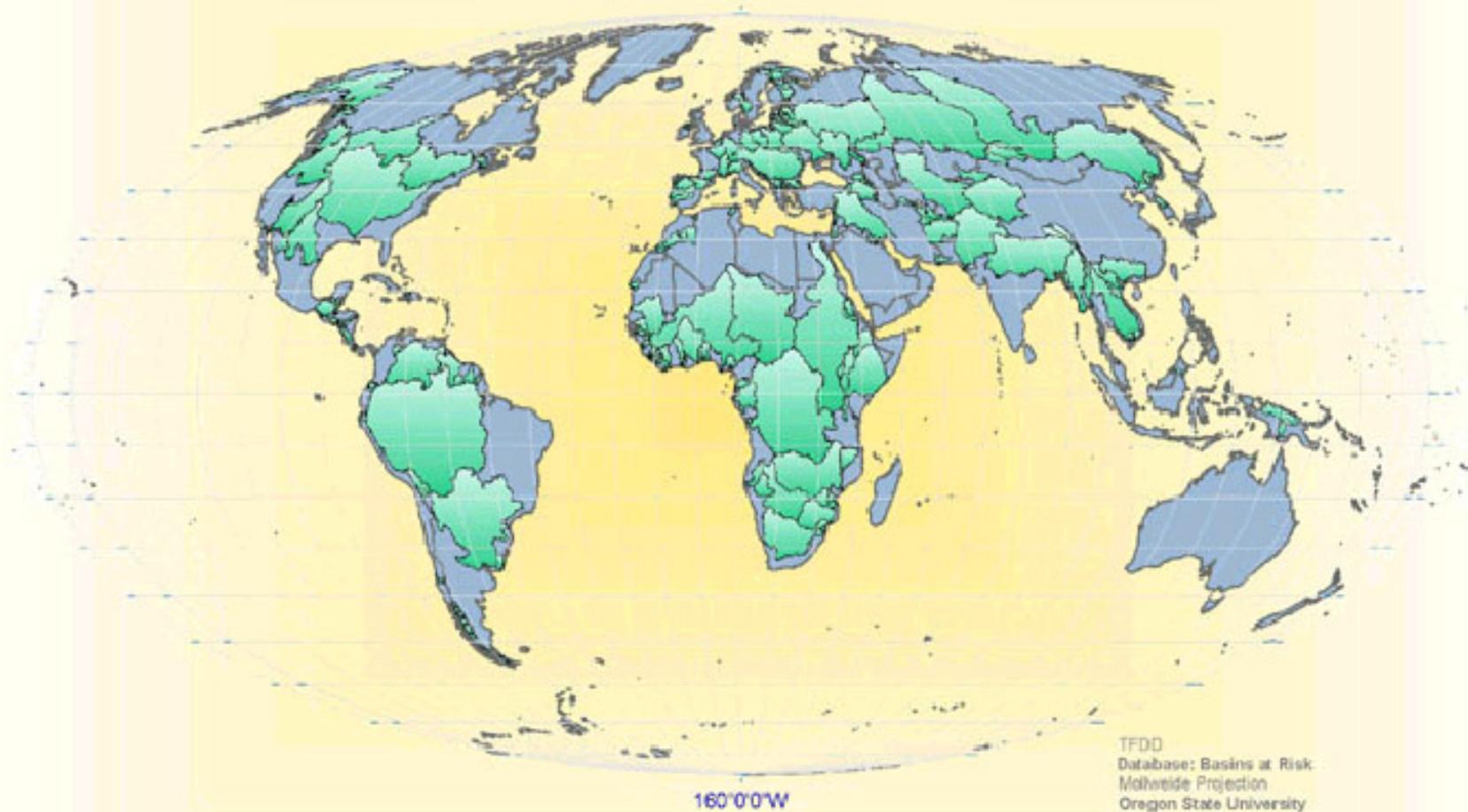
Many countries **not** on track to reach MDG sanitation target



**Progress in
sanitation
coverage, 1990-
2002**

**(UNICEF/WHO
JMP)**

International Basins of the World



TFDD
Database: Basins at Risk
Mollweide Projection
Oregon State University
October 2000



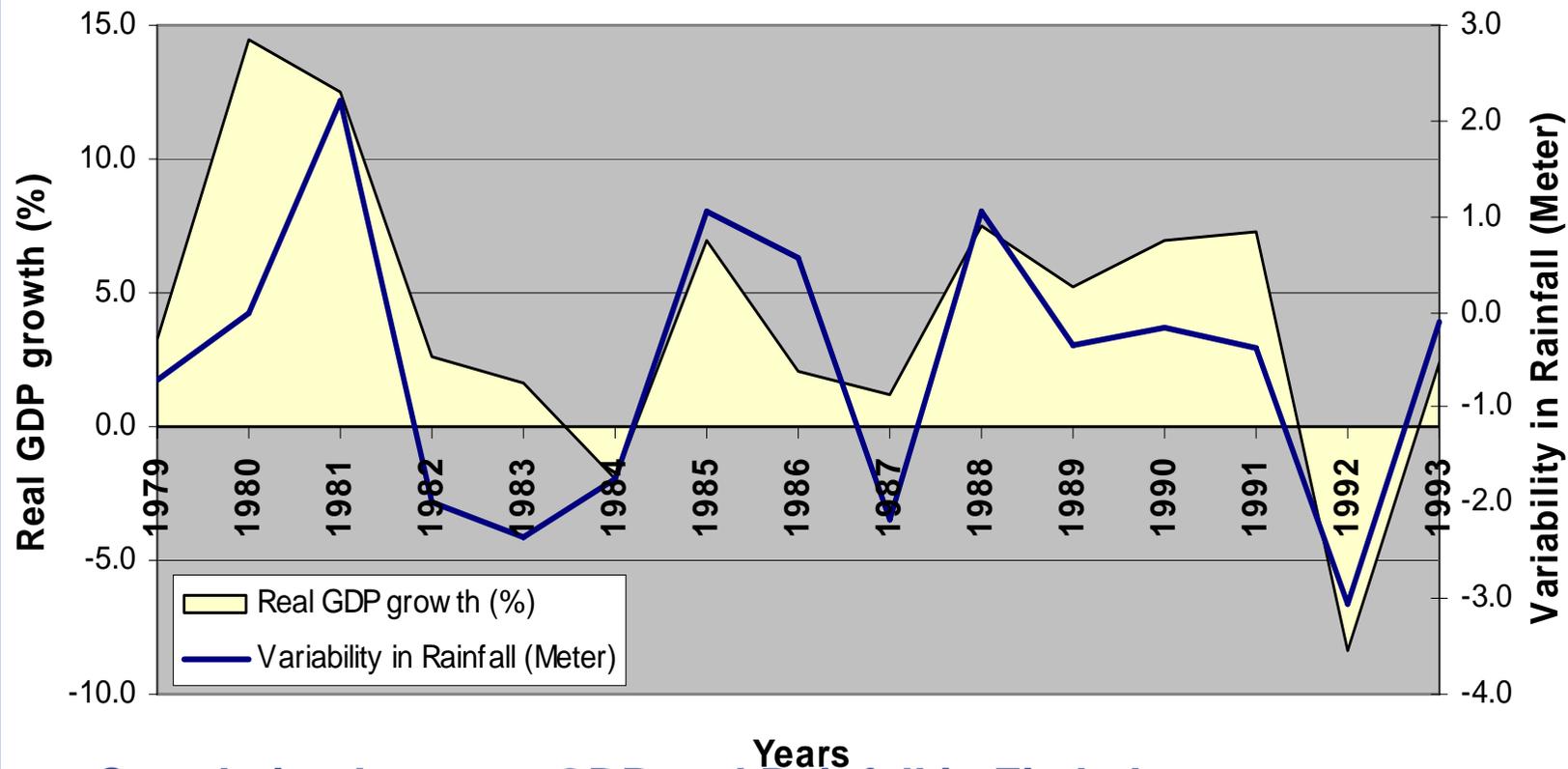
International Hydrological Programme

LOOMING WATER CRISES



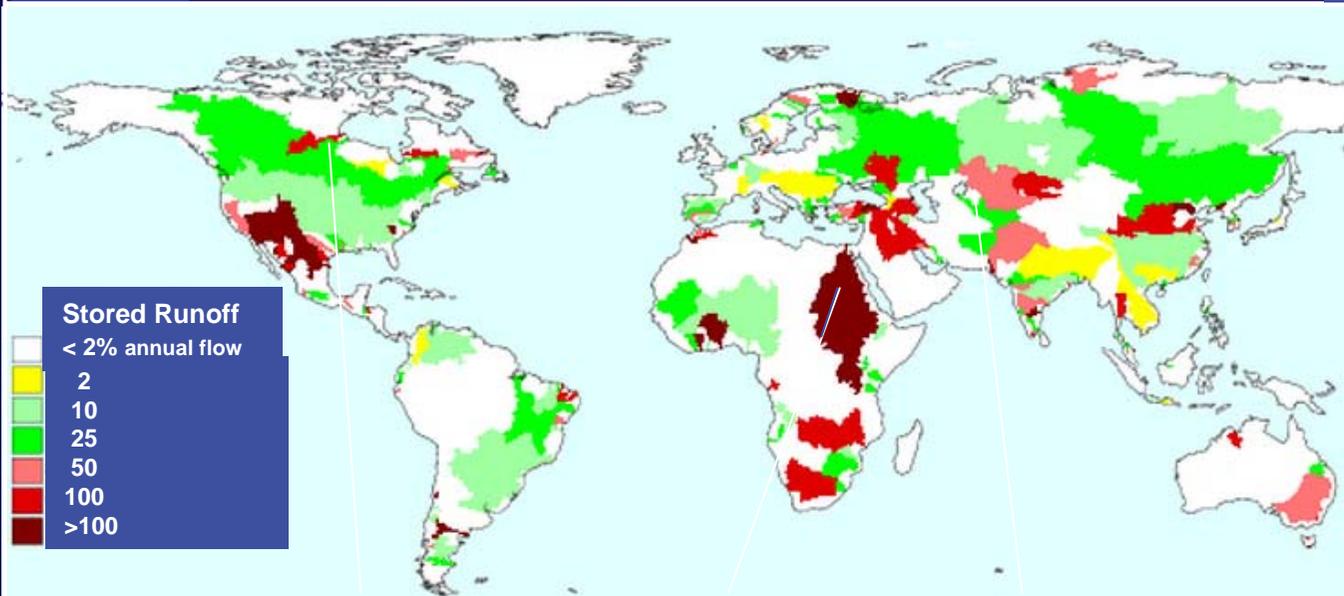
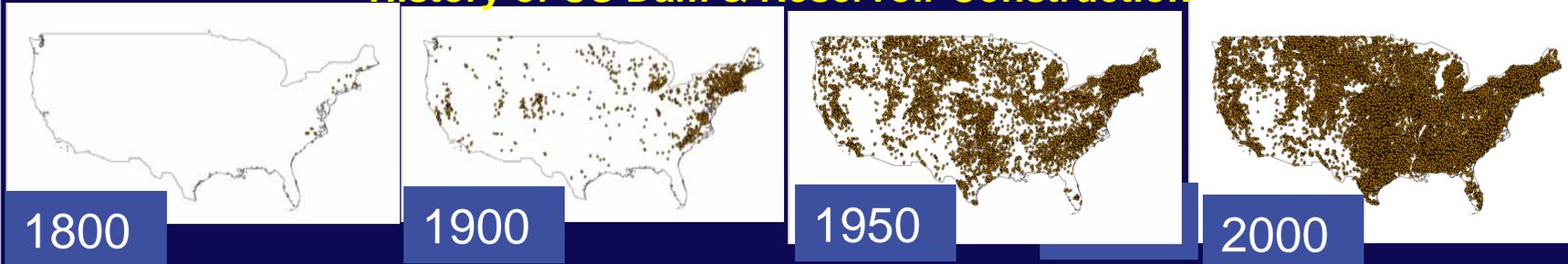
Rainfall affects growth..

the case of Zimbabwe

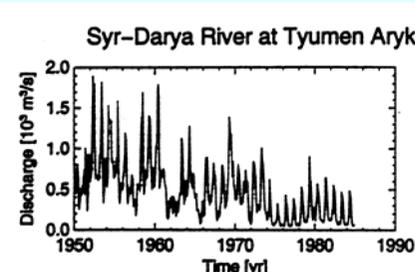
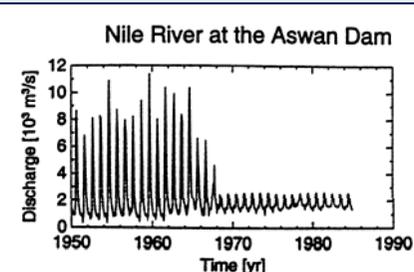
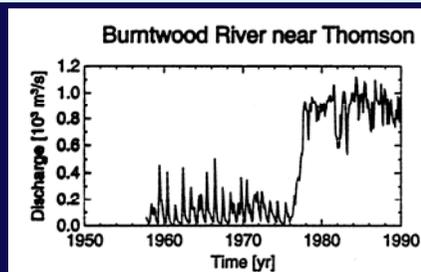


Correlation between GDP and Rainfall in Zimbabwe

History of US Dam & Reservoir Construction

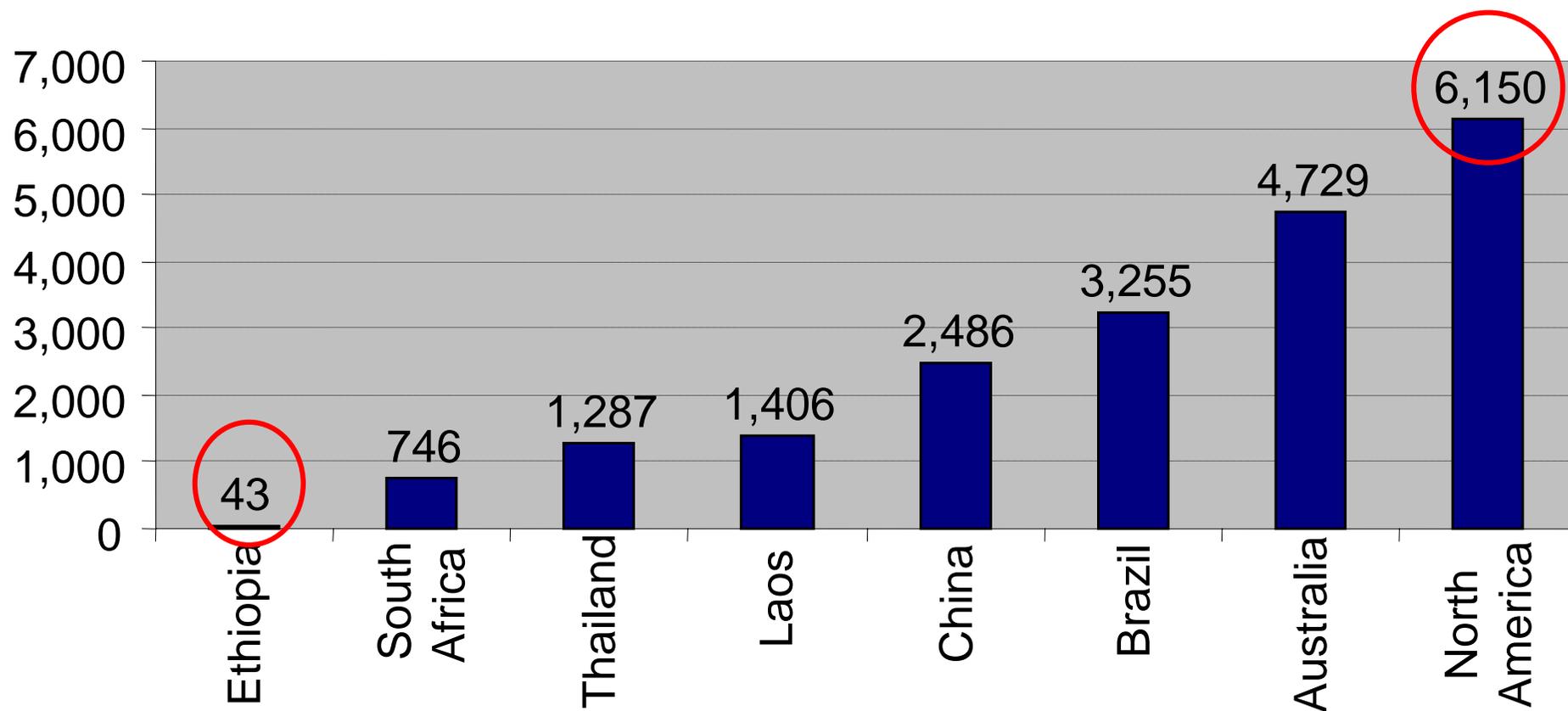


- 700% increase in water held by river systems
- Several years of residence time change in many basins
- Tripling of river runoff travel times globally (from 20 up to 60 days)
- Substantial impact on aquatic biodiversity
- Interception of 30% of continental TSS flux



From: Vörösmarty et al. 2004, *Eos-AGU Trans.*

Infrastructure gap: Water storage



The challenge we all have

*How to put water in the minds
of people?*



What happened over the past years?

- **1997**
 - **1st World Water Forum (Marrakech)**
 - **UN GA Special Session 19 (Rio +5)**

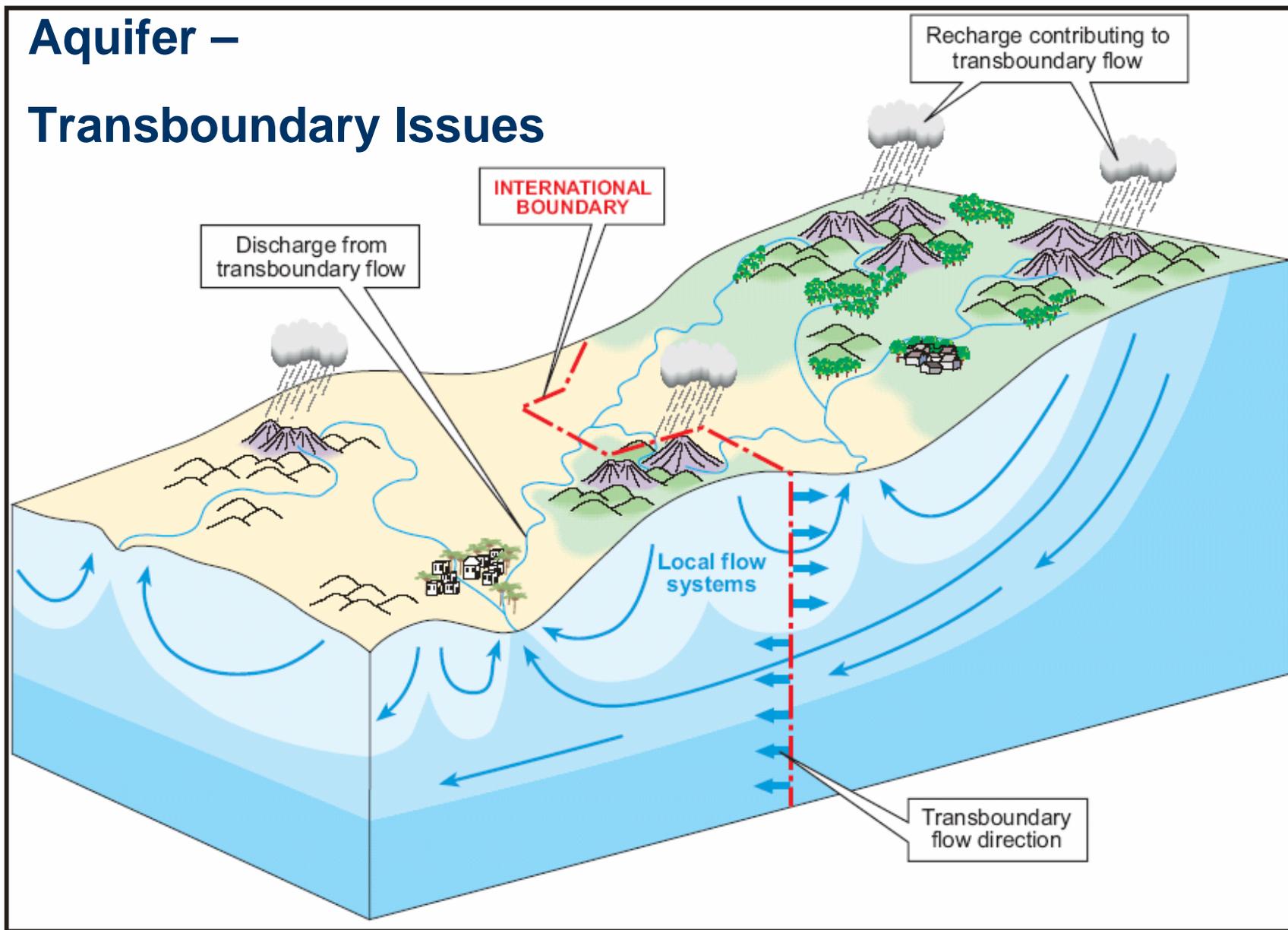
“...water will become a major limiting factor in socio-economic development...”
 - **UN GA 51**

Adoption of the UN Convention on the Law of the Non-Navigational Uses of Transboundary Water Courses





Aquifer – Transboundary Issues



Water Resources are recognized as a UNESCO Principal Priority

**A new consensus is emerging
in international thinking about
Water Resources**

World Water Assessment Programme

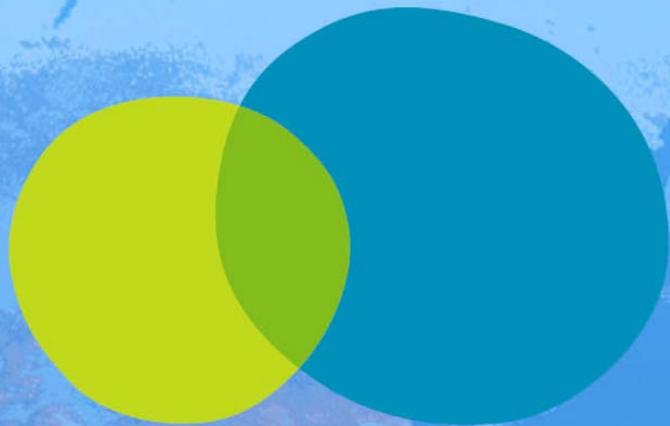
(WWAP)



The State of The World's Freshwater Resources



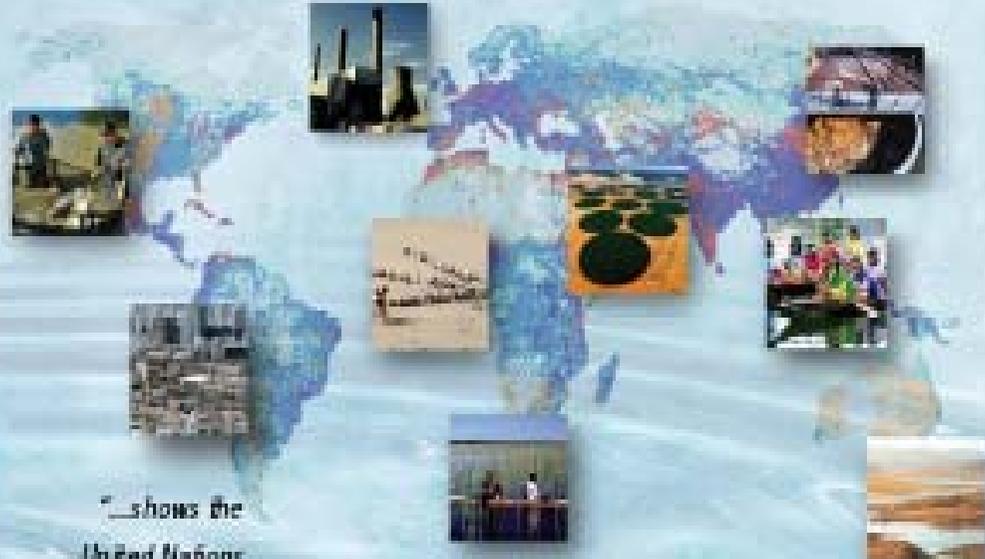
Water for People Water for Life



World Water
Assessment Programme



The United Nations
World Water Development Report



"...shows the United Nations at work, helping the world to confront current and impending water crises. I recommend this publication to the widest possible audience."
Bill Ayres

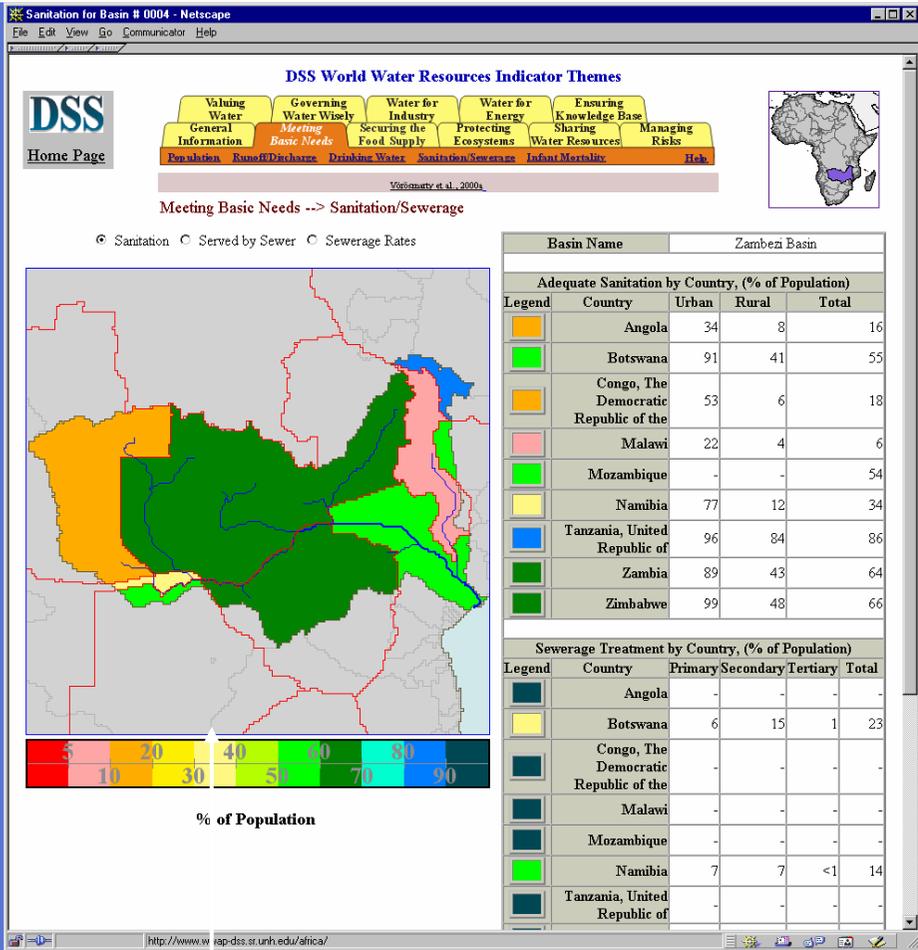
Water

a shared responsibility

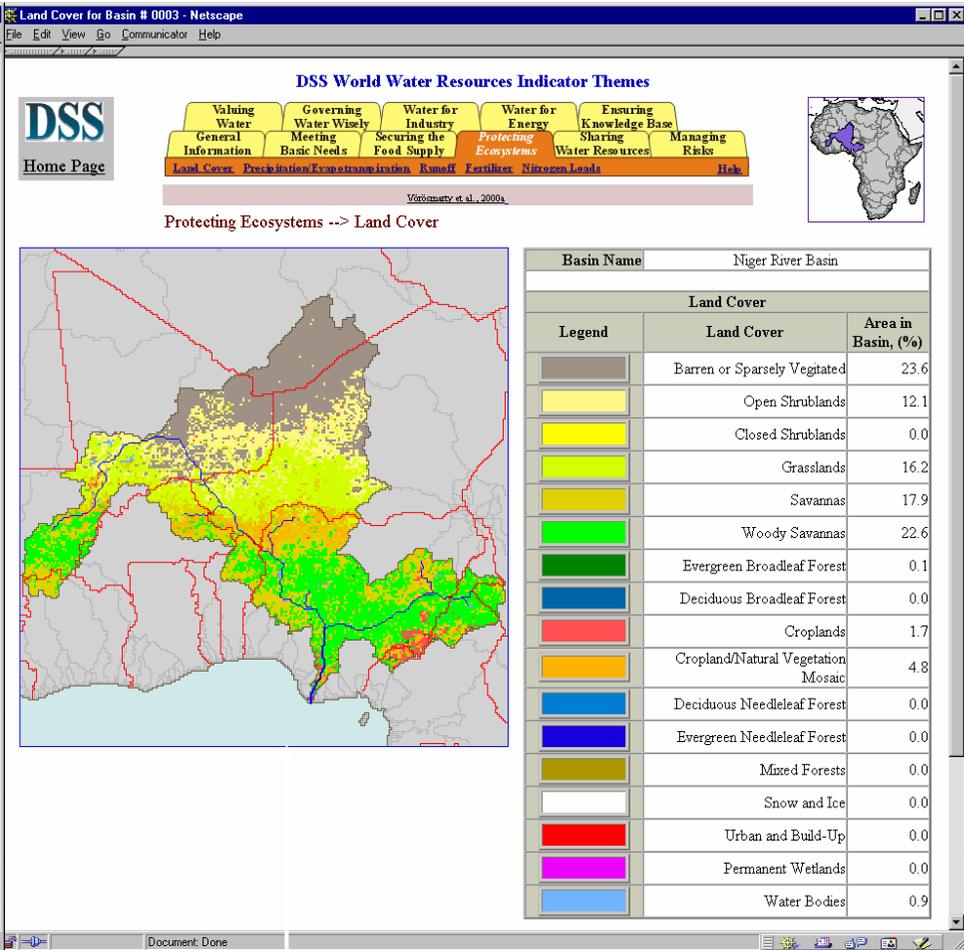


World Water
Assessment Programme

The United Nations
World Water Development
Report 2



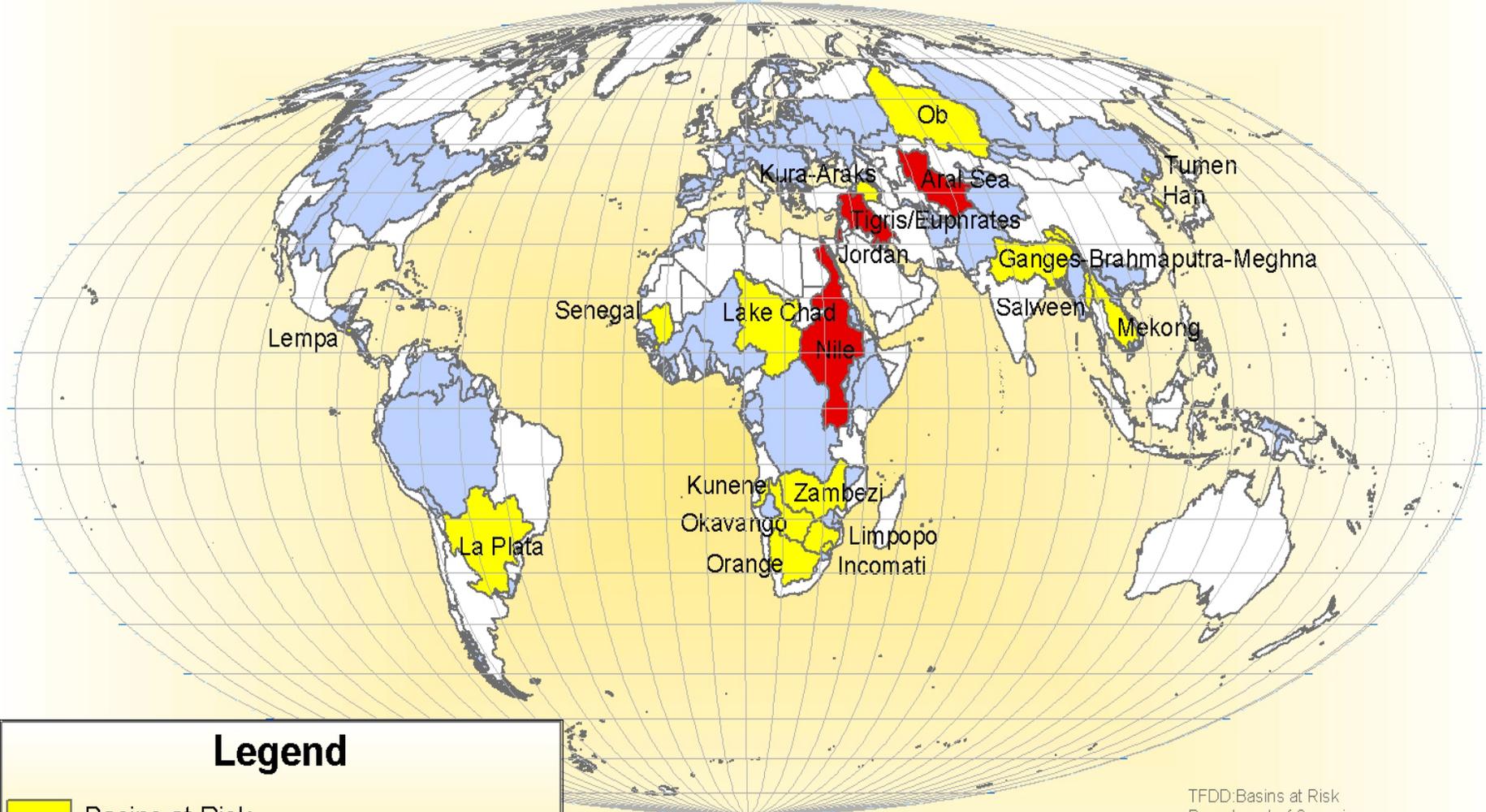
Sanitation



Satellite Land Cover

MAJOR CHALLENGE: Harmonize Geophysical and Social Dimensions Approaches

Basins at Risk



Legend

- Basins at Risk
- Political Boundaries
- International Basins
- Basins Currently in Dispute/Negotiations

TFDD:Basins at Risk
Department of Geosciences
Oregon State University
Cartography: Greg Fiske
June 2001

From **Potential Conflict** to **Co-operation Potential**



Water for Peace

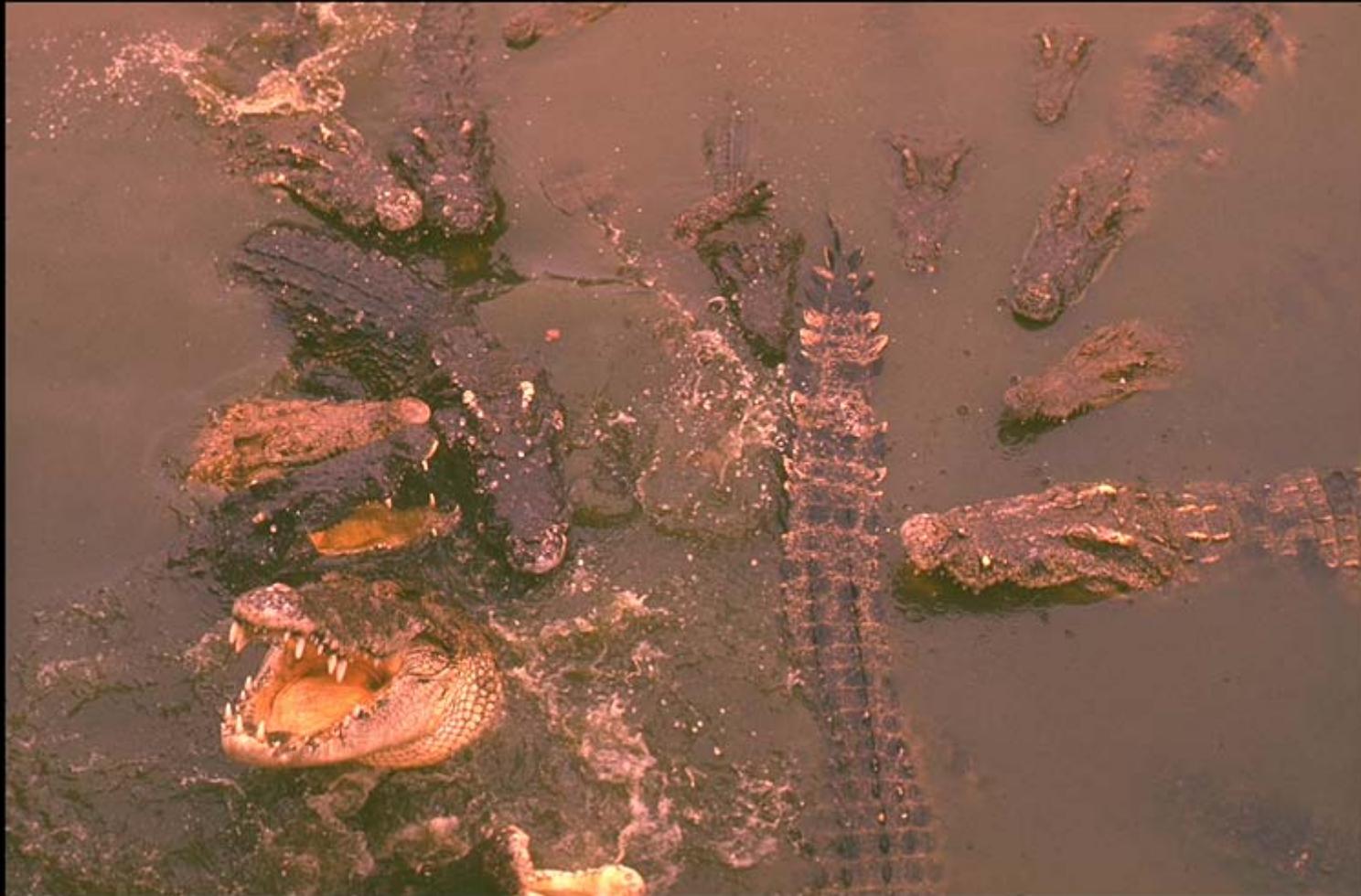
a contribution to

World Water Assessment Programme





International Hydrological Programme



The International Hydrological Programme

(IHP)



**Intergovernmental scientific programme on
Water Resources of the
UN system**

- * *Created in 1975 after the International Hydrological Decade*
- * *Member States define needs and plans of phases*
- * *Growing emphasis on management and social aspects*

IHP Phases

1965-1974 IHD: Experimental Basins

World Catal. of Very Large Floods

World Water Balance & WR of the Earth

1975-1980 IHP-I

1981-1983 IHP-II

1984-1989 IHP- III

**1990-1995 IHP- IV Hydrology and Water Resources for
Sustainable Development**

**1996-2001 IHP-V Hydrology and Water Resources under
Vulnerable Environment**

**2002-2007 IHP-VI Water Interactions:
Systems at Risk and Social Challenges**





Water Interactions : Systems at Risk and Social Challenges

Phase VI (2002-2007)

International Hydrological Programme
of UNESCO

Themes

- 1 Global changes and water resources
- 2 Integrated Watershed and Aquifer Dynamics
- 3 Land Habitat Hydrology
- 4 Water and Society
- 5 Water Education and Training



Evolution of IHP phases: continuity with change

1990-1995 IHP IV

Hydrology and Water Resources Sustainable Development
in a **Changing Environment**

1996-2001 IHP-V

Hydrology and Water Resources Development
in a **Vulnerable Environment**

2002-2007 IHP-VI

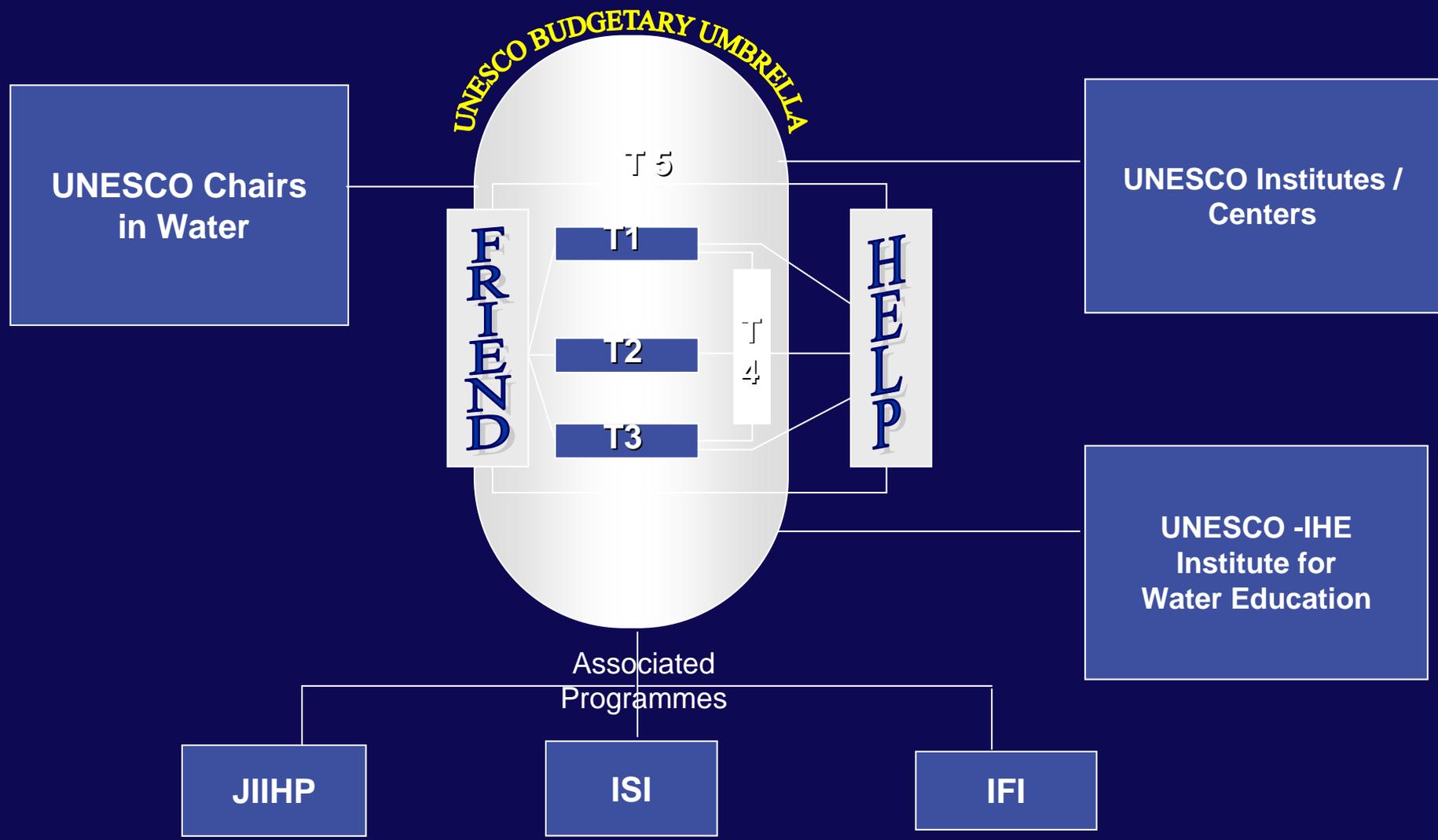
Water Interactions:
Systems at Risk and **Social Challenges**

2007-2012 IHP-VII (proposed)

Water Dependencies:
Systems under Stress and **Societal Responses**



Interlinkages of IHP FRIEND HELP JIHP (PUB)

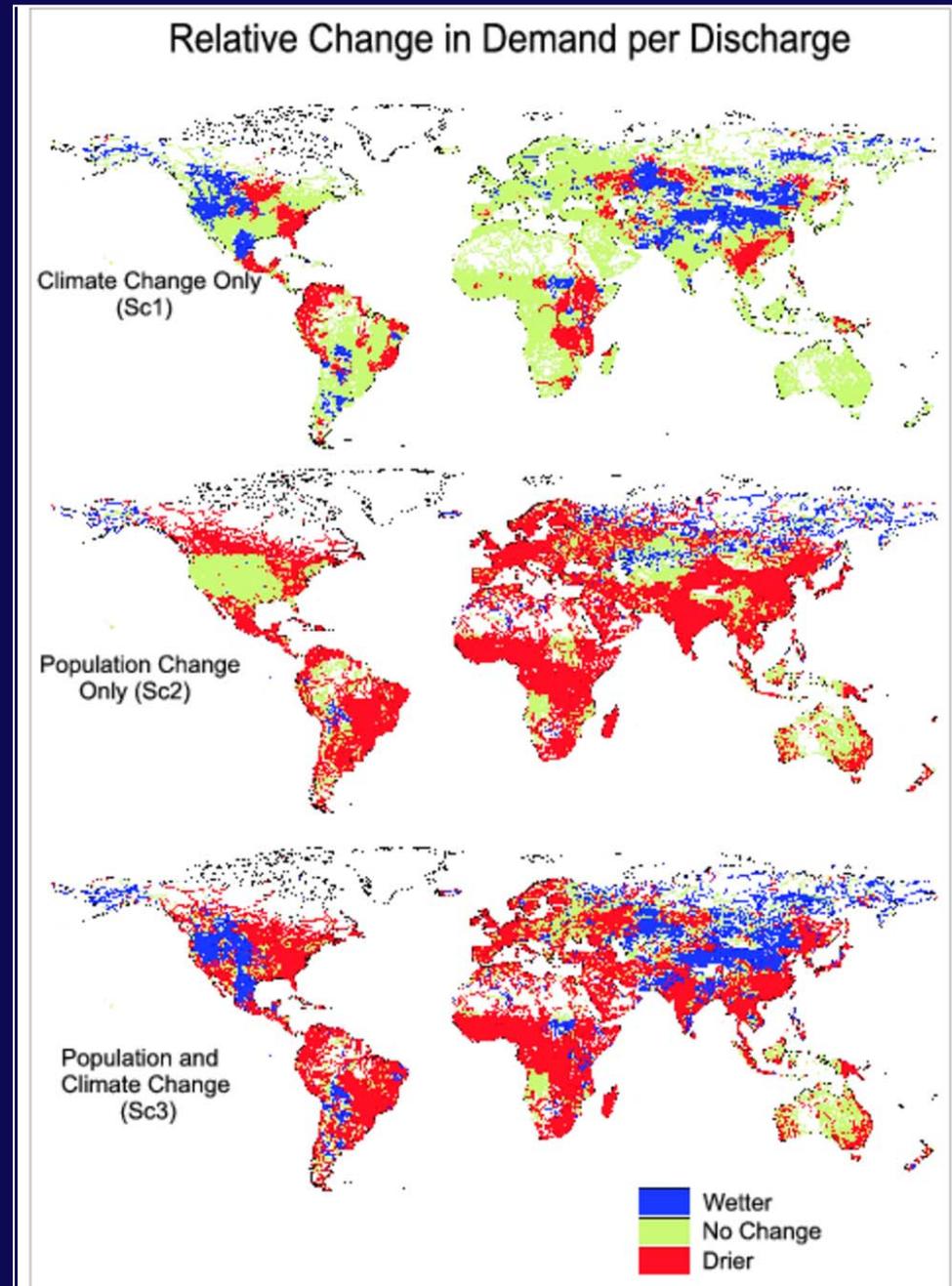


Water Stress Changes to 2025

- 80% of future stress from **population & development**, not climate change!
- Correct Priorities?
(E.g. 85% US global change research funding to climate and carbon)

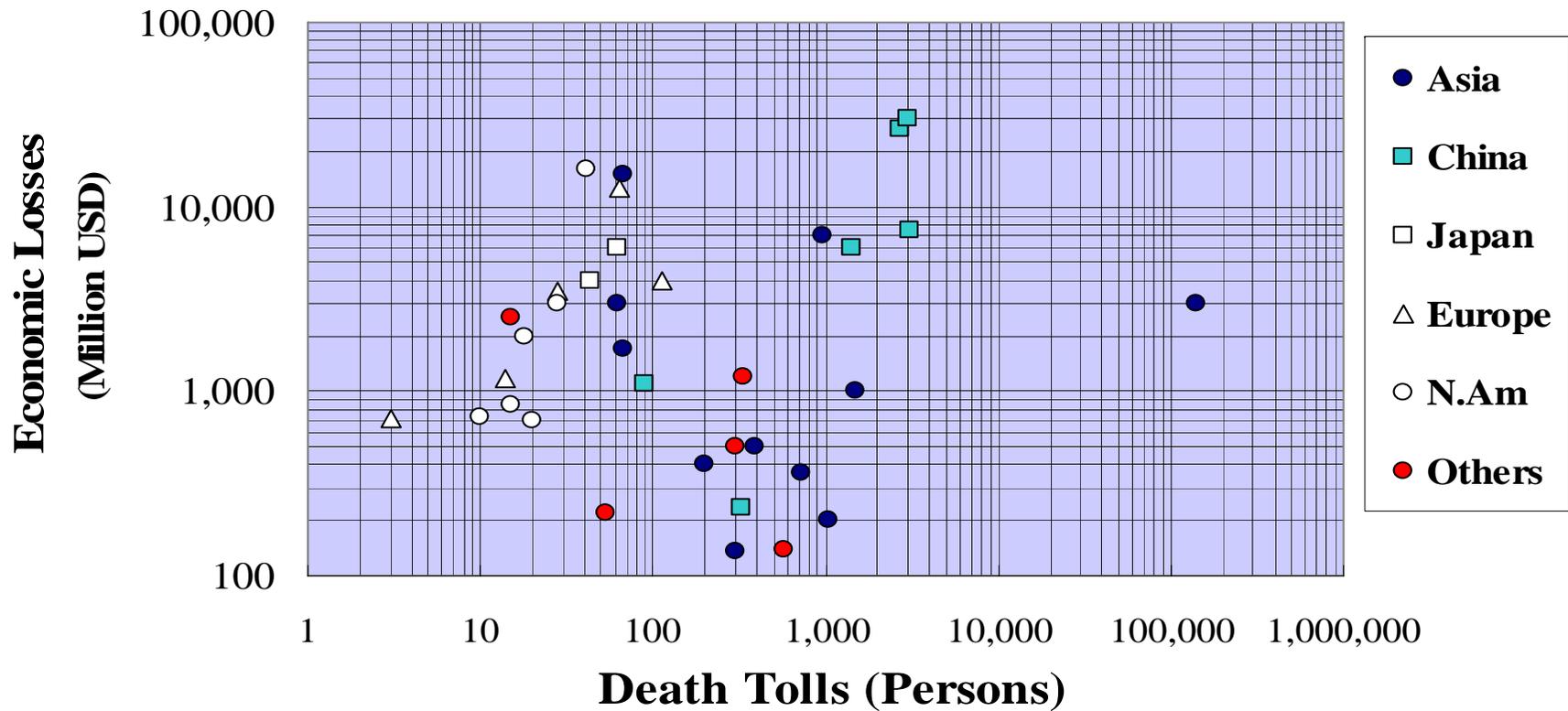


UNH



Vörösmarty et al. 2000

Damages of Floods in 1990's



Need for a new initiative

- 2002 World Summit on Sustainable Development (Johannesburg)
- 2003 3rd World Water Forum (Kyoto, Shiga & Osaka)



- ➔ - **Necessity to improve risk management measures, technologies and capacity building relevant to flood-related disasters**

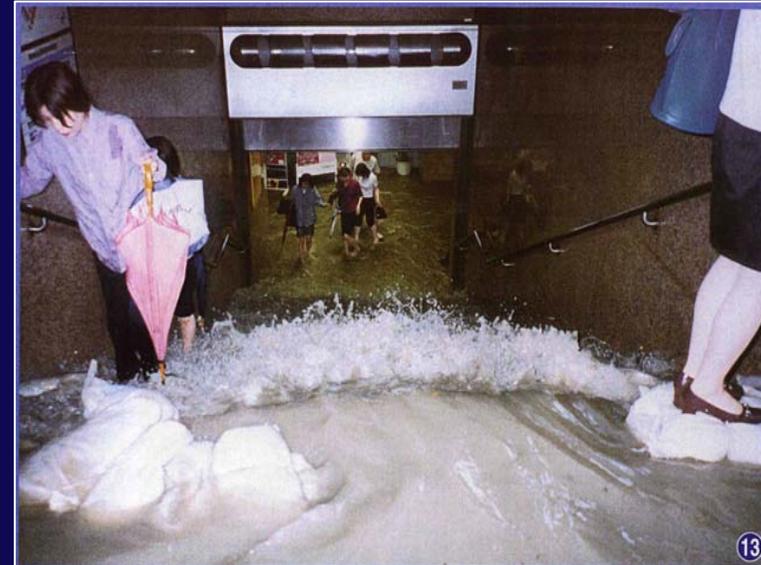


Fukuoka Flood in 1999

(Source : MLIT)

- Urban expansion taking place downward → Underground flood risk
- Recent developments → Long term risks are not experienced

(Source: Herat, UNU)



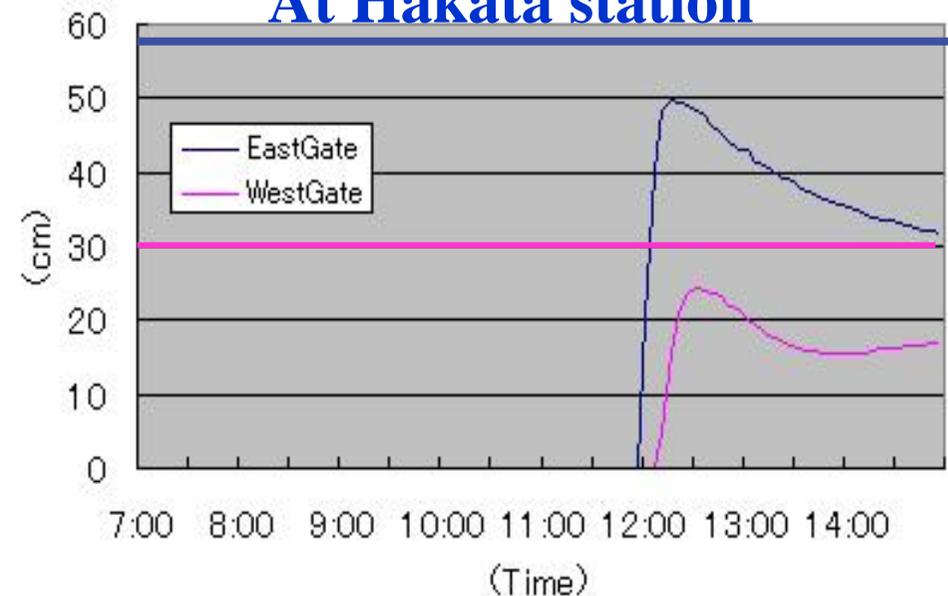
Fukuoka simulation



Volume of water entered into underground space:

- 2,017 m³ (simulated volume)
- 1,320 m³ (total pumped water station)

At Hakata station



IFI

International Flood Initiative /Programme



IIASA



International Hydrological Programme

The UN inter-agency International Flood Initiative

Mission Statement

The International Flood Initiative promotes an integrated approach to flood management, at the same time, reducing social, environmental and economic risks that result in and from floods and increasing the benefits from floods and the use of flood plains.

UNESCO, WMO, UNU, ISDR

IAHS, IIASA



International Hydrological Programme

Overall objectives

The overall objective of IFI is to build capacities in countries in order to gain and advocate better understanding and handling of hazards, vulnerabilities and benefits involved with floods by promoting all measures leading to that end by applying the following guiding principles:

- Living with floods
- Equity
- Empowered participation
- Inter-disciplinarity and trans-sectorality
- International and regional cooperation



International Hydrological Programme

Specific objectives

- **Improve data collection and analysis for flood management;**
- **Enlarge the knowledge-base in respect to risk and benefits of floods;**
- **Enhance the benefits of floods;**
- **Develop and improve institutional frameworks for flood management;**
- **Develop area-specific adaptation strategies;**
- **Develop approaches to assess and reduce vulnerability;**
- **Improve floodplain management in rural and urban areas;**
- **Optimize a mix of structural and non-structural approaches;**
- **Improve forecasting and early warning of floods for both rural and urban areas;**



International Hydrological Programme

International Centre for Water Hazard and Risk Management

under the auspices of UNESCO

(UNESCO-ICHARM, Tsukuba, Japan)



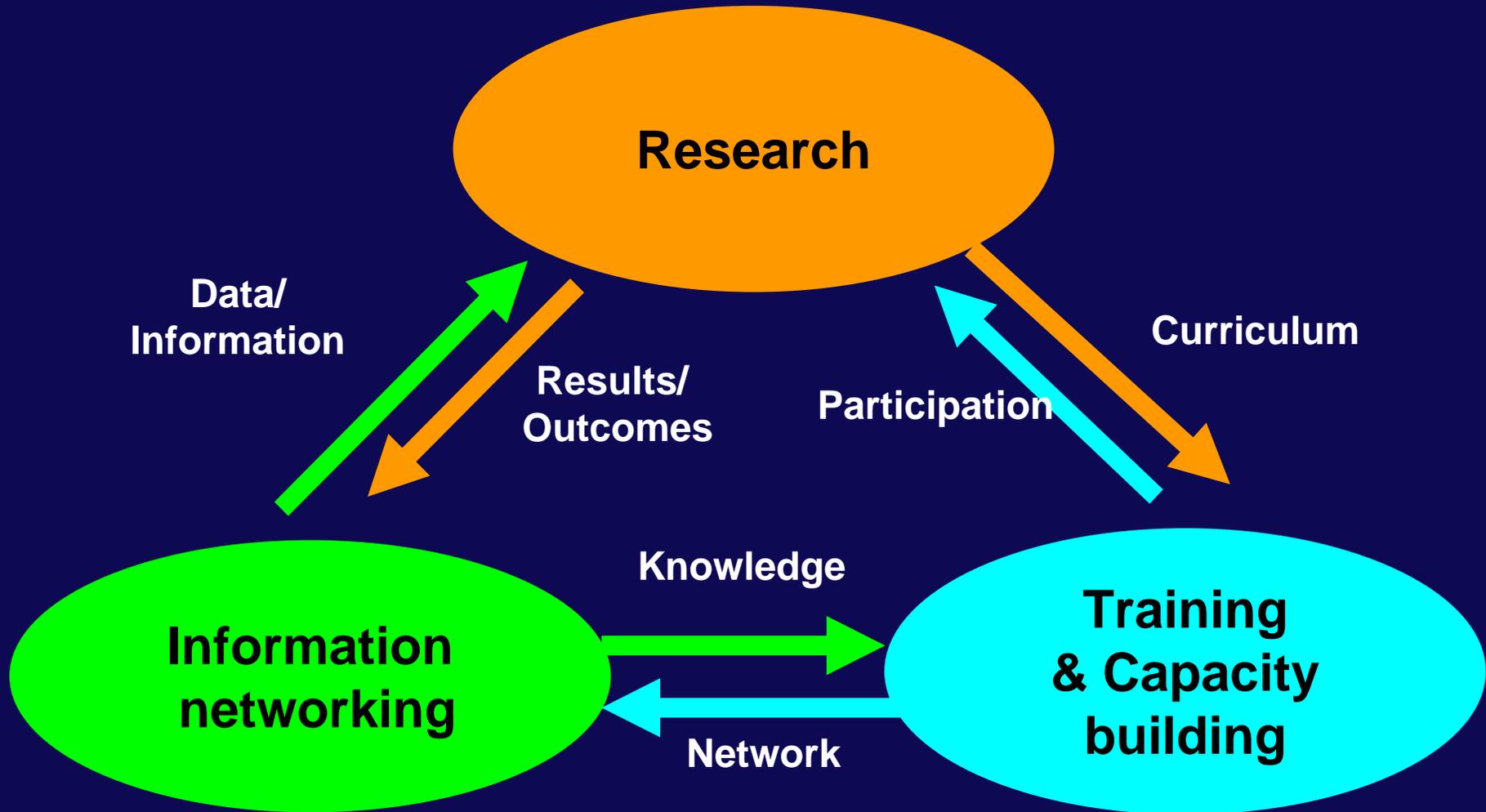
International Hydrological Programme

The ICHARM Building



- ◆ **Research Staff** : 20 (at the initial stage)
- ◆ **Center building** : will be completed in autumn 2005
- ◆ **Office space** : 2,000m²

The Three Pillars of UNESCO-ICHARM





International Hydrological Programme

Activities - Research -

- **Contribution to international projects such as WWAP and IFI**
- **Hydraulic / hydrological prediction, observation, modeling and analysis**
- **Risk assessment and risk management technologies for water-related hazards**

• • • and others



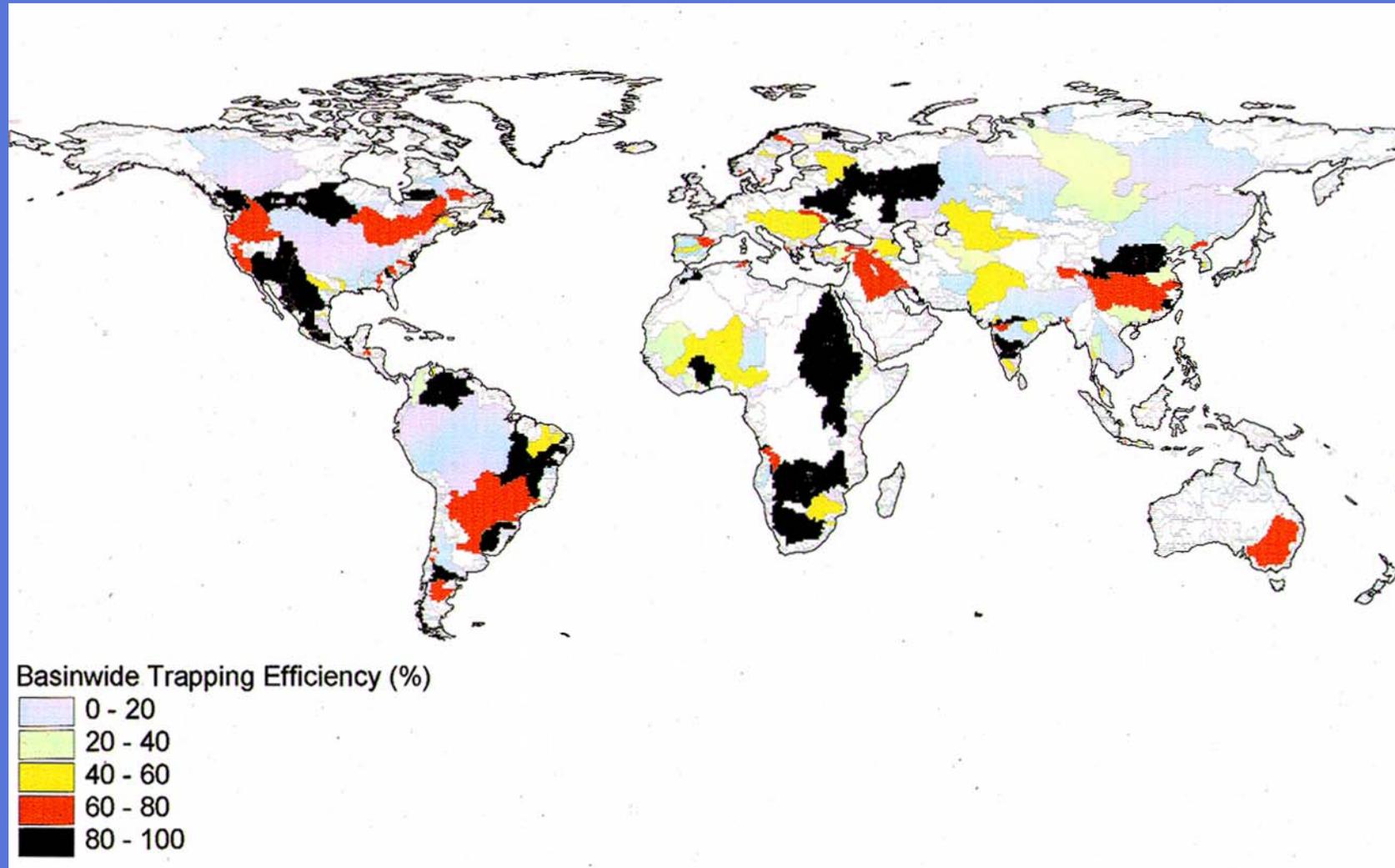
International Hydrological Programme

ISI

International Sediment Initiative

Human Fingerprint on Land-to-Ocean Linkages

--Intercepted sediments that “nourish” our coastlines





International Hydrological Programme

International Research and Training Centre on Erosion and Sedimentation

under the auspices of UNESCO

(UNESCO-IRTCES, Beijing, China)

Flow Regimes from International Experimental and Network Data

**An International Collaborative Study
in Regional Hydrology**



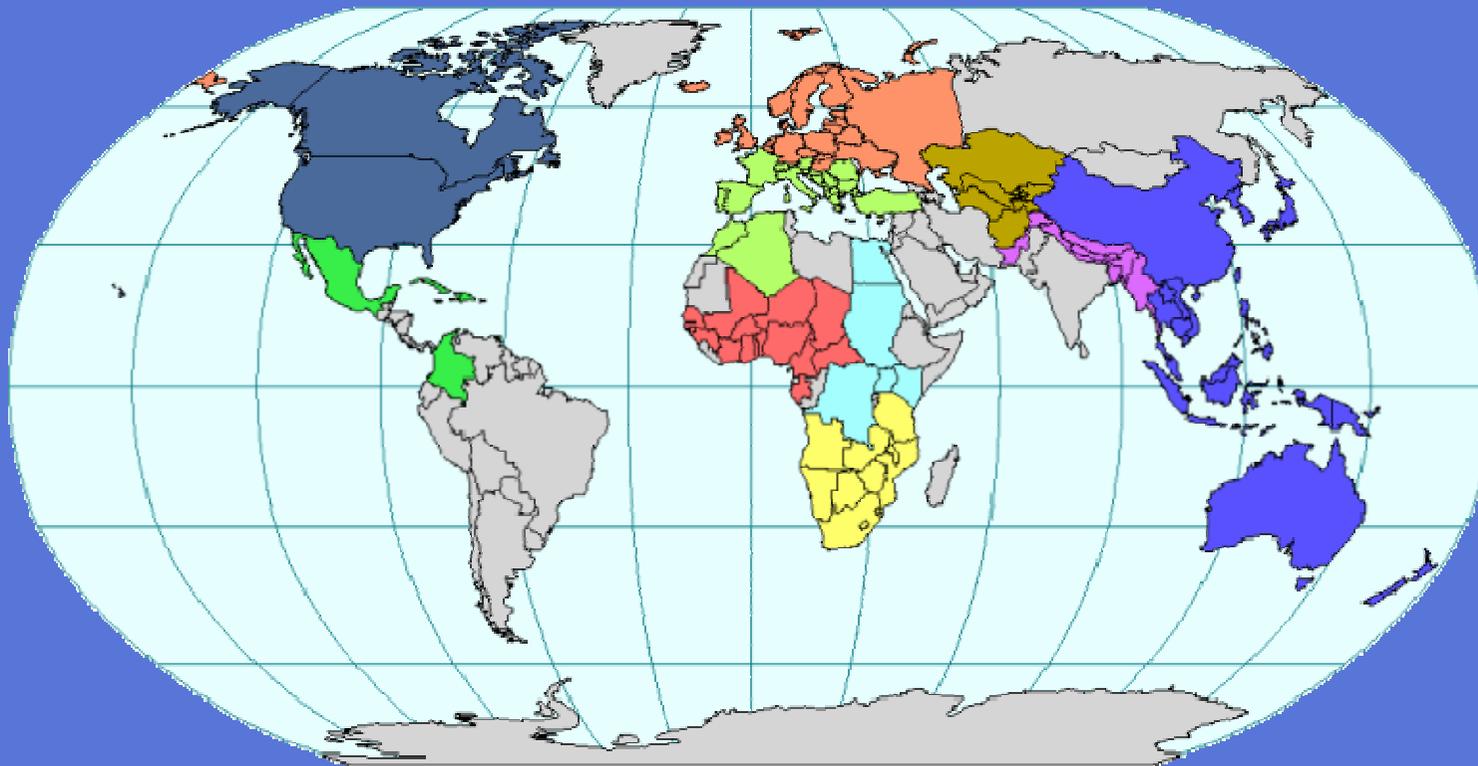


International Hydrological Programme



FRIEND : a global project

The primary objective is to improve understanding of hydrological variability and similarity across time and space in order to develop hydrological science and practical design methods.



Established

- | | | |
|-----------------|---------------|-------|
| N Europe | Asian Pacific | Nile |
| AMHY | HKH | AMIGO |
| Southern Africa | AOC | |

Emerging

- | |
|--------------|
| Central Asia |
| N America |



HELP



Hydrology for the Environment, **Life and Policy**

<http://www.unesco.org/water/ihp/help>

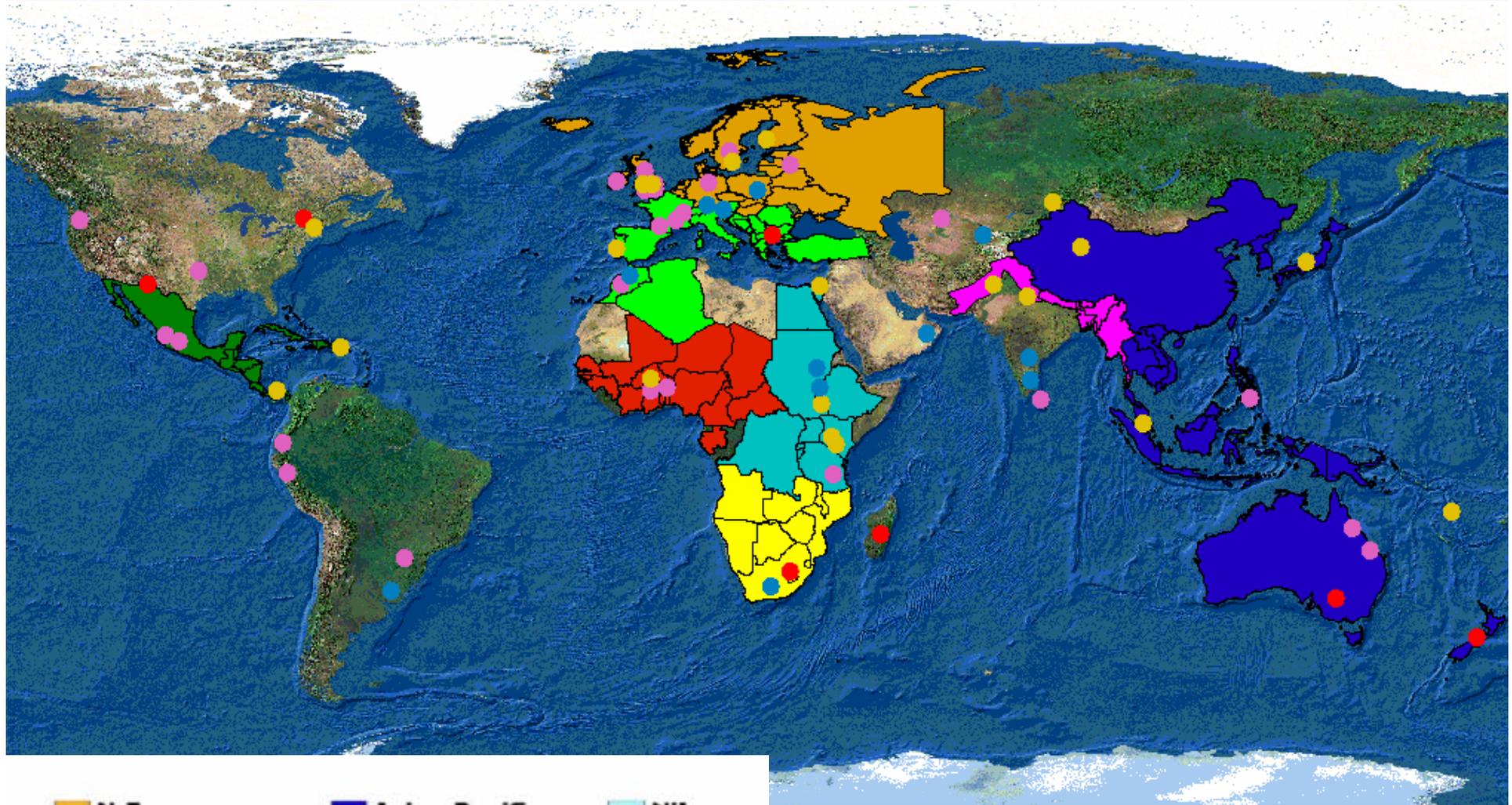
To deliver social, economic and environmental benefit to stakeholders through sustainable and appropriate use of water by directing hydrological science towards improved integrated catchment management basins

Real people

Real catchments

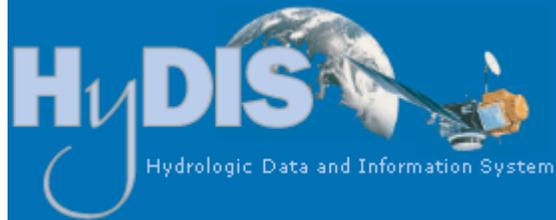
Real answers

FRIEND and HELP Networks

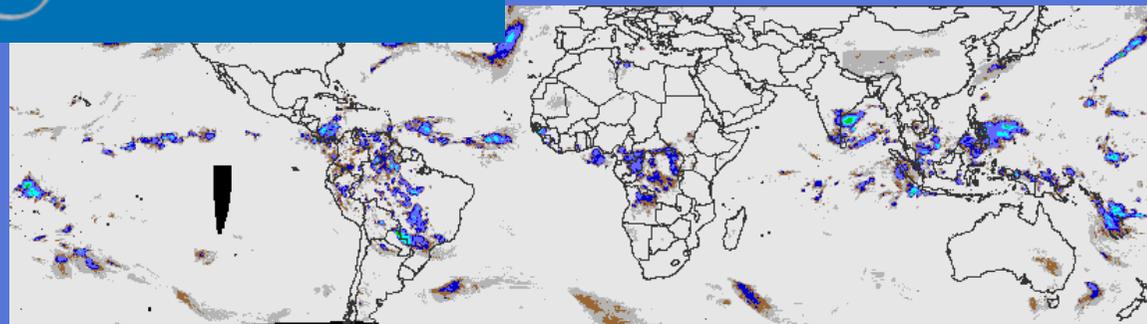


N Europe	Asian Pacific	Nile
AMHY	HKH	AMIGO
Southern Africa	AOC	

Demonstration	Evolving
Operational	Proposed



Precipitation



In Association
with

UCIrvine



Modeling Short Course Materials

www.G-WADI.org/shortcourses



The 1st G-WADI workshop was held in Roorkee, India where world leaders in arid zone hydrology and modeling came to provide advice and training on hydrological modeling methods and software, focused on the special needs and problems of arid and semi-arid areas. Participants came from Australia, Africa (North and South), South America, the Middle East, USA, UK, India, Pakistan, China and the Central Asian region. The aim is to produce web-based information and access to software tools. Course materials will be available on the G-WADI web site.

Remote Sensing Data

hydiss.eng.uci.edu/hydis-unesco



G-WADI has teamed up with the University of California-Irvine and SAHRA to make remotely sensed data on key hydrologic parameters available over the Internet. The Hydrologic Data and Information System (HyDIS) provides precipitation, and other data sets at user-selected spatial and temporal resolutions through a user-friendly interface.

G-WADI

Water and Development
Information for Arid Lands -
A Global Network



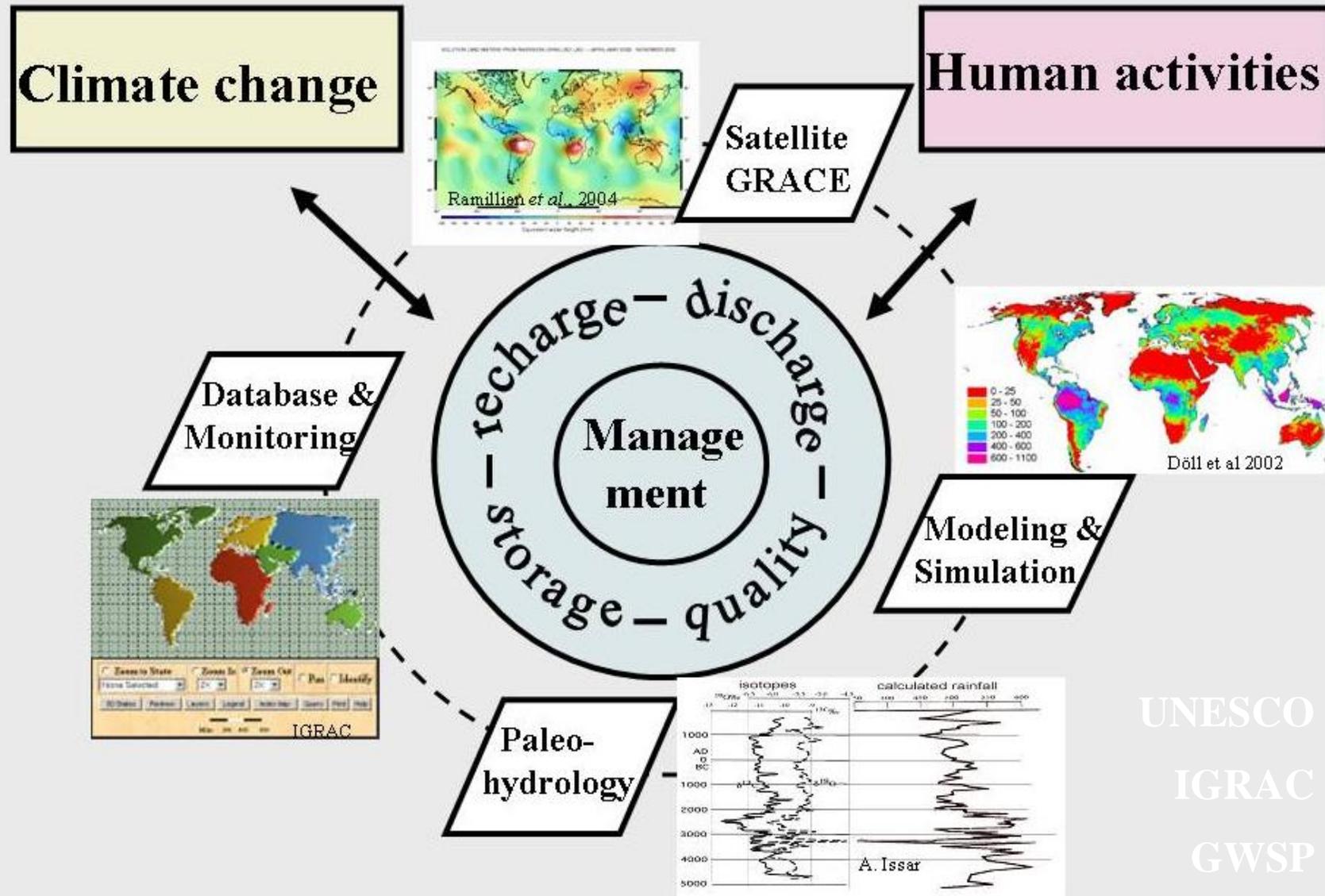
United Nations
Educational Scientific
and Cultural Organization

UNESCO Intergovernmental International
Hydrological Programme (IHP)

supported in part by:
Department for International Development (DFID)
leading the British government's fight against world poverty

www.g-wadi.org

Groundwater Resources Assessment under the Pressures of Humanity and Climate Change (GRAPHIC)





International Hydrological Programme

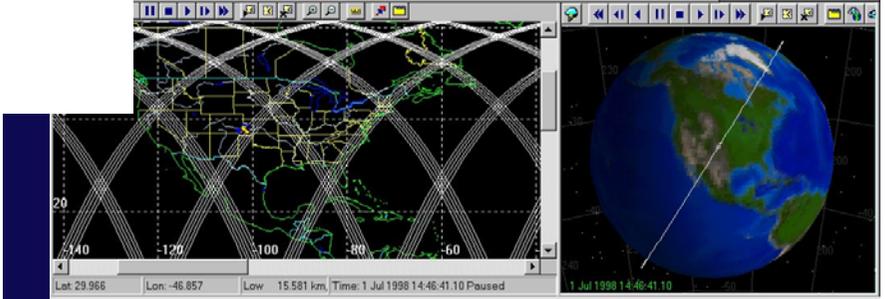
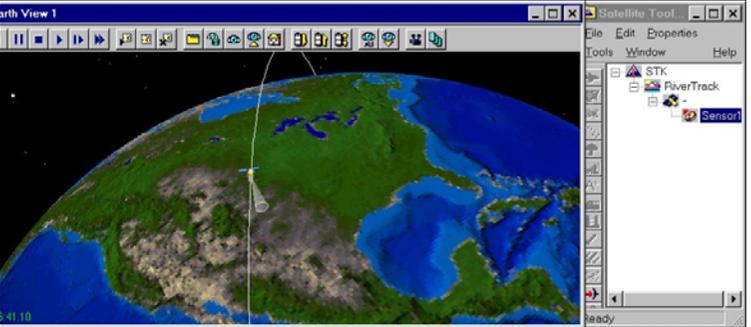
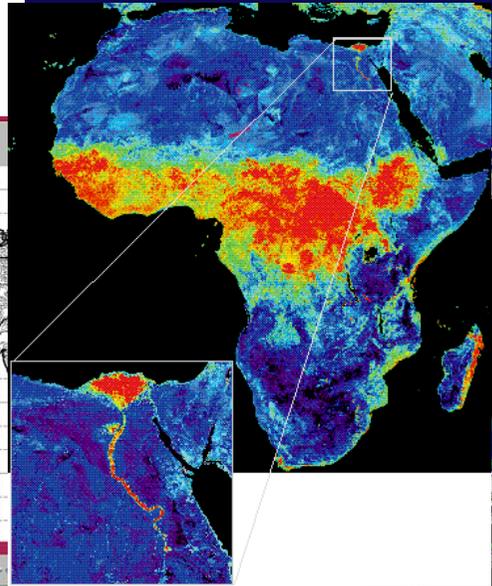
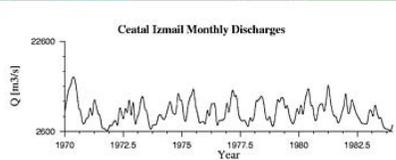
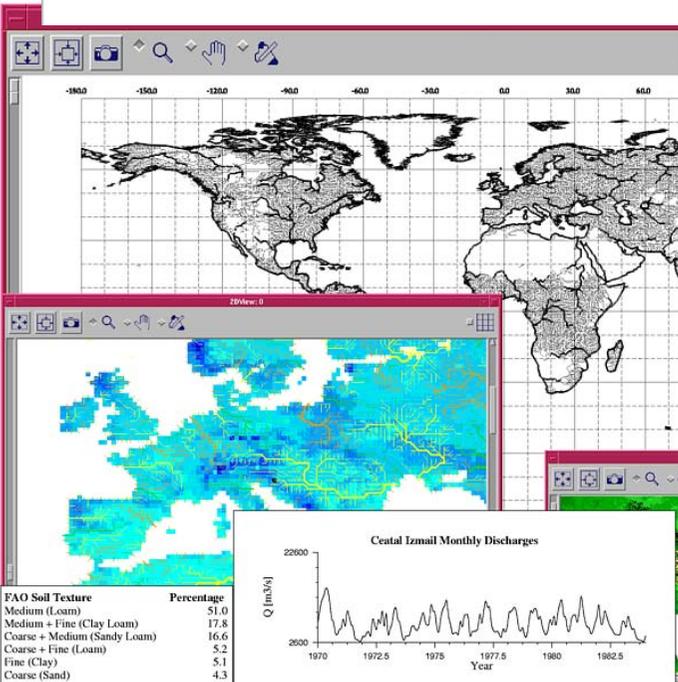
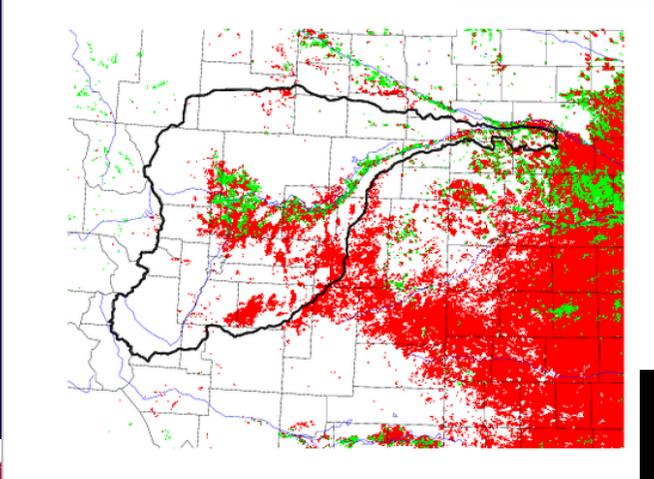
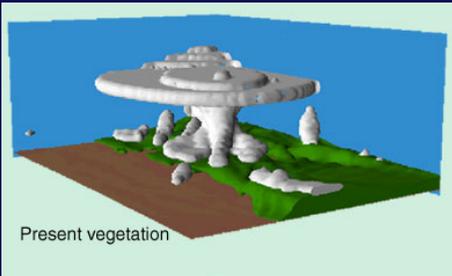
**“There is no sustainable
development without
adequate information about
the state of the Earth and its
environment”**

Statement at WSSD

High Technology Earth Systems Tools

- Satellite data
- Simulation models
- Geospatial analysis tools

They show promise but.....



The data issue

- The case of Africa
- Interconnectedness through data
- Local data networks:
 - The ethical choice vs.
 - The global needs to minimize bias
- GEOSS: space and in situ observations
- Will data secrecy be gone?
- Will it be replaced by sharing?
- What is the way out of trouble?

International
Hydrological
Programme (IHP)

Global Earth Observation System of Systems (GEOSS)





International Hydrological Programme

WATER EDUCATION AND CAPACITY BUILDING



International Hydrological Programme



Existing Centers and Institutes

One CATEGORY 1:

- **UNESCO-IHE Institute for Water Education** (Delft, The Netherlands)

Twelve CATEGORY 2 Centers:

- **IRTCUD** – International Research & Training Center (Belgrade, Serbia & Montenegro)
- **IRTCES - International Research & Training Center on Erosion & Sedimentation** (Beijing, China)
- **CATHALAC** – Centro del Agua para los Trópicos Húmedos de LAC (Panama City, Panama)
- **Humid Tropics Hydrology Center for South East Asia & the Pacific** (Kuala Lumpur, Malaysia)

Existing Centers and Institutes

CATEGORY 2 (cont.):

- RCTWS – Regional Center for Training and Water Studies in Arid & Semiarid Zones (Cairo, Egypt)
- **RCUWM – Regional Center on Urban Water Management** (Teheran, Iran)
- ICQHHS – International Center on Qanats and Historic Hydraulic Structures (Yazd, I.R. of Iran)

Existing Centers and Institutes

New CATEGORY 2 Centers approved by the 33rd General Conference:

- **International Center for Water Hazards and Risk Management - ICHARM** (Tsukuba, Japan)
- **IHP-HELP Center on Water Law and Policy, Dundee, UK**
- **European Regional Ecohydrology Center** (Łódź, Poland)
- **Centro Regional para la Gestión del Agua en Zonas Urbanas LAC** (Bogotá, Colombia)
- **CAZALAC - Centro del Agua para Zonas Áridas y Semiáridas de LAC** (La Serena, Chile)



CONTINUE COMPREHENSIVE, GLOBAL ASSESSMENTS AND CONSTANT VIGILANCE

- *Humans are now a part of the system*
 - New challenges to understand their role in the Earth System*
 - New opportunities for gaining knowledge*
 - Will our role be domination or adaptation?*