IUCN
Rue Mauverney 28
1196 Gland
Switzerland

Tel. +41 22 999 0000
Fax +41 22 999 0002
mail@iucn.org
www.iucn.org

Submission for the Nairobi Work Programme under the "Adaptation planning processes addressing ecosystems and interrelated areas such as water resources" section

Water Infrastructure Solutions from Ecosystem Services underpinning Climate Resilient Policies and Programmes (WISE-UP)

Description of relevant activities and collaborating partner institutions

Project led by *The International Union for Conservation of Nature (IUCN)*
Partners: *The Ghana Water Research Institute – Council for Scientific and Industrial Research (WRI-CSIR), The African Collaborative Centre 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).*

'WISE-UP to climate'[1] sets out to demonstrate natural infrastructure as a 'nature-based solution' for climate change adaptation and sustainable development. The project develops knowledge on how to use mixed portfolios of built water infrastructure (e.g. dams, levees, irrigation channels) and 'natural infrastructure' (e.g. wetlands, floodplains, watersheds) for poverty reduction, water-energy-food security, biodiversity conservation, and climate resilience. WISE-UP aims to show the application of optimal portfolios of built and natural infrastructure using dialogue with decision-makers to identify and agree trade-offs. The project also seeks to link ecosystem services more directly into water infrastructure development in the Volta River Basin (Ghana principally, but also Burkina Faso) as well as the Tana River Basin in Kenya.

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 from seven institutions (listed above). Inter-disciplinary by design, the success of the project lies in its ability to bridge the social and natural sciences.

Using the Tana and Volta as demonstration basins, IWMI is exploring the eco-hydrological functions of built and natural infrastructure in the context of climate adaptation through a range of techniques, including modelling, ecosystem service mapping and the development of "benefit functions" linked to hydrological functions. BC3's economic valuation work is assigning monetary value to different system impacts and natural infrastructure investments. This information facilitates analysis of the economic costs and benefits associated with infrastructure, management and climate shifts. The University of Manchester's river basin impact modelling and trade-off analysis integrates IWMI and BC3's outputs to generate the set of best available (i.e. most efficient and robust) combined built and natural infrastructure investment options for an uncertain climate future. Each combination of built and natural infrastructure provides a different balance of benefits which is then represented graphically for stakeholders to discuss.

The political economy research on decision logics and political drivers, complements the ecosystem infrastructure investment analysis by bringing a deeper understanding of why and how basin stakeholders make the investments decisions they do and how climate change is understood. This analysis allows the project to target the correct institutions and stakeholders (including brokers of

[1] WISE-UP is a four and a half year project which started in August 2013.

information and networks of influence) that are key to more effective application of evidence and influence of change. The basin leads, WRI-CSIR and ACCESS, work alongside the other partners to help ground truth the research. They develop in-country skills and capacities for sharing results, aiming to strengthen understanding and ownership of data and tools under WISE-UP.

Weaving a joint project narrative through iterative learning is the Action Learning process under WISE-UP. Led by IUCN, this engages basin stakeholders directly from the start putting them in the driver's seat to actively guide project research and direction. The process is designed to operate at the interface between the development of new scientific evidence and the identification of the political dynamics and economic drivers shaping decision making and policy. This is critical to better understand how to make information and innovative tools practical, useful and trusted – how to take science into policy circles and decision making processes. It helps us shape the future stages of research and field work, and allows WISE-UP to continually evaluate the relevance of its work.

Key results

WISE-UP is generating preliminary results concerning infrastructure choices and options, and how these relate to climate futures using the latest climate and hydrological information and predictions. This is set in context using political-economy research and sensitive information concerning decision making. The project has been engaging with basin stakeholders to ensure that it builds products/outputs that are accessible, relevant and directly applicable. Final project outputs will be packaged and shared by the end of 2017 but here are summary points of results from the work under WISE-UP so far: (please note that figures are in draft form and that results need further verification)

- **Eco-hydrology functions of infrastructure in the context of sustainable adaptation (IWMI):**
  - Baseline reports publisehd for the Volta and Tana river basins.
  - Climate change scenarios anaylsis for Tana and Volta basins.
  - Ecosystem services mapping (see figure 1) at community level and basin level ecosystem service benefit functions developed for integration of natural infrastructure processes into system modelling for trade-off analysis.
  - Remote sensing data produced to review flooding extent and irrigation schemes in the Lower Tana Basin. This will help to inform the project on better understanding the role of flood plain grazing, river bank gardens and river bank recession agriculture.
  - Sedimentation analysis under different future climate scenarioes in the Upper Tana Catchment.

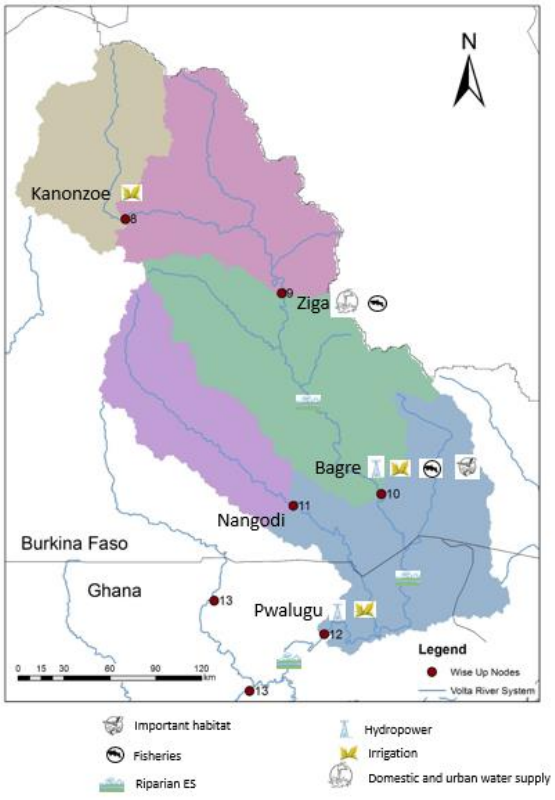


Figure 1: Ecosystem services mapping in the Volta Basin

- **Ecosystem valuation and benefits of natural infrastructure (BC3):**
  - Economic valuation results have been produced at household level in the sub-catchment of the Kimakia, in the Tana River Basin (Kenya) and from the Pwalugu area in the Volta River Basin (Ghana) – see figure 2 below.

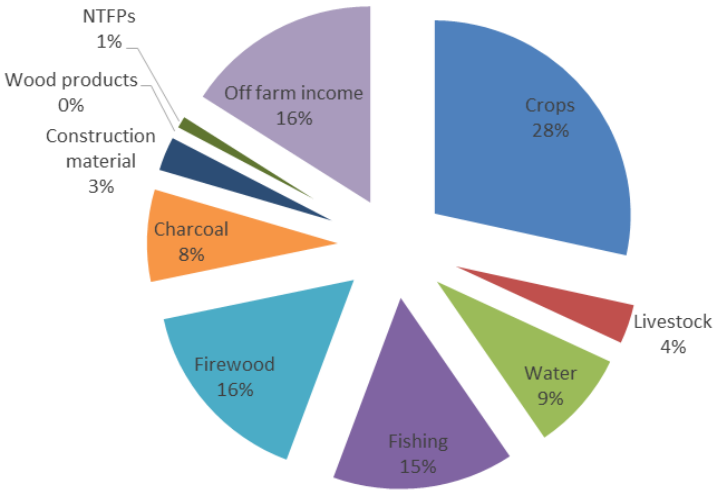
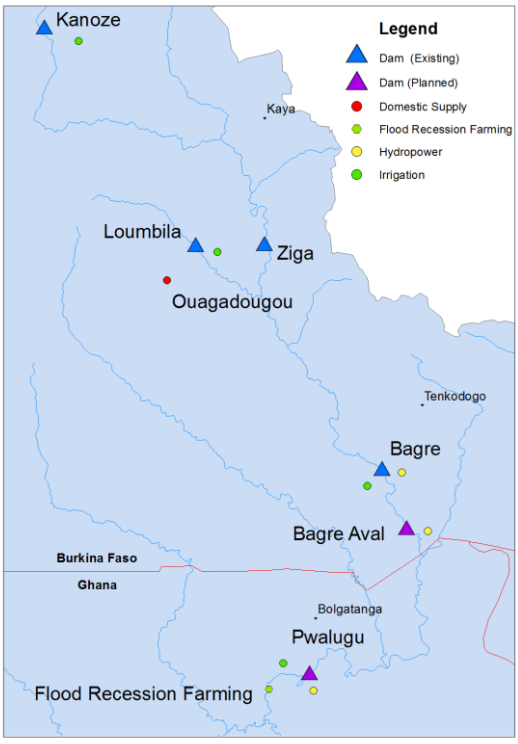


Figure 2: Average contribution of different income sources to the livelihood of an average household in Pwalugu communities

- **Systems modelling and trade-off analysis (University of Manchester):**
  - Systems model (see figure 3) built and trade-off results for the Volta have been produced and optimised using real data for three performance metrics: hydropower, irrigation and flood recession farming. An example of the trade-off curves produced is illustrated in the parallel axis plot graph below (figure 3) that shows 5 different trade-off scenarios between three options. The final results will be able to include 10 decision options – developed in collaboration with basin stakeholders.



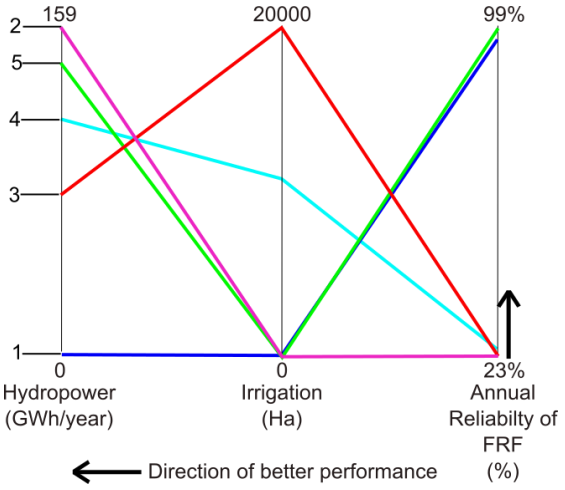


Figure 4 (above). Trade-offs between Hydropower, Irrigation and Flood Recession Farming implied between different specifications and operating rules of the Pwalugu dam.

Figure 3 (left). The Pwalugu case study area showing modelled natural and built infrastructure and their resulting benefits.

- Systems model built and trade-off results for the Tana have been produced which demonstrate cliamte change implications on different trade-off options of built and natural infrastructure investments. An example of the trade-off curves produced is illustrated in the scatter plot graph below (figure 5) that shows the possible trade-offs between urban water supply and hydropower generation. The final results will be able to include 10 decision options – developed in collaboration with basin stakeholders.

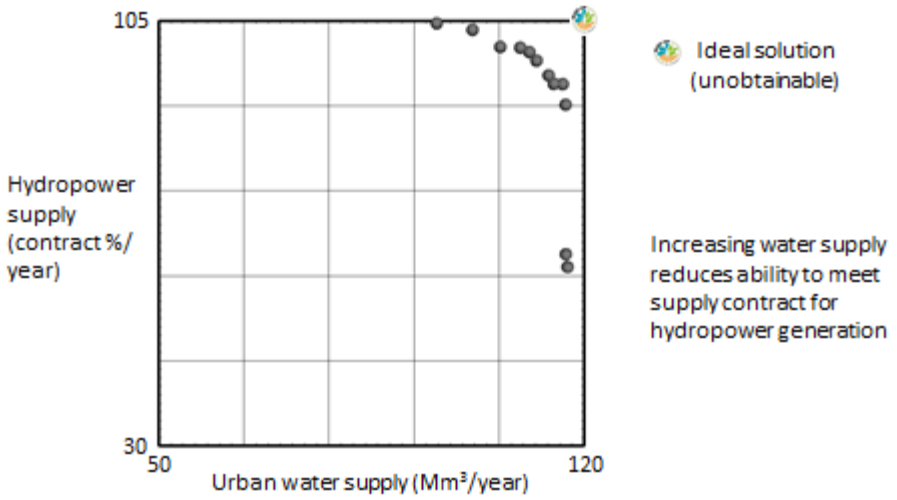


Figure 5 An example of a scatter plot trade-off curve which shows urban water supply against hydropower in the Tana basin

- **Political economy analysis of water infrastructure decisions and governance (ODI)**:
  - Analysis of political drivers of decision-making and the room for manoeuvre / entry points to increase influencing of decision logics. The results have examined the underlying drivers, incentives and constraints to understand how stakeholders interact in pursuit of their interests, promoting some policy objectives or isolating others, towards making certain investment choices. The aim is to identify opportunities to introduce innovation to policy-making and river basin planning, with a view to promoting equitable, sustainable and climate-compatible solutions.

- **Action learning process with stakeholders to strengthen applications of evidence and tools in policy making, infrastructure decisions and consensus building (IUCN):**
  - 4 sets of Action Learning meetings (over 2015-2016) with both a wider stakeholder group and decision-makers delivered in both the Tana and Volta basins, to verify and provide guidance into the research under WISE-UP.

- **Capacity building for integrating built and natural water infrastructure and sharing results (CSIR/ACCESS):**
  - Series of workshops to build in-country understanding of WISE-UP's approach and the tools and results produced have been delivered in-country to a range of stakeholders including decision-makers, NGOs, academics. This included: IRAS modelling training, participatory scenarios visioning wokshop, economic valuation tools, participatory ecosystems mapping at local level and systems modelling training.

Description of lessons learned and good practices

Joint learning occurs at two levels, at one level between the project and basin stakeholders to understand the political, social, economic and environmental landscapes in the Volta and Tana River basins and then within the project research team itself between social and natural scientists. Some key points include:

- There has been a focus in interest from stakeholders on the systems modelling technical results. This is to some extent unsurprising but as a project that combines social and natural sciences, it is important to raise the profile of the interlinkages and learning that comes from an inter-disciplinary approach. That understanding adaptation is not only about better understanding the natural environment but crucially how people interact with, value and manage nature – at all levels. The Action Learning meetings provide a crucial platform for improving our communication and messaging on inter-disciplinary research for better understanding climate change adaptation - giving the floor to the range of disciplines, tools and methods being used under WISE-UP.
- The range of interpretations of the term 'ecosystem services' has created delays in learning and sharing of results/experiences. It also has implications on discussions around climate change adaptation and nature based solutions. WISE-UP has attempted to tackle this by working on a new conceptualisation (visualised through an infographic and developed in a journal article) of 'ecosystem services' and how they relate to built infrastructure to ensure clarity and agreement.
- To reach real integration of multi-disciplinary research, continuous and active facilitation between partners/scientists is needed. Even when agreements are reached and research aligns, it cannot be assumed that it will continue in that way.

Description of key challenges

Challenges with first the recognition and then the implementation of natural infrastructure approaches are complex. A dominance in conventional approaches and weakness in institutional capacities leaves natural infrastructure absent from many discussions. 'Ecosystem based Adaptation' tends to be small scale, sporadic, and cause confusion with institutions as to the benefit, the overlap, and the complementarity of this work. In the Volta particularly, questions are raised on the economics of adaptation, to better understand the possible savings from mobilising adaptation actions. Natural infrastructure management also sits with communities, so coordination with built infrastructure becomes complex and sporadic, when ideally large scale coordination is required with institutions.

Action Learning has provided key insights into power struggles between institutions to respond to climate change, but also the political ownership of large built infrastructure projects that overrides technical reasoning and hydrological variabilities and climate change predictions. There are concerns therefore as to the nature of decision making for adaptation, and medium term responses to changing hydrology actually reducing the resilience to respond to climate change, and possible negative effects on hydropower generation and other development activities for example.

Technical capacity in the national institutions remains challenging to integrate project outputs. Ideally skills and tools need to be slowly transitioned into institutions to increase understanding and buy-in to the work. A review of the INDC's submitted to the Paris CoP indicates that national responses to climate change rely on existing approaches, and new knowledge, tools, information, and skills are difficult to harness and mobilise (see the WISE-UP M&E document for further information). Communicating the complexity of what WISE-UP is doing as a multi-disciplinary project brings challenges where the context and therefore the results are complex. In Kenya, the 15 County Governments in the Tana Basin will need to become more engaged and aware of the project

through the Action Learning process, and WISE-UP aware of the governance challenges the new structures bring.

Planned next steps (as appropriate)
The project will end in Dec 2017 but currently working to solidify relationships with key institutions for a continued use of outputs, tools and data beyond the project.