

# Integrating Climate Adaptation in Water Catchment Planning in Uganda

## BRIEFING NOTE

The Government of Uganda is assessing climate risks and supporting the integration of climate change adaptation into water resources management at the national, sectoral and district levels, including at the catchment level. Water resources management needs to consider and address climate risks given the expected impacts of changing temperatures and rainfall patterns, and increasing extreme weather events.

This briefing note provides an overview of the results of a climate risk assessment of water resources in the Ruhezamyenda catchment in Uganda, sets out recommendations on how to incorporate the learning into planning and implementation at the catchment level, and describes lessons for the country's National Adaptation Plan (NAP) process. The audience for this briefing note is the Ministry of Water and Environment responsible for water management and climate change planning in Uganda, as well as other government and non-government actors supporting the mainstreaming of climate adaptation in catchment management plans and participating in Uganda's NAP process.

### 1. Introduction

Water management in Uganda is undertaken at different levels using a catchment-based approach rather than following district boundaries. The main water management functions are carried out at the regional level through four Water Management Zones that work under the central oversight and guidance of the Directorate of Water Resources Management, Ministry of Water and Environment. The aim of deconcentrated management is to move the functions closer to stakeholders and communities, which helps to focus on the real problems on the ground, improve the analytical underpinnings of projects, and provide opportunity for stakeholders to participate in the development of plans and implementation of projects (Directorate of Water Resources Management, 2017a).



Catchment management plans have been developed for 15 hotspot catchments in Uganda, funded by the Ministry of Water and Environment and development partners (Victoria Water Management Zone, 2018; Ministry of Water and Environment, 2015c, 2018). These 15 catchments are considered hotspots because of increasing population pressure, water scarcity, loss of wetlands, and soil erosion. The development of catchment management plans is based on the Uganda Catchment Management Planning Guidelines (Directorate of Water Resources Management, 2014) and overseen by Catchment Management Committees that are representative bodies with membership from various stakeholder groups including district governments, private sector, civil society and community organizations. The committees lead a collaborative process to develop, revise, and oversee the implementation of catchment management plans.

The development of most catchment management plans to date did not include integration of climate change concerns. To address this gap, revisions to the catchment management planning guidelines were proposed in 2017 to support the systematic integration of climate change in the development and implementation of catchment management plans (Directorate of Water Resources Management, 2017b). The mainstreaming of climate change in catchment management plans is a priority for the Ministry of Water and Environment, and the development of climate risk assessments and integration of adaptation actions in catchment management plans is underway including in the Maziba, Mpanga, and Ruhenzamyenda plans (Africa4Climate, 2017; Mehdi, et al., 2019; Lake Victoria Basin Committee, 2018). The Water Management Zones, working with Catchment Management Committees, have responsibility for mainstreaming climate change in catchment management plans, with guidance provided by the Climate Change Department, Ministry of Water and Environment (Directorate of Water Resources Management, 2017b).

The integration of climate change in catchment management plans is informed by the overarching climate change policy and guidelines developed by the Climate Change Department. The Uganda National Climate Change Policy recognizes the importance of catchment management plans and encourages the integration of climate change concerns into water conservation and water resource management efforts (Ministry of Water and Environment, 2015b). The *Guidelines for the Integration of Climate Change in Sector Plans and Budgets* recommend undertaking impact and vulnerability assessments, and using the results of these assessment to identify opportunities to integrate adaptation actions in plans and budgets (Ministry of Water and Environment, 2014).

The Climate Change Department is responsible for disseminating information on climate change, providing strategic advice, and coordinating climate change actions. This includes leading the NAP process to integrate climate risks into national development planning and programs and identify medium- and long-term adaptation needs (see Box 1). The experience of integrating climate change in catchment management plans is important

### **Box 1. Status of Uganda's NAP process**

The Government of Uganda embarked on its NAP process by submitting its NAP roadmap to the United Nations Framework Convention on Climate Change in 2015. Uganda is clarifying its approach to the NAP process. To date, the country has pursued a hybrid approach where adaptation is simultaneously considered at the national level and in sector-specific planning.

The government launched a NAP for the agriculture sector in November 2018; and the Strategic Program for Climate Resilience: Uganda established the business cases for five priority projects to catalyze investment to build the resilience of communities, improve food security, climate-proof urban infrastructure and strengthen capacity to manage climate change (Ministry of Water and Environment, 2017). The country is developing a proposal to access funding from the Green Climate Fund for its NAP process.

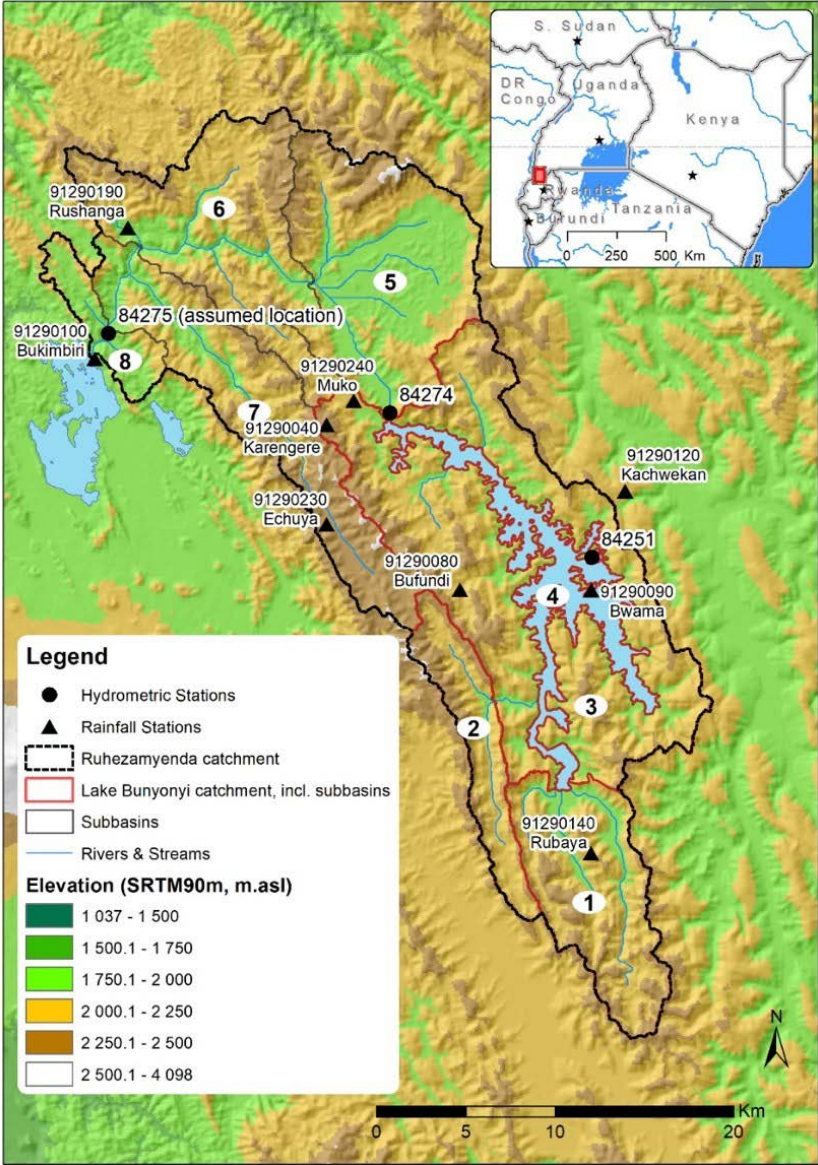
Uganda's high-level adaptation priorities are identified in the country's Nationally Determined Contribution (NDC) and include: reducing vulnerability and addressing adaptation in agriculture and livestock, forestry, infrastructure, water, energy, health, and disaster risk management (Ministry of Water and Environment, 2015a). These priorities and actions are based on the *Uganda National Climate Change Policy* (Ministry of Water and Environment, 2015b) and reflect the content of *Uganda Vision 2040* (Government of Uganda, 2013) and the country's *Second National Development Plan (2015/16–2019/20)* (Ministry of Water and Environment, 2015c).

for Uganda's NAP process because it demonstrates the importance of prioritizing adaptation actions based on scientific evidence that is validated by local stakeholders, and provides a framework for mainstreaming adaptation into strategies and programs in other catchments. In addition, it is crucial that the NAP process ensures that adaptation efforts at the catchment level are linked with, and are informing, other adaptation efforts occurring at the sectoral, national and district levels (Dazé, Price-Kelly, & Rass, 2016).

## 2. Case Study: The Ruhezamyenda catchment

The Ruhezamyenda catchment, one of 15 hotspot catchments in Uganda, lies in the southwestern corner of the country. The catchment has a total size of 722 km<sup>2</sup> and is dominated by Lake Bunyonyi (49.6 km<sup>2</sup>) (see Figure 1). The catchment is densely populated, with the region's population density, between 320 and 415 persons per km<sup>2</sup>, being second only to Kampala (Geo-Ref.net, 2018). The catchment is very hilly with steep slopes, and very little original forest cover remains. The valley bottoms are often wide and flat and filled with wetlands, many of which have been drained and converted to arable farmland. The Ruhezamyenda catchment is experiencing soil erosion, soil fertility loss, landslides, floods, and water scarcity. The challenges are exacerbated by climate change, increasing population pressure, and loss of wetlands and deforestation mainly because of conversion to agricultural land.

The 2015 Ruhezamyenda Catchment Management Plan proposed actions to support the sustainable development of catchment surface and groundwater resources (Albert Water Management Zone, 2015a). The catchment management plans guidelines at the time did not include mainstreaming of climate change, a gap noted by stakeholders in the preparation of the plan. To address this gap, the NAP Global Network during the period January 2017 to October 2018 supported the Albert Water Management Zone, Directorate of Water Resources Management, and the Climate Change Department to assess the impacts of climate change on the Ruhezamyenda catchment. The methodology to assess the impacts is described below and summarized in Table 1.



**Figure 1. Ruhezamyenda catchment: Overview map topography and sub-catchments**

*Update to Mehdi, et al., 2019*



**Table 1. Methodology: Assessing climate risks and identifying adaptation actions in the Ruhezamyenda catchment management plan**

Step	Method
<b>1. Identification of catchment for study</b>	<ul style="list-style-type: none"> <li>• Literature review</li> <li>• Review of Ruhezamyenda Catchment Management Plan</li> <li>• Field visit to Lake Bunyonyi</li> <li>• Consultations with government and catchment stakeholders</li> </ul>
<b>2. Assessment of climate impacts and risks</b>	<ul style="list-style-type: none"> <li>• Application of hydrological model to simulate climate in the catchment for the mid-term future and far future</li> <li>• Interpretation of climate simulation results to identify climate change and impacts of climate change in the catchment</li> <li>• Identification of priority adaptation actions to address climate risks</li> </ul>
<b>3. Identification of priority adaptation actions</b>	<ul style="list-style-type: none"> <li>• Validation workshop with stakeholders from the catchment</li> <li>• Refinement of priority adaptation actions</li> </ul>
<b>4. Finalization of technical report</b>	<ul style="list-style-type: none"> <li>• Revision of report to incorporate stakeholder input</li> <li>• Publication of report</li> </ul>

A scoping mission was undertaken in July 2017 to confirm the Ruhezamyenda catchment as the focus of the work and to obtain information about the condition of the catchment. The information, gathered through stakeholder consultations and field observations, informed the development of the technical study, *Assessment of the Current and Future Available Water Resources under Different Climate Scenarios in the Lake Bunyonyi Catchment*, Uganda (Mehdi, et al., 2019). This climate risk assessment examined current and future potential water resources under different climate scenarios in the Lake Bunyonyi catchment given the important role of the lake in the hydrology of the entire Ruhezamyenda catchment. The climate risk assessment applied the hydrological model COSERO (COntinuous Semi-distributed RunOff) to simulate climate in the catchment for the mid-term future (2041–2070) and for the far future (2071–2100) for each of two Representative Concentration Pathway (RCP) scenarios, RCP4.5 and RCP8.5.1

The assessment determined that the **Ruhezamyenda catchment is extremely vulnerable to the impacts of climate change and communities are already experiencing these impacts**. The simulation results showed that higher temperatures and more annual precipitation will lead to higher actual evapotranspiration amounts in the catchment. The runoff for the catchment for future periods showed much uncertainty, but the overall trend is toward increasing runoff, especially in the far future.

**The results of the hydrological modeling indicated that the climate risks facing the catchment in the future are expected to be broad and include dealing with too much water, more variability in precipitation, more low-flow periods, and more intense rainfall that can lead to flooding and increased landslides.** As such, the adaptation approach needs to include robust solutions that will work in a range of possible climate scenarios, and strike a balance between immediate and long-term needs. The approach should prioritize no- and low-regret actions, which are anticipatory adaptation actions that provide benefits regardless of future climate change and place emphasis on vulnerable areas in the catchment (Mehdi, et al., 2019).

<sup>1</sup> A Representative Concentration Pathway (RCP) is a greenhouse gas concentration trajectory adopted by the Intergovernmental Panel on Climate Change for its Fifth Assessment Report. Four pathways—RCP2.6, RCP4.5, RCP6.0 and RCP8.5—are considered possible depending on the amount of greenhouse gases emitted in the future. The four RCPs aim to represent greenhouse gas concentrations. RCP4.5 assumes that global annual greenhouse gas emissions peak around 2040 and then decline. RCP8.5 assumes that emissions continue to rise throughout the 21st century.

The climate risk assessment was validated by stakeholders from the catchment in October 2018. The stakeholders—representatives from national and district governments, civil society organizations, private sector and the media—provided input on the priority adaptation actions needed in the catchment based on the evidence set out in the climate risk assessment. **The priority adaptation actions included: improve soil, water and land management, through engagement with women and men in the communities to improve their farming practices and livelihoods; improve hydro-meteorological data collection and management; enhance coordination and collaboration across sectors and levels of government; and develop and implement a communication strategy on climate change impacts and adaptation.**

Many of these adaptation actions are aligned with priority actions already identified in the Ruhezamyenda Catchment Management Plan, although some of the priority adaptation actions—mainly related to research and data management—are not included in the catchment management plans. (See Annex 1 for details of priority adaptation actions.) Some pilot projects focusing on water, soil, and land conservation are underway to support climate change adaptation while also improving peoples' livelihoods; but these activities need to be accelerated and scaled up to have a real impact.

### 3. Integrating Climate Change Adaptation in Catchment

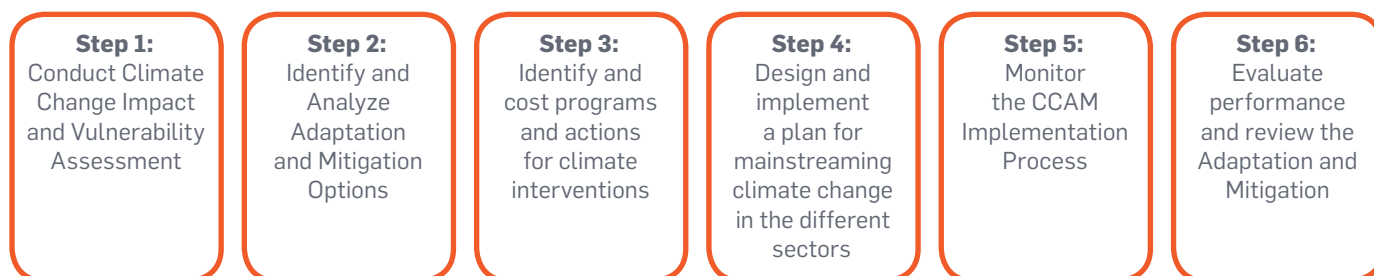
The next steps include integrating the results of the climate risk assessment in the Ruhezamyenda Catchment Management Plan to guide planning and implementation. The suggested way forward is consistent with the mainstreaming guidelines developed by the Climate Change Department (see Figure 2), and includes:

- **Step 1 – The climate risk assessment reviews climate change impacts and vulnerabilities in the Ruhezamyenda catchment and is intended to enhance and complement the catchment management plans.** The climate risk assessment could be included as an addendum to the plan, similar to the *Catchment Situation Analysis Report* (Albert Water Management Zone, 2015b). The Ruhezamyenda Catchment Management Plan is a living document, and the Albert Water Management Zone and Catchment Management Committee can work to integrate the climate risk information in the next iteration of the catchment management plan. A more important issue in the short term is ensuring that decision makers and stakeholders are aware of the results of the assessment. The Directorate of Water Resources Management can share the learning from the climate risk assessment and mainstreaming process with other Water Management Zones and at the national level, including with the Climate Change Department. The Catchment Management Committee, guided by the Albert Water Management Zone, plays a key role in disseminating learning with stakeholders in the catchment including district government offices, civil society organizations and communities.



- **Step 2 – The climate risk assessment provides the evidence for prioritizing adaptation actions.** The report identifies adaptation options and emphasizes no-regrets adaptation actions that have co-benefits at the community level and for small-holder farmers. Prioritizing a few manageable and affordable adaptation actions that can be achieved over the next three years—rather than trying to do everything—is a prudent way to move toward improved climate resilience in the catchment. The Directorate of Water Resources Management, Albert Water Management Zone and the Catchment Management Committee play critical roles in ensuring coherence on adaptation planning across the different sectors and levels of government.

**Figure 2. Steps for mainstreaming climate change in sector plans and budgets**



Source: Adapted from Ministry of Water and Environment, 2014, page 8.

- **Step 3 – Identify the costs of the priority adaptation actions, setting out both the i) additional costs to include adaptation concerns in the actions already costed in the catchment management plan, and ii) costs for adaptation actions not in the catchment management plan.** A resource mobilization strategy can be developed to identify potential funding for a catchment approach to adaptation or for discrete adaptation activities. Implementation partners can work to access finance through various means, including domestic budget allocations, official development aid and international climate finance. The Climate Change Department can facilitate access to international climate finance, and the Directorate of Water Resources Management can mainstream adaptation at the catchment level in its budgeting processes to request domestic funds.
- **Step 4 – Implementing the priority adaptation actions is the largest challenge, requiring funding and improved technical capacity at the catchment level.** Effective implementation of the priority adaptation actions identified in the climate risk assessment requires integration of actions into other development tools and plans such as catchment management, district development, sector, and land-use plans. These plans can be reviewed to identify potential linkages with adaptation priorities identified in the climate risk assessment.  

The cross-sectoral nature of catchment management plans means that the adaptation actions need to be undertaken in various sectors—such as agriculture, mining, forestry, and disaster preparedness—which requires coordination and integration of adaptation into on-going projects and programs. A review of existing programming in the catchment can help to identify on-going actions that can be modified for stronger adaptation outcomes. Various players can be engaged in implementation depending on the adaptation action, including the Ministry of Water and Environment, Water Management Zones, sector departments, district and local governments, civil society organizations and the private sector.
- **Steps 5 and 6 – Monitoring and evaluation is a critical component to ensure that the activities deliver adaptation benefits, reflect lessons from the implementation process, and enable domestic and international adaptation reporting.** Indicators with baseline information can be developed for priority actions to enable the monitoring and evaluation of the adaptation outcomes. The Directorate of Water Resources Management, with guidance from the Climate Change Department, can lead monitoring and evaluation of adaptation in catchments to ensure consistent monitoring across the water management zones and facilitate national reporting. Catchment Management Committees can assist with data collection at the local level.



## 4. Recommendations for Uganda's NAP Process

The Climate Change Department has embarked on Uganda's NAP process, which aims to integrate climate change adaptation into development planning at national, sectoral and subnational levels with the ultimate objective of reducing the country's vulnerability to climate change impacts in the medium and long terms. The results of the Ruhezamyenda catchment climate risk assessment provide lessons for Uganda's emerging NAP process, discussed below.

### **Coordinated and coherent adaptation planning and actions are required across sectors and levels of governments**

Given the cross-cutting nature of climate change adaptation, the need to influence and coordinate across various actors, sectors and levels of governance is critical. Effective coordination and clarity of roles can enhance implementation of priority adaptation actions. Many adaptation actions, similar to actions in a water catchment, require the input and expertise of various sectors: communication across ministries and departments—including the Climate Change Department and Directorate of Water Resources Management—and engagement across levels of government from national to local levels. The NAP process could be steered by a coordination mechanism that ensures the engagement of representatives from various sectors and levels of government, from national government to Catchment Management Committees.

### **Information sharing on adaptation, including about the NAP process, at the subnational level and between national and subnational levels can increase efficiencies and is critical to increase buy-in for adaptation action**

Sharing of adaptation information (such as risk assessments, case studies, and learning from adaptation initiatives) across sectors and levels of government, and with other stakeholders including politicians, can increase buy-in for the NAP process and for mainstreaming adaptation in planning, budgeting, and implementation of programs and projects. In addition, information about the NAP process itself could be shared at all levels including at the subnational level from the beginning of the process.

Information sharing can also increase efficiencies and help to mainstream climate change in other catchment management plans. The climate risks and proposed adaptation actions in the Ruhezamyenda catchment climate risk assessment are similar to those found in the technical report on mainstreaming adaptation in the Mpanga Catchment Management Plan and the Lake Victoria vulnerability assessment and adaptation plan. Given the uncertainties and paucity of data—noted in both the Mpanga and Ruhezamyenda climate risk assessments—it may not be cost effective to undertake detailed hydrological modeling in all catchments to identify expected climate impacts and priority adaptation needs. The Directorate of Water Resources Management and the Catchment Management Committees may opt to review existing studies that integrate climate change in catchment management plans to identify appropriate adaptation actions that could be incorporated in other catchment management plans. Various climate risk and vulnerability assessments have been undertaken at the regional,



national, and sector levels that can inform climate impacts and adaptation priorities in catchment management plans (see for example Africa4Climate, 2017; Kikoyo & Nobert, 2015; Taylor, et al., 2014; UNDP, 2013; USAID, 2013). The National Climate Change Resource Centre is well placed to compile and categorize these assessments, and make them publicly available to provide access to scientific and technical knowledge to inform catchment planning as well as the NAP process.

### **Engagement of local stakeholders in the NAP process is crucial for buy-in and sustainability of adaptation interventions**

District governments and community stakeholder groups, such as Catchment Management Committees, can articulate climate impacts and priorities at the local level. For the NAP process to enable adaptation at the subnational level, it needs to engage district governments, community groups and civil society organizations that are active on the ground to identify and implement adaptation actions that address local needs. Local engagement, including with politicians, builds awareness, increases ownership, and increases the sustainability of the adaptation interventions.

Capacity development can help the multiple stakeholders from a variety of sectors better understand the NAP process. This can help stakeholders bring their knowledge and skills to the NAP process and ensure that local realities are reflected in the NAP.

### **The NAP process can help raise funding for adaptation action at the catchment level**

Moving forward to implement the priority adaptation actions identified for the Ruhezamyenda catchment will require significant funding. Accelerated and strategic investments in climate adaptation is one of the key expected outcomes of the NAP process. Water Management Zones working with Catchment Management Committees can input priority actions with budgets to the NAP process to guide potential funders.



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## Annex 1. Priority Adaptation Actions Identified in the 2018 Climate Risk Assessment of the Ruhezamyenda Catchment

Priority adaptation actions identified in the 2018 climate risk assessment
<p><b>Governance</b></p> <ul style="list-style-type: none"><li>• Accelerate and scale up the implementation of adaptation measures identified in the 2015 catchment management plan, some of which have been successfully piloted in the catchment.</li><li>• Prioritize access to climate finance to implement adaptation priorities in the catchment.</li><li>• Engage with women and men in the communities and local stakeholders to introduce improved farming practices.</li><li>• Develop, communicate and enforce by-laws to protect the catchment.</li><li>• Enhance coordination and collaboration across sectors and levels of governance to support alignment between the catchment management plan and other sectoral and local development plans and their effective implementation.</li></ul>
<p><b>Communication and capacity development</b></p> <ul style="list-style-type: none"><li>• Develop and implement a communication strategy on climate change impacts and adaptation in the catchment.</li><li>• Train farmers and other actors on no-regrets adaptation options.</li></ul>
<p><b>Water, soil and land management and livelihoods improvement</b></p> <ul style="list-style-type: none"><li>• Implement and maintain terraces and bund systems to improve crop yields and manage soil erosion in the catchment.</li><li>• Manage excess surface water runoff in the catchment to reduce soil erosion and infrastructure damage.</li><li>• Stop the conversion of wetlands to farmland and eucalyptus woodlots in the catchment—complementary measures include alternative sources of fuel wood and efficient cookstoves, and rehabilitation of degraded land.</li></ul>
<p><b>Data management</b></p> <ul style="list-style-type: none"><li>• Install and maintain hydrometric and meteorological stations throughout the catchment.</li><li>• Monitor sub-daily precipitation events at 15- or 30-minute intervals in a variety of landscapes found in the catchment, such as steep hills and lowlands.</li><li>• Strengthen the exchange of data between the Uganda National Meteorological Authority and Ministry of Water and Environment by establishing and implementing protocols for climate data management.</li></ul>
<p><b>Research</b></p> <ul style="list-style-type: none"><li>• Undertake site-specific assessments of climate change impacts in the catchment.</li><li>• Determine drivers of land-use change in the catchment to understand how land use / land cover will evolve in the future, especially due to a growing population.</li><li>• Carry out additional modelling studies to examine anthropogenic change in the catchment.</li></ul>

Source: Mehdi, et al., 2019.





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