

WISE-UP TO CLIMATE

Recognising, protecting, and investing in the natural infrastructure of river basins can help society adapt to climate change impacts

Combining our understanding of natural systems with the ingenuity of built infrastructure allows us to maximise the benefits of both to ensure our economies prosper

The role of dams is to capture and store water when there is excess for use when there is too little. Dams "regulate" flows, decrease floods, help to stabilize extreme flows and increase flows

Upstream natural infrastructure (NI)

Natural infrastructure in the headwaters of river basins can **affect the performance of downstream built infrastructure** designed to manage water resources.

The condition of natural systems that help collect, store, clean and convey water and sediment through infiltration, groundwater recharge, erosion control, etc can **modify hydrological processes**, affecting the volume and timing of water runoff and fluxes of sediment and nutrients. In turn, this can affect the ecological condition of rivers and reservoirs, with implications on water supply provision, electricity generation, flood protection and biodiversity.

Built Infrastructure (BI)

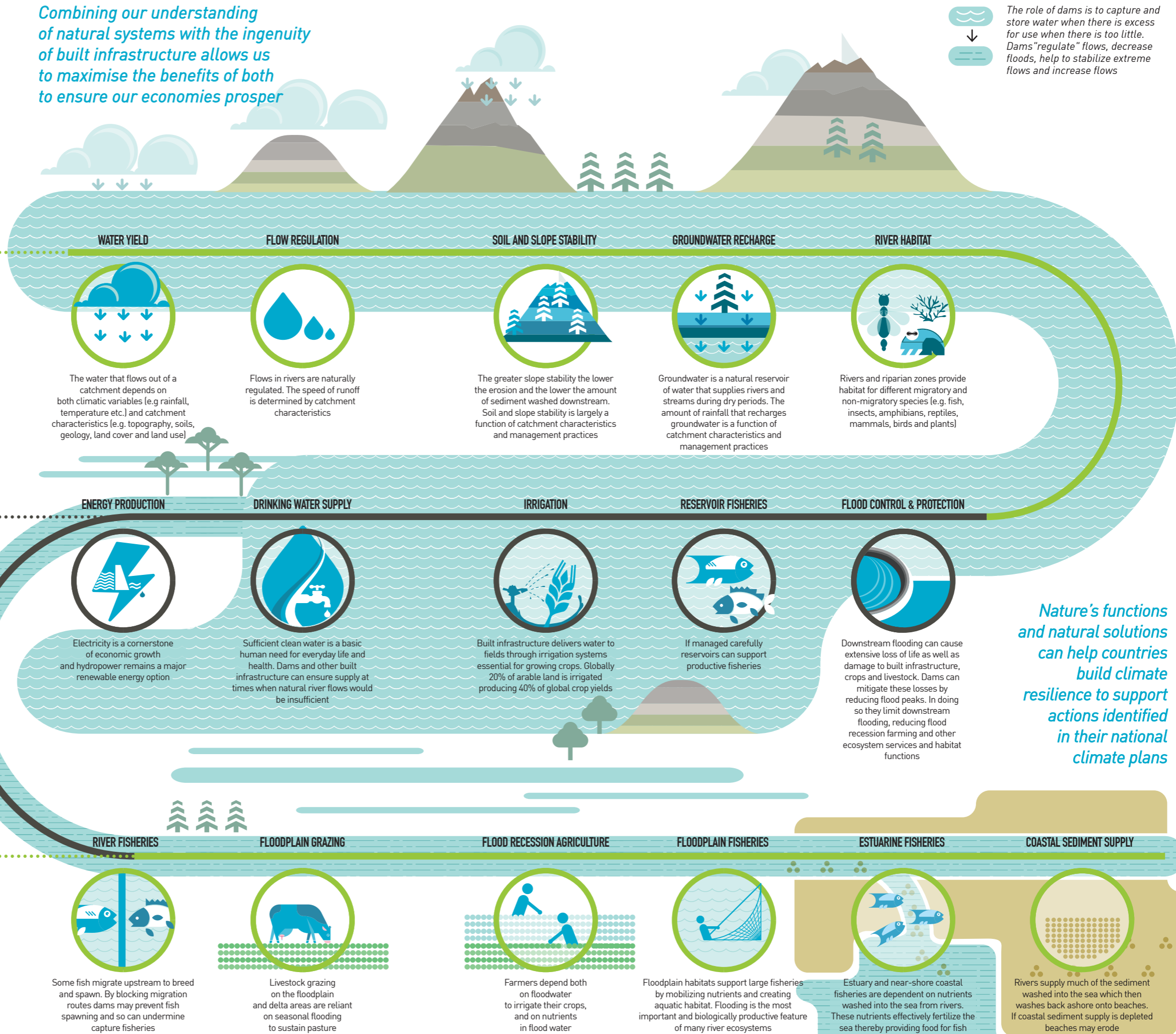
As the Earth's climate changes we need to retain flexibility in water resource systems in order to be able to adapt. We need to **respond to climate change** through better design and configuration of natural and built infrastructure to provide adaptation solutions.

Built infrastructure allows societies to better cope with the natural variability of rivers, making water available when it would not be under natural conditions. However, it can also modify natural river flows significantly, disrupting freshwater habitat, biodiversity, ecosystem services, and downstream natural infrastructure functions.

Careful **planning and management of built infrastructure** can minimize the losses and maximize the benefits accruing from both built and natural infrastructure.

Downstream natural infrastructure (NI)

Downstream river flows can be affected by the presence and operation of built infrastructure. This impacts the environmental and social benefits gained from flooding such as fisheries, fertile land for livestock grazing and flood recession farming. **The way built infrastructure is designed and operated** can affect the water/sediment/nutrient fluxes in river systems.



WATER YIELD

The water that flows out of a catchment depends on both climatic variables (e.g. rainfall, temperature etc.) and catchment characteristics (e.g. topography, soils, geology, land cover and land use)

FLOW REGULATION

Flows in rivers are naturally regulated. The speed of runoff is determined by catchment characteristics

SOIL AND SLOPE STABILITY

The greater slope stability the lower the erosion and the lower the amount of sediment washed downstream. Soil and slope stability is largely a function of catchment characteristics and management practices

GROUNDWATER RECHARGE

Groundwater is a natural reservoir of water that supplies rivers and streams during dry periods. The amount of rainfall that recharges groundwater is a function of catchment characteristics and management practices

RIVER HABITAT

Rivers and riparian zones provide habitat for different migratory and non-migratory species (e.g. fish, insects, amphibians, reptiles, mammals, birds and plants)

ENERGY PRODUCTION

Electricity is a cornerstone of economic growth and hydropower remains a major renewable energy option

DRINKING WATER SUPPLY

Sufficient clean water is a basic human need for everyday life and health. Dams and other built infrastructure can ensure supply at times when natural river flows would be insufficient

IRRIGATION

Built infrastructure delivers water to fields through irrigation systems essential for growing crops. Globally 20% of arable land is irrigated producing 40% of global crop yields

RESERVOIR FISHERIES

If managed carefully reservoirs can support productive fisheries

FLOOD CONTROL & PROTECTION

Downstream flooding can cause extensive loss of life as well as damage to built infrastructure, crops and livestock. Dams can mitigate these losses by reducing flood peaks. In doing so they limit downstream flooding, reducing flood recession farming and other ecosystem services and habitat functions

RIVER FISHERIES

Some fish migrate upstream to breed and spawn. By blocking migration routes dams may prevent fish spawning and so can undermine capture fisheries

FLOODPLAIN GRAZING

Livestock grazing on the floodplain and delta areas are reliant on seasonal flooding to sustain pasture

FLOOD RECESSION AGRICULTURE

Farmers depend both on floodwater to irrigate their crops, and on nutrients in flood water

FLOODPLAIN FISHERIES

Floodplain habitats support large fisheries by mobilizing nutrients and creating aquatic habitat. Flooding is the most important and biologically productive feature of many river ecosystems

ESTUARINE FISHERIES

Estuary and near-shore coastal fisheries are dependent on nutrients washed into the sea from rivers. These nutrients effectively fertilize the sea thereby providing food for fish

COASTAL SEDIMENT SUPPLY

Rivers supply much of the sediment washed into the sea which then washes back ashore onto beaches. If coastal sediment supply is depleted beaches may erode

Nature's functions and natural solutions can help countries build climate resilience to support actions identified in their national climate plans