WATER USE

Statistical, Economic and Social Research and Training Centre for Islamic Countries
Higher Council for Environment and Natural Resources
“Water Resources Management”

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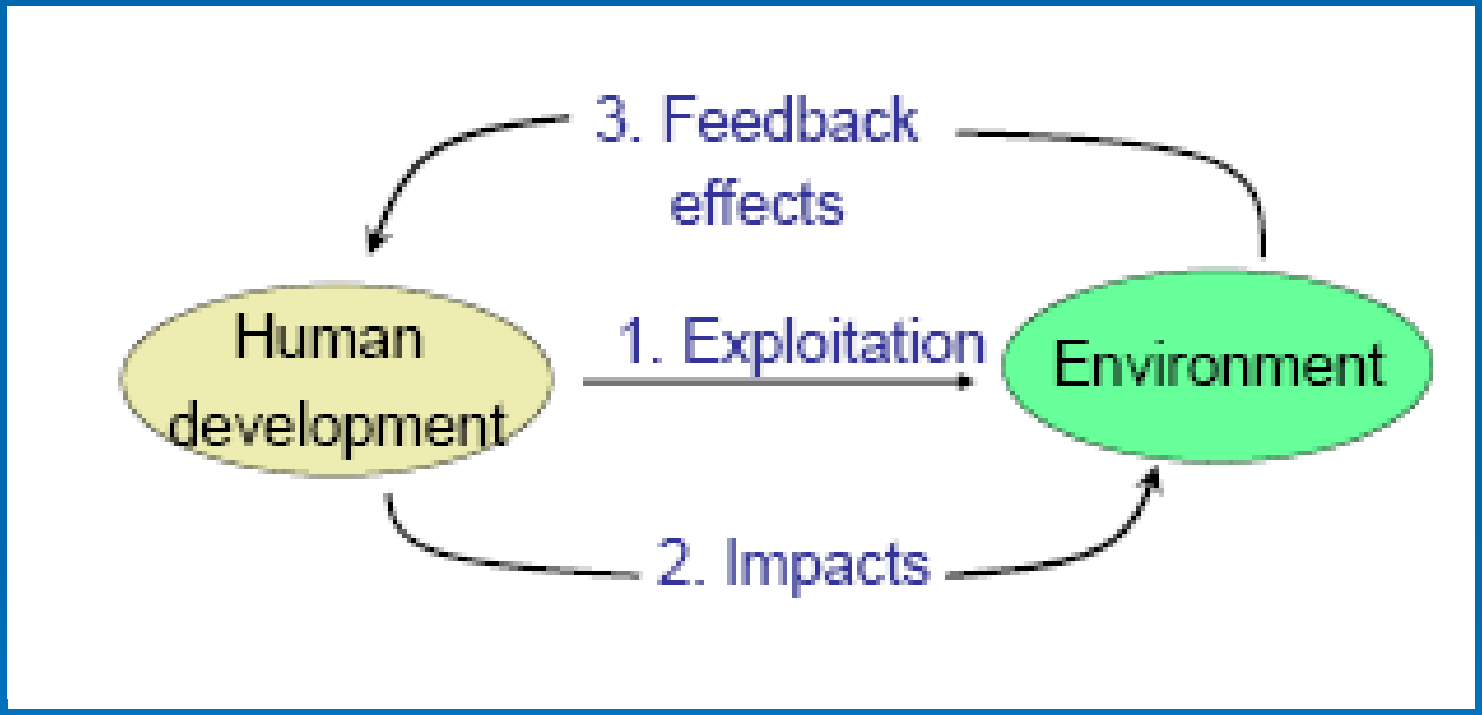
Khartoum,Sudan

Objectives / contents of Presentation

- Impacts of resource use
- Impacts of water use
- Benefits of IWRM

The human-environment system



Impacts of human activities on the environment

Impacts:

- Lowering or increasing water tables
- Reduced or increased base or peak flows in rivers
- Changed chemical composition of water, air and soil
- Replacement of certain species by others
- Replacement of certain ecosystems by others
- Climate change

Effects:

- Depletion of resources
- Degradation of soils (decreasing fertility, erosion)
- Degradation and loss of valuable natural ecosystems (forests, wetlands)
- Pollution of soil, water and air
- Reduced biodiversity

increased occurrence of droughts and floods

The water users: Human interventions into ecosystems

Water quantity
- flood protection
- irrigation
- drainage
- groundwater abstraction
- water supply
- sanitation
- flow regulation
- power generation
- navigation

Water quality
- organic matter and nutrients
- sediments
- chemical pollution
- thermal pollution

Feedback effects

- Pollution, radiation ⇒ public health at risk
- Land degradation ⇒ reduced crop yields and food security
- Upstream water withdrawals ⇒ downstream water scarcity
- Upstream catchment activities ⇒ downstream flooding
- Disasters
- Depletion of fossil fuel reserves ⇒ energy crisis
- Biodiversity loss ⇒ loss of genetic reservoir for medicinal purposes
- sea-level rise ⇒ islands and delta's at risk

Impacts of human activities on the environment

- Every human activity impacts on the environment
  - Changes of the environment are unavoidable
  - The question is rather when impacts become *too large*
- The upper (physical) limit *Remain within the possible*
  - Over-exploitation of resources
  - Exceeding the assimilation capacity of the environment
- A more strict (economic) limit *Remain within the desirable*
  - Activity should not be undertaken if non-intended lost environmental value is larger than the activity's intended added value
  - Private cost, social cost

Impact of sectors using water on water resources

- Most water uses benefit society
  - But water uses van have negative impacts
  - In an IWRM approach such impacts are recognised and accounted for.

Impact of water use sectors on water resources

	☺ impacts	☹ impacts
Environment	Natural treatment Storage Hydrological cycle	
Agriculture	Return flows Increased infiltration Decreased erosion Groundwater recharge Nutrient recycle	Depletion Pollution Salinisation Water logging Erosion
Water supply / sanitation	Nutrient recycle	High level of security water pollution

IWRM benefits for environment

- Protection of upstream catchments (soil erosion, reforestation, land use)
- Pollution control
- Environmental water needs are accounted for
  => environmental flows = minimum flow necesary to support ecosystem
- Helps increasing awareness among other users about ecoystem needs and benefits

IWRM benefits for environment

- environmental flow = minimum required flow to sustain ecological functions

- “quantity, quality and timing of water flows required to maintain the components, functions, processes and resilience of aquatic ecosystems that provide goods and services to the people”

IWRM benefits for environment

Environmental flow to support functions:

- Drinking water & groundwater recharge
- Food (fish)
- Fuelwood / grazing / cropping
- Biodiversity
- Flood protection, navigation
- Waste assimiliation
- Recreation, amenities

IWRM benefits for environment

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IWRM benefits for agriculture

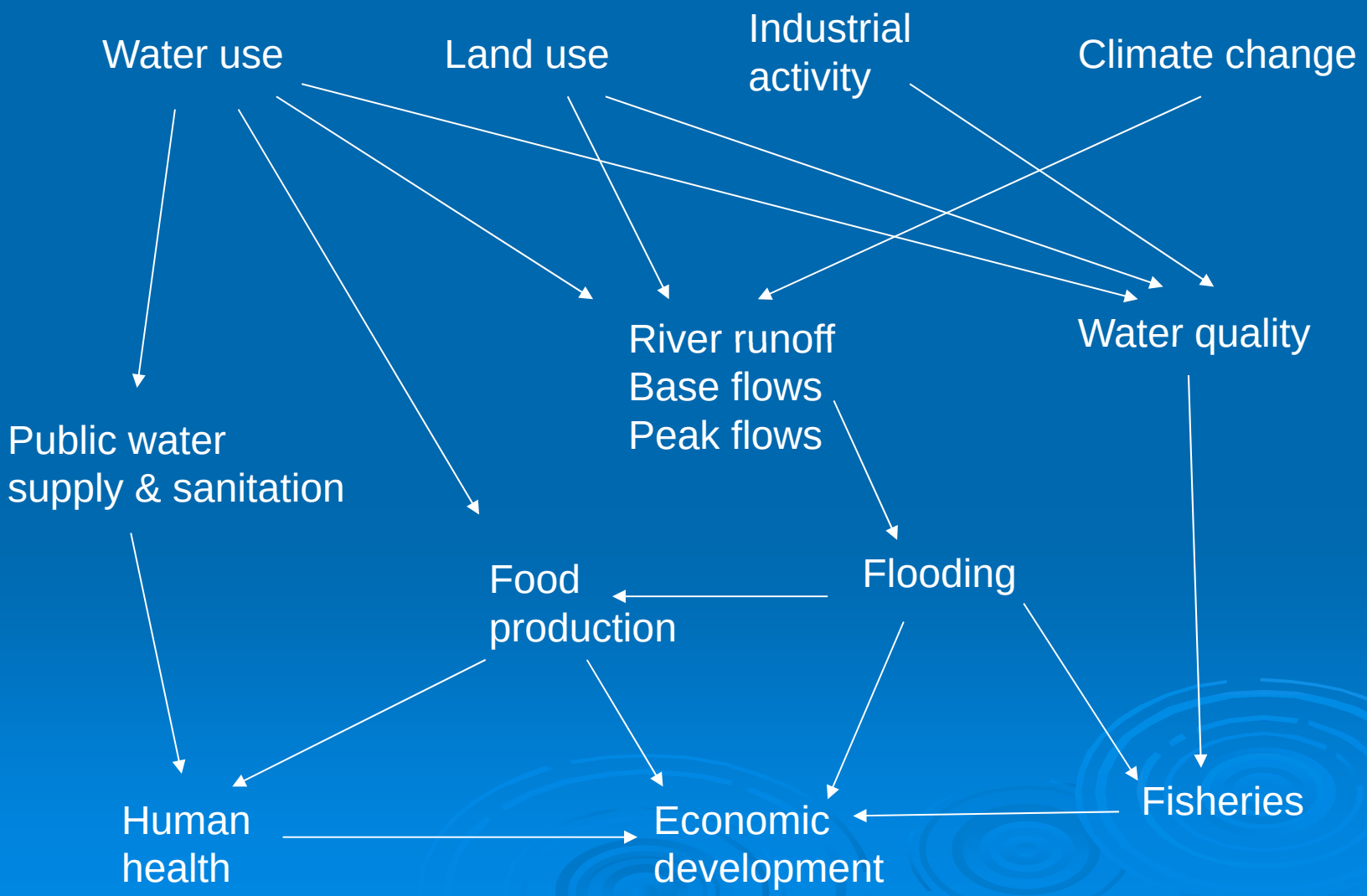
- Agriculture is biggest user and a major diffuse polluter of surface water and groundwater
- From economic point of view, water should be diverted to other uses that add higher value
- However, IWRM accounts for more than just economic considerations (employment, food security)
- Integrated planning => IRWM directed at increase in water productivity

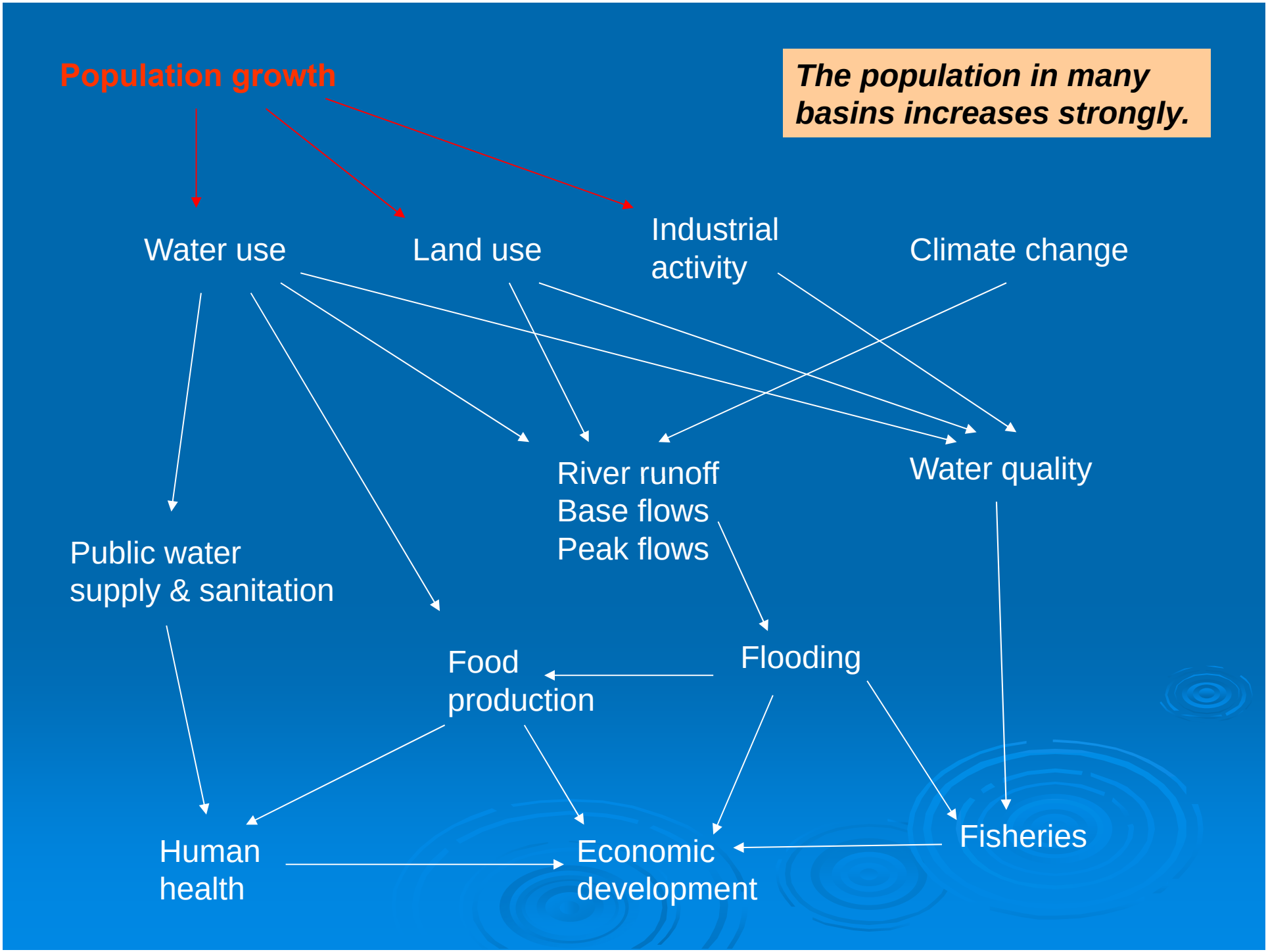
IWRM benefits for water supply and sanitation

- Focus on security of domestic water supplies at reduced treatment cost (as pollution is addressed as well!)
- Stimulates recycling, reuse and waste reduction
- Integration of domestic component in new irrigation schemes

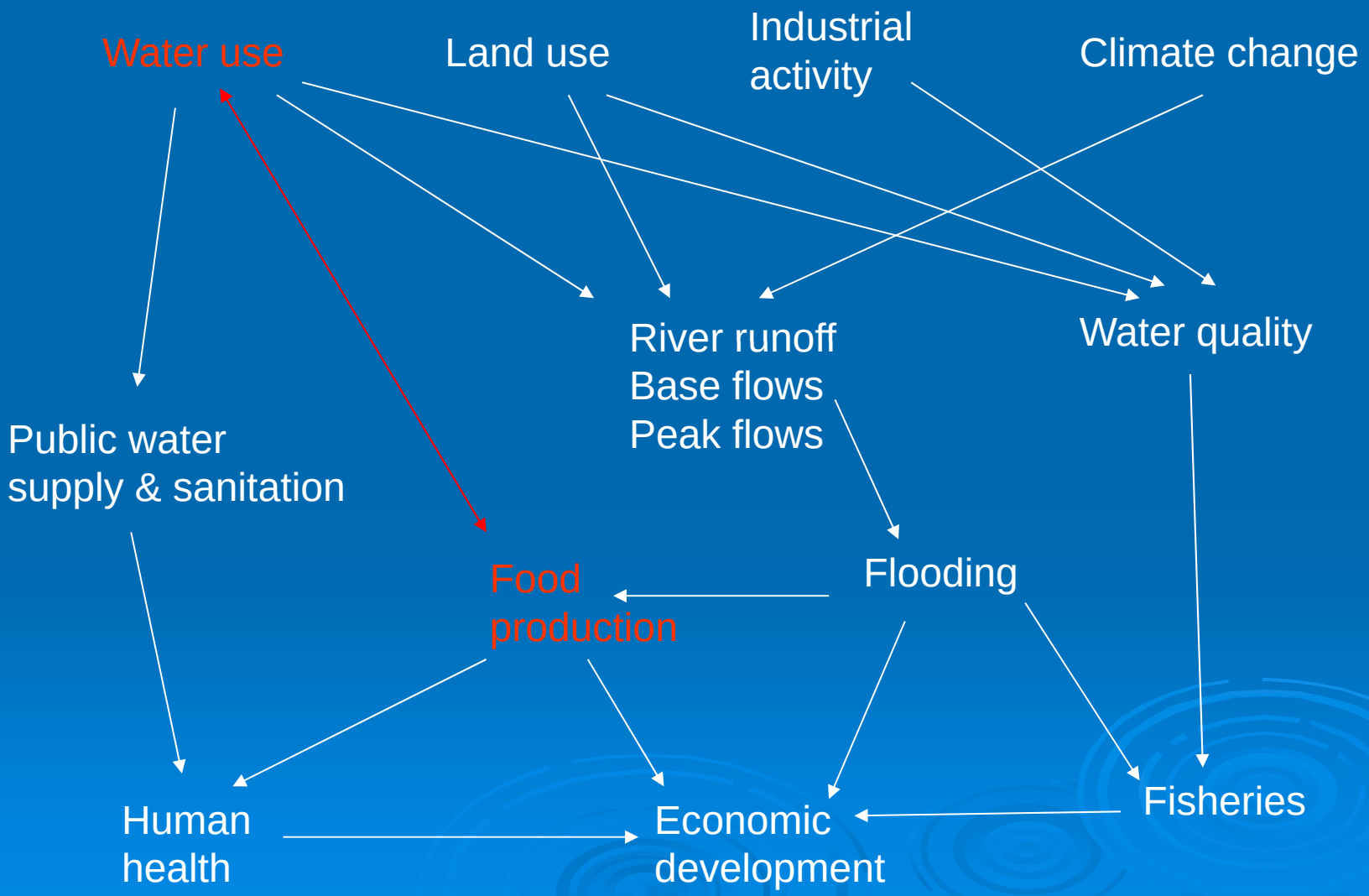
Interactions in river basin systems

Interactions in river basins

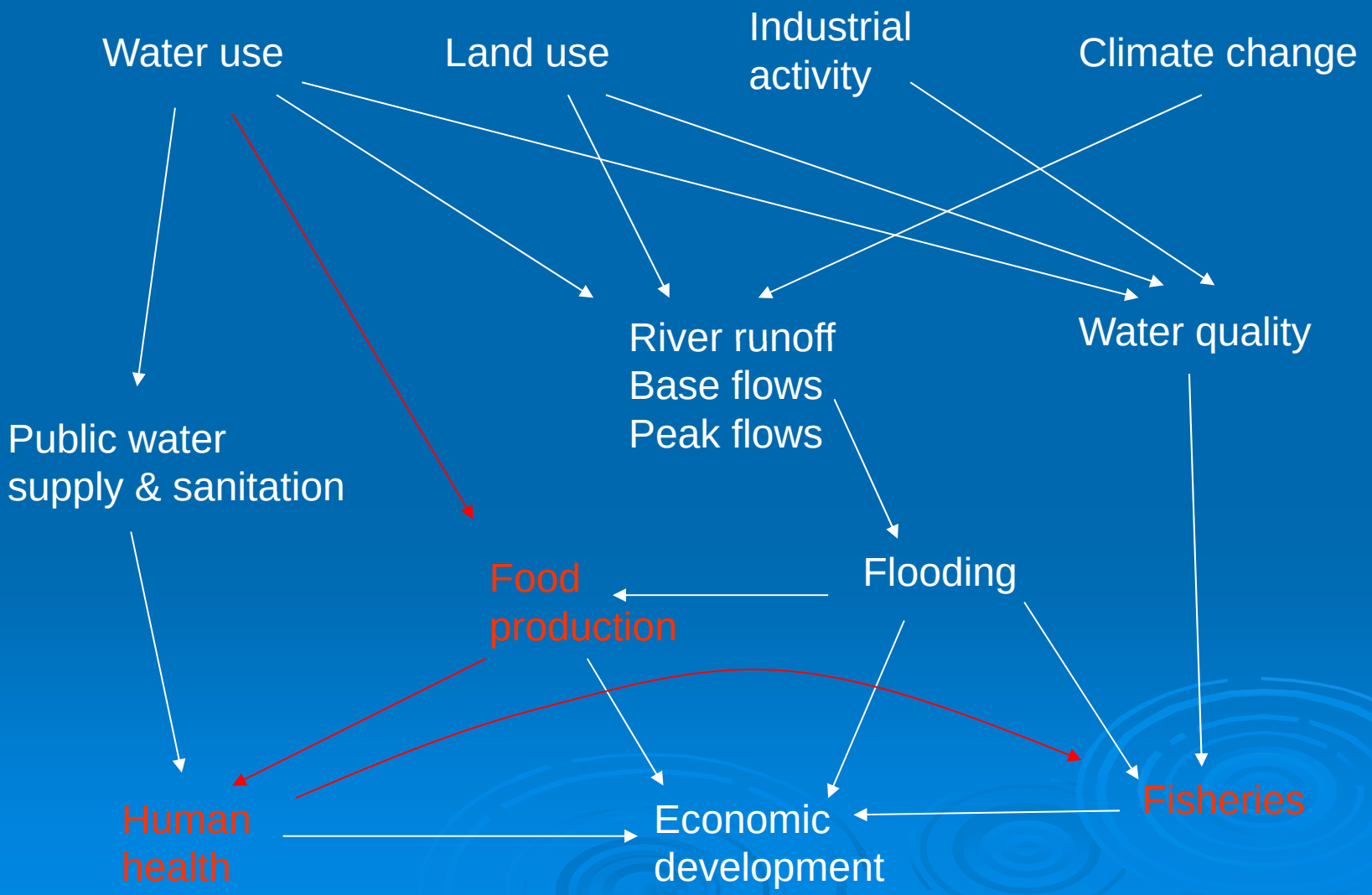



Population growth
The population in many basins increases strongly.
Water use
Land use
Industrial activity
Climate change
River runoff
Base flows
Peak flows
Water quality
Public water supply & sanitation
Food production
Flooding
Human health
Economic development
Fisheries

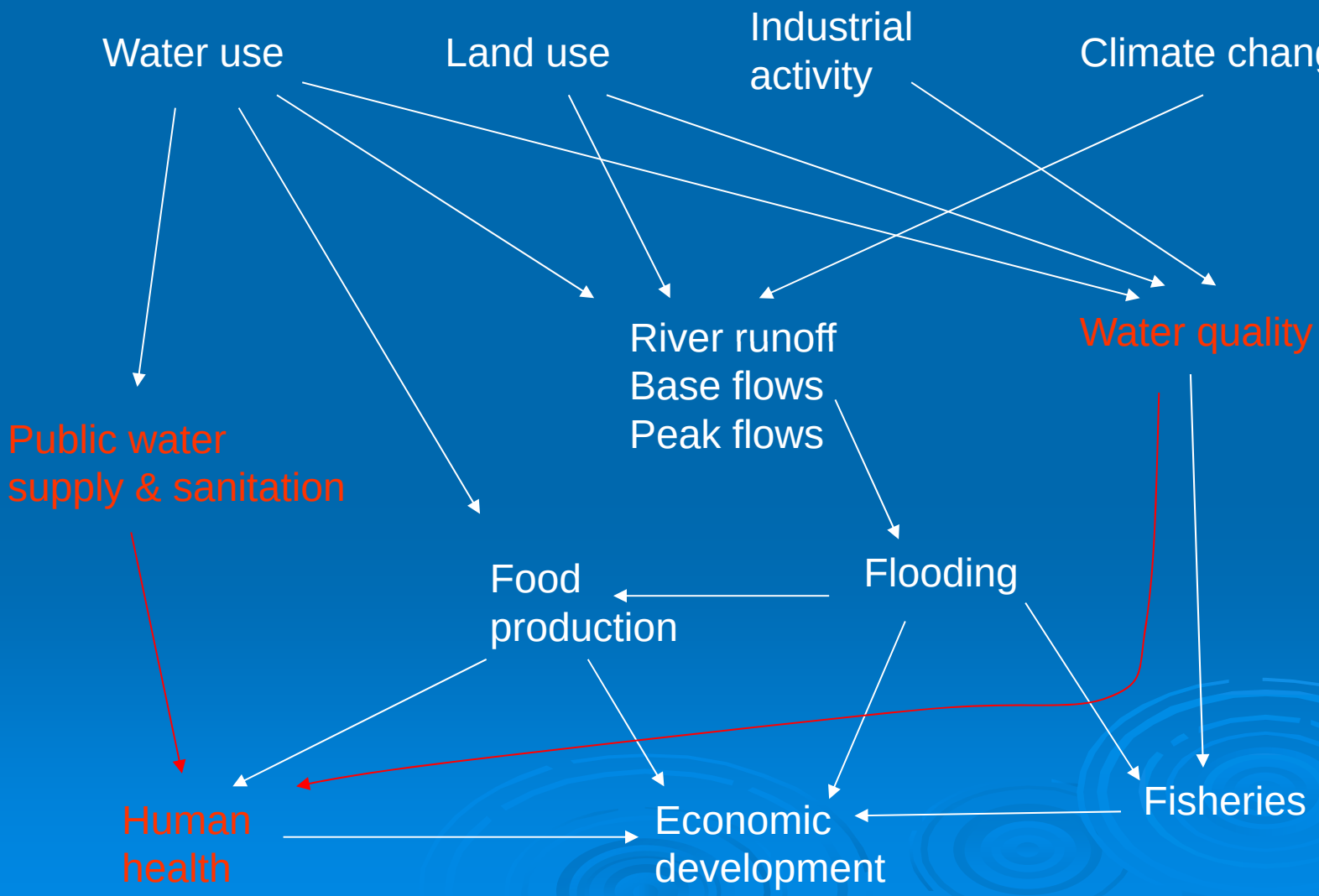
Food demand in many of basins increases by 25-50% in the next 25 years, with a corresponding increase in water demand.



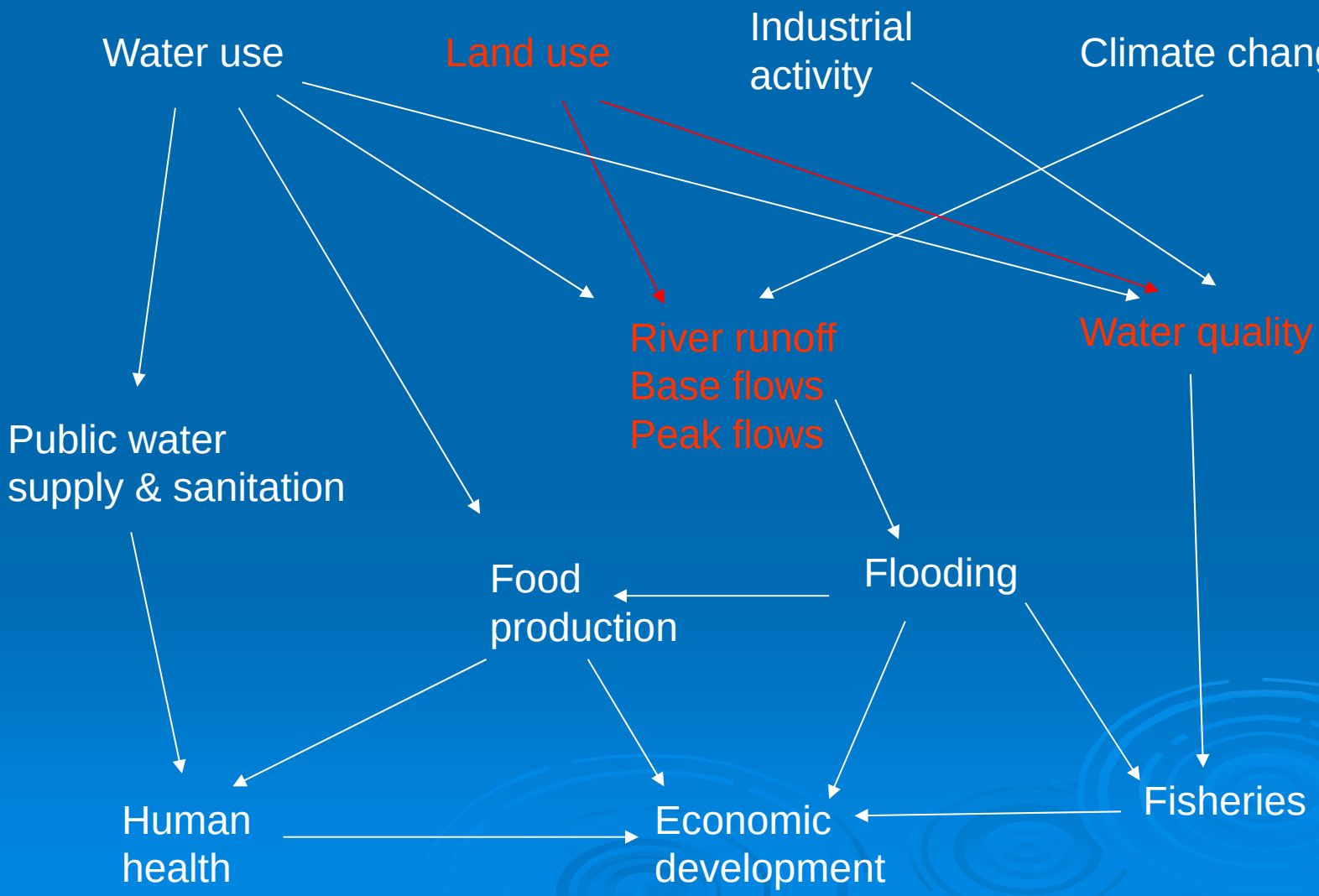
Fish and rice are often the most important sources of animal protein. Together they form the basis of food security for many people.



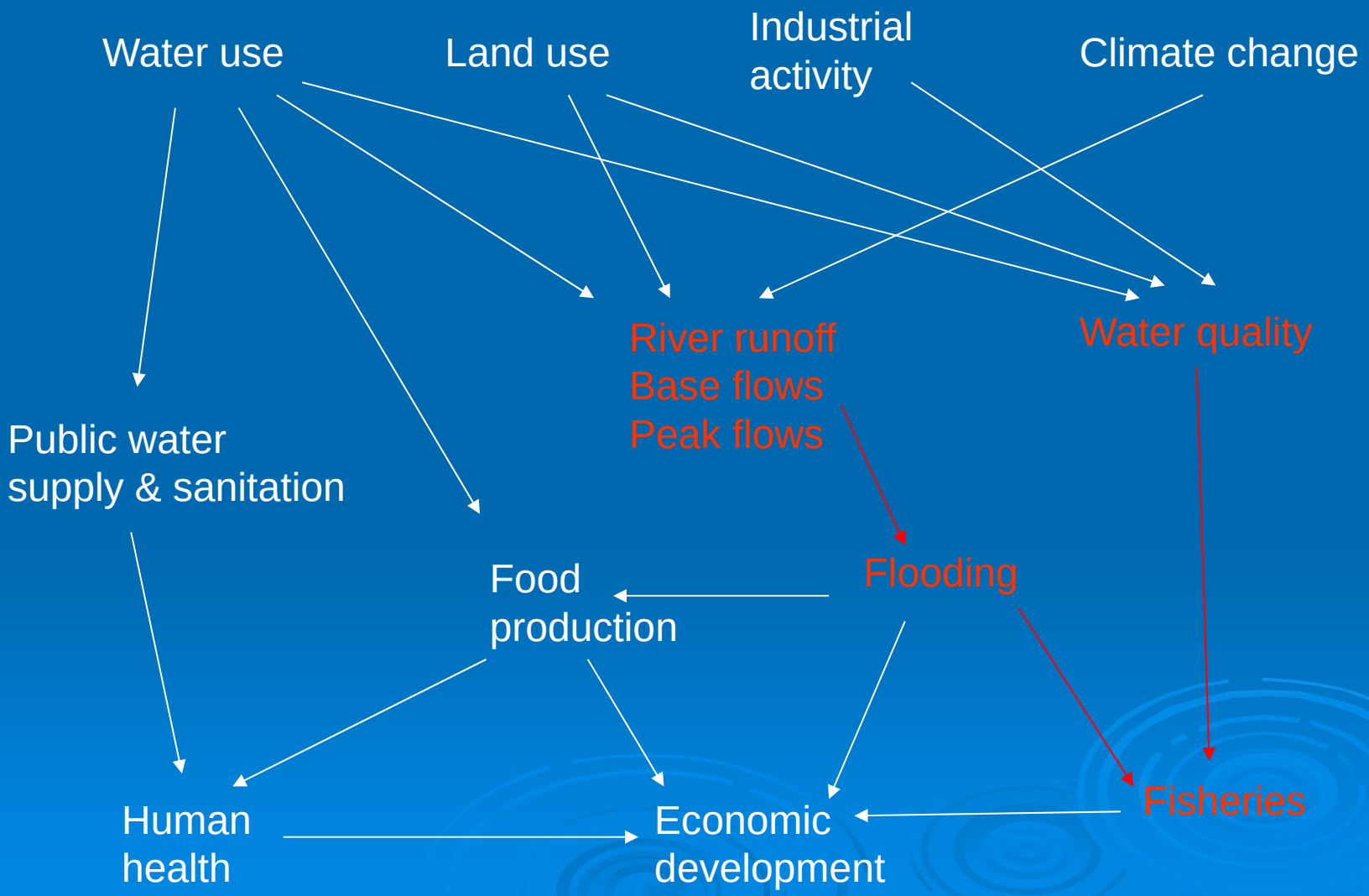
A large share of the population doesn't have access to safe drinking water; even less people have proper sanitation services.



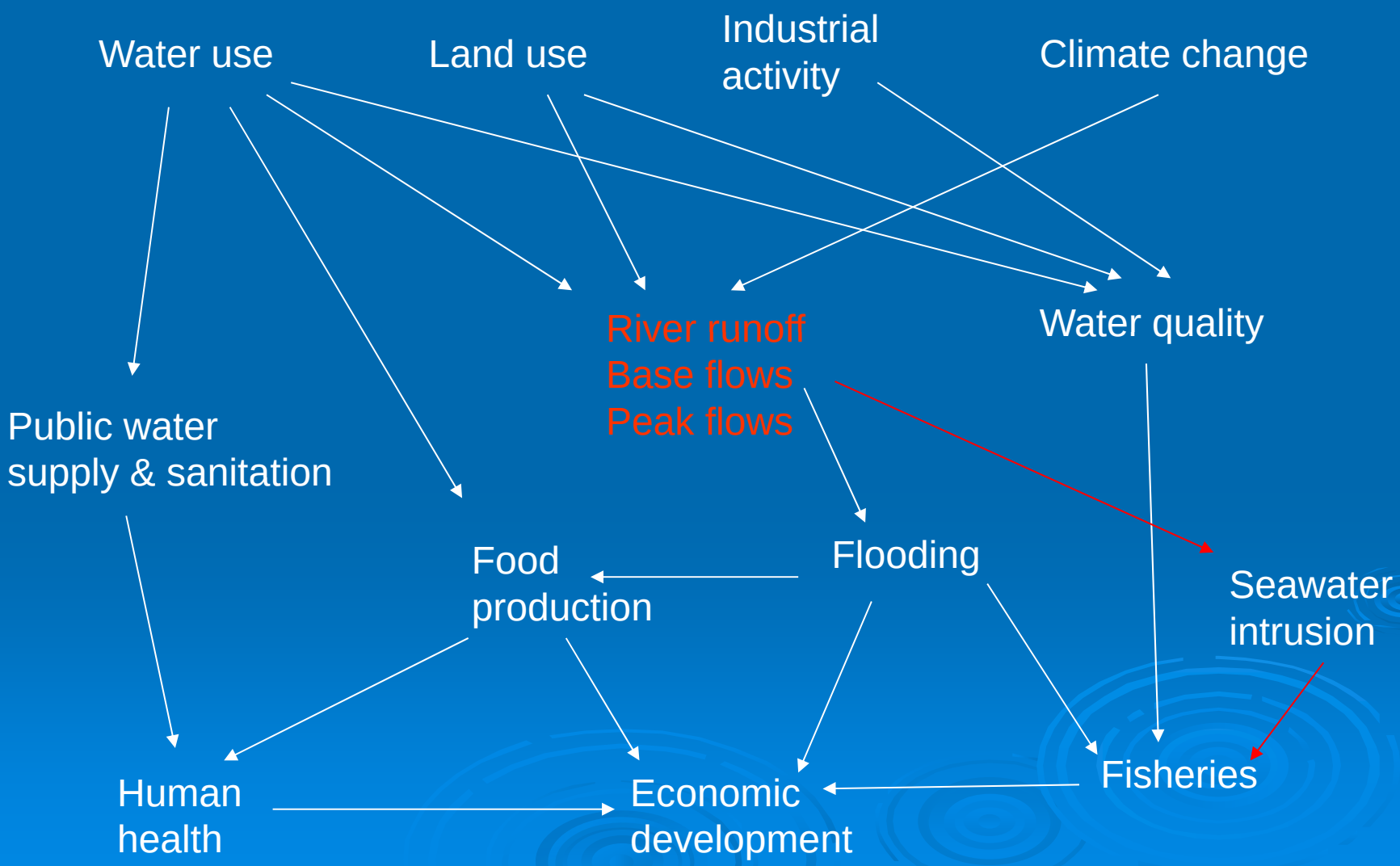
Deforestation and erosion affect downstream runoff and water quality.



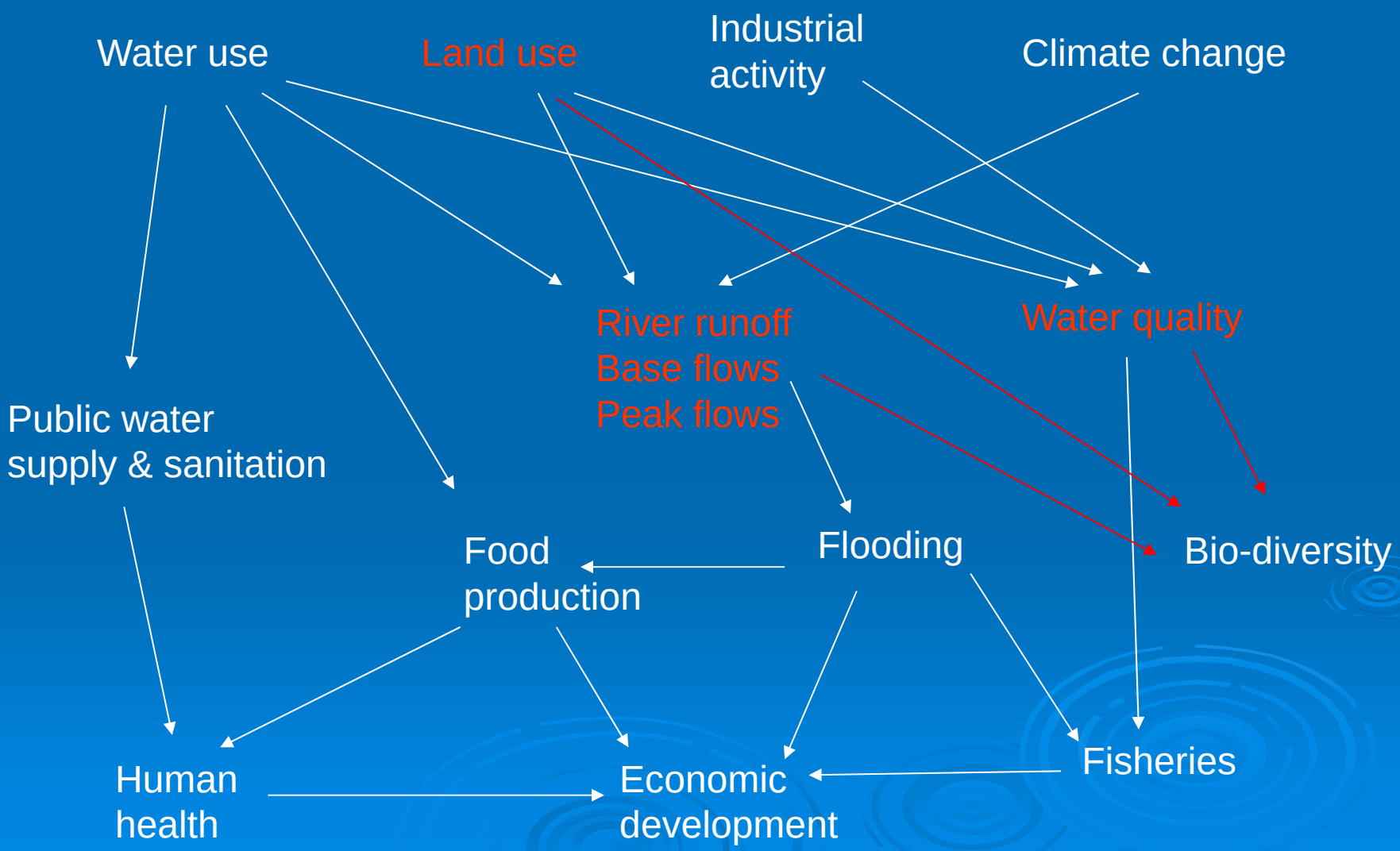
Changing runoff and water quality conditions impact on the delicate balance of downstream wetland ecosystems.



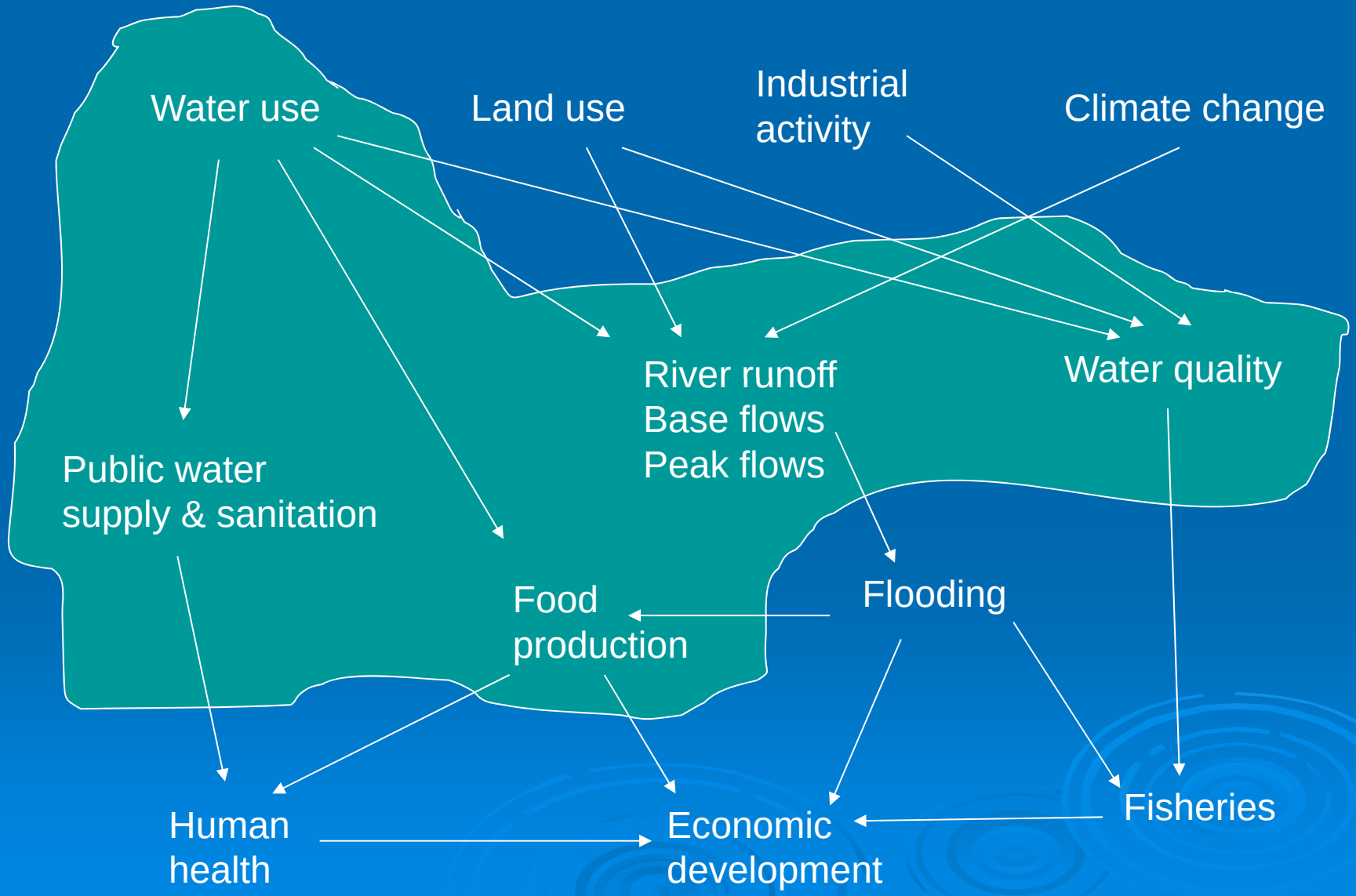
River delta's are highly sensitive to volumes of freshwater input.



Biodiversity in deltas is among the richest in the world.



Interactions in river basins



IWRM

- Classical' WRM:
  - Supply oriented, sector focused, engineering-based
  - Top down 'water master planning'
  - Focus on water availability and development
- 'Integrated' WRM:
  - Demand-oriented, multi-sectoral approach
  - Addresses interaction between sub-sectors
  - Considers institutional requirements
  - Deals with capacity building

IWRM

- Response to increased pressure on water resource systems from population growth and economic development
- Management and development of resources in interaction with users, uses and institutions

IWRM

- ‘Integrated’ WRM 3 E’s:
  - Environmental sustainability
  - Equity, social
  - Economic efficiency
- Integrated’ WRM 3 aspects:
  - Enabling environment (policies, legislation)
  - Equity, social (right access)
  - Economic efficiency

Interactions in river basin systems: Conclusion

- A river basin is a complex system:
  - Many sub-systems
  - Non-linear cause-effect chains
  - Feedback mechanisms
  - Uncertainties
- Need to consider the different uses of water together: water uses are interdependent

THANK YOU FOR YOUR ATTENTION…