








# WISE-UP to climate

**Water Infrastructure Solutions from Ecosystem Services**  
underpinning Climate Resilient Policies and Programmes



‘WISE-UP to climate’ is a project that demonstrates natural infrastructure as a ‘nature-based solution’ for climate change adaptation and sustainable development. The project will develop knowledge on how to use portfolios of built water infrastructure (eg. dams, levees, irrigation channels) and natural infrastructure (eg. wetlands, floodplains, watersheds) for poverty reduction, water-energy-food security, biodiversity conservation, and climate resilience. WISE-UP will show the application of optimal portfolios of built and natural infrastructure using dialogue with decision-makers to agree trade-offs. WISE-UP will run over a four-year period and link ecosystem services more directly into water infrastructure development in the Tana (Kenya) and Volta (Ghana-Burkina Faso) river basins.

## Activities

-  **Assessments of Natural Infrastructure** – tested in decision-making on infrastructure in the Volta and Tana basins
-  **Hydrological Monitoring** – eco-hydrological functions quantified in planning models
-  **Economic Assessment** – returns on investment for natural and built infrastructure options compared
-  **Novel Tools** – innovation for analyzing trade-offs in river basins and built and natural infrastructure optimized
-  **Innovation Drivers** – opportunities for new policies and investment strategies identified and promoted
-  **Action Learning** – learning by doing with decision makers and stakeholders participating in dialogues and negotiations
-  **Capacity Building & Communications** – skills and capacities strengthened through ‘learning communities’ and dissemination of results to knowledge networks.

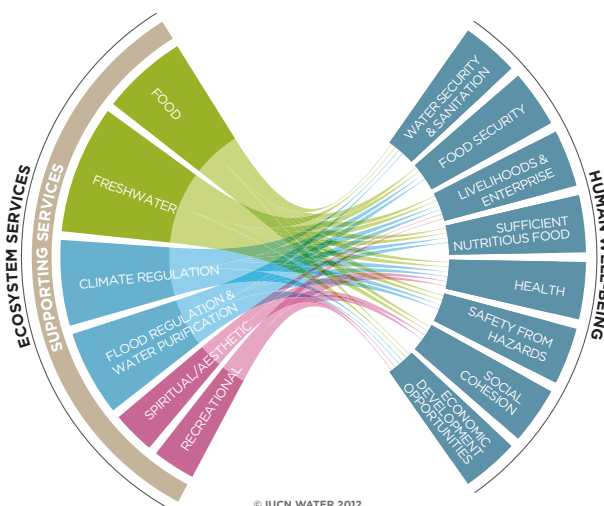


“We need to show that protecting ecosystems can help us achieve the Millennium Development Goals and build resilience to climate change... Maintaining and restoring our natural infrastructure can provide economic gains worth trillions of dollars each year. Allowing it to decline is like throwing money out the window.”

UN Secretary General Ban Ki-moon, September 22, 2010

## Ecosystem Services

Services from ecosystems underpin water, food and energy security (see fig.1). Without healthy ecosystems in well-functioning watersheds, the infrastructure built for irrigation, hydropower or municipal water supply may not function sustainably, and is unlikely to achieve the economic returns necessary to justify investments. Equally, external factors such as climate change can adversely affect the stock of services an ecosystem provides. With its functions integral to water, food and energy, and their interdependence, nature is part of the infrastructure portfolio.



**Fig.1** Ecosystem services and the linkages with human well-being

## Combining Built and Natural Infrastructure

Water security is vital for sustainable economic growth and poverty reduction. Investments are made worldwide in water infrastructure, for storage and flood control, water supply and quality, and for disaster-risk reduction. However, these



investments and their benefits are not always evenly distributed, with least-developed countries often the most poorly serviced.

The benefits from combined water infrastructure portfolios include water, food and energy security, industrial development and wealth generation. Benefits are amplified in particular when ecosystem services are linked more directly into water infrastructure development. When river basins themselves are treated as infrastructure, more optimal outcomes for poverty reduction, ecosystem management, growth and climate resilience can be achieved.

## Climate Resilient Policies and Programmes

Growth, poverty reduction and climate change adaptation are issues with the highest priority on the policy agenda for many developing countries. Water infrastructure is seen as an asset for growth and poverty reduction, and in strategies for climate change adaptation. However, competing policy narratives argue that water infrastructure degrades ecosystem services that the poor rely on most. In some cases, this may impact the natural resilience of river basins to climate change.

WISE-UP will support new policies and strategies for water infrastructure that will better and more coherently address and integrate policy goals for growth, poverty reduction and climate adaptation. The project will provide critically-needed knowledge and tools for managing the trade-offs between built infrastructure and the ecosystem services provided by natural infrastructure.

### Examples of natural and built infrastructure providing same benefits

Natural infrastructure	Built infrastructure	Benefit
Forests and wetlands	Water filtration facility	Clean drinking water
Forests (on slopes upstream of hydroelectric facility)	Periodic sediment dredging	Reliable power and flood control
Mangroves	Sea walls	Shoreline protection from storm
Coral reefs	Breakwaters and groins	Reduced beach erosion
Natural floodplains	Dikes and canals	Flood prevention
Wetlands	Tertiary water treatment facility	Clean effluent from municipal or industrial processes

When integrating built and natural infrastructure in water development portfolios, long-term sustainable solutions for water security and climate change adaption can be achieved.



## Benefits from Natural Infrastructure

Infrastructure solutions for water security that incorporate both natural and built options are known to work. These can enhance efficiency, effectiveness and equity, but also spur implementation and progress towards long-term availability of water for all. From this, benefits then flow, for example:

» **Drinking water supply** – watershed management saved \$5bn in capital costs for New York City and \$300m annually; storage of Beijing's drinking water in the Miyun watershed forests is worth \$1.9bn annually.

» **Food security** – Tonle Sap lake and Mekong river fisheries supply 70-75% of people's animal protein intake in Cambodia and are worth up to \$500m annually, employing 2m people.

» **Climate change resilience** – with investment in developing skills and water institutions, people in the Pangani river basin (Tanzania) are negotiating 'environmental flows' to sustain the ecosystem services they need for climate change adaptation, food and water security.

» **Energy security** – returns on investment in soil conservation has significantly extended the life expectancy of the Itaipu dam (Brazil, Paraguay); watershed management has been worth \$15-40m for the Paute hydroelectric scheme (Ecuador).

» **Land management** – watershed restoration on the Loess Plateau (China) has eliminated the need for drought-related emergency food aid to a region that is home to 50m people.

» **Risk Reduction** – Restoring mangroves in Vietnam for storm defence provides a 'win-win' result, improving the livelihoods of local resource users, biodiversity, as well as enhancing sea defences.

## WISE-UP to climate

will work in partnership with stakeholders in two river basins



### THE TANA

In the Tana river, Kenya's longest river, growing competition amongst water users is projected to intensify with the development of new hydropower plants, climate variability, as well as increasing urban, agricultural, and ecosystem demands. The Tana river is also the only river providing water to the lower delta inhabited by a poor and vulnerable population. River sediments and nutrients support the health of beaches and marine parks, critical contributors to Kenya's national economy.

A critical challenge will be to adapt water management to climate change impacts while finding ways of equitably and efficiently balancing competing water demands. In the Tana river basin, long-term climate resilient and sustainable solutions satisfying all water users and water developers will need to be implemented in order to avert conflict, livelihood losses, ecosystem degradation and economic hardship. Results from WISE-UP will provide policymakers, water users and scientists with evidence of solutions to integrate built infrastructure into the basin's natural ecosystem that is critical for national development.



### THE VOLTA

The Volta River Basin in West Africa covers 417,000 km<sup>2</sup> and is shared by six countries: Ghana, Burkina Faso, Mali, Côte d'Ivoire, Togo and Benin. Water resources in the basin are under stress, as a result of increasing demand due to high population growth, variability of rainfall and runoff, and uncoordinated water resources development. Flooding, water shortages and pollution, loss of biodiversity, waterborne diseases, and proliferation of aquatic weeds affect the region's poor disproportionately.

The critical water resource challenges in the basin can be addressed through better mechanisms for coordination amongst riparian States, through increased water storage for subsistence farmers, by reducing waterborne disease, and supporting biodiversity, and deriving maximum benefits from hydropower through existing and planned hydropower plants. WISE-UP in the Volta Basin will provide analysis, information and tools to help governments, basin agencies, and stakeholders assess options for climate-resilient water infrastructure development and the associated trade-offs.

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supports river basin organisations mobilise natural infrastructure as an adaptation solution

## Learning with Stakeholders

The project will be shaped through close stakeholder involvement from the outset. River basin stakeholders will guide and inform the project components to ensure that outputs are tailored to basin needs. A series of iterative learning workshops will present results transparently to better understand decision making processes and the reality of trade-offs in deciding to build, restore, rehabilitate both built and natural infrastructure assets including reservoirs, floodplains, irrigation systems, and pasture land.

The project will provide results for decision makers in climate change adaptation and water resource management strategies. New policy options will be considered that integrate water management and ecosystem based approaches to support climate change adaptation. WISE-UP to climate provides a unique approach to integrate ecosystems as infrastructure in river basin models, and linking their performance to economics and livelihoods will help inform new river basin adaptation discussions.

### KEY QUESTIONS GUIDING WISE-UP IN THE TANA AND VOLTA

- » How should investments be allocated between built and natural water infrastructure to provide optimal results for competing goals?
- » What combinations of built and natural infrastructure provide most benefits for the poor and are most equitable?
- » What governance and institutional arrangements are best suited to effective adaptive management and management of uncertainties?
- » What is the business case for investing in natural infrastructure solutions alongside built infrastructure development?

## PARTNERSHIP

The implementing partnership of WISE-UP brings together a wide variety of expertise. Resource scientists, engineers, computer modellers, economists, governance and political economists, water managers and climate change specialists will work with stakeholders to jointly build the project's knowledge base. WISE-UP is a global partnership that brings together the council for scientific and industrial research, Water Research Institute – Council for Scientific and Industrial Research (CSIR), The African Collaborative Center for Earth System Sciences (ACCESS) – University of Nairobi, the International Water Management Institute (IWMI), the Overseas Development Institute (ODI), the University of Manchester, the Basque Centre for Climate Change (BC3), and the International Union for Conservation of Nature (IUCN).

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### CONTACTS

**Mark Smith**  
Director IUCN Global Water Programme

Rue Mauverney 28  
1196 Gland  
Switzerland

[water@iucn.org](mailto:water@iucn.org)



#### »» Tana Contact Point

**Prof Eric Odada**  
Director, African Collaborative Center for Earth System Sciences (ACCESS)

Department of Geology,  
Chiromo Campus,  
University of Nairobi  
P.O Box 30197-00100,  
Nairobi, Kenya

Tel: +254204447740  
Email: [eodada@uonbi.ac.ke](mailto:eodada@uonbi.ac.ke)

#### »» Volta Contact Point

**Dr. Emmanuel Obuobie**  
Research Scientist,  
Water Research Institute

Council for Scientific and Industrial Research  
P.O.Box AH 38 Achimota,  
Accra, Ghana

Tel: +233 302 775351 (office)  
+233 24 1441038 (mobile)  
Email: [obuobie@yahoo.com](mailto:obuobie@yahoo.com)

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