Infrastructure-Induced Conflicts:

A Case Study of the Timau Water Sub-catchment Area, Kenya

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September 2025

Acknowledgements

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Cover Photo: Nanyuki, Kenya © Asim

We extend our sincere gratitude to all the stakeholders who made this work possible. Special thanks go to the Centre for Training and Integrated Research in ASAL Development (CETRAD), the British Institute in Eastern Africa (BIEA), and the National Irrigation Department for their invaluable technical and institutional support. We are equally grateful to the Timau Water Resource Users Association (WRUA) for their active collaboration and to the local communities whose knowledge, time, and participation were central to this study. Your collective contributions have been instrumental in shaping this report.

Development Geography Occasional Paper ISSN 2364-3005

Acronyms

WRUA	Water Resource Users Association
WRA	Water Resource Authority
IWRM	Integrated Water Resource Management
KII	Key Informant Interview
FGD	Focus Group Discussion
GIS	Geographic Information System

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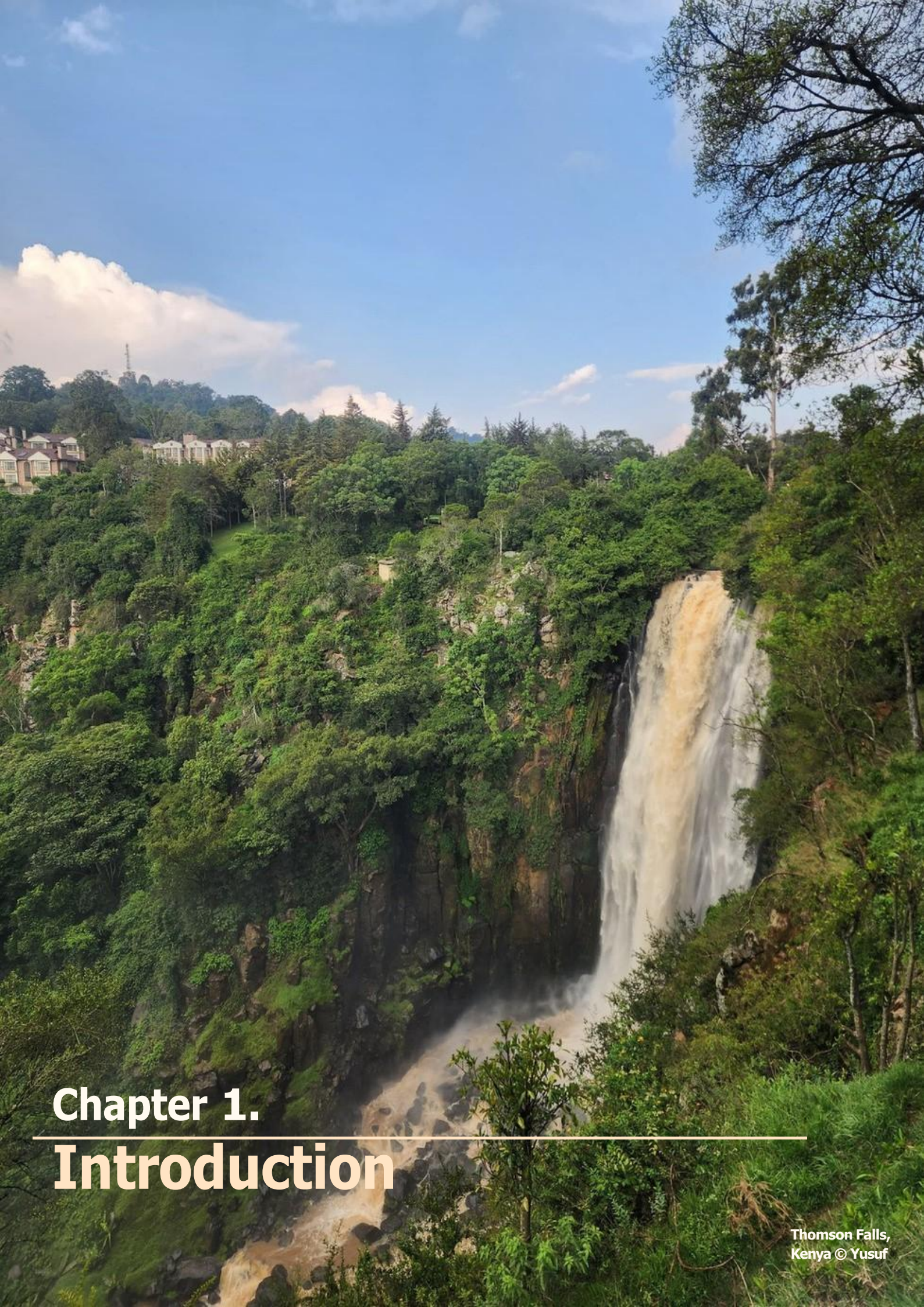


Chapter 1.
Introduction

Thomson Falls, Kenya © Yusuf

"Clean water?... no, we simply consume that river water and trust that God purifies it once it gets to our intestines."

The quoted statement reflects the experience of most individuals residing in the Timau sub-catchment area who lack access to clean water and the necessary amounts. Water emerged as a significant concern following the events of the 2002 water crisis, which also led to the establishment of Kenya's National Water Act in 2002 aimed at addressing water-related challenges. Water management is a critical concern in numerous areas globally, particularly in regions experiencing shortages. In other parts of the world, this has led to conflicts fueled by water as a trigger (for instance, in India), water used as a weapon (such as among the nomadic pastoralists in West Africa), and water being a casualty (for example, in Yemen) (Gleick et al., 2020a). In line with Gleick et al. (2020a) water resources or infrastructures become victims of conflict, functioning as targets or casualties of violence. The Timau sub-catchment area exhibits characteristics akin to those in Yemen, where water infrastructure has evolved into essential components for water supply and a source of conflict, particularly in the presence of disputes (notably illustrated by the damaged water systems (also called intakes) at the Rugirando spring area, as depicted in Appendix 1). Although the constitution of Kenya, Article (43) 2010, ensures that every individual has the right to clean and safe water in sufficient amounts and acceptable sanitation standards, a significant number of people in Timau encounter the opposite.

The Timau Sub-Catchment in Kenya is crucial for water resource management, influenced by socio-political, institutional, and environmental factors. The 2002 Water Act facilitated decentralization, creating community-based organizations like Water Resource User Associations (WRUAs) to improve Integrated Water Resource Management (IWRM) (K'Akumu, 2009; Ngigi C Macharia, 2007). WRUAs function as joint management entities for water resources and conflict resolution, situated within the governance schema between the Water Resources Authority and water users (Water Act, 2016, p. 28). However, complexities regarding infrastructure management, participant involvement, and local participation factors remain inadequately explored. This research focused on water governance dynamics and conflicts related to infrastructure in the Timau Water Sub-catchment Area.

[1] 08/09/2025 In-depth interview with a Female respondent in Timau ward zone in sharing experience pertaining water access in Timau ward.

1.1 Background

The Timau Water Resource Users Association (WRUA) operates within a geographically expansive and ecologically critical area extending from the Mount Kenya region. This sub-catchment, recognized as one of the most significant in the region, encompasses major rivers such as Ngusishi, Teleswani, and Sirimon, all of which contribute substantially to local livelihoods, agricultural production, and ecosystem sustainability. Timau itself is widely regarded as one of the largest and most important water catchment areas in the region. The catchment is divided into three distinct zones, each with unique characteristics and challenges. The upper zone is predominantly forested and serves as the primary source of water for downstream users. The middle zone is more densely populated and faces considerable challenges related to water pollution from domestic, agricultural, and industrial activities. The lower zone stretches toward Laikipia, where water access is often facilitated through portable pumps and water puns, reflecting both the geographic distance from source areas and the infrastructural limitations present in this region. Within the Timau catchment, infrastructure development has included the establishment of approximately 20 water intake points. Initially, the WRUA invested in a shared intake system designed to equitably serve multiple users. However, governance-related conflicts among stakeholders led to tensions, vandalism, and ultimately the destruction of this common facility highlighting the vulnerability of shared infrastructure in contexts of competing water demands.

Water management techniques differ throughout the catchment. Commercial farmers, especially in the upper and middle areas, use harvested rainwater alongside river water during rainy seasons and depend significantly on boreholes and dams for irrigation.

At present, there are 34 registered boreholes within the catchment, many of which were financed through community contributions, political sponsorships from local leaders such as Members of County Assembly (MCAs), or donor-funded initiatives. Additionally, the use of water pans (as illustrated in Appendix 2), large, excavated basins lined with dam liners has emerged as a popular strategy to improve on-farm water storage. Water allocation in the Timau catchment is formally regulated through legal permits and monitored using flow meters and river gauges. These tools are intended to ensure compliance with abstraction quotas and prevent overuse of the resource. Nevertheless, enforcement remains inconsistent, and actual water use often deviates from permitted levels due to weak institutional oversight, technical constraints, and varying user practices. These challenges underscore the complex interplay between resource availability, governance mechanisms, and user behaviour in the management of shared water resources.

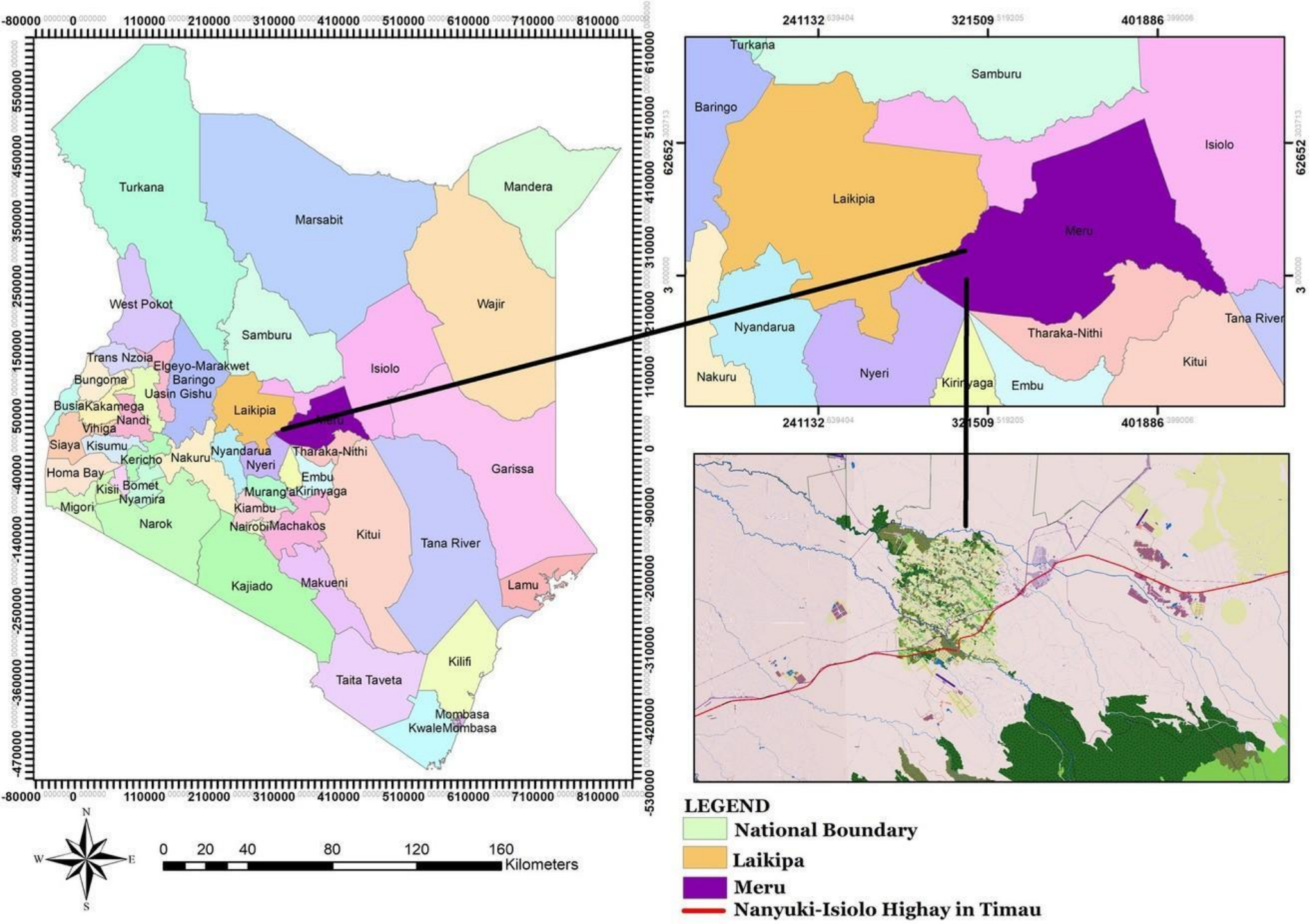


Figure 1 Timau Location in the context of Kenya

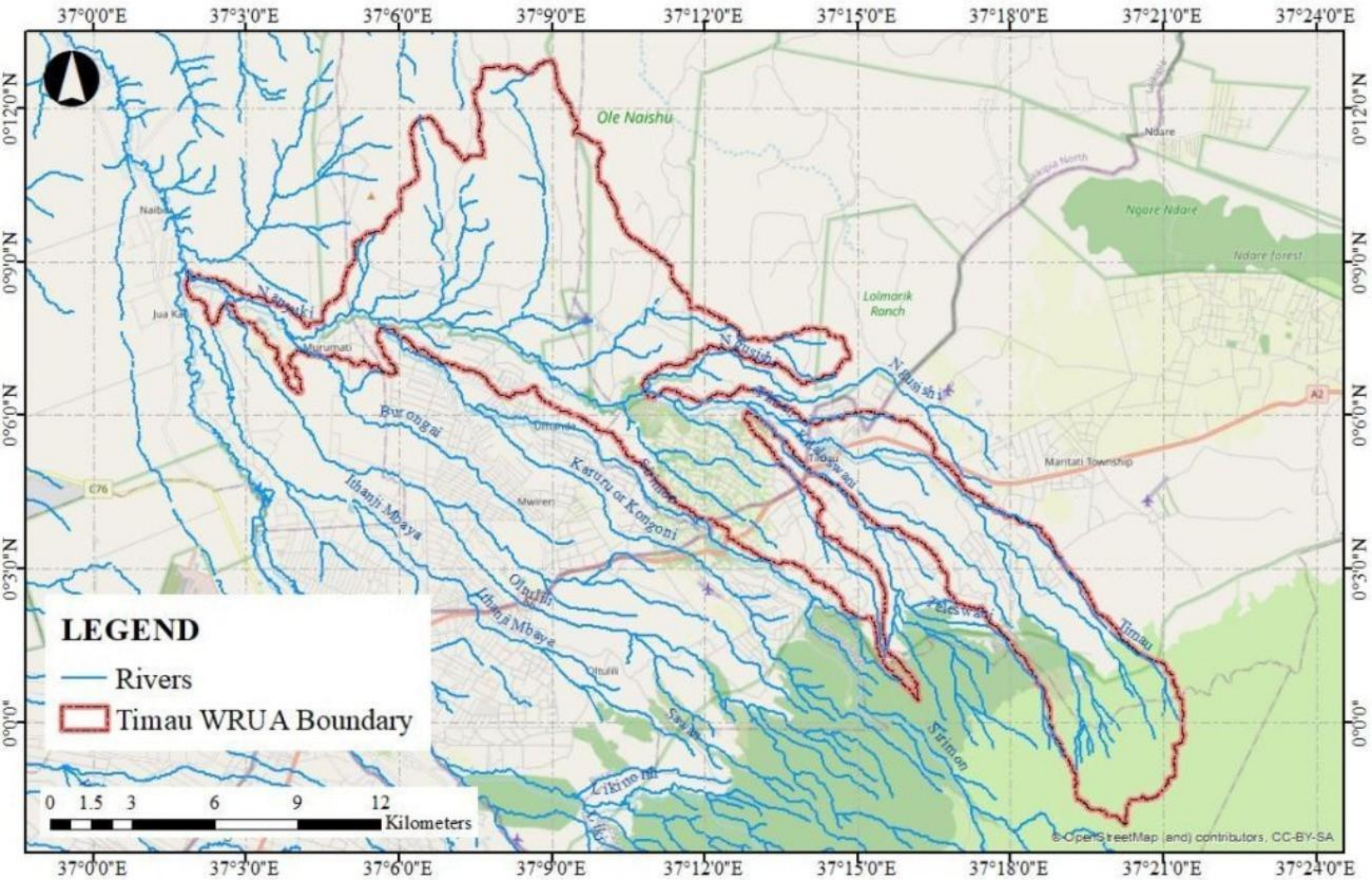


Figure 2 Administrative boundary map of Timau WRUA sub-catchment and hydrology

1.2 Problem Statement

Kenya is among the countries prone to water scarcity, with only 696 m^3 of renewable freshwater available per capita annually, which is far below the 1,000 m^3 threshold (Njora C Yılmaz, 2021). Despite government efforts and the 2002 Water Act introducing institutional reforms, access to clean water remains limited, with only about 55% of the population having reliable water access (Mathenge et al., 2014). In the Timau Sub-Catchment, water infrastructure governance processes are often fragmented and influenced by power asymmetries, limited participation, and varying interpretations of Integrated Water Resources Management (IWRM) principles. While WRUAs have been established to represent community interests, questions persist about how inclusive, effective, and transparent these bodies are in conflict management and resolution especially infrastructure driven conflicts. This study sought to explore the dynamics of infrastructure-induced conflicts taking a case study of the Timau water sub- catchment area in Kenya.

1.3 Research Questions

RO 1: To examine the role of water infrastructure development (e.g., dams, irrigation schemes, and pipelines) in shaping access to and control over water resources in the Timau Water Sub-catchment Area.
RO 2: To analyse the nature, causes, and stakeholders involved in conflicts arising from water infrastructure interventions in the Timau Water Sub-catchment Area.

1.4 Conceptual Framework

The study utilized a political economy viewpoint on the theory of Integrated Water Resource Management (IWRM). Haas (1992) contends that epistemic communities, viewed as expert networks, significantly impact the formation of social knowledge and the process of policy-making, especially as bureaucracies grow and issues become increasingly technical. This is another problem that frequently weakens these types, particularly regarding project execution, where the governance of water infrastructures remains uncertain, subsequently sparking conflicts. Although many evaluations of the connections between water and conflict have concentrated on water as a catalyst for violence due to arguments over control and access to water resources, another significant type of water conflict has been increasing in relevance: water as a victim or objective of conflict (Gleick et al., 2020a). Moreover, within IWRM, the perspectives of consumers and governments can frequently be eclipsed by these expert networks because of differing power dynamics stemming from the international community. Additionally, the water conflict chronology (Gleick, 2018) documents instances where water resources and infrastructure are targeted during violent acts, civil and regional conflicts, and wars between nations (Gleick et al., 2020a). Throughout history, many instances of deliberate assaults on water infrastructure, such as wells, dams, irrigation systems, treatment and distribution facilities, and energy plants essential for the functioning of established water systems, have been recorded, spanning from ancient eras through significant 20th-century wars to the current day (Gleick et al., 2020a). Allouche (2016) points out that although IWRM has emerged as a widespread global discourse, its execution varies because of local adjustments and disputes, showcasing the complexities, particularly concerning water infrastructures and management outside the scope of implementation.

Timau middle stream river Kenya © Asim

Chapter 2.

Methodology

2.1 Research Design

This study adopted a qualitative approach to offer a more nuanced understanding of infrastructure induced conflicts in water governance within the Timau sub-catchment. A qualitative design enhances the validity of findings by allowing triangulation of data sources and analytical techniques (Creswell C Clark, 2017).

2.2 Qualitative component

To explore the complexities of governance and infrastructure induced conflicts, the qualitative component included 7 Key Informant Interviews (KIIs) with stakeholders such as WRUA officials, county water administrators, NGO representatives, and community elders. Additionally, 2 Focus Group Discussions (FGDs) were conducted with community members to gather diverse perspectives on

inclusivity, power structures, and conflict resolution in water governance.

20 individual in-depth interviews were carried out, with the number noted only after reaching the saturation point in data collection. These methods are effective for uncovering social dynamics and meanings behind observed behaviors (Patton, 2015). To enhance contextual understanding, document analysis of WRUA constitutions, meeting records, and local water policy documents was also conducted, allowing for triangulation of findings and better interpretation of the governance landscape (Bowen, 2009).

2.3 Data collection and tools

Two interview guides (see Appendix 3 and 4) were created, with one utilized for the Key Informant Interviews and the other employed for the Individual In-depth Interviews and the 2 Focus Group Discussions in the Timau sub- catchment area. Purposive sampling and snowball sampling methods were employed to gather data from individual in-depth interviews and Key Informant Interviews correspondingly. A transact walk was carried out that provided information and enabled the selection of candidates for individual interviews as well as those for the Focus Group Discussions. The observation technique was utilized to gather visual data included in this report and for Geographic Information Systems (GIS) mapping of regions with various water infrastructures and their present conditions. (see Map of major water infrastructures found in Timau sub-catchment, indicate their status and key)

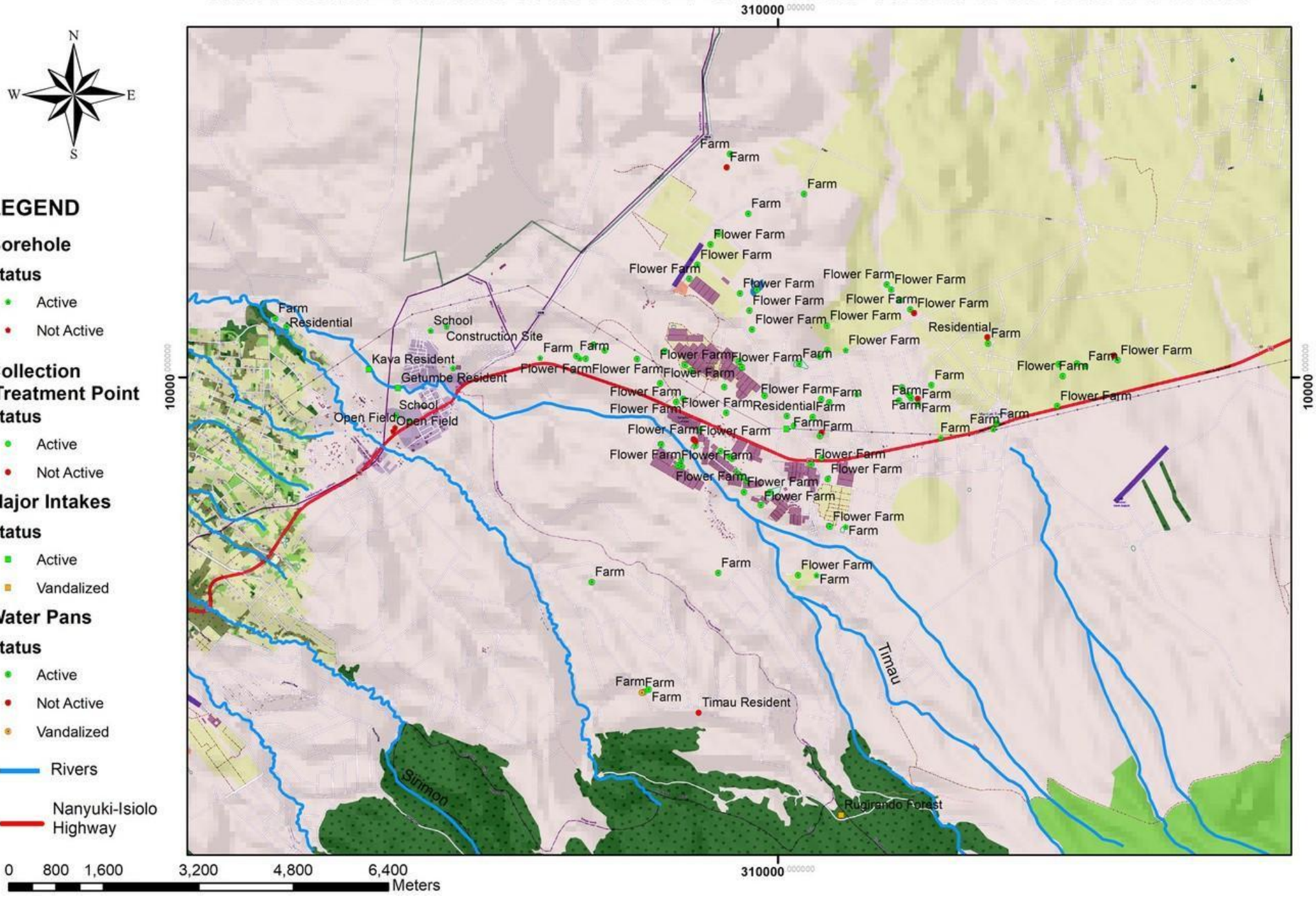
2.4 Data Analysis

Data was originally intended to be analyzed with MAXQDA; however, the team lacked someone with a license for it while in the field. Consequently, the analysis was conducted thematically using a manual thematic analysis tool, with coding influenced by both inductive and deductive approaches. Worthwhile to note is that; thematic analysis is well-suited for identifying recurring themes related to institutional barriers, inclusion, and power asymmetries (Nowell et al., 2017).

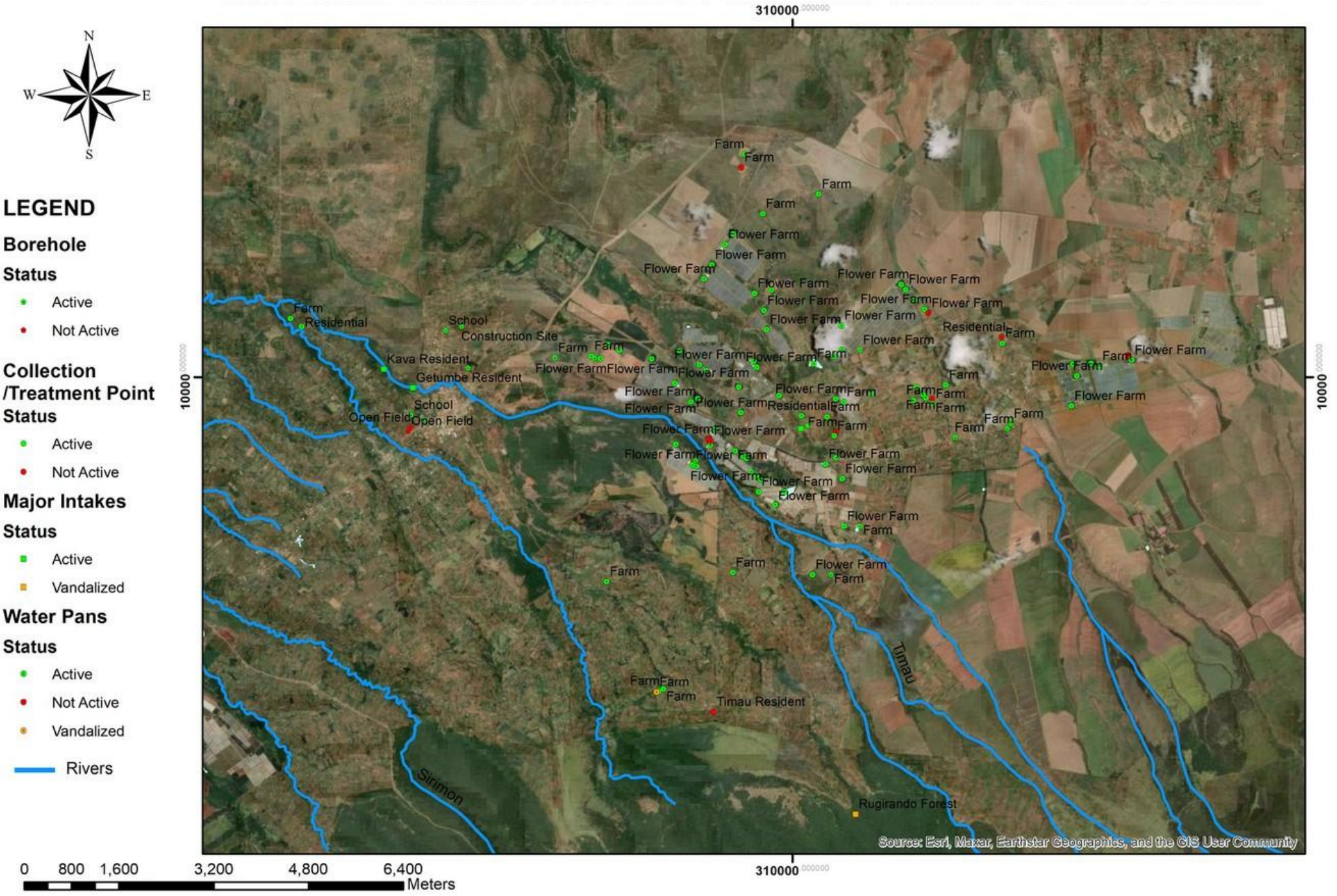
2.5 Ethical Considerations

The research followed the recognized ethical standards for studies. Ethical clearance was secured from the appropriate institutions, specifically the Water Resources Users Association, before data gathering commenced. Consent was obtained from all participants, and rigorous measures were implemented to safeguard participants' privacy and confidentiality (Israel C Hay, 2006). Participation was optional, and participants maintained the right to leave at any time without consequence.

WATER INFRASTRUCTURE MAP OF TIMAU WRUA SUB CATCHMENT



Active and Dormant Infrastructure in Timau Sub-catchment



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Chapter 3.

Findings

As the morning sun ascends above the slopes of Mount Kenya, the Timau River continues its flow downstream, meandering through farms, homes, and wetlands. In the Timau Sub-catchment, water serves as both a vital lifeline and a disputed resource. Fair and sustainable management is the responsibility of two main bodies: the Timau Water Resources Users Associations (WRUAs) and the Water Resources Authority (WRA).

3.1 The Timau WRUA: A Community in Leadership

The Timau WRUA, formed in 2005, broadens its focus beyond river management to encompass boreholes, wetlands, and vital water sources. Operating across two counties, it is structured into three zones: Upper Zone with a Chairperson and five members, Middle Zone with four members including a Treasurer, and Lower Zone with three members including a secretary. It involves commercial farmers for governance representation and conducts regular barazas [2] to address water distribution and conservation. The WRUA educates families on rainwater harvesting and enforces water allocation schedules. Challenges include uneven borehole distribution and funding issues. Nonetheless, it plays a key role in water conservation, combating illegal extraction, and monitoring water systems. The WRUA is vital for water conservation, addressing illegal extractions, promoting ecological restoration, and overseeing household systems and catchment areas as community water managers and advocates.

[2] Barazas is a term used to mean community meetings

3.2 The WRA: Steering Policy and Procedure

The Water Resources Authority (WRA) regulates Kenya's water resources, complementing the efforts of the Water Resources User Associations (WRUA). The WRA ensures compliance with national water regulations while assisting Timau farmers with water usage standards, pollution management, and ecosystem flow maintenance. They verify farmers' fee payments, supply necessary equipment, and assess infrastructure compliance. Capacity building is essential, with WRA promoting climate-smart farming and advanced irrigation techniques, advocating a shift from flood to drip irrigation. Collaboration occurs with the Community Forest Association (CFA) for agroforestry projects, fostering agriculture within forest boundaries, and uniting WRA, WRUA, and agronomists to improve irrigation systems.

3.2.1 Patterns of Collaboration between WRUA and WRA

The collaboration between WRUA and WRA is established via a Memorandum of Understanding, yet in practice, it is sustained through frequent communication and common goals. They collaborate to oversee water extraction locations, resolve conflicts, and conduct joint awareness initiatives. They are dedicated to harmonizing the requirements of upstream and downstream users while safeguarding the river's future. In several respects, the WRUA serves as the "ears and eyes" of the catchment, promptly addressing community issues, whereas the WRA acts as the "compass," ensuring that everyone stays focused on the broader goal of sustainable water management.

Table 1: Comparison of WRUA and WRA roles in the Timau sub-catchment

Aspect	Timau WRUA (Water Resources Users Association)	WRA (Water Resources Authority)
Institution Type	Community-based organization, registered under the Office of the Attorney General; linked to WRA via MOU	Government statutory authority under national water law
Geographic Scope	Timau Sub-catchment (covering upper, middle, and lower zones across two counties)	National mandate, with local offices covering sub-catchments
Representation	14 elected members: Upper Zone (5 including Chairperson), Middle Zone (4 including Treasurer), Lower Zone (3 including Secretary); commercial farmers co-opted	Appointed government officers stationed locally
Core Mandate	Day-to-day water governance, conflict resolution, conservation activities	Regulation, policy enforcement, and technical oversight

Key Activities	- Protecting catchment areas and water sources - Monitoring illegal abstractions - Implementing water rationing schedules - Organizing barazas for education and conservation - Promoting rainwater harvesting and storage infrastructure	- Issuing water use permits and ensuring compliance - Educating on water laws and pollution control - Assessing farm needs and distributing irrigation equipment - Promoting efficient irrigation systems (e.g., drip) - Ensuring ecosystem flow requirements
Community Engagement	Highly relies on local knowledge, barazas, and grassroots enforcement	Moderately engages through training, sensitization, and collaboration with WRUA
Funding	Annual member subscriptions, donations from NGOs/individuals	Government budget allocations, project-based funding
Collaboration Mechanism	Works with WRA through MOU for joint monitoring, capacity building, and conflict resolution	Partners with WRUA for local-level implementation and data gathering

The Timau Sub-catchment's water narrative highlights collective accountability, with the WRUA offering community management and leadership while the WRA contributes technical skills and regulatory power. Despite facing challenges like budget deficits and rising demand, their partnership is vital for sustainable water governance, ensuring the Timau River supports both current and future users.

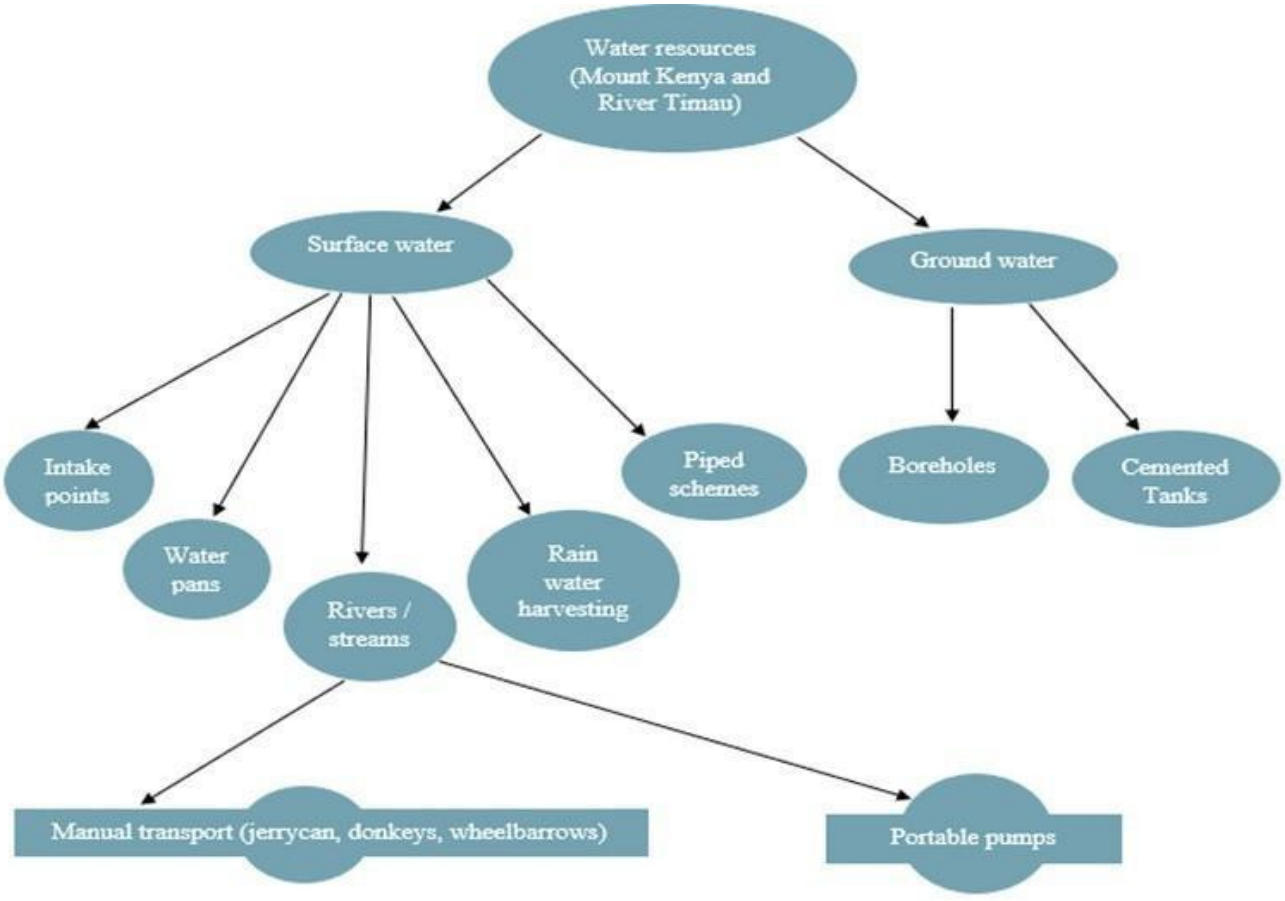
3.3 Water resources and infrastructures in Timau sub-catchment

The Timau sub-catchment oversees its water resources via approximately 20 intake points regulated by the Water Resources Users Association (WRUA), along with water pans serving as reservoirs (see Appendix 2). A total of 34 registered boreholes established either by the community, political, or donor financial support were identified (see Appendix 5 for a school borehole). While infrastructures such as boreholes and water pans are frequently utilized, affluent households might possess rainwater harvesting systems and storage tanks, although some remain non-operational because of theft. Furthermore, casual water gathering techniques from rivers such as Timau and Ewaso Nyiro demonstrate the community's strength in confronting water access issues, emphasizing a diverse strategy for ensuring water security.

Table 2: Various types of Infrastructures and usage description in Timau

Type of Infrastructure	Description and Usage	Challenges / Notes
Surface water intake points	20 intake points along rivers, some managed under WRUA for equitable distribution.	Dependence on river flows; vulnerable to seasonal fluctuations.
Water pans	Excavated basins, often lined with dam liners, used for storing water during rainy season or holding borehole water	Limited capacity; require pumping equipment; risk of theft of pumps/pipes.
Boreholes	34 registered boreholes funded by communities, politicians, and donors. Provide groundwater for domestic and agricultural use.	High installation/maintenance costs; uneven access across households.
Rainwater harvesting tanks	Storage tanks used to capture roof runoff during rainy season. More common among wealthier households.	Limited adoption due to cost of tanks; insufficient during prolonged dry seasons.
Cemented tanks	Permanent storage structures, sometimes supplied from common intake points.	Non-functional without pipes/pumps; frequent theft of equipment.
Piped schemes (IMETHA system)	Organized piped water distribution from external sources.	Limited coverage; affordability issues for poorer households.
River/stream abstraction	Direct fetching from Timau and Ewaso Nyiro rivers using jerrycans, kettles, or small pumps.	Labour-intensive; insecure due to theft of pipes/equipment.
Manual transport methods	Use of donkeys, wheelbarrows, and human labour (carrying	Strenuous, time-consuming, requires hiring extra labour in

Figure 5: Water Infrastructures in Timau sub-catchment



Source: Authors' own construct

3.3.1 Case Study: The Timau Community Borehole

The Timau Community Borehole, a corporate social responsibility (CSR) initiative by Tima Floor, was established about two and a half years ago to serve Timau Mixed Day Secondary School and the surrounding community under a 50–50 management agreement (see Appendix 5). It features a solar-powered pumping system for sustainable water access, improving availability of clean water. However, the borehole's limited storage capacity cannot meet peak seasonal demands, necessitating up to seven additional tanks to ensure adequate supply during dry periods, highlighting the connection between infrastructure capacity and equitable water access.

3.4 Key Statistics from Spatial Data Collection

The spatial survey identified a range of water infrastructures across the Timau Sub catchment, highlighting their distribution, functionality, and management status.

Narrative Interpretation: The spatial mapping identified 18 boreholes, with the majority located on farms (33%) and flower farms (28%). Schools, institutions, and open fields each accounted for 11%, while construction sites represented only 6%. Most boreholes (89%) were functional, indicating relatively strong operational efficiency despite uneven spatial distribution.

Table 3: Key Statistics from Spatial Data

Water Infrastructure	Total Identified	Distribution (%)	Status (%)
Boreholes	18	Farms (33), Flower Farms (28), Schools (11), Other Institutions (11), Open Field (11), Construction Sites (6)	Active (89), Inactive (11)
Dams / Water Pans	87	Flower Farms (68), Farms (26), Residential (6)	Active (89), Inactive/Vandalised (10)
Major Intakes	4	–	Active (75), Inactive/Vandalised (25)
Collection & Treatment Points	2	–	Active (50), Inactive (50)

Dams and water pans were the most widespread infrastructure, totaling 87 across the sub catchment. Large- scale flower farms dominated, accounting for 68%, compared to 26% on farms and only 6% in residential areas. While 89% of these dams were active, the heavy concentration in flower farms points to commercial prioritization and potential inequities in water access.

Four major intakes were mapped, of which three (75%) were active and one (25%) was vandalized. Given their importance in distributing river water, the loss of even one intake threatens downstream users and exacerbates competition.

Finally, only two collection and treatment points were identified, with one active and one inactive (50% each). This limited presence of treatment infrastructure highlights a significant governance and public health gap, as communities remain reliant on untreated river water.

3.5 Water governance (access and control) in the Timau sub-catchment

The governance of water in this case is built on a formal allocation framework, where legal abstraction is monitored through devices like flow meters and river gauges. On paper, this ensures that no user exceeds their permitted quota, but in practice compliance is inconsistent. Weak enforcement and technical challenges mean that some users take more or less than they are allowed. The Timau WRUA, supported by officers like extensions officer, shares responsibility for monitoring with the wider community. Their checks cover whether farmers respect abstraction limits, comply with environmental rules, and keep up their annual subscriptions.

This suggests a structure in which formal regulatory control sits alongside local responsibility, but where gaps in enforcement open space for rule-bending.

3.5.1 Access: physical, financial, and social

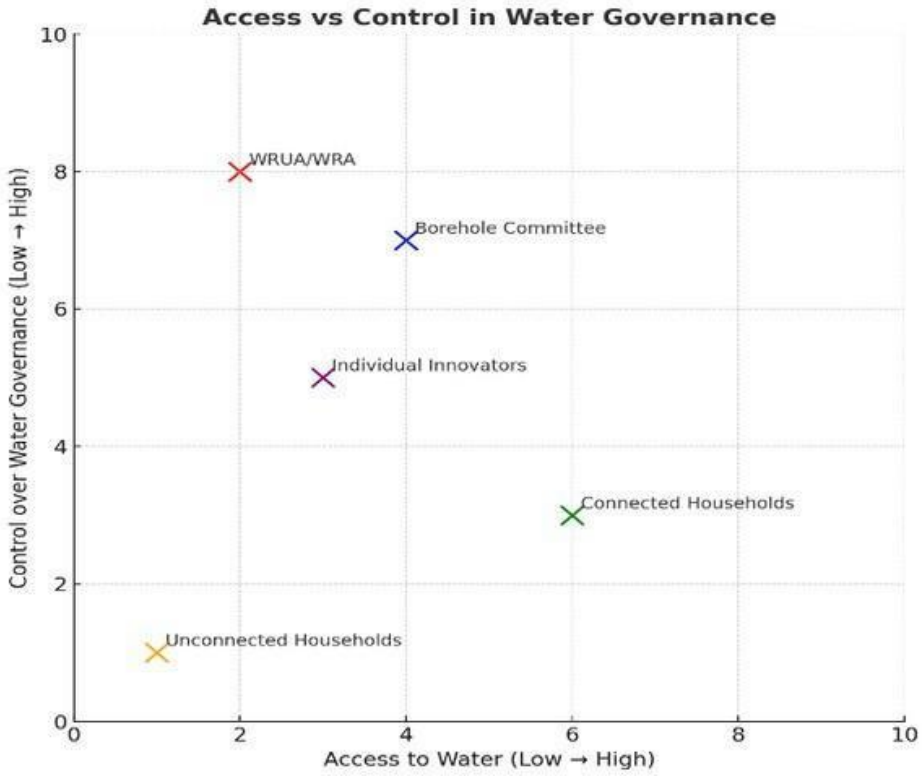
Access to water is shaped by both infrastructure and money. The borehole in Appendix 5, managed by a nine- member community committee, currently serves only twenty-five households, with ambitions to reach three hundred. Expansion is slowed by the high cost of piping and maintenance. To join, households must pay a 500 Kenya shilling registration fee and contribute 20,000 Kenya shillings toward infrastructure. This upfront cost has been crucial in creating and maintaining the system, but it also risks excluding poorer households. The committee's leadership includes both men and women, as well as youth representation, but the top two positions remain male. Despite being under the regulatory oversight of WRUA and WRA, the borehole receives no government funding, forcing the community to rely on its own resources.

3.5.2 Local innovation and adaptation

Local adaptation plays a role in managing water day-to-day. The worn dam liner, for example, is to be replaced by an individual using personal funds, reflecting both commitment and the absence of institutional maintenance support. Similarly, the practice of creating small holes in pipes (see Appendix 6) to act as "air lock breathers" shows ingenuity in solving pressure problems with available means. These measures underline a pattern where operational control lies firmly in community hands, while regulatory authority rests elsewhere.

Overall, access in this system is uneven, limited by high entry costs and slow infrastructure growth. Control is layered, legally centralized under formal bodies, but operationally decentralized to local committees and individuals (water project groups). In this arrangement, resilience is often a product of local initiative rather than institutional backing, which can strengthen community autonomy but also deepen inequalities.

Figure 6: Matrix showing each stakeholder's position in terms of access and control.



Source: Authors' own construct

The figure above makes visible how WRUA/WRA hold high regulatory control but low direct access, while for instance the borehole committee has strong operational control yet limited reach. Connected households have relatively high access but little governance influence, and unconnected households remain low in both. Individual innovators sit in the middle, able to affect local solutions but with modest access themselves.

3.6 Stakeholders (primary and secondary) in Timau water governance

In the Timau sub-catchment, water governance involves a diverse network of stakeholders, primarily rural households and large-scale farms that rely on water for various needs, along with water user committees managing allocation and conflicts. An extension officer acts as a crucial connector between private farms and the Timau Water Resources Authority (WRA), providing technical advice and ensuring adherence to environmental policies. Secondary stakeholders like the Timau Water Rural Users Associations and WRA offer oversight and policy guidance but face resource limitations. Interestingly, politicians have little impact on water distribution, with challenges primarily arising from user behaviour and weak enforcement, underscoring the need for enhanced local governance.

Table 4: Stakeholder mapping: Timau sub-catchment

Stakeholder	Type	Role in Water Governance	Influence Level	Interest Level
Water Users (rural households, commercial farms)	Primary	Directly consume and manage water resources for domestic/agricultural use	High	High
Water User Committees	Primary	Grassroots allocation, conflict resolution, and local management	Medium	High
Extension Officer	Primary	Technical support, monitoring, liaison between farms and WRA, training	Medium–High	High
Timau Water Rural Users Associations	Secondary	Coordination of rural users, advocacy, limited oversight	Medium	Medium–High

Water Resources Authority (WRA)	Secondary	Policy enforcement, regulation, monitoring	High	Medium–High
Politicians	External	Minimal direct involvement in water distribution	Low	Low–Medium

3.7 Infrastructure-induced water conflicts in Timau sub catchment

Water deprivation for downstream communities often results in vandalism of upstream infrastructure. Acts of sabotage are fueled by frustration, exclusion from governance, and feelings of marginalization. Theft of materials such as scrap metal exposes further weaknesses in the water distribution network.

Governance failures and corruption worsen conflicts, as projects often favor a few while neglecting wider community needs. Lack of participation in decision-making drives resentment and destructive behavior. Weak enforcement of water laws reduces trust in institutions, encouraging communities to bypass legal channels. Disputes over shared infrastructure are common, particularly where multiple users depend on a single abstraction point. Unauthorized connections, rationing violations, and resource inequalities lead to quarrels and facility destruction. Socio-economic divides intensify tensions when borehole contributors demand exclusive access, creating friction with non-contributors.

Social cohesion declines as distrust spreads, leaving pastoralists and smallholder farmers more vulnerable due to unreliable water access. Household-level disputes, such as fights over water- fetching gear, highlight the insecurity of supply.

River control during dry seasons is another source of tension. Upstream users sometimes block water for irrigation, causing shortages downstream. Such disputes can escalate into violent confrontations requiring intervention from Water Resource Users Associations (WRUAs) or law enforcement. Political interference and collective punishments further weaken WRUAs' ability to resolve conflicts.

Environmental factors compound the problem. Elephants damage pipelines in search of water, while agricultural runoff pollutes rivers, forcing reliance on unsafe sources. Women are disproportionately affected as they are often responsible for water collection.

Large-scale commercial farms worsen structural inequalities by using advanced extraction methods, while smallholders and households struggle to access sufficient water. This imbalance fuels resentment at communal water points, where favoritism and exclusion spark disputes. Wealthier users can shield themselves from scarcity, leaving poorer communities more exposed and frustrated.

FGD
Kenya © Asim

Chapter 4.

Discussion

This chapter discusses the research findings in relation to existing literature and the study's objectives. The themes developed from the research questions and data analysis are used to structure the discussion, providing coherent answers to the research questions.

4.1 Water infrastructural development in Timau sub-catchment

Water infrastructures play a central role in ensuring access. When vandalized or poorly maintained, water provision and availability are compromised. In many parts of the world, a small hand-size water pipe simply serves an individual home or restaurant. In Timau, however, a similar hand-size water pipe often sustains over 100 people, underscoring the heightened importance of even modest infrastructure in this context. Because of their centrality, water infrastructures in Timau have become not only points of access but also instruments of control. Where misunderstanding arise, they often become either the cause of conflict or the casualty of it. As Gleick et al. (2020b) observes in the context of Yemen, civilian infrastructure including energy and water systems has frequently been targeted during conflict.

A similar, though localized, pattern is evident in Timau: whenever water intakes are constructed without adequate consultation among all stakeholders, their survival is often short-lived. This is exemplified by the vandalized intake shown in Appendix 1. Although data on water-related conflicts in Timau remain limited, parallels can be drawn with global patterns.

For instance, the Pacific Institute's Water Conflict Chronology reported more than 100 attacks on water infrastructure in Yemen in 2019 alone, including strikes on utilities, tanks, treatment plants, wells, and desalination facilities (Kennedy, 2017; Watson, 2018). Just as Yemen has become emblematic of water scarcity driven by conflict, Timau too faces chronic scarcity, exacerbated by disputes over infrastructure.

4.1.1 Access and control of water infrastructures in Timau sub-catchment

Access to water in Timau is shaped by the ownership structure of infrastructure. Both collectively owned and individually owned systems exist, and this ownership also determines who exercises control. However, ultimate authority over water resources whether surface or groundwater rests with the government. Unlike in Uganda, where individuals may exploit privately established water sources without direct state involvement, Kenya requires all water users to notify the government and pay usage fees. These charges are calculated based on the source and the volume of water extracted. This regulatory framework ensures state oversight but also creates tensions around access and control, particularly where infrastructure is financed and managed by individuals or communities.

4.2 Collective water infrastructures

This encompasses water infrastructures that are collectively owned and accessed by the community or a specific group within it. Funding can be done collectively or through a primary committee or financial supporter, after which users are given guidelines and methods to acquire membership.

4.2.1 Surface water intake points

Surface water intake points, such as those found on Mt. Kenya, form a central part of Timau's water infrastructure. These intakes serve multiple projects, as shown by the numerous pipes stemming from a single intake in Figure 3. At the time of data collection, 20 intake points were recorded, though the actual number across the mountain is far higher. All intakes are managed and supervised by the Water Resources Users Association (WRUA), which ensures equitable distribution. A key rule guiding their establishment is that 30 percent of water must always be left to flow downstream for community and livestock use. Despite their importance, establishing intakes is complex and resource intensive. Many respondents, including WRUA officials, highlighted the need for government and donor support to expand the number of intakes. As one respondent explained:

> *"We understand the reason behind most of the vandalism you see here, it comes down to the limited number of intakes. People have long expected us as WRUA to build more, but we lack the capacity and depend on external organizations or funders. Often, when an intake is vandalized, it is because it was constructed without adequate consultation with users. For them, that intake represents a potential source of scarcity, and vandalizing it becomes their way of addressing the issue." [3]*

This perspective reframes how scarcity is understood. Jepson (2014) argues that the notion of "security" implies both objective and subjective existential threats, shaping actions, responses, and positions. In urban contexts, scarcity often centers on the availability of funds to pay for piped or processed water. In Timau, however, scarcity extends beyond financial concerns to include the processes of consultation, participation, and maintenance of collectively owned intakes. These differing notions of water security inform public policies that either enhance human and ecosystem well-being or strengthen protection and monitoring measures (Jepson, 2014).

[3] 08/05/2025 Interview with the Manger for Timau Water Rural Users Association held at the common water intake.

4.2.2 Water pans

Water pans; known elsewhere as small dams are another critical form of infrastructure in the Timau sub-catchment. Constructed either individually or collectively, these pans collect water through rain harvesting or by pumping river water. Collectively owned pans serve members of a specific water project, while individually owned pans typically provide water for household and farm use. Figure 4a and b illustrates an individual water pan and pump owned by a female agricultural entrepreneur. Worthwhile to note is that during the dry season, when river flows diminish and water tables drop, some individuals with pans extend access to neighbors without charge. One respondent explained her approach:

"This is a village, and we take collective responsibility for infrastructure. Even though this water pan and pump are mine, I leave them here in the bush where you found them (see Figure 7a and 7b). We protect each other's property, and since we grew up together like siblings, why wouldn't I give my neighbors access if they lack water?"[4]

Such practices highlight the role of social dynamics in shaping access and control. In Timau's villages, reciprocity and trust foster communal sharing of resources, contrasting sharply with the more transactional dynamics observed in urban areas. Nevertheless, water pans are expensive to establish and maintain. They require costly liners to store water effectively, as well as fuel pumps to fill them, hence expenses that remain out of reach for many Timau residents. This financial barrier limits the widespread adoption of pans, despite their potential to mitigate scarcity.

4.2.3 Boreholes

Boreholes represent another form of collective water infrastructure in the Timau sub-catchment. They are established, accessed, and controlled collectively through management committees. A total of 34 registered boreholes were identified in the study area, established through joint efforts of communities, politicians, and donors. While boreholes are highly effective in water provision, their installation and maintenance costs are quite high, which contributes to uneven household access. Drawing on Amartya Sen's capabilities theory, water security depends on the ability to access reliable, safe, and sufficient water, as gaps in reliability and access erode essential human functioning (Sen, 2014). In Timau, households with the financial capacity to secure borehole membership enjoyed better water access and greater opportunities to sustain livelihoods, while poorer households were excluded. Important to note is that; despite decades of community requests for a public borehole, residents pointed to government neglect. Their frustration was heightened when a borehole was drilled to serve a government-funded affordable housing project (see Appendix 7), while long-standing community demands for water infrastructure remained unmet. This raised critical questions about state priorities and equity in water provision.

4.2.4 Piped system (IMETHA)

The IMETHA piped system represents another collective infrastructure in Timau. Water is sourced externally, and households contribute both installation costs and recurring user fees. In line with Sen's framework, access to this system is strongly tied to financial capacity, which limits participation primarily to wealthier households. Consequently, coverage across the sub-catchment remains low. The IMETHA system is also used by farmers for irrigation (see Figure 8). However, this has generated tensions with other water users, who argue that irrigation consumes disproportionate amounts of water. Critics have called for stricter regulation or the promotion of water-efficient technologies such as drip irrigation to balance competing demands.

[4] 08/12/2025 interview with a female farmer at the Timau ward zone who had a water pump that was always kept in the bush just adjacent to the river where water is pumped from.

Figure 7a: Community water pans

Figure 7b: Community water motor

Figure 8 Irrigation by IMETHA pipe system

4.3 Individual water infrastructures

At the household level, water infrastructure in Timau is diverse but unevenly distributed. Wealthier families often rely on rainwater harvesting tanks that collect roof runoff during the rainy season. However, the high cost of tanks and the unreliability of rainfall during prolonged dry seasons limit widespread adoption. Other residents rely on small-scale, low-cost options such as jerrycans for storage. These containers are highly valued, sometimes even hidden to prevent theft, as illustrated by a tree nursery owner who concealed his jerrycans in his nursery beds (see Figure 6). He noted that many others had left the tree business due to persistent water scarcity and their inability to afford pumps or tanks. Manual transport methods including donkeys (see Figure 7) and wheelbarrows also form part of individual infrastructure. While owned privately, these assets are often hired out, demonstrating the interdependence of households in coping with scarcity. These examples highlight how the absence or inadequacy of infrastructure intensifies water scarcity. For instance, a nursery bed owner relying solely on jerrycans struggles to irrigate during dry seasons, whereas access to a pump or storage tank would significantly ease operations. Thus, disparities in infrastructure ownership directly translate into inequalities in water access and livelihood resilience.

4.4 Infrastructural driven water conflicts in Timau sub-catchment

Most studies on the relationship between water and conflict have traditionally emphasized water as a driver of violence, particularly through disputes over access and control of resources. However, a growing but less examined dimension is water as a casualty or target of conflict, often through deliberate attacks on infrastructure (Gleick et al., 2020b). Yemen provides an extreme example, where since 2015 water systems have become central targets in a complex web of civil and proxy warfare. A similar pattern is emerging in Kenya's Timau Sub- catchment, where water infrastructure not only facilitates access but also fuels disputes.

Timau's topography, shaped by water flowing from Mount Kenya, creates distinct zones of access: upstream, midstream, and downstream. This spatial divide, coupled with competing interests, generates tension among users. Earlier attempts to address these challenges such as the "30% rule," which promoted inclusivity in water access (Jaglin, 2014) were designed to turn infrastructural diversity into an opportunity. Yet, implementation remains problematic. Instead of a coordinated piped system, the area is fragmented by numerous small pipes that draw directly from mountain sources (Furlong C Kooy, 2017). This patchwork approach not only weakens collective responsibility but also makes intakes more vulnerable to vandalism and perpetuates inequities in distribution. A more centralized system, where a main pipe feeds multiple branches, could enhance efficiency, accountability, and fairness. Water insecurity downstream adds further complexity. Declining river levels partly driven by climate change are often interpreted locally as the result of over-extraction by upstream large-scale farmers. With little sensitization about climate change, frustration turns into direct action, including the vandalization of intakes. As one respondent explained:

"Twenty years ago, the Timau River flowed abundantly, and water conflicts were unheard of. Today, the levels are so low that children can play in the riverbed. Each time water decreases, we assume upstream farmers have blocked it from reaching us."[5]

[5] 08/11/2025 statement from one water user among those that attended a focus group discussion.

Figure 10 Donkey carrying water from source

Figure G Hidden Jerry cans by local farmer

This illustrates how global climate change manifests as localized conflict, with infrastructure symbolizing injustice. Addressing such challenges requires not only improved infrastructure but also education on climate impacts, a role increasingly falling to the Water Resources Authority (WRA) and Water Resource Users Associations (WRUAs).

Participation or the lack thereof also shapes water infrastructure conflict dynamics. When communities are excluded from decision-making about water projects, resentment builds. Infrastructure becomes both a physical and symbolic site of inequality, where theft and sabotage reflect deeper frustrations rather than mere opportunism (Alba et al., 2022). Damaged intakes and stolen materials (see Appendix 1) highlight the fragility of current systems. Ultimately, without inclusive governance and transparent planning, water infrastructure in Timau risks remaining a flashpoint for conflict rather than a tool for equitable access. Conflicts over shared water infrastructure are often intensified when multiple users depend on a single abstraction point. Scarcity and drought amplify these tensions, as illustrated by the longstanding disputes between the Indian states of Karnataka and Tamil Nadu over the Cauvery River. In September 2016, the Indian Supreme Court ordered Karnataka to release water to drought-stricken Tamil Nadu, sparking violent protests in Bengaluru (Gleick et al., 2020b; Iceland, 2017). A similar dynamic is observed in Timau, Kenya, where water projects allocate usage by designated days. Despite equal scheduling, some users perceive inequities, believing that others enjoy greater access. Such perceptions frequently fuel resentment and conflict within the sub- catchment.

Beyond scheduling disputes, inequalities in access and use deepen the problem. Unauthorized connections, violations of rationing rules, and resource disparities often escalate into heated arguments or even deliberate destruction of facilities. Socio-economic divides further complicate matters: for instance, contributors to borehole construction often expect exclusive rights, leading to clashes with non-contributors. As Kemerink- Seyoum et al. (2019) argue, water governance is inherently "messy," shaped by pragmatic and tactical decisions as much as by power relations. This calls for greater attention to hydro-social relations in understanding and addressing water conflicts. As Jepson (2014) reminds us, formal connections do not guarantee equitable or reliable service affordability, quality, and consistency remain key challenges, hence justifying the importance of hydro-social relations in mitigating disputes and conflicts.

Institutional weaknesses further exacerbate tensions. Limited enforcement of water laws and policies erodes public trust, prompting communities to bypass official channels, sometimes through destructive actions. Stronger community engagement offers a pathway forward. Water Resource Users Associations (WRUAs), when inclusive and transparent, have proven more effective in reducing vandalism and unauthorized use. Dialogue, consistent monitoring, and fair enforcement of rules are essential to maintaining trust and preventing escalation. Yet shortcomings remain collective punishments can foster resentment, while political interference undermines the legitimacy of conflict resolution, often privileging wealthier users and fueling vandalism among marginalized groups.

Environmental pressures add further complexity. Human-wildlife conflicts, such as elephants damaging pipelines in search of water, highlight the competition for limited resources. Agricultural runoff worsens water quality, pushing communities toward unsafe sources and intensifying competition at remaining points, which is a burden that disproportionately falls on women tasked with water collection. Addressing these issues requires recognizing the household as the central unit of water use and governance (Jepson, 2014). Households and small businesses, such as Timau's tree nurseries, play a crucial role in shaping water practices. For instance, some communities observe "environmental days (Sunday)," during which no water is drawn from projects, allowing natural flows to support ecosystems. Others contribute to pollution reduction by planting trees along the Timau river, framing these actions as both environmental stewardship and part of their contributions to WRUA fees (Harriden, 2012).

[6] 08/11/2025 statement from one water user among those that attended a focus group discussion.

5. Conclusion and Recommendations

5.1 Conclusion

Water governance cannot be understood through a single case, as access and control vary across contexts. The Timau sub-catchment illustrates how scarcity shapes unique dynamics: even a small pipe serving more than 100 users constitutes a significant project, and its failure can trigger conflict and vandalism. In this setting, infrastructure represents not only technical systems but also economic resources, which remain inaccessible to many marginalized households. Excluded from formal projects, these communities often resort to river collection, yet disputes still emerge through unauthorized use and infrastructure theft. As Jepson (2014) argues, water security extends beyond physical access to encompass health, equity, and human wellbeing, making inclusive participation central to sustainable water governance. Without meaningful engagement, government interventions risk privileging supply-driven models that neglect local needs, as seen with borehole projects linked to affordable housing initiatives. Structural inequalities exacerbate tensions: large-scale farms employ advanced extraction technologies, while smallholders and households face persistent shortages. These disparities generate friction at communal water points, where perceptions of exclusion and favoritism frequently escalate into conflict. In Timau, water infrastructure disputes therefore reflect a convergence of environmental, social, and governance challenges. Conflicts span from household- level tensions to broader institutional struggles, underscoring how water insecurity is inseparable from power relations and resource management practices. Addressing these challenges requires moving beyond technical fixes toward governance approaches that combine infrastructure management with inclusivity, equitable enforcement, and recognition of households and local practices as essential actors in securing long-term water access.

5.2 Recommendations from Timau water users

Stakeholders in the Timau sub-catchment highlight urgent reforms needed to strengthen water governance. They recommend modernizing monitoring and enforcement through automated meters, river sensors, mobile alerts for illegal use, and reliable data systems. Additionally, greater funding is necessary to support field patrols, repair damaged infrastructure, and improve coordination between the Water Resources Authority, county governments, and water user associations to ease permitting processes.

Community involvement is emphasized as critical to sustainable water management. Respondents propose continuous capacity building and ensuring local participation in project planning, construction, and management to reduce vandalism and conflict. Public education on lawful water use, conservation, and catchment protection is viewed as a way to foster shared responsibility. Furthermore, environmental protection remains a priority. Stakeholders stress tree planting, watershed restoration, and strict enforcement of the ecological flow rule (30%) to safeguard river systems and minimize conflicts driven by scarcity.

Sustainable financing and partnerships are seen as essential. A blend of government funding, donor support, and community contributions is proposed to maintain infrastructure, extend pipelines, and subsidize conservation tools. Important to note, however, is that respondents caution, against over-reliance on external aid and encourage stronger local revenue generation mechanisms.

Overall, the strategic actions suggested are secure reliable financing, adopt modern monitoring technologies, institutionalize community participation, expand affordable storage, promote reforestation, and strengthen inter- agency cooperation. Together, these measures could create a resilient water governance system capable of reducing conflicts while addressing future challenges from climate change and population growth.

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Appendix

Appendix 1. Damaged water systems at the Rugirando spring area

Appendix 2. Water Pans: large excavated basins lined with dam liners

Appendix 3: Focus Group Discussion (FGD) guide:

Target Participants

1. Local farmers (both smallholders and commercial)
2. Pastoralist community members
3. Women and youth group representatives
4. Local WRUA or CBO members
5. Domestic water users (households)

Group Size: 6–10 participants

Duration: 60–90 minutes

Introduction

1. Welcome participants and introduce ourself
2. Explain the objective of our study (non-political, academic research)
3. Emphasize confidentiality and voluntary participation
4. Obtain verbal consent to participate

Guiding Questions

Section A: Local Understanding and Experiences

1. What are the main types of water infrastructure in your area (e.g., dams, canals, boreholes, pipelines)?
2. Who uses these water systems and for what purposes (e.g., farming, livestock, domestic use)?
3. Has the development of water infrastructure changed how people access or control water?

Section B: Perceived Fairness and Governance

1. Who decides where and how water infrastructure is developed in your area?
2. Do you think the process is fair and inclusive? Why or why not?
3. Are all groups in the community—women, youth, pastoralists, farmers—equally considered?

Section C: Nature and Causes of Conflicts

1. Have there been any disagreements or conflicts about water access, sharing, or infrastructure use?
2. What caused these conflicts (e.g., land disputes, unequal access, broken infrastructure, political influence)?
3. Who are the main actors involved in these disputes (e.g., individuals, WRUAs, large-scale farmers, government agencies)?

Section D: Conflict Management and Recommendations

1. How are these conflicts usually resolved—formally or informally?
2. Are local institutions like WRUAs or chiefs effective in resolving disputes?
3. What would you suggest to improve fairness and reduce conflict around water infrastructure development?

Appendix 4: Key Informant Interview (KII) Guide

Target Informants:

1. County Water Officers or Ministry officials
2. Water Resources Authority (WRA) staff
3. WRUA leadership
4. Chiefs or assistant chiefs
5. NGO staff working on water or conflict resolution
6. Water engineers or project planners
7. Leaders of large-scale irrigation projects or farms
8. Duration: 45–60 minutes

Introduction

1. We greet the respondent and explain the purpose of the study
2. Emphasize confidentiality, and that there are no right or wrong answers
3. Ask for verbal consent to proceed

Interview Questions

Section A: Institutional Role and Infrastructure Development

1. Can you describe the types of water infrastructure projects implemented in the Timau subcatchment in recent years?
2. What agencies or institutions are responsible for their planning, funding, and implementation?
3. How are decisions about location and beneficiaries made?

Section B: Access, Control, and Governance

1. How has infrastructure development influenced water access and control in this region?
2. Are there policies or governance structures that regulate who gets access to water from new infrastructure?
3. How are equity and fairness ensured in decision-making?

Section C: Conflict Dynamics

1. Have any conflicts emerged from infrastructure projects in Timau? If so, can you describe the nature and causes?
2. Which groups are usually in conflict (e.g., smallholder farmers vs. large-scale farms, upstream vs. downstream users)?
3. What are the main drivers of these tensions—technical, political, economic, or social?

Section D: Resolution and Recommendations

1. What mechanisms are in place for conflict resolution (formal institutions, community dialogue, WRUAs)?
2. How effective are these mechanisms in resolving disputes?
3. What reforms or strategies would you recommend to reduce conflicts and promote inclusive water governance in future infrastructure projects?

Appendix 5. Solar powered; a registered school borehole

Appendix 6.

Appendix 7. Borehold at government-funded affordable housing project

Appendix 8. Timau Water Infrastructure Coordinates and Location

A. Boreholes

SN	Easting	Northing	Use	Location
1	311334.00 m E	9717.00 m N	Active	Flower Farm
2	304145.00 m E	10784.00 m N	Active	School
3	304414.00 m E	10855.00 m N	Active	Construction Site
4	304527.00 m E	10154.00 m N	Active	Timau DCC Office
5	305994.00 m E	10326.00 m N	Active	Farm
6	306660.00 m E	10316.00 m N	Active	Flower Farm
7	312753.00 m E	8981.00 m N	Active	Farm
8	313690.00 m E	9247.00 m N	Active	Farm
9	313634.00 m E	9126.00 m N	Active	Farm
10	303544.00 m E	9148.00 m N	Not Active	Open Field
11	303514.00 m E	9094.00 m N	Not Active	Open Field
12	311144.00 m E	10460.00 m N	Active	Flower Farm
13	308370.00 m E	8594.00 m N	Active	Flower Farm
14	309309.00 m E	8405.00 m N	Active	Flower Farm
15	311146.00 m E	7481.00 m N	Active	Farm
16	310654.00 m E	6665.00 m N	Active	Farm
17	303565.00 m E	9365.00 m N	Active	School
18	303782.00 m E	9276.00 m N	Active	Institutional
Note: The use (Active/Not Active/Vandalised) was determined by the condition of the infrastructure and based on the response of the people around				

Appendix 8. Timau Water Infrastructure Coordinates and Location

B. Dams (Water Pans)

SN	Easting	Northing	Use	Location
1	306862.00 m E	6550.00 m N	Active	Farm
2	307745.00 m E	4703.00 m N	Active	Farm
3	307819.00 m E	4741.00 m N	Active	Farm
4	307705.00 m E	4685.00 m N	Vandalized	Farm
5	301522.00 m E	10989.00 m N	Active	Farm
6	306602.00 m E	10357.00 m N	Active	Farm
7	306760.00 m E	10313.00 m N	Active	Flower Farm
8	306889.00 m E	10548.00 m N	Active	Flower Farm
9	307077.00 m E	10455.00 m N	Active	Flower Farm
10	307625.00 m E	10308.00 m N	Active	Flower Farm
11	308092.00 m E	10443.00 m N	Active	Flower Farm
12	308431.00 m E	10209.00 m N	Active	Flower Farm
13	309346.00 m E	10270.00 m N	Active	Flower Farm
14	309393.00 m E	10168.00 m N	Active	Flower Farm
15	309093.00 m E	9836.00 m N	Active	Flower Farm
16	308404.00 m E	9639.00 m N	Active	Flower Farm
17	310834.00 m E	10456.00 m N	Active	Flower Farm

18	310707.00 m E	10352.00 m N	Active	Flower Farm
19	310361.00 m E	10228.00 m N	Active	Farm
20	309777.00 m E	9691.00 m N	Active	Flower Farm
21	309478.00 m E	8262.00 m N	Active	Flower Farm
22	309389.00 m E	8332.00 m N	Active	Flower Farm
23	308613.00 m E	8853.00 m N	Active	Flower Farm
24	308369.00 m E	8501.00 m N	Active	Flower Farm
25	308282.00 m E	9587.00 m N	Active	Flower Farm
26	308031.00 m E	8868.00 m N	Active	Flower Farm
27	308684.00 m E	9115.00 m N	Active	Flower Farm
28	308579.00 m E	8951.00 m N	Not Active	Flower Farm
29	308619.00 m E	8924.00 m N	Not Active	Flower Farm
30	309030.00 m E	8755.00 m N	Active	Flower Farm
31	309179.00 m E	8665.00 m N	Active	Flower Farm
32	309224.00 m E	8630.00 m N	Active	Flower Farm
33	309127.00 m E	9400.00 m N	Active	Flower Farm
34	309864.00 m E	8064.00 m N	Active	Flower Farm
35	309711.00 m E	7849.00 m N	Active	Flower Farm
36	309427.00 m E	8066.00 m N	Active	Flower Farm
37	310741.00 m E	8646.00 m N	Active	Residential
38	313687.00 m E	9217.00 m N	Active	Farm
39	315730.00 m E	10289.00 m N	Active	Flower Farm
40	315667.00 m E	10368.00 m N	Not Active	Flower Farm

41	315183.00 m E	10187.00 m N	Active	Flower Farm
42	315044.00 m E	10229.00 m N	Active	Flower Farm
43	314733.00 m E	10222.00 m N	Active	Flower Farm
44	314805.00 m E	10019.00 m N	Active	Flower Farm
45	314709.00 m E	9517.00 m N	Active	Flower Farm
46	310739.00 m E	9069.00 m N	Not Active	Farm
47	310706.00 m E	9009.00 m N	Active	Farm
48	310584.00 m E	9331.00 m N	Active	Farm
49	310864.00 m E	9578.00 m N	Active	Flower Farm
50	310731.00 m E	9632.00 m N	Not Active	Flower Farm
51	310559.00 m E	8534.00 m N	Active	Flower Farm
52	310841.00 m E	8286.00 m N	Active	Flower Farm
53	310150.00 m E	9347.00 m N	Active	Residential
54	301710.00 m E	10854.00 m N	Active	Residential
55	308507.00 m E	11657.00 m N	Active	Flower Farm
56	308640.00 m E	11895.00 m N	Active	Flower Farm
57	308997.00 m E	12415.00 m N	Active	Flower Farm
58	308864.00 m E	12238.00 m N	Active	Flower Farm
59	309565.00 m E	10805.00 m N	Active	Flower Farm
60	309643.00 m E	11470.00 m N	Active	Flower Farm
61	309521.00 m E	11123.00 m N	Active	Flower Farm
62	309360.00 m E	11411.00 m N	Active	Flower Farm
63	310825.00 m E	10870.00 m N	Active	Flower Farm

64	311835.00 m E	11564.00 m N	Active	Flower Farm
65	311914.00 m E	11477.00 m N	Active	Flower Farm
66	312061.00 m E	11297.00 m N	Active	Flower Farm
67	312229.00 m E	11145.00 m N	Active	Flower Farm
68	312298.00 m E	11079.00 m N	Not Active	Flower Farm
69	310443.00 m E	13086.00 m N	Active	Farm
70	309499.00 m E	12757.00 m N	Active	Farm
71	309189.00 m E	13763.00 m N	Active	Farm
72	309136.00 m E	13537.00 m N	Not Active	Farm
73	308991.00 m E	6702.00 m N	Active	Farm
74	310341.00 m E	6666.00 m N	Active	Flower Farm
75	308541.00 m E	10115.00 m N	Active	Flower Farm
76	308013.00 m E	9900.00 m N	Active	Flower Farm
77	308315.00 m E	8518.00 m N	Active	Flower Farm
78	312250.00 m E	9646.00 m N	Active	Residential
79	312205.00 m E	9703.00 m N	Active	Farm
80	312363.00 m E	9637.00 m N	Not Active	Farm
81	312091.00 m E	9833.00 m N	Active	Farm
82	312042.00 m E	9610.00 m N	Active	Farm
83	312368.00 m E	9550.00 m N	Active	Farm
84	312590.00 m E	9868.00 m N	Active	Farm
85	313544.00 m E	10570.00 m N	Active	Farm
86	310873.00 m E	7484.00 m N	Active	Flower Farm
87	313535.35 m E	10675.67 m N	Not Active	Residential
Note: The use (Active/Not Active/Vandalised) was determined by the condition of the infrastructure and based on the response of the people around				

Appendix 8. Timau Water Infrastructure Coordinates and Location

C. Major Intake

SN	Easting	Northing	Use	Location/Name
1	311066.00 m E	2629.00 m N	Not Active Vandalized	Rugirando Major Intake
2	310148.00 m E	9133.00 m N	Active	Nguisishi Comon Water Intake
3	303596.00 m E	9823.00 m N	Active	Getumbe Single Intake
4	303104.00 m E	10134.00 m N	Active	Kava Hydrum Water Project
Note: The use (Active/Not Active/Vandalised) was determined by the condition of the infrastructure and based on the response of the people around				

D. Collection & Treatment Points

SN	Easting	Northing	Use	Location/Name
1	308667.00 m E	4349.00 m N	Not Active	Treatment Point (Timau Resident)
2	310265.00 m E	9183.00 m N	Active	Collection Point (Nguisishi
Note: The use (Active/Not Active/Vandalised) was determined by the condition of the infrastructure and based on the response of the people around				

Appendix G. Transect Walk Diagram in consulatation with community