



# RIVER BASIN INFORMATION SYSTEMS INITIATIVE

## Example of Global International Waters Assessment

Presentation made in Megeve- France - International  
Conference on: "Integrated water resource management in  
upper river basins" 5 to 6 September 2002



## RIVER BASIN INFORMATION SYSTEMS

- Ongoing degradation of freshwater resources and marine water bodies constitutes a major threat to ecological systems and human well-being.
- 80% of pollutants responsible for the degradation originate from land based human activities in the drainage basins or rivers that discharge into coastal areas.
- Irrigation for agricultural purposes, transforms large amounts of river water into evaporating green water and depletes the freshwater flow. The results is also higher concentrations of pollutants in rivers discharging to the coastal seas due to reduced amounts of available water for dilution.



# RIVER BASIN INFORMATION SYSTEMS

## RBIS as a data provider

- The river basin information systems could provide data also to other organizations, governments, regional and local authorities and also NGO's and private sector.
- **One option** is that the proposed initiative approach requires water data to be managed on the basins, rather than according to geographical or political boundaries and information system crosses national borders.



# RIVER BASIN INFORMATION SYSTEMS

## *GIWA PERSPECTIVES FOR RIVER BASIN APPROACH: OPTIONS*

- Utilize existing structure, but organize and ensure co-ordination of major global programmes related to each river basin so that information are organized jointly by cross-boundary programmes.
- Identify a river basin of relevant and sufficient size and information sources and create criteria for definition of river basins borders.
- Identify the needs of information and water data available from different relevant existing sources;
- Identify the relevant content of the data.



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## *OPTIONS continued:-*

- Across-sectoral approach to cover economic as well as environmental and health information such as:-
  - maintenance of drinking water supplies,
  - the irrigation of crops and
  - use in many industries.
  - In economic assessment RBIS should become an essential part of water management planning.
- Governance of river basin water would be included into the RBIS.
- Involve the public. Make information easily accessible and understandable



# RIVER BASIN INFORMATION SYSTEMS

- **Contribution of GIWA**
- Could provide river basin information from subregional assessments & from 66 subregions, focusing on international, transboundary waters.
- The GIWA assessment are undertaken from the perspectives of
  - Water quality and quantity
  - Associated biodiversity and habitats and their use by society
  - The societal causes of the regionally identified issues and problems
  - Scenarios of future conditions based on projections of demographic, economic and social changes associated with the process of human development



# RIVER BASIN INFORMATION SYSTEMS

- **Analytical phase (phs1) will provide:**
  - general description of the physical and socio-economic, water environment and geographic characteristics plus human parameters and activities that influence the subregion.
  - priority issues selected from;
    - Freshwater shortage
    - Pollution
    - Habitat and community modification
    - Unsustainable exploitation of fisheries and other living resources



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- The causal chain analyses will provide results of:
  - linkages between perceived problems, immediate cause and their social root causes.
  - The sectors analyzed are:
    - agriculture
    - industry
    - transport
    - fisheries
    - forestry
    - energy production
    - urbanization
    - tourism





# RIVER BASIN INFORMATION SYSTEMS

- Causes associated with driving forces ( root causes) of the problem, related to:
  - demographic
  - technological
  - economic
  - social
  - governance

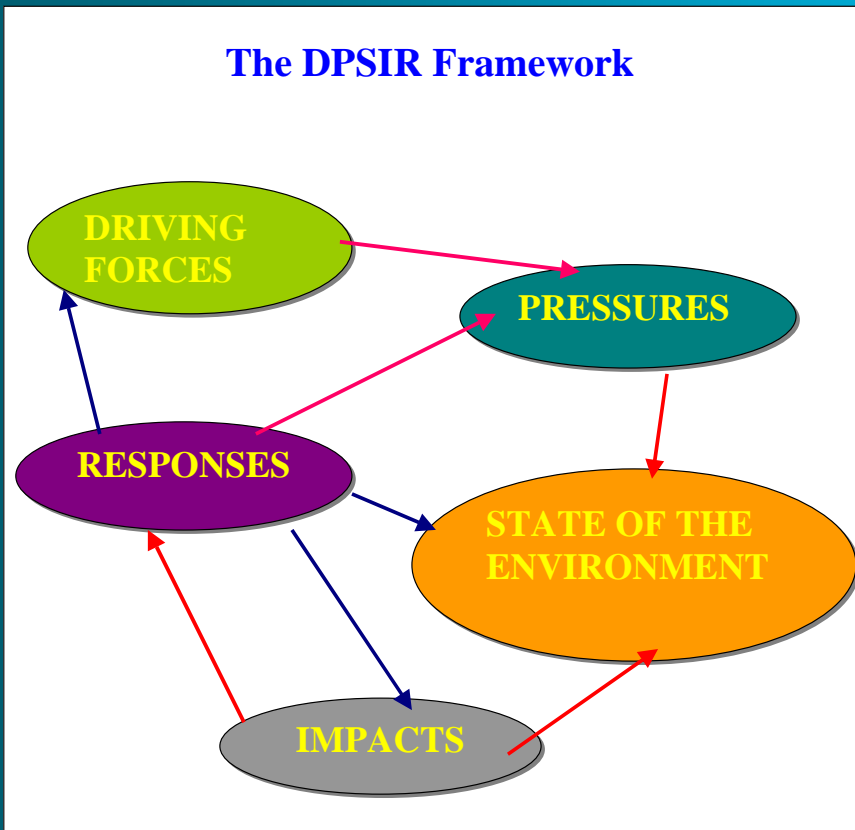
Will be identified

- GIWA sub-regional results will be provided in different form
- The potential aspects of RBIS should be included into reporting in a very early stage.



# RIVER BASIN INFORMATION SYSTEMS

The DPSIR Framework



- **Driving Forces:** Socio-economic and socio-cultural forces driving human activities, which increase or mitigate pressures on the environment.
- **Pressures:** Stresses which human activities place directly on the environment.
- **State:** The condition of the environment.
- **Impacts:** The effects resulting from this condition
- **Responses:** Responses by society to the environmental situation



# RIVER BASIN INFORMATION SYSTEMS

## The Causal-Chain Model

**Problem** ⇒

**Concerns** ⇒

**Issues**

**Immediate causes**

**Human activity** ⇒ **Driving forces** ⇒

- Agriculture
- Forestry
- Fishing
- Aquaculture
- Mining
- Industry
- Energy production
- Transport
- Tourism
- Urbanisation
- Military activity

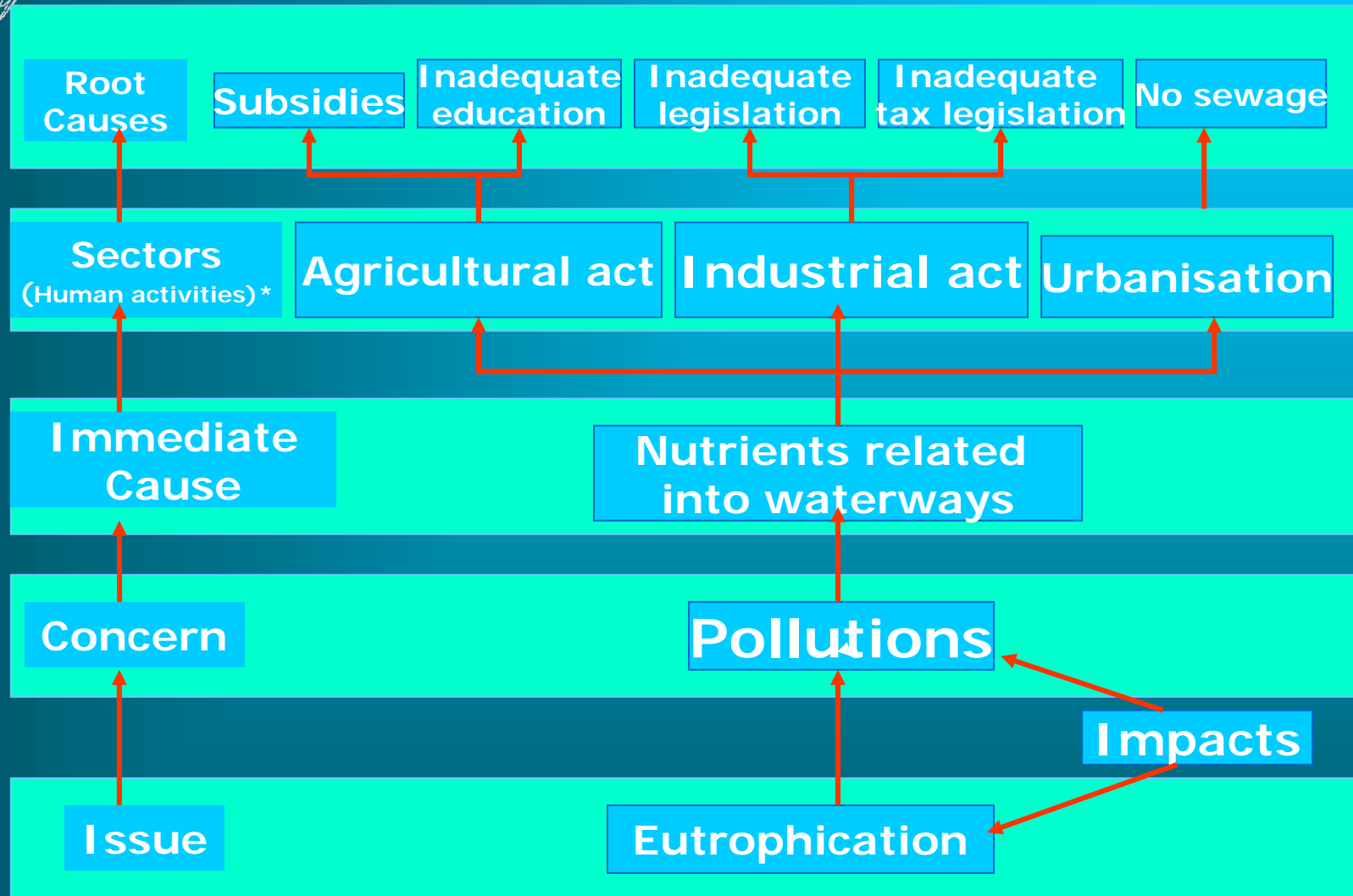
- Human needs & wants
- Markets
- Economics
- Demography
- Lifestyle
- Poverty
- Infrastructure
- Investments
- Financing

**Governance**

- Enforcement
- Agreements
- Legislation
- Laws
- Rules
- Regulations
- Education
- Institution
- Competence
- Capacity



# RIVER BASIN INFORMATION SYSTEMS

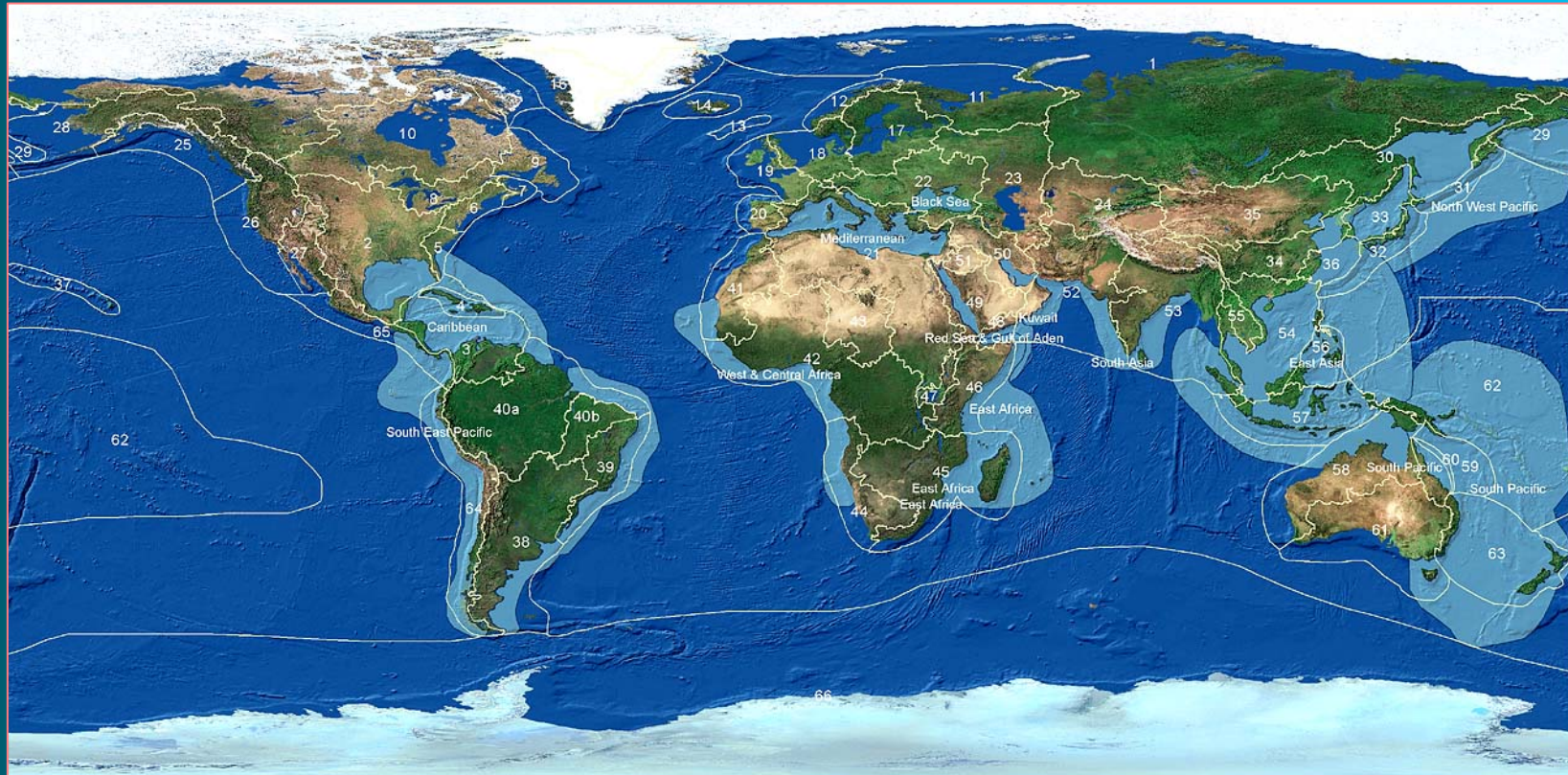


\* Include specific activities



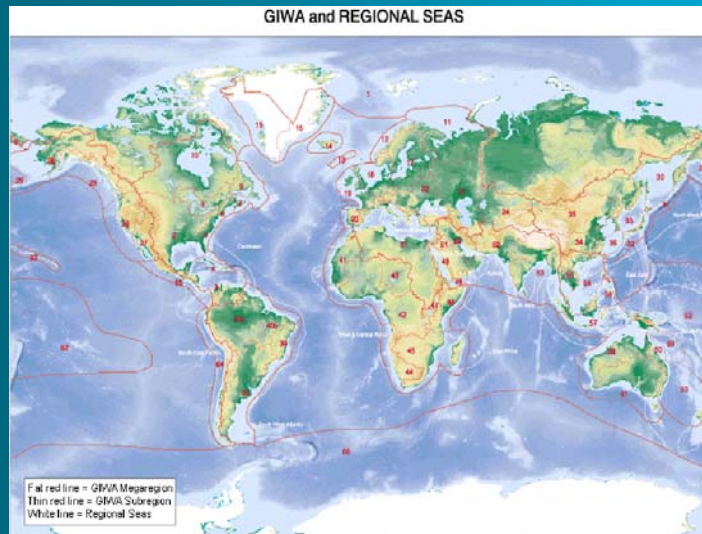
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## GIWA REGION BOUNDARIES





# RIVER BASIN INFORMATION SYSTEMS



- **GIWA REGION BOUNDARIES**
- For more information on GIWA, boundaries, regions, waterbasins and countries please refer to the following website:-
- <http://www.giwa.net/boundaries/boundaries.phtml>



# RIVER BASIN INFORMATION SYSTEMS

Global International Waters Assessment

## Case studies from Sub-Saharan Africa





# RIVER BASIN INFORMATION SYSTEMS

## Scaling and Scoping in Region V: *Sub Saharan Africa & Major Freshwater Catchments*

Major transboundary River Basins

- Senegal
- Gambia
- Volta
- Niger/Benue
- Congo
- Cunene
- Orange
- Okavango
- Great Ruaha
- Mangoky
- Limpopo
- Zambezi (with its tributaries)
- Tana
- Ruvuma
- Juba–Shabelle-Ewaso Nyiro
- Chari–Logon
- Kamadogou

In addition, the assessment includes smaller river basins that have a significant environmental impacts on marine ecosystems, such as:

- Tugela
- Save
- Incomati
- Buzi
- Umbelezi
- Athi-Galana-Sabaki
- Berg River
- Pangani
- Omo



(Note that the Nile River that originates from the East African Highlands was not assessed because It's catchment drains into the Mediterranean Sea, Sub Region 21)





# RIVER BASIN INFORMATION SYSTEMS

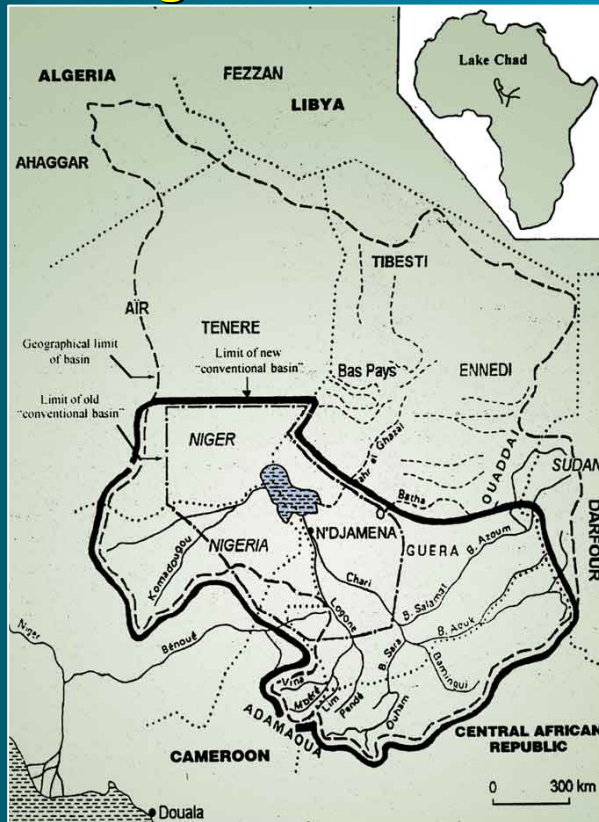
## ■ Some common characteristics

- There exists great seasonal variation in stream flow for nearly all rivers in the continent (rivers are mainly recharged by monsoon rainfall)
- Most parts of the continent experience alternating periods of drought and floods.
- Changes in climate conditions especially in the Sahel, over the last three decades has had severe impacts on stream flow of rivers within these regions.
- Nearly all the major river systems have one or more dams of different sizes that impact on downstream water supplies.
- There is the element of increasing sediment loading in rivers due to conversion of natural forests into agricultural lands.
- Chemical pollution is also reported in isolated cases especially within mining and petroleum drilling areas.



# RIVER BASIN INFORMATION SYSTEMS

## Lake Chad Sub Region 43: Chari-Logone and Komadugu-Yobe River Basins



### Introduction

Lake Chad is shared by Cameroon, Niger, Nigeria, Central African Republic and Chad. The Lake is the fourth largest Lake in Africa and the third largest Endoreic Lake in terms of area, after the Caspian and Aral Seas. The Chari – Logone and Komadugu – Yobe river systems drain into Chad.

### 1. Freshwater Shortage

Irrigation, municipalities and industry are major water consumers.

- Logone River has 1 dam while Komadugu –Yobe has a total of 18 dams
- There are 2,9100 hectares of large-scale irrigated area within the Chari-Logone basin
- There are 16,312hectares of large scale irrigated area in the Komadugu –Yobe basin
- There is additional 69, 300 hectares of small-scale irrigation on the Komadugu-Yobe system

### 2. Pollution

- High levels of eutrophication due to nutrient loading
- Chemical pollution from mines, petroleum drilling, agricultural and urban wastes
- Suspended sediments from soil and wind erosion
- Solid wastes from industrial effluent.



# RIVER BASIN INFORMATION SYSTEMS



### 3. Habitat and Community modification

- Loss and modification of wetlands, periodic waters and running waters and
- Rapid spread of acacia albida that threatens groundwater recharge

### 4. Unsustainable exploitation of fisheries

- Fisheries in Lake Chad have declined by 50,000 tones per year over the past two decades primarily as a result of the shrinking of the Lake. In 1980, fish catch averaged 150,000 tones per year, today; the catch has declined to only 100,000 tones per year.
- Rapid loss of riparian belts that provide spawning habitats coupled with poor fishing practices have equally had an impact.

### 5. Global Change

- This region has experienced a gradual shift in rainfall conditions for the past thirty years.
- Evaporation of open water bodies i.e. the rivers and the lake has continued to increase
- Consequently, there has been considerable decline in water level of the lake, river basins and associated aquifers

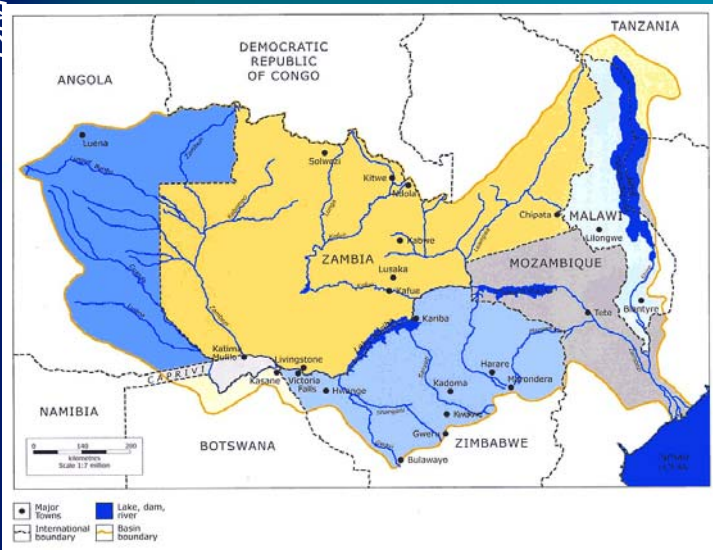
### 6. Socio-economic and health implications

- Migration of people and livestock, changes in productivity of agricultural, fisheries, and forestry, loss of property value, and costs of weed control, worsening food and employment security, and increased costs of human health care.



# RIVER BASIN INFORMATION SYSTEMS

## Sub-Region 45 : Agulhas Current



- The Zambezi River (by far the largest river basin in the sub region covers approximately 1,300,00km<sup>2</sup>), Limpopo and Okavango delta plus 9 trans-national river systems were assessed during the GIWA scoping exercise.
- Eight riparian countries within the South African Development Community (SADC) share the Zambezi River Basin. 38.4 million people live and eke for a living in the basin area.
- Large-scale industrial farming (sugar, maize, fruits, livestock), and small-scale subsistence production, fisheries and industry are important economic activities.

### 1. FRESHWATER SHORTAGE

- Damming of major rivers (for irrigation and hydropower generation), pollution of existing water supplies, abstraction of groundwater resources, and droughts are contributing to freshwater shortage. The Zambezi River has 3 large dams resulting in >50% reduction in stream flow.
- Nutrient loading from agricultural inputs, suspended sediments and solid wastes from unregulated discharge of raw sewage and other industrial effluents is rampant.
- Wells have started drying up and require further digging to reach the water table.



# RIVER BASIN INFORMATION SYSTEMS

## 2. LOSS AND MODIFICATION OF AQUATIC HABITATS.

(i) riparian belts, (ii) springs, (iii) flood plains, (iv) rice paddys, (v) running water fast flowing and flood plains and (vi) standing water mesothropic.



## 3. UNSUSTAINABLE EXPLOITATION OF FISHERIES

Though data on Catch Per Unit Effort (CPUE) trends are scanty, over exploitation of fisheries is recognized as a serious problem in both inland and marine waters. Poor fishing practices (use of fine wire mesh mosquito nets and traditional basket endanger juvenile fish)

Favored fish species such as Maluti Monnow in Lesotho and Kapenta in Kariba are endangered.

## 4. GLOBAL CHANGE

Extreme swings between above average rainfall resulting in flooding with recurrent droughts can be explained by changes in hydrological cycle.

## 5. Social –economic and health impacts.

(i) high costs of reconstruction after incidences of flooding and droughts, (ii) associated economic and social costs for reduction in agricultural potential, decline in industrial production and fisheries, (iii) social implications to reduced access to clean water by rural and urban water user, (iv) migration and displacement of people and exposure to dangers of land mines that get dispersed during floods (Mozambique), (v) loss of animal nutrition among the riverine communities and (vi) costs for treatment for approximately 70% of the population affected by water borne epidemics.



# RIVER BASIN INFORMATION SYSTEMS

**RESULTS** should be focused on:

- Identification of approach to more effective environmental management of river and lake basins

**OUTPUTS** should be:

- Projects on Sustainable use of water resources in rivers and lakes basins

Examples of projects: **In Sub-Saharan Africa**, in GIWA Africa's Transboundary waters. i.e.

Transboundary waters investigated include:

- **the Zambezi, Limpopo, the Juba-Shabelli and Okavango**



# RIVER BASIN INFORMATION SYSTEMS

## For the UNEP RIVER BASIN INFORMATION SYSTEM (UNEP-RBIS)

- Funded by the United Nations Environment Programme
- and developed in cooperation with University of New Hampshire
- Visit the following website:  
<http://www.watsys.sr.unh.edu/rbis-unesp/>