WATER SECURITY & SUSTAINABLE DEVELOPMENT HUB

CRITICAL WATER GOVERNANCE

Contextualising water security in Colombia, Ethiopia, India and Malaysia

July 2023 Joint Report

UK Research and Innovation
GCRF Global Challenges Research Fund

Critical Water Governance

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ABSTRACT

Global water security – a reliable and acceptable quantity and quality of water, and managing water related risks for all – is foundational to sustainable development. Demand for freshwater is projected to increase by more than 40% by 2050. Coupled with the impact of climate change, water security is now one of the biggest global challenges. The Water Security and Sustainable Development Hub (funded by the UK Research and Innovation's Global Challenges Research Fund (GCRF)) seeks to adopt a systems approach to deal with water security at both a global and local scale. The interdisciplinary research of the Hub's workstream 5 (WS5) has made a significant theoretical contribution to linking critical thinking, and its focus on politics and power dynamics, with the systems approach. The aim of WS5's research is to critically examine how a change in a system of water governance may occur to achieve water security and promote sustainable development. Through a number of empirical and evidence-based case studies throughout the world, WS5 seeks to deliver a clearer understanding of the underlying context and the power exercised in water governance, in order to reveal the challenges and shortcomings that severely hinder the achievement of water security. In meeting these goals, a more explicit mobilisation of critical water governance will be engaged in local situations around the world. In practice, we intend to use empirical evidence of a systems approach from within our Collaboratories – Colombia, Ethiopia, India, and Malaysia – to develop an overarching systems framework, and transfer a policy for water security (including guidance, best practice and tools, e.g. a water security measurement tool) to inform future global and local development frameworks.

This Joint Report presents the findings of the first stage of an intensive research project conducted by each Collaboratory, in order to contextualise water security in their respective case studies through a critical perspective on water governance. While illustrating the context specific for policy-makers and challenges for development policy and practice, this Joint Report contributes to expanding the knowledge and understanding of the contested narratives around water governance, and the problems and drivers in achieving water security.

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Abbreviations

ANDESCO	National Association of Public Services and Communications Companies of Colombia
BAKAJ	Johor State Regulatory Body
CAR	Autonomous Regional Corporations
CARs	Regional Autonomous Corporations
CONPES	National Council for Social and Economic Policy
CRV	Central Rift Valley
CWSO	Community Water Supply Organisations
DDA	Delhi Development Authority
DID	Department of Drainage
DJB	Delhi Jal Board
DMP	Delhi Master Plan
DOE	Department of Environment
EPL	Popular Liberation Army
FARC-EP	Revolutionary Armed Forces of Colombia
GCRF	Global Challenges Research Fund
GEF	Global Environment Facility
GWSP	Global Partnership for Water Security and Sanitation
IKI	International Climate Protection Initiative
IMF	International Monetary Fund
IWRM	Integral Water Resource Management
M-19	19th of April Movement
MADS	Ministry of Environment and Sustainable Development
NAHRIM	National Hydraulic Research Institute of Malaysia
NCTD	National Capital Territory of Delhi
NRW	Non-revenue water
NWRC	National Water Resources Council
OECD	Organisation for Economic Cooperation and Development
PAAB	Pengurusan Aset Air Berhad
POMCAS	Water Resource Management Plans and the Hydrographic Basin Management Plans
SDGs	Sustainable Development Goals
SINA	National Environmental System
SPAN	National Water Services Industry Commission
TNC	The Nature Conservancy
UCRB	Upper Cauca River Basin
UN	United Nations
UNGA	United Nations General Assembly
WS	Water Security
WS5	Workstream 5
WTP	Water Treatment Plants

INTRODUCTION

Mohsen Nagheeby, Jaime Amezaga, Anna Mdee

About 12 years ago, John Beddington, the former United Kingdom Government Chief Scientific Adviser, warned that "we head into a *perfect storm* [of food shortages, scarce water and insufficient energy resources] in 2030".[1] However, he probably never expected that the world would also experience a severe global pandemic, which put higher pressure on water governance and the effort to achieve 'water security'. The pandemic has uncovered inequalities and injustices that are affected by power imbalances among actors, and underlined the world's fragility to secure basic water.[2] Today, worldwide water scarcity, the threat of climate change, global warming, and environmental degradation associated with socioeconomic inequity, have led the United Nations General Assembly (UNGA) to declare 2018–2028 as the International Decade for Action on "Water for Sustainable Development".[3] In addition, the UN's High-Level Political Forum identified water security as a "critical determinant of success in achieving most other Sustainable Development Goals (SDGs)". The global efforts for water security and sustainable development continued by the UN 2023 Water Conference which as the UN says, the most important water event in a generation. Achieving 'water security' *per se* is a major challenge across all levels of governance, from local and reginal to global, and its definition and interpretation are politically contentious. Many countries in the world are now struggling to achieve 'water security' or are being challenged by the existing order: from Malaysia and India in Asia, to the UK in Europe, Ethiopia in Africa, and Colombia in South America.

There is almost a broad consensus that politics and power are the major factors shaping water governance and the patterns of water security; as Swyngedouw expresses it, "when two equal rights meet, power decides" (Swyngedouw, 2009, p. 58). The links between water security and the surrounding politics have been well researched and debated, in order to better grasp the complexity of water governance. However, with ongoing water-related challenges and global threats to human security and future generations, the questions of "what does water security mean for each actor?" and,

[1] https://www.theguardian.com/science/2009/mar/18/perfect-storm-john-beddington-energy-food-climate
[2] https://www.ids.ac.uk/opinions/covid-19-reveals-and-further-increases-inequalities-in-water-and-sanitation/; https://www.frontiersin.org/articles/10.3389/frsc.2021.645914/full.
[3] http://www.un.org/en/events/waterdecade/index.shtml.

more importantly, “water security for whom?”, merit further investigation. Moreover, one crucial question is *how* ‘water security’ could be achieved among variable rival users within the political context and asymmetric power relations. Considering the disjunction between policy formulation at a global and national/local level, this question is also followed by other critical questions that have received scant attention: How can we address these water security challenges at a global level, and deal with the complexity of the ‘wicked’ problems of water governance nationally and locally? To what extent and how can we transfer the complexity of local and national circumstances to the global water-related policies (e.g., SDGs framework)?

The GCRF Water Security and Sustainable Development Hub seeks to adopt a systems approach to deal with water security at both a global and local scale. In so doing, the ‘theory of change’ outlines the Hub’s ambitions for change, and describes the logical pathways to creating that change in water governance. While the Hub is aware of criticisms of the frequently ‘apolitical’ stance of the systems approach, the interdisciplinary research of the Hub’s workstream 5 (WS5) has made a significant theoretical contribution to linking critical thinking, and its focus on politics and power dynamics, with the systems approach. The aim of WS5’s research is, therefore, to critically examine how a change in a system of water governance may occur to achieve ‘water security’ and promote sustainable development. Through a number of empirical and evidence-based case studies throughout the world, WS5 seeks to deliver a clearer understanding of the underlying *context* and the *power* exercised in water governance, in order to reveal the challenges and shortcomings that severely hinder the achievement of ‘water security’. In meeting these goals, a more explicit mobilisation of critical water governance will be engaged in local situations around the world. In practice, we intend to use empirical evidence of a systems approach from within our Collaboratories – Colombia, Ethiopia, India, and Malaysia – to develop an overarching systems framework, and transfer a policy for water security (including guidance, best practice and tools, e.g. a water security measurement tool) to inform future *global* and *local* development frameworks, and catalyse funding for future water security initiatives (see Figure 1).

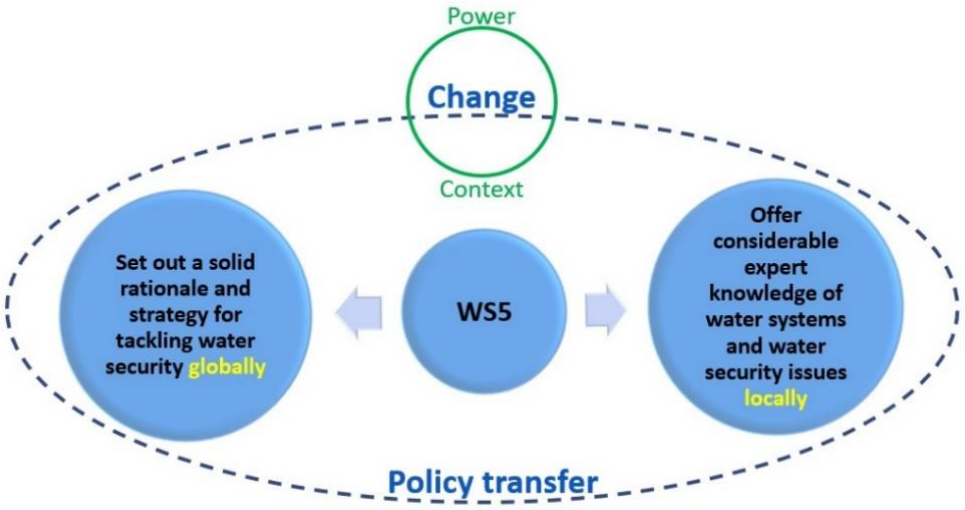

Figure 1. WS5's system of thought and goals

This Joint Report presents the findings of the initial stage of an ongoing intensive research project conducted by each Collaboratory, in order to *contextualise* 'water security' in their respective case studies through a critical perspective on water governance. This Joint Report, therefore, seeks to contribute to expanding the knowledge and understanding of the contested narratives around 'water security'; the visible and invisible actors in decision-making processes; the political context and power dynamics in water governance; and ultimately, the problems and drivers in achieving 'water security'.

Overarching framework: critical water governance to achieve water security

The meaning of 'water security' has been contested by different narratives from both academics and practitioners. Water security is mainly defined as "an acceptable level of water-related risks to humans and ecosystems, coupled with the availability of water of sufficient quantity and quality to support livelihoods, national security, human health and ecosystem services" (Bakker and Morinville 2013, p. 1). Although we agree with this definition in the Hub, we argue that the interpretation of water security may differ in practice from one country or user to another, influenced by many endogenous and exogenous factors, such as the (geo)political context, the socio-economic priorities, ecological aspects, etc. The definition and interpretation are socially and politically constructed within different perceptions and discourses, including food security, economic security, energy security, environmental security or socio-political security. Understanding the various interpretations of water security and related competing discourses is, therefore, *essential* to effective water governance.

The diverse, even conflicting interpretations of water security – and "water security for whom?" – influence water governance. The examination of water governance, therefore, rides on various

theoretical waves. While the debate about the definition and role of water governance in addressing sustainable development, and especially for achieving 'water security', has evolved since the UN Water Conference at Mar del Plata in 1977, there are still considerable contestations regarding its modality, interpretation and implementation. This creates an arena fraught with political, ideological and economic divisiveness in terms of local and 'global' criteria, and serious contradictions among the developmental and environmental goals used to reflect sustainable development (Woodhouse and Muller, 2017).

The ongoing battle is either in the broader context of a 'North–South' dichotomy, in relation to geographical context, cultural identity, economic interests and political history (e.g., colonialism); or between varied theoretical and ideological perspectives (e.g., neoliberalism). All are often influenced by global hegemonic capitalism's emphasis on 'dollar per drop' rather than 'care per drop'. This backdrop of contestations and contradictions in debates highlights the dominance of the *political* dimension and the impact of *power* relationships among actors in shaping water governance, so that they overshadow other factors (economic, physical, etc.) involved in decision-making processes, and manipulate them.

The related discussion and policy analysis regarding water governance often have an unclear purpose, in terms of using an analytical, descriptive or normative perspective. However, this theoretical examination will centre mainly on uncovering the roles and linkages among power, structure and agency in shaping water governance; it will also consider how water governance can be improved to promote equity and justice, or what the focus of the Hub is (i.e. water security). The approach is to examine the question of "who gets what, when, where and how?", in a way that considers the extent to which we can achieve and maintain water security, and how to do so. Answering these questions requires an understanding of the context, along with analysis of the processes and discourses, and the outcomes of water governance. The analysis may produce a wide range of answers, differentiated principally by their emphasis on diverse theoretical variables; for example, actors, power, interests, discourses, and beliefs/values. It is also the case that competing narratives of 'water security' (what it is and how it should be achieved), coexist and compete in all societies. These competing narratives often respond to and reflect dynamics of power.

It is true that no singular definition of governance exists, and it can mean "anything and nothing" (Jessop, 1998, p. 29). However, the theoretical approach of the Water Hub is to move beyond the optimistic view of neoliberal institutionalism, which is mainly blind to the role of *power* in shaping rules and practices in water governance. Therefore, the Hub seeks to focus on *critical* approaches (i.e. sensitive to the role of power and power asymmetry among actors), in order to offer more in-depth

insights into the issues surrounding water governance. We argue that understanding different types of power (including hard and soft, material and non-material; e.g. water infrastructures in one particular part of the basin, knowledge, discourse, class, race, gender), and how it may influence rules and practices of water governance, provides a clearer picture of the problems, symptoms and root causes. This will prevent the Hub's study from examining the complexity of water governance in a vacuum. Therefore, the purpose of the WS5 in the Hub is to present the Hub Collaboratories' respective river basins through a critical lens. The aim of critical analysis of water governance is to highlight different forms of distribution: (1) distributions of water, (2) distributions of voice and authority, and (3) distributions of knowledge and expertise (see Zwarteveen et al., 2017). Water governance in this context is not restricted to the formal institutions and actors. It rather focuses on the mainly *invisible* politics of decision-making processes over contested water distributions, which are influenced by the internal/external context, history, and power relations among formal and informal actors. Thus, the Hub sees the achievement of water security more as a political dynamic related to water governance, rather than to those depoliticised technical aspects. We build on this overarching line of thought to illustrate the complexity of water governance.

WS5's objectives and roadmap

Each Collaboratory group of the Hub – Colombia, Ethiopia, India, Malaysia, and including the UK-based groups – will focus on clearly defined research questions that reflect a specific 'problem' (or defined set of problems) concerning water security and governance. The question will be examined through the overarching mindset, explained above: reaching a critical understanding of the complexity of water governance by focusing on power, as means of achieving the context-dependent 'water security'. The critical descriptive analysis of national water governance should provide a fuller picture of local governance realities that might be in conflict with the normative criteria of 'global packages' such as SDG6. This analysis will be followed by policy transfer to international scale (i.e. SDGs). Indeed, the local/original context and the analytical results should be formulated as 'lessons learned' to reflect on international policies, as this will help to transfer policy from local to international scale.

As shown in Figure 2, the research in WS5 follows three stages, whose objectives are outlined below:

1. Contextualisation
    1.1. To reveal and conceptualise contested narratives of 'water security' within the context of each basin: respective competitive discourses and policies
    1.2. To explore problématique:

a) To contextualise and describe the complexity of existing water governance: structure, actors (formal and informal; external and internal and broader), institutions, norms, processes and strategies, inequality and power dynamics;

b) To identify the 'shadow of the past': historical context and the main causes of the existing pattern of water governance;

c) To identify the 'shadow of the future': water security-related risks such as climate change, development, or (geo)political uncertainties;

d) To identify (and select) a key problem focus in existing water governance.

2. Problem focus and analysis: 'Critical' analysis of water governance

a) To apply a 'critical' conceptual framework for analysing the power dynamics in existing water governance;

b) To develop a complex understanding of power, discourse and policy within water governance.

3. Policy analysis and transfer

a) To develop knowledge on policymaking concerning 'water security';

b) To provide lessons learned for international policy/indicators (i.e. SDG6).

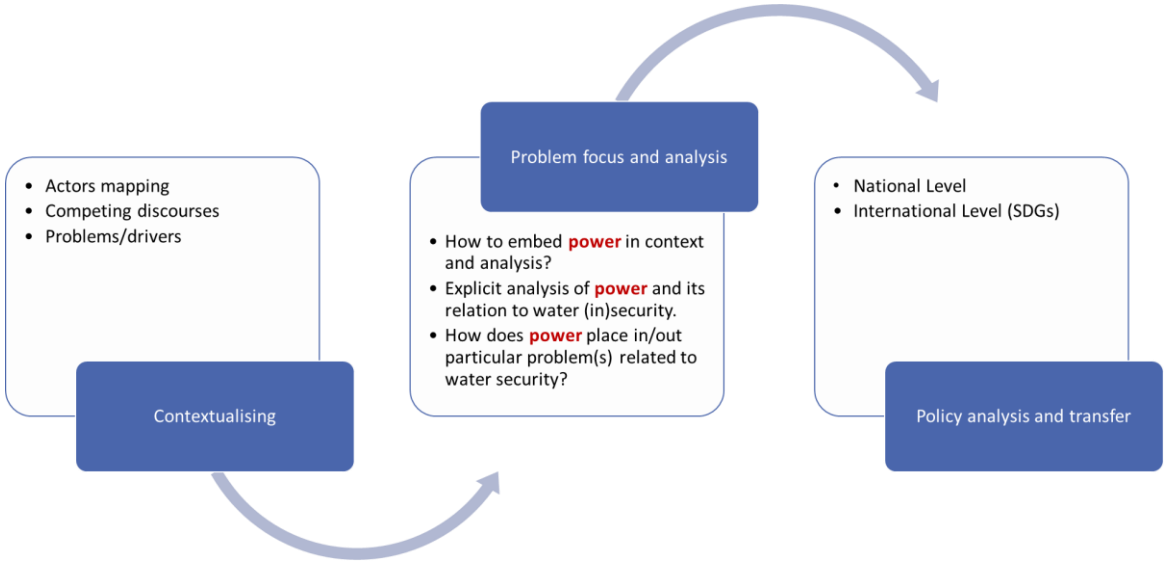

Figure 2. Mapping the research: the roadmap and developmental stages

This report will focus on *contextualising* water governance complexity, and the related challenges/drivers of water (in)security, within a larger social and political framework. Each Collaboratory represents a river basin in its country; they share some similarities and differ from each other in many hydrological, ecological, social and political, economic and cultural aspects. They comprise the Upper Cauca River Basin in Colombia; the Abbay, Awash, and Central Rift Valley River Basins in Ethiopia; Delhi and the Yamuna River in India; and the Johor River Basin in Malaysia. To

contextualise the situation regarding water governance, the report seeks to critically reflect on three following questions in each river basin:

a) What are the competing water security discourses and what does 'water security' mean to different actors?
b) Who represents whom (actor mapping), and how do power relations among those actors influence water governance and accordingly 'water security'?
c) What are the main problems/challenges/risks for achieving 'water security' (or drivers of water insecurity)?

In so doing, and given the complex nature of water governance, the report for each river basin will follow a three-step approach in its study (see Figure 3), as follows: (a) The research will follow the above-mentioned critical line of thought regarding water governance, to reveal how 'water security' is understood in each river basin, and to uncover the various contradictory and often contested discourses over 'water security' among different actors. It is crucial in this study to identify how various water-related discourses have been constructed in the case of each basin, and how they may reflect the interests and positions of different actors. This will be followed by (b) actor mapping in each river basin, and providing a better understanding of power relations among those actors. Power plays a crucial role in shaping water governance and identifying who can have 'better' or 'more' access to water. Therefore, this part of study will provide a basis for critically and extensively analysing the role of power relations in securing water, and the respective practices of management, utilisation and allocation in each river basin. Then, the study will identify (c) the main problems/challenges/risks to achieving 'water security' (or drivers of water insecurity). These challenges and drivers may vary from one actor to another, depending on their interests. Therefore, this part will reflect on previous steps' findings on how 'water security' is understood by each actor and how power plays a role. The goal of the Hub is to improve 'water security', towards creating a shared understanding of equitable and sustainable water utilisation in each basin.

Figure 3. The three-step approach in 'contextualising' water governance in WS5

Summary and outline of the report

Building upon a critical approach to water governance, this report will present the different varieties of functions, practices and histories in the context of water governance, as seen in Asia, Africa and South America. Structurally, the report is divided into five chapters.

Community empowerment and local governance

Following this introduction, in Chapter 2, we begin with the South American perspective, in the context of water governance in the upper Cauca River Basin. The study of water governance in this river basin aims to critically analyse the empowerment of community and local governance. Neither the National Water Policy of Colombia nor the Regional Plans of Cauca and Valle del Cauca clearly reflects on the concept of 'water security'. However, 'water security' is understood differently from securing an accepted quantity and quality of water at household level; guaranteeing safety in relation to water-related hazards (mainly flooding and drought); protecting human security; or Integral Water Resource Management (IWRM), on which the National Water Policy of Colombia focuses. With such various competing discourses surrounding 'water security', a number of different actors in the Upper Cauca River Basin – some of them hidden or unknown – struggle to influence 'water security' within their power relations apparently in their own favour: for instance, the illicit crops sector, illegal mining, the Cauca Free Trade Zone, the Yumbo Industrial Zone, the sugar cane agro-industry, the forestry and paper industry sector, and the Hass avocado growers. The dynamic, competitive nature and asymmetric power relations between the industry sector and the illicit crops and illegal mining sector shape the water governance of the Upper Cauca River Basin, and accordingly the water-related decisions of the municipal administrations and the different state institutions. However, although they were affected by colonial politics, the policies in relation to water security have been significantly developed, particularly since 1997 – resulting in the creation of the Collaborative Platform of the Upper Cauca River Basin by the Ministry of Environment. Notwithstanding, the current structural problems, emanating from the relationship between development models, the illegal market, and corruption, are putting water security at risk and generating environmental conflicts.

Water problemscapes and the political economy/ecology of water resources development

Next, in Chapter 3, we move to the Horn of Africa, Ethiopia, to illustrate the complex nature of water governance in the Central Rift Valley River Basin; we examine a spectrum of environmental, economic and political issues, through the lens of 'water problemscapes'. While the region is experiencing growing water demand, the 'water security' discourses have been constructed around contentious issues such as the impacts of climate change, water development and pollution, upstream and downstream utilisation, and upland degradation and its impact on the water level of lakes. There are a wide range of challenges to achieving water security, including population growth, increased demand, and land management-related problems. Such challenges need to be holistically tackled, particularly to help balance the water demands for economic development and maintaining ecosystem functions.

Infrastructure violence and inequity in water governance

Chapter 4 will bring us to India, where the study centres on how economics, political ideology and power relations influence poverty and marginalisation. This chapter will explore the competing discourses, particularly those regarding unequal distribution of supply across Delhi, and vulnerable communities' exclusion from drinking water. Water security here is tied to infrastructural violence, as the related perspectives have changed from technical and structural aspects to the socio-political dimension. The unjust discrimination and marginalisation of certain groups within the community in terms of access to drinking water have different social dimensions, and are highly influenced by power. Power is exercised by formal and informal actors in different levels of influence, from the state level through legislative instruments, to the very local level, where tanker drivers decide where and to whom water should be delivered in various slums and unauthorised areas. The problems associated with this unjust water supply in Delhi are not only limited to the insufficient number of fresh water sources and installed capacity of water treatment plants; in addition, the negative impact of upstream activities, conflicts among states supplying raw water to Delhi, and high concentrations of ammonia in Yamuna River, intensify the situation. The root causes of this water governance situation will be examined through critical analysis.

Multiple actors, gaps, and overlaps in law and the control of lands in water governance

Chapter 5 will focus on the Johor River Basin in Malaysia; the river is suffering from low water quality, and users are struggling with inadequate quantity. This chapter presents the competing discourses regarding water security that emanate from the complexity of Malaysia's political system, which reflects the federal–state relationships. While the water security discourses echo the local struggles with water scarcity and water-related disasters, the history of colonisation and a long-term water transfer

agreement between Malaysia and Singapore also play significant roles in shaping the perceptions concerning water security. The water governance in Johor River Basin crosses three levels: federal, state, and local. The water security problems mainly arise from institutional and legal arrangements.

Overall, the report will show a wide range of case studies and provide a contextualised understanding of water security discourses, actors and power relations, as well as the problems and drivers affecting their water governance. Keeping a 'critical' approach in mind, the report aims to provide a basis for further comparative examination of water governance in the next phase of research – i.e. problem focus and analysis – in order to not only shed light on the realities on the ground and lessons learned at a local level, but also to critically reflect on the international criteria of SDGs.

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COLOMBIA

Critical Water Governance in the Upper Cauca River Basin[4]

Mariela García, Federico Pinzón, Carolina Blanco, Natalia Duque, Alejandro Figueroa

Introduction

'Governance' is a term currently used in all development projects, so that it seems to have always been present. Yet it is important to remember that before the predominance of neoliberal politics, the term 'governance' was not used in Latin America. It was mainly in the 1990s that the triad of new public management, governability, and governance began to be a common language.

'New public management' brings to public management the concepts, logic, models and instruments of private management, in order to achieve the '3 Es' (efficiency, effectiveness, and economy) (Varela, 2019; Escobar, 2019). In this way, the state reconfigures itself to adopt the values, management modes and cultural ethos of the private sector. This approach has turned public goods into merchandise, and citizens into customers.

Economist John Williamson coined the term 'Washington Consensus' in 1989, to refer to common guidelines that prevailed among institutions based in this city – such as the International Monetary Fund (IMF), the World Bank, and the United States Department of the Treasury – in relation to developing countries; these guidelines were initially aimed at Latin America. However, in a globalised world, these organisations began to demand the implementation of economic measures and political and state reforms, known as the 'structural adjustment programmes', to grant loans. The countries under the influence of the

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Organisation for Economic Cooperation and Development (OECD), since 1995, have also published guidelines for the application of the neo-liberal model in these countries – known as the guidelines for 'Governance in Transition'.

Authors such as Oszlak (1994) consider that four fundamental strategies were followed for the dismantling of the Welfare State: privatisation, de-monopolisation, deregulation, and decentralisation. Issues such as education, health and public services, which had been the responsibility of the Welfare State, are now entering the market sphere. Under these conditions, the term 'governance' basically refers to the decentralisation of state power, and the emergence of the co-responsibility of different actors to address the problems of development and social welfare. In Latin American countries, the state has sold its main industrial, commercial and economic companies, and the provision of health services, social security, pension funds and essential public services, such as transportation, water supply, sanitation, electricity and telecommunications, has been privatised to varying degrees.

The greatest expression of the neoliberal model was developed in Chile during the dictatorship of General Augusto Pinochet. The Constitutional Reforms promoted during the 1990s in different Latin American countries (Colombia in 1991, Argentina in 1994, Venezuela in 1999) have played an important role in introducing new public management. However, several authors of the region consider that in Latin America a hybrid state model survives, in which the Anglo-Saxon new public management, of a post-bureaucratic nature, runs in parallel with pre-bureaucratic clientele's practices and the bureaucratic model.

Nevertheless, it is true that the poor quality of public services in Colombia in the 1980s caused different social movements to promote the decentralisation process. There was also pressure from structural adjustment programmes that sought to fulfil the mandates of the Washington Consensus. The decentralisation process, initiated in 1986, brought about a fundamental change by making water supply and sanitation the responsibility of the municipalities. All national sectoral agencies and programmes were dismantled. In addition, the conditions for the application of structural adjustment policies in this sector were created through the 1991 Constitution, whose provisions were regulated by Law 142 of 1994.

In the environmental field, the National Policy for Integrated Water Resources Management (IWRM) of 2010 understands IWRM as a systematic process to optimise the coordinated management "of water, land and related resources, in order to maximize the resulting social and economic well-being in an equitable manner, without compromising the sustainability of ecosystems" (Global Water Partnership, 2000, p. 22).

The policy presents IWRM as a process that seeks to consolidate the sustainable use of water resources to meet human well-being and safety objectives; recovery, conservation, equitable use of natural resources; and inclusive socio-economic development.

In 2000, The Hague's Ministerial Declaration on "Water Security in the 21st Century" was the first time the concept of security was related to water. It proposed that to meet the involved challenges of water security (meeting basic needs; securing the food supply; protecting ecosystems; sharing water resources; managing risks; valuing water; governing water wisely), actions must be based on IWRM. This has led to water security (WS) and IWRM being considered in many cases to be equivalent or overlapping. It also implies that over the years WS has replaced IWRM. However, the Colombian government did not mention the concept of WS until the Water and Sanitation Master Plan, prepared by the Vice Ministry of Water and Basic Sanitation in 2018. This document adopts the definition of WS produced by the United Nations (UN) in 2013.

Nevertheless, the most significant change that has taken place in Latin America in relation to water resources management has been the recognition of nature as a subject of rights. Ecuador was the first country to recognise the rights of nature in its constitutional reform of 2008, followed by the Constitution of Bolivia. In Colombia, the Judgment of the Constitutional Court T622 (2016) recognised the Atrato River as a subject of rights. The ruling ordered the formation of a Commission of Guardians of the River, which comprises representatives of community organisations and a delegate of the Environmental Ministry.

The Colombia Collaboratory is very interested in this change, because the Cauca River was declared a subject of rights on 17 June 2019 by the Superior Court of Medellín. Therefore, as part of the Colombian Collaboratory's research on the basin, it is important to understand the state of the rights granted to the river: protection, conservation, maintenance and restoration. This document is focused on the Upper Cauca River Basin (UCRB); it examines the competing discourses around WS in Colombia, the UCRB's main actors, its problems and drivers, and provides some conclusions.

Competing discourses

During the Cold War (1947–1989), the term 'security' was fundamentally used to refer to the defence of the state's borders through weapons, military intelligence, or deterrence. The end of the Cold War and the emergence of globalisation led to the appearance of critical security studies, whereby security shifted from the sphere of the state to society. Tuchman (1989), in his pioneering article, stated that the 1990s would demand a broadening of the definition of security "*to include resource, environmental and demography*

issues" (p. 162); especially due to the severity of environmental problems that transcend the narrow limits of countries. In the European context, Buzan et al. (1990) argued that current problems need to consider that societal security will become increasingly important.

The publication of the Human Development Report of 1994, which focuses on 'human security' (UNDP, 1994), has played a key role in this shift. Instead of territorial security, it focused on people-centred security, and proposed that if the former security was sought through arms, the latter would be achieved through sustainable human development. The report underlines the importance of working on food security, health security, etc., to achieve human security. This approach was strengthened in 1998 with the publication of *Security: A new framework for analysis*, by intellectuals linked to the Copenhagen Peace Research Institute; the book states that securitisation is the possibility of labelling any (social, environmental, economic) issue as security if a specific population group determines that it is fundamental to guaranteeing its existence.

In Latin America, since the beginning of the Cold War, the concept of national security developed by the United States has had a strong influence. This is because the region became a strategic zone for US security policy, especially after the triumph of the Cuban revolution. In Colombia, under the security approach proposed by the United States, the Security Statute was promulgated in 1978; its validity expired in 1982, but it caused arbitrary detentions, torture, disappearances, etc. Later, between 2002 and 2010, President Álvaro Uribe established the Democratic Security policy, which analysts state increased the rates of false prosecution (Cárdenas and Villa, 2013). This partially explains the low importance that the Colombian state has given to the concept of WS.

At the international level, the UN's definition of WS (2013) has spread. It refers to *"the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being,*[5] *and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability*"[6] (p. 10). This document also considers WS as a condition for any other security, such as food or energy security. The drivers of water insecurity, including climate change, demographic growth,

[5] Human well-being has multiple constituents, including basic material for a good life, freedom of choice and action, health, good social relations, and security (MA, 2003).

[6] This definition of water security is based on the one provided in UNESCO's International Hydrological Programme's (IHP) Strategic Plan of the Eighth Phase (see UNESCO-IHP, 2012a), endorsed at the 20th Session of the UNESCO-IHP Intergovernmental Council (UNESCO-IHP, 2012b: Resolution XX-5).

urbanisation and migration, are gaining greater relevance in political agendas, and are given prioritised attention to achieve a developed and safer world.

In Colombia, the promotion of the WS concept has not been carried out by government entities, but by international NGOs. They have articulated with the private sector to define strategies for water protection and conservation. These NGOs are mainly funded by the World Bank, which has promoted the Global Partnership for Water Security and Sanitation (GWSP) since 2017.[7] The GWSP allows the coordination of aid in different countries, through the efforts of international institutions, civil society and donors, to contribute to WS at a global level (World Bank, 2020).

The Latin American Alliance of Water Funds was established in 2011, and aims to contribute to WS through the creation and strengthening of funds. This initiative arises from the agreement between the Interamerican Development Bank, IDB, FEMSA Foundation of Mexico, the Global Environment Facility (GEF), the International Climate Protection Initiative (IKI), and The Nature Conservancy (TNC) (Latin American Alliance of Water Funds, 2021).

There are currently 24 Water Funds; 10 are in Latin American countries, and 14 are in the process of being created. Colombia, with seven funds, has the largest number in the region; its funds are constituted in the municipalities of Bogotá, Cúcuta, Medellín, and Cali; there is also one at the departmental level in Valle del Cauca (Latin American Alliance of Water Funds, 2021). In the latter, its strategic lines are: IWRM, Biodiversity Conservation, Adaptation to Climate Change, Sustainable Production Systems, Environmental Education, and Institutional Strengthening (Water for Life and Sustainability Fund Foundation, 2021). Its sphere of action contains basins located in the upper geographical valley of the Cauca River, which corresponds to the north of the department of Cauca, Valle del Cauca, and the south of Risaralda (Latin American Alliance of Water Funds, 2021).

At the national level there is also the Water for Colombia Coalition, a collaborative platform led by the Ministry of Environment and Sustainable Development (MADS, Spanish acronym), the National Association of Public Services and Communications Companies of Colombia (ANDESCO, Spanish acronym), and TNC. It is supported by more than 40 entities, including Ecopetrol,[8] IDB, DNP, Postobón,[9] and the Latin American Alliance of Water Funds (Water Coalition for Colombia, 2021). Among the Coalition's objectives are

[7] This Partnership's two antecedents are the Water and Sanitation Program and the Water Resources Cooperation Program.
[8] A Colombian petroleum company.
[9] A Colombian sugar-sweetened beverage company.

improving the Colombian cities' capacity to mitigate and adapt to climate change; strengthening and positioning the Water Funds; promoting collective action at the national level to influence better water governance in Colombia; and promoting the adoption of better corporate water practices.

The WS discourse promoted by these alliances has been permeating the public institutions. The MADS website shows six news items that explicitly mention WS; the first was published in 2014. Three of them refer to Water Fund partnerships as strategies to contribute to WS, and two are related to the declaration of Paramo's delimitation. This is a first step towards its protection and to guarantee ecosystem services, mainly the water supply; thus, it contributes to the WS of the population (MADS, 2016, 2017).

However, the WS concept is not included in the documents that guide national water policy (IWRM, 2010; National Climate Change Policy, 2017), nor in regional policy (Departmental Public Policy of Environment and Integral Management of Water Resources of Valle del Cauca 2017–2027; Comprehensive Climate Change Plan for Valle del Cauca, 2019; Comprehensive Plan for the Management of Territorial Climate Change of Cauca, 2040).

As was mentioned in the introduction, the only document that uses the UN's WS definition is the Water and Sanitation Master Plan of 2018. In this plan, the WS strategies are oriented towards access to water service and increasing coverage in drinking water, with a prominent interest in the quality of water service. Its general framework is the fulfilment of the Sustainable Development Goals (SDGs), especially Goal 6, "Clean Water and Sanitation" (UN, 2015).

The use of the WS concept mainly remains in the public staff's oral discourse. Some government officials associate it with the establishment of agreements or alliances, as it has been promoted in Colombia by international organisations. Furthermore, it overlaps with the concept of IWRM. As an advisor of the departmental government stated, WS refers to the "agreement of wills for the governability and governance of the hydrographic basins". They develop "advice and articulation of strategic actors of the territory of Valle del Cauca for the protection of ecosystems and the integral water resources management"[10].

In contrast, the concept of WS is unfamiliar to leaders of Community Water Supply Organisations (CWSO) based at the UCRB, especially for members of the second-level organisations such as AQUACOL[11] and

[10] Interview developed between May - June 2022 to the stakeholders of the Colombian Collaboratory.
[11] Association of Community Water and Sanitation Services Providers of Colombia.

FECOSER.[12] However, when they hear about WS, they associate it with the fact of having sufficient quantity and quality of water for human consumption, and guaranteeing water for various uses (productive, industry, among others) in the territory.

They also associate WS with the protection of water sources and water; not only for humans, but also for other forms of life. This may be because the CWSOs – in addition to supplying water to 40 per cent of the rural population and the urban peripheries of the country – in many cases are working on the conservation of water sources, through actions such as isolation and reforestation of river rounds and watersheds.

There are also community organisations that are conserving aquatic ecosystems such as wetlands, lakes and small water sources. This situation allows them to incorporate an environmental dimension in water management, which is reflected in their approach to the concept of WS. This shows a process of anchoring, where organisations try to integrate their existing attitudes and knowledge into a new concept, as a way of becoming familiar with the new ideas (Granada, 2007).

Actors mapping and power relations

Actors at the national level

Water resource management in Colombia comprises three different aspects: (1) water resource allocation and pollution control; (2) watershed management; and (3) management of the sectoral demand for water and drinking water supply. The responsibility for the first two areas falls under the National Environmental System (SINA, Spanish acronym), and the last one is handled by the Ministry of Housing, City and Territory (Figure 4).

The Environmental System is coordinated and supervised by the Ministry of Environment and Sustainable Development, which is responsible for formulating the IWRM Plan, defining contamination limits, natural resource use, management, and monitoring of protected areas. All environmental licensing is done through the National Authority of Environmental Licences (ANLA, Spanish acronym), and the Regional Autonomous Corporations (CARs, Spanish acronym), which act as environmental authorities in the regional sphere (Figure 4).

[12] Federation of Rural Community Water Supply Systems of Valle del Cauca.

The System is also assisted by a technical support group constituted by five different institutes, dealing with specific topics: IDEAM (Institute of Hydrology, Meteorology and Environmental Studies), Alexander Von Humboldt Institute (biodiversity research), INVEMAR (Institute of Marine and Coastal research), SINCHI (Amazonian Institute for Scientific Research), and IIAP (Environmental Research Institute of the Pacific).

The last area, the management of the sectorial demand for water and drinking water supply, is subject to intersectoral management between SINA, the National Planning Department (DNP, Spanish acronym), the Commission for the Regulation of Drinking Water and Basic Sanitation (CRA, Spanish acronym), the Superintendency of Public Services (SSPD, Spanish acronym), and the following Ministries: Health and Social Protection (MSPS, Spanish acronym); Agriculture and Rural Development (MADS, Spanish acronym); Development and Housing, City and Territory (MVCT, Spanish acronym) (Figure 1).

1. MSPS: Oversees and coordinates the Water Quality Protection and Control System (Decree 1575 of 2007) through the Environmental Health Subdirectory. This body oversees compliance with the quality standards of water for human consumption, and thus manages the associated risks to human health.

2. MVCT: Through the Vice Ministry of Drinking Water and Basic Sanitation, it sets out "*the technical requirements that must be met by the infrastructure, equipment and procedures used by water utilities, to guarantee the quality of the service, and which does not imply undue restriction of the competition*" (Law 142 of 1994). It also deals with applying the Technical Regulation of Drinking Water and Basic Sanitation.

3. MADR: The Rural Public Goods Directorate "*coordinates, designs and evaluates, the policies, plans, programmes and projects of rural development with a territorial approach aimed at the provision of rural public goods which affect the social and productive development of the countryside*" (MADR, 2021).

4. CRA: Its fundamental purpose is to regulate monopolies, promote competition and the sustainability of the drinking water and basic sanitation sector, avoid abuses, and guarantee the provision of high-quality services, with reasonable fees and wide coverage. To do so, it relies on the issuance of regulations and the adoption of measures to guarantee the application of technical standards on drinking water quality, according to guidelines from the Ministry of Social Protection.

5. SSPD: An entity attached to the National Planning Department; it controls, inspects and monitors entities that provide home public services.

6. DNP: The entity in charge of the design, orientation and evaluation of public policies, the management and allocation of public investment, the definition of the private sector´s frameworks of action, and their concretion in the government´s programmes and projects.

Additionally, to support intersectoral articulation around national environmental issues and IWRM, two councils were created: the National Environmental Council by Decree 3079 of 1997, and the National Water Council by Decree 585 of 2017. The latter consists of the MADS and the MVCT, the MSPS, Ministry of Mines and Energy, the MADR, the DPN, and IDEAM as a permanent member but without a vote. It articulates policies, plans and programmes at the public level, through the National Policy of IWRM for the conservation and sustainability of the water resource; improving water quality; efficient use; optimising risk management; and promoting research to reduce contamination (Figure 4).

SINA interacts and interrelates with various actors that address the environmental dimension. One of them is the Ministry of National Education, which formulates the Environmental Education Policy. The objective of this policy is to coordinate actions of all actors and scenarios in which the subject is addressed at the local, regional and national levels. The intention is to reconstruct the culture and orient it towards an environmental ethic, within the framework of sustainable development (National Environmental Education Policy, 2002).

Actors at departmental/regional and municipal levels

Territorial entities at the departmental and municipal levels are responsible for implementing the guidelines defined at the national level (Figure 4).

The departmental governments develop, manage and implement the policies aimed at the sustainable development of each department, by fulfilling its administrative, monitoring and evaluation, and financial functions; and by giving the municipalities and service providers the assistance they require to exercise the powers bestowed by law. They are in charge of the Departmental Water Plans, which are the state's strategy to address the problems of infrastructure, dispersion, legality, and scope of the provision of public services in the territory.

Considering that many actors are involved in the water issue, it is necessary to generate spaces for decision-making that make it possible to "overcome the fragmentation of sectoral water management, which in itself restricts water security" (Vice Ministry of Water and Sanitation, 2018 p. 41). Hence, the MADS has established Collaborative Platforms, which involve "the articulation of investments and public and private actions around the basins, for the integral management of water resources" (PND 2018, 2022, p. 486). To date, only two collaborative platforms have been created in the country: Chinchiná-Caldas River Basin, and UCRB. They were legalised by the signing of an agreement of wills between the actors involved, on 5 June and 21 August 2020 respectively (MADS, 21 August 2020) (Figure 4).

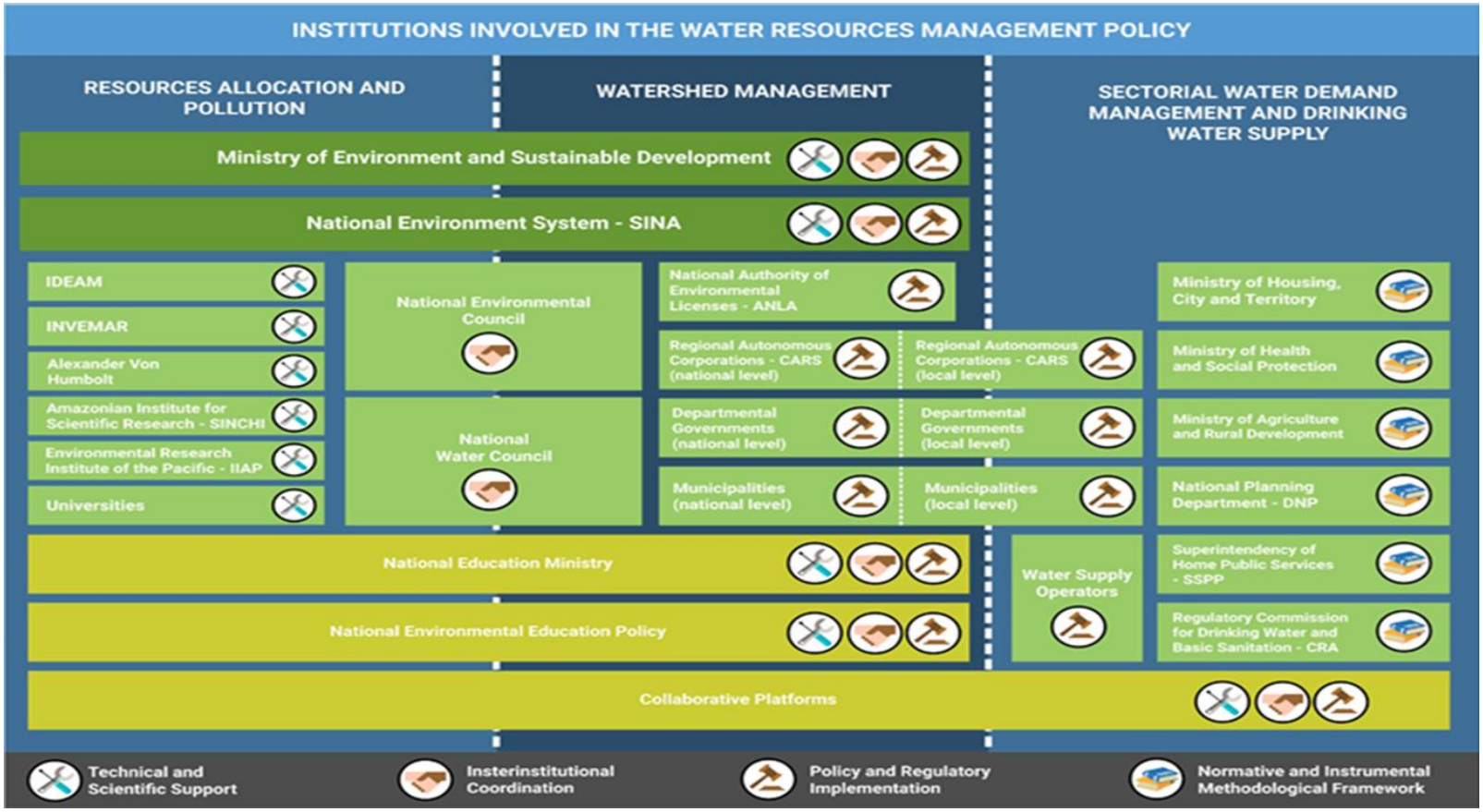


Figure 4. Institutions involved in the Water Resources Management Policy (Prepared by the authors, 2021)

Environmental authority at the regional level

The Water Resource Management Plans and the Hydrographic Basin Management Plans (POMCAS, Spanish acronym) are developed by the Autonomous Regional Corporations (CAR, Spanish acronym). These entities are the Regional Environmental Authorities, and their mission also includes fostering alliances with actors from different sectors and promoting actions aimed to guarantee a healthy environment, to improve the population's quality of life and the competitiveness of the region, within the framework of sustainable development.

There are five CARs in the UCRB (CORPOCALDAS, CRC, CRQ, CARDER, CVC), whose respective scope of action is the departments located in the basin: Caldas, Cauca, Quindío, Risaralda, and Valle. They grant concessions, authorisations and environmental licences for the use of natural resources; evaluating and carrying out environmental monitoring of water uses; collecting taxes and contributions for the use and exploitation of natural resources; punishing violations of environmental regulations; and establishing the guidelines for the management of hydrographic basins.

Community actors

To achieve greater impact on decision-making in their territory, as key actors within it, community organisations have partnered to balance power asymmetries. The second-level organisations, namely AQUACOL, FECOSER, and the Corporation for the Protection and Conservation of Watersheds (CORPROCUENCAS, Spanish acronym), form the main Water Supply Communities Partnership in the UCRB.

- AQUACOL's members are based in Cauca and Valle del Cauca. Its activities are intended to increase the technical and administrative capacity of rural water supply systems; it also develops advocacy actions with government institutions at the local, regional and national levels.
- FECOSER's members are settled in Valle del Cauca. This organisation's main objective is the protection of water, focusing on the defence of community water management. It also carries out advocacy actions at different levels.
- AQUACOL and FECOSER have been invited to participate actively in the Departmental Council of Environmental Policy and Integral Management of Water Resources (CODEPARHT, Spanish acronym) (Blanco-Moreno, 2021), due to being recognised as representatives of community water management organisations.

- CORPROCUENCAS is based in Cauca Department, which includes rural community water supply systems and an irrigation district. Its objective is the conservation of the water sub-basins where water is collected for the Sotará, Timbío and El Tambo municipalities. Since 2015, it has been part of the Alliance for Water, an initiative established to strengthen strategies for the defence of water in such municipalities. Since 2017, it has also belonged to the Interinstitutional Technical Table for the Integral Management of Water Resources in micro-basins of the same municipalities, together with the CRC, the University of Cauca, Cicaficultura, and representatives of the municipal administrations (RNAC, 2020).

Other organisations which develop some actions for the conservation and protection of the sub-basins in the Cauca Department are the Peasant Association of Popayán Municipality: Network of Natural Reserves (ASOCAMPO, Spanish acronym), and the Peasant Association of the village Quintana (ASOPROQUINTANA, Spanish acronym). They also carry out productive activities, as well as the defence of their rights as peasants (WHO, Asociación de Cabildos Genaro Sánchez y Fondo para el logro de los OM, s.f).

These organisations have been making their demands visible to other actors and the state. However, it is the business sector which exercises economic and political power in the UCBR, and it also generates the greatest negative impact on the Basin. Nevertheless, it has not prevented the community organisations from gaining prominence in the different processes of articulation at the local, regional and national levels, for the protection and conservation of the basin. This has been evidenced in the formation of the Basin Councils, the Commission for the Recovery of the Cauca River Basin, and the Collaborative Platform for the Recovery of the UCRB.

Instances of coordination in the UCRB

In 2009, the National Council for Social and Economic Policy (CONPES) issued the 3624 document: "Programme for the clean-up, management, and environmental recovery of the UCRB". However, there are no records of significant actions being carried out in applying it. In subsequent years, different engagement processes have been carried out between actors whose scope of action is the UCRB and whose shared purpose is its preservation.

The International Forum "Recovery of the Cauca River: making timely decisions for the water supply in the region" was held in Cali in 2017, under the leadership of the Municipal Comptroller (Contraloría Cali, 2017). The inter-institutional work that emerged from this Forum gave rise to the formation, in the same year, of the Commission for the Recovery of the Upper Cauca River Basin. This Commission arose with the purpose of drawing up a shared and comprehensive vision for the long-term recovery of the

basin (Propacífico, 2019). In turn, this Commission managed to sign, with the MADS, a Memorandum of Understanding with the aim of "promoting inter-institutional coordination at the national, regional and local levels to achieve the sustainability of the Cauca River, as well as alternatives to improve the quality and availability of water" (MADS, 2018). Figure 5 shows the entities that make up the Commission.

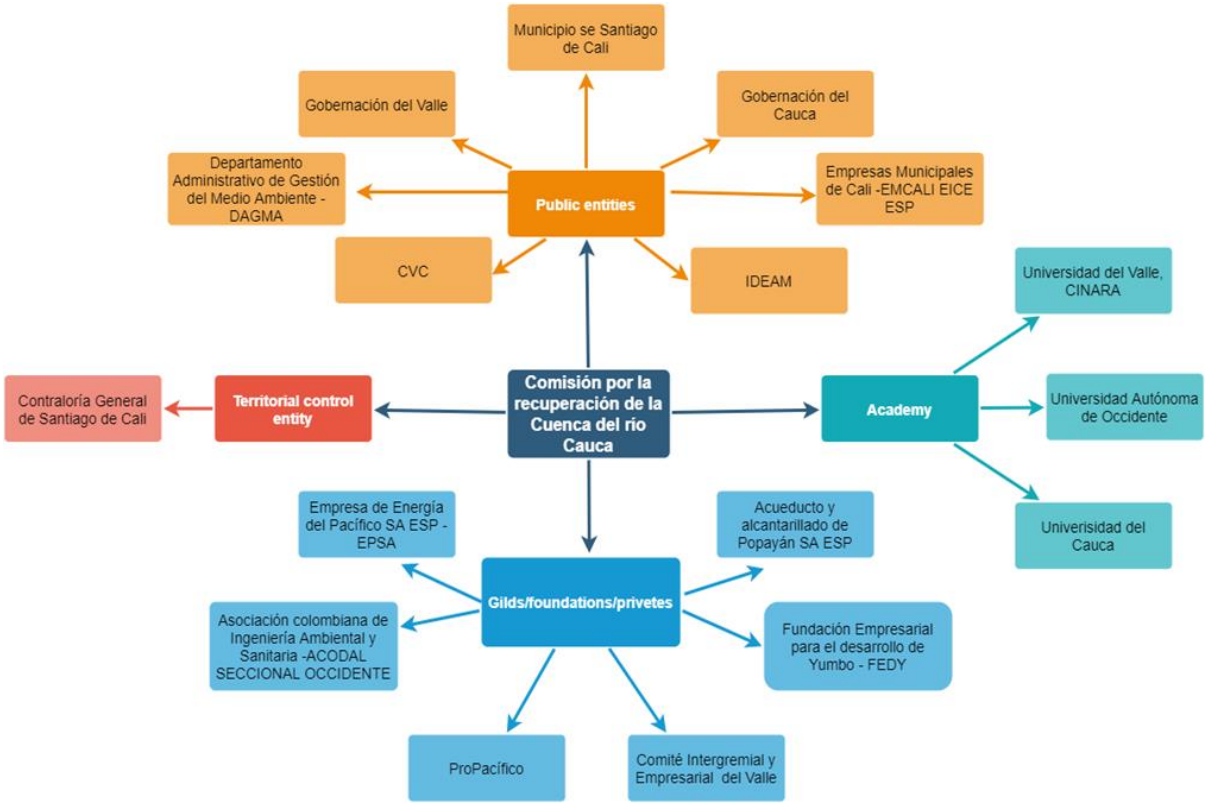


Figure 5. Members of the Commission for the Recovery of the Cauca River Basin (Prepared by the authors (2021), based on Propacífico (2019) and the Commission for the Recovery of the Cauca River Basin (2020))

The UCRB Platform emerged in 2019 from the national level. Its objective is "*the effective articulation of different actors, framed in collective action, which tends to the recovery and sustainability of the water resource in the basin, through the improvement of the quality of the river and the restoration and/or rehabilitation of degraded ecosystems associated with the different current economic activities in the territory*" (Caicedo, 2020, p. 16).

Figures 5 and 6 make clear that both the Platform and the Commission mostly consist of the same actors. There are fewer actors in the Collaborative Platform than in the Commission. They include the MADS, as the promotor of this strategy, at the national level; and governmental and non-governmental actors, mainly from the department of Cauca, which are not members of the Commission. NGOs are mainly added by the Valle Department.

Considering that the Commission was created before the Collaborative Platform, it could have been part of this as a body; nevertheless, the involved actors are independent members. This situation raises a question about the way in which these two entities are coordinated for the development of their actions in the Basin.

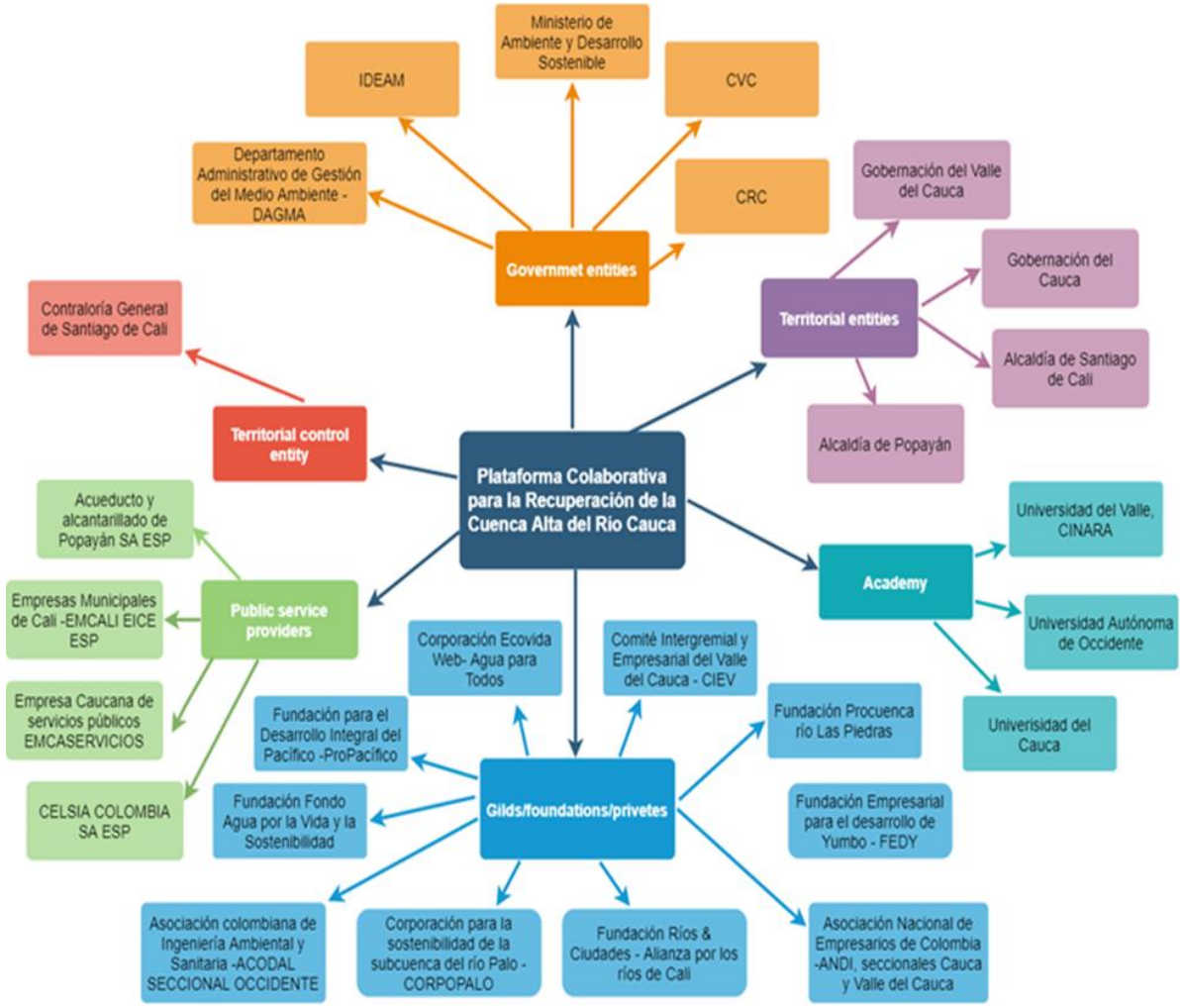


Figure 6. Members of the Collaborative Platform for the Recovery of the UCRB (Prepared by the authors (2021), based on MADS (News, 2020) and the Colombian Collaboratory (Webinar Water Governance at UCRB, 2020))

At a regional level, the Department of Valle del Cauca has created CODEPARHT. Its mission is "articulating actions aimed to the preservation, conservation and sustainability of natural resources and ecosystems, guaranteeing their responsible use by communities and society in general of Valle Department" (Article 2 of Ordinance No. 421 of 26 July 2016, p. 2).

Organisations at the sub-basin area in the UCRB

While 25 POMCAs have been elaborated in the UCRB, corresponding to the same number of sub-basins, only nine Basin Councils have been constituted. If this is contrasted with the diversity of actors that participated in the working groups for the elaboration of the POMCAs, it can be said that the type of participation that has been promoted is consultation (Arnstein, 1969). This does not guarantee participation in decision-making, nor the development of the necessary processes for implementing the agreements defined in the POMCAs.

Despite the diversity of actors in the existing Basin Councils, the indigenous and Afro-descendant communities do not participate in all of them. Likewise, there is little participation from higher-education institutions. It should be also noted that while Basin Councils have not been formed in most of the sub-basins, these bodies have already elected members for a second period in the sub-basins located in the Department of Risaralda and in the municipality of Cali.

Problems and drivers

Considering the power dynamics that determine the water flows in the UCRB, and their impacts on the biophysical aspects of the basin and on its habitants, six relevant issues can be identified: (i) the grabbing of the largest volume of water by the sugar cane agro-industry, and the pressures that it generates on other uses, including protected areas; (ii) the prioritisation of areas with the highest concentration of population, for implementing policies or technical infrastructure improvements to optimise the drinking water service; (iii) the discharge of pollution generated by industry; (iv) the dynamics of the armed conflict and illegal economies in the basin territory; (v) mining; and (vi) the differences between local and regional realities. This aspect is always hidden within the aggregated basin statistics.

Sugar cane agro-industrial model

The development of an agrarian capitalism based on the 'hacienda mentality' led to the expulsion of large groups of small landowners from the inter-Andean valley to the flanks of the central and western mountain ranges in Valle del Cauca department. Thus, the valley became free for the cultivation of sugar cane. In the 1960s, the commercial break between Cuba and the United States increased the international market for Colombia.

In the mid-1980s, the agricultural frontier was expanded to previously floodable land because of the Salvajina reservoir's opening, linked to the construction of an infrastructure of dikes in the riverbed

(Vélez-Torres et al., 2013). Later, at the beginning of the 21st century, the Law 693 of 2001 on fuel ethanol (Fedebiocombustibles, 2017) generated a great boost for this biofuel, which increased the number of hectares cultivated.

The sugar cane sector is the largest consumer of water in the basin. In the Valle del Cauca alone, sugar cane monoculture demands 64.1 per cent of the surface water of the Cauca River, and has a concession for 87.8 per cent of the groundwater (Galvis, 2017). Considering that 296,127 hectares are planted with sugar cane inside the Basin (Figure 7), the demand for water has increased. However, it is mainly used to produce fuel alcohol, not to achieve food security.

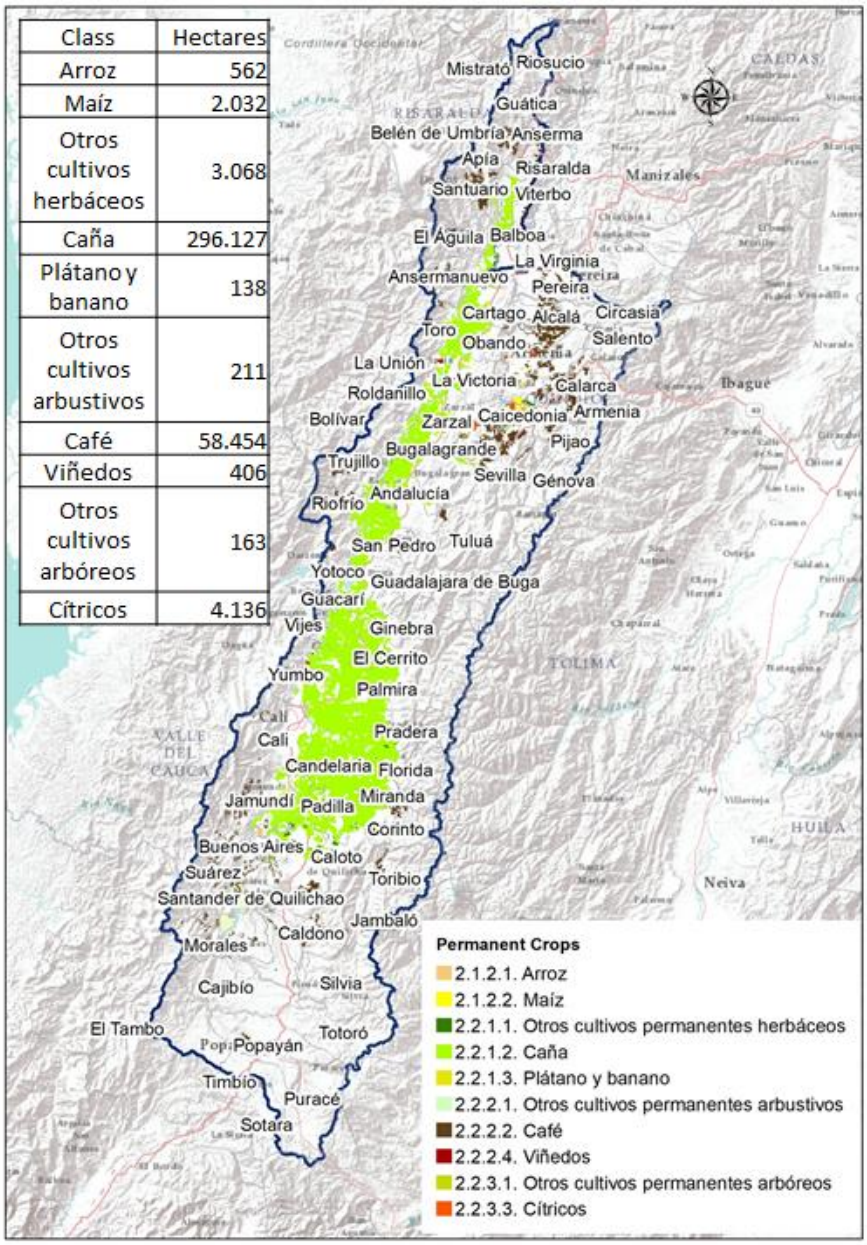


Figure 7. Permanent crops in UCRB (IDEAM (2018), elaborated by Colombian Collaboratory)

The extent of sugar cane cultivation is very large compared to other land uses; it exceeds in magnitude all other permanent crops and the sum of all the protected areas that exist in the basin (Figure 8). This situation is very risky, in relation to conserving strategic ecosystems.

According to Decree 2372 of 1 July 2010, the National Parks Division is responsible for the National System of Protected Areas. CONPES 3680 of 2010 also states that protected areas should be managed as an ecological representative system, with effective management that contributes to territorial planning and the fulfilment of national sustainable development objectives (Parques Nacionales, 2021). Consequently, there is a risk that economic activities could be prioritised here, instead of these areas' strict conservation.

Protected Area	Hectares
Distritos Regionales de Manejo Integrado	89.988,0
Reservas Forestales Protectoras Nacionales	73.868,9
Parque Nacional Natural	69.421,8
Parques Naturales Regionales	10.320,2
Distritos de Conservacion de Suelos	9.122,4
Reserva Natural de la Sociedad Civil	8.376,9
Reservas Forestales Protectoras Regionales	412,7
Areas de Recreacion	137,6
Santuario de Fauna y Flora	0,2

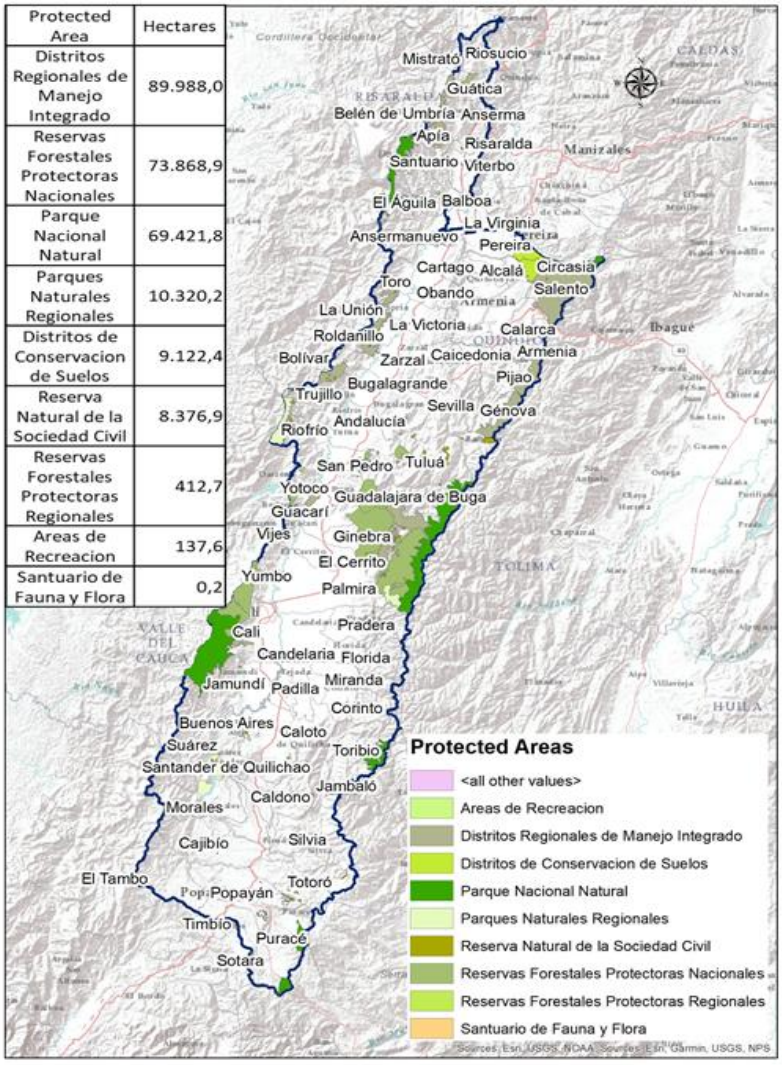


Figure 8. Protected areas in the UCRB (Colombian Environmental Information System (2021), elaborated by Colombian Collaboratory)

The agro-industrial model monopolises water and soil in the UCRB. Thus, human consumption has become the second-largest demander of surface water from the Cauca River, with 26.1 per cent

concessioned (Galvis, 2017). This leads to an unequal distribution process between urban and rural areas, in the quantity and quality of drinking water.

The inclusion in the same map (Figure 9) of the sugar cane areas, the reserve zones, and the mining titles granted and in process, shows the low availability of suitable land for agricultural use by the inhabitants of the UCRB. For instance, in the North of Cauca Department – and specifically in the flat areas – there is a high-intensity agricultural system based on sugar cane, and large extensions dedicated to forestry production; as well as a strong economic sector, because of the declaration of two free trade zones according to the Paez Law (Law 218 of 1995) (Zuluaga Albarracin, 2003).

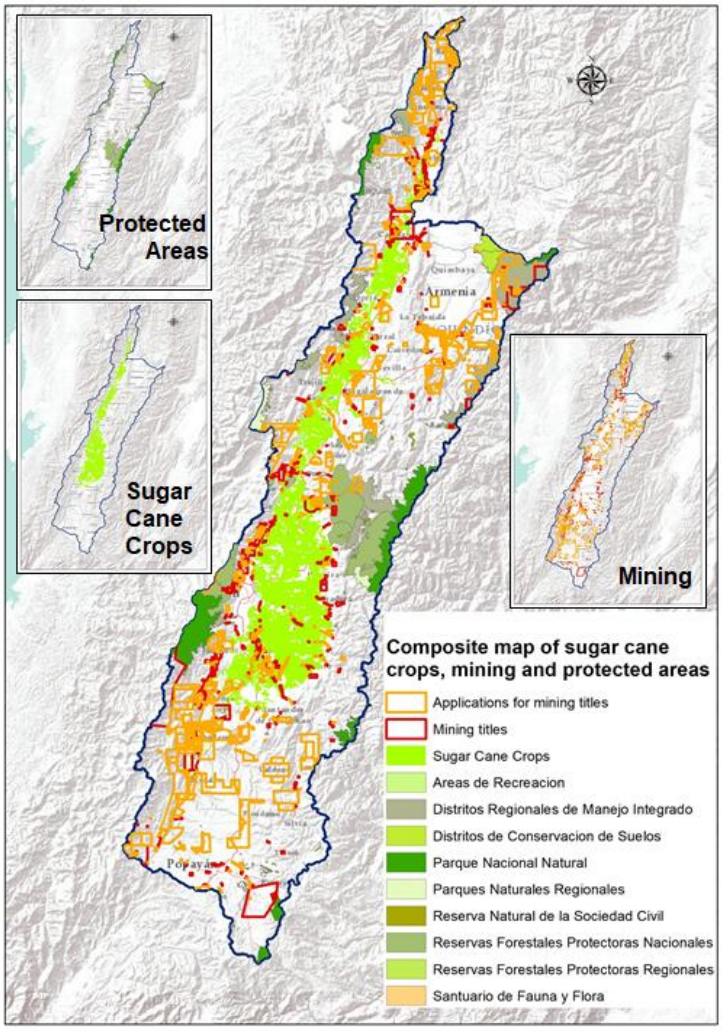


Figure 9. Sugar cane crops, mining and protected areas (IDEAM (2018), Tierra Minada (2018), Colombian Environmental Information System (2021), elaborated by Colombian Collaboratory)

In these circumstances, small and medium-scale productive processes are restricted to mountainous areas with high slopes, low productivity, and limited vocation, according to national norms. This situation, in many cases, compromises the productive viability of the territories' vulnerable

communities. Hence, in most municipalities of the UCRB, a model of family agriculture that is derived from recent colonisation processes still prevails (FIP-ICESI, 2019).

Areas with the highest population concentration are prioritised

The UCRB area is home to a population of 5,884,882 inhabitants (DANE, 2018). Therefore, it is relevant to examine the association between areas with a higher concentration of inhabitants and water grabbing; Figure 10 presents the demographic distribution by quintiles. The red polygons represent the 20 per cent of municipalities with the largest population. The conformation of clusters around the departmental capitals is generally seen in the UCRB. The largest one is Santiago de Cali, together with the intermediate cities of Valle and part of the northern Cauca. The other three clusters are associated with Popayán as the capital of Cauca, Armenia in Quindío, and Pereira in Risaralda.

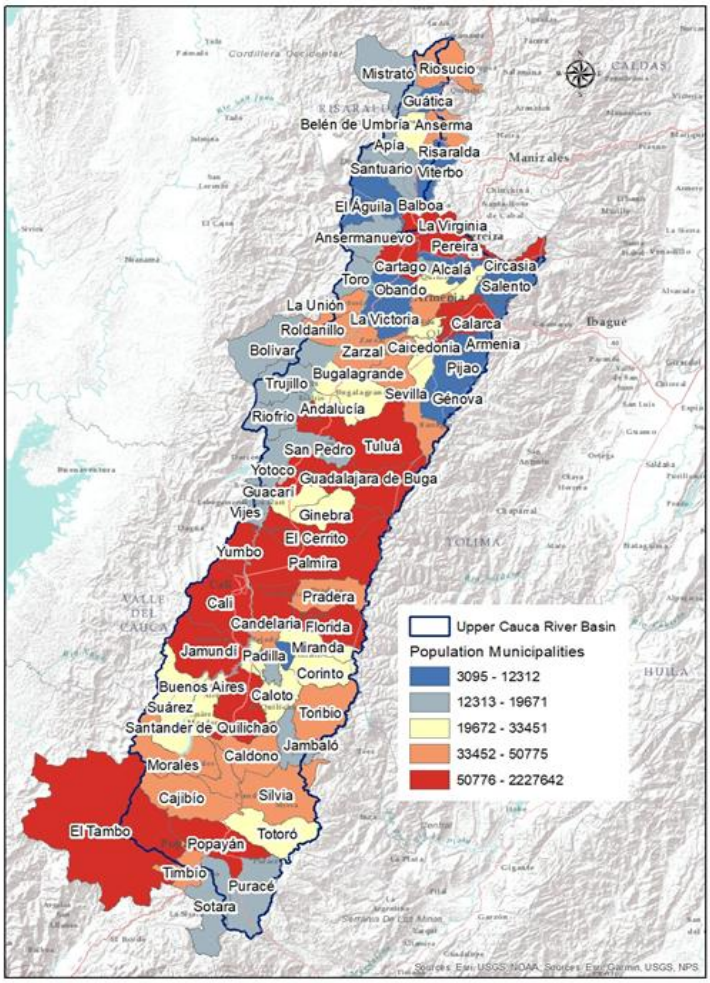
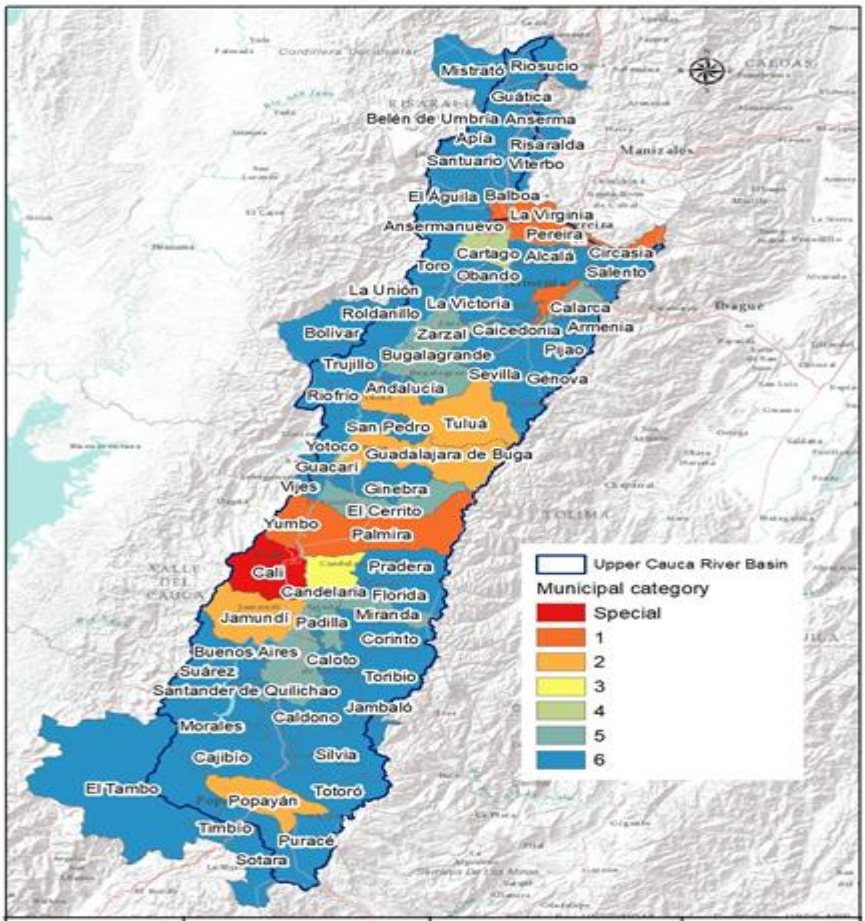


Figure 10. Population distribution of municipalities by quintiles in UCRB (IDEAM (2013); DANE (2018), elaborated by Colombian Collaboratory)

One-fifth of the municipalities represent 76 per cent of the total basin population (DANE, 2018). These conglomerates concentrate most of the UCRB's inhabitants, as well as the largest state investment

budgets in the territory. According to Colombian legislation (Laws 617 of 2000 and 1551 of 2012), the country's municipalities are classified in a hierarchy of 1 to 6, based on the number of inhabitants of the municipality, but mainly on its current income of free destination, and on a criterion called economic importance (Duque, 2017), as presented in the following Figure 11:



Municipal category	Inhabitants	Free destination income	Economic importance
Special	> 500.000	> 400.000	grade 1
1	100.001 - 500.000	100.000 - 400.000	grade 2
2	50.001 - 100.000	50.000 - 100.000	grade 3
3	30.001 - 50.000	30.000 - 50.000	grade 4
4	20.001 - 30.000	25.000 - 30.000	grade 5
5	10.001 - 20.000	15.000 - 25.000	grade 6
6	= < 10.000	= < 15.000	grade 7

Figure 11. Distribution of UCRB municipalities by category (IDEAM (2013), Duque (2017), DANE (2018), elaborated by Colombian Collaboratory)

In Figure11, the cluster structure by category resembles the quintiles by population. This shows that the financial resources for investments are concentrated in the largest cities of the basin, where projects tend to expand the cities' water supply.

Santiago de Cali, the only special category municipality in the UCRB, is one of many examples in Latin America where cities are transformed into insatiable water entities. Instead of curbing population growth given the critical conditions of water resources, they continue to rely on the creation of industries with high water consumption. This also has a significant impact on the contamination of water sources (Peña, 2013).

Although six rivers flow through the territory of Cali to discharge their waters into the UCRB, since the late 1980s, new sources have been sought to ensure the necessary water supply for the city's functioning. Some projects are oriented to expand the catchment to Pacific sources (the Dagua, Yurumanguí, San Juan, and Anchicayá rivers). Others are related to the Claro, Timba and Jamundí rivers, or deep wells on the left bank of the Cauca River (Pérez, Delgado and Torres, 2012). Projects to increase the flow availability of Cali have gained momentum, despite urban drinking water system losses being 16.89 m^3 per user (EMCALI, 2019). Cali, Bogotá and Medellín are the main contributors of chemicals discharges into Colombia's water systems, amounting to 918,670 tonnes per year (IDEAM, 2015).

There is a specific problem associated with the southern drainage area of Cali, which leads to polluting discharges into the Cauca River, four kilometres before the intake of the two main drinking-water treatment plants. This also causes cuts in service and has harmful effects downstream (CVC, 2016). This situation can be extrapolated to other municipalities, such as Jamundí or Pereira, which do not have wastewater treatment plants. However, the CVC has presented advanced feasibility studies of a project that would allow the expansion area of Cali and Jamundí to have "assured" drinking water until the year 2050 (CVC, 2019). According to the number of projected houses, the expansion area would be equivalent, by population, to the fifth-largest city of the UCRB (Armenia) (DAPM, 2018).

There is also an unequal distribution in terms of the drinking water quality in the UCRB. The Water Quality Risk Index (IRCA, Spanish acronym), presented in Figure 12, shows the percentage of samples with high-risk or unviable sanitary conditions in the year 2019 (red polygons). The municipalities with a low category and low population have a critical sample rate of more than 26.67 per cent, reaching 71.87 per cent in the case of Vijes.

The basin reflects an unequal distribution of drinking water quality. The large urban conglomerates present better IRCA; these areas have more inhabitants and greater fiscal capacity to invest in municipalities.

Industry

The UCRB contains many industrial enterprises. Figure 12 shows the municipalities that exceed the national average in terms of concentration of industries and number of people employed. Compared to the national level, the UCRB has 22 municipalities in this condition, of which Yumbo, Palmira and Caloto are in the top ten in Colombia (Donato and Haedo, 2019).

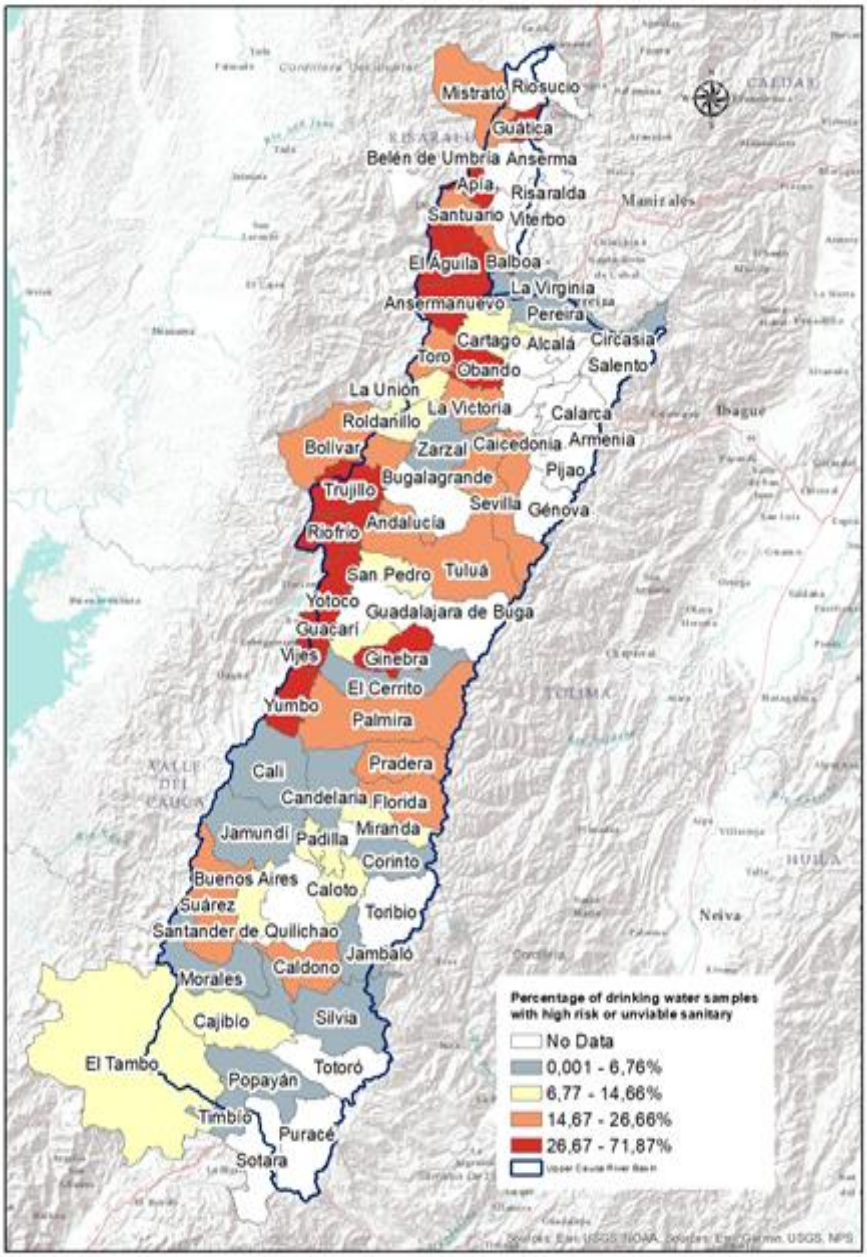


Figure 12. Criticality by municipality of the WQI in UCRB (IDEAM (2013); Elaborated by the Hub's Colombian Collaboratory)

Figure 13 identifies mainly two large industrial clusters: the south-central area of the Valle department, and the north of the Cauca department, around the municipality of Caloto. This is the influence zone of

the Paez law, which through Decree 780 of 13 March 2008 established the figure of a permanent free trade zone for companies favoured by this law. It entitles them to pay only 15 per cent income tax and complementary taxes for a period of 30 years (Donato and Haedo, 2019).

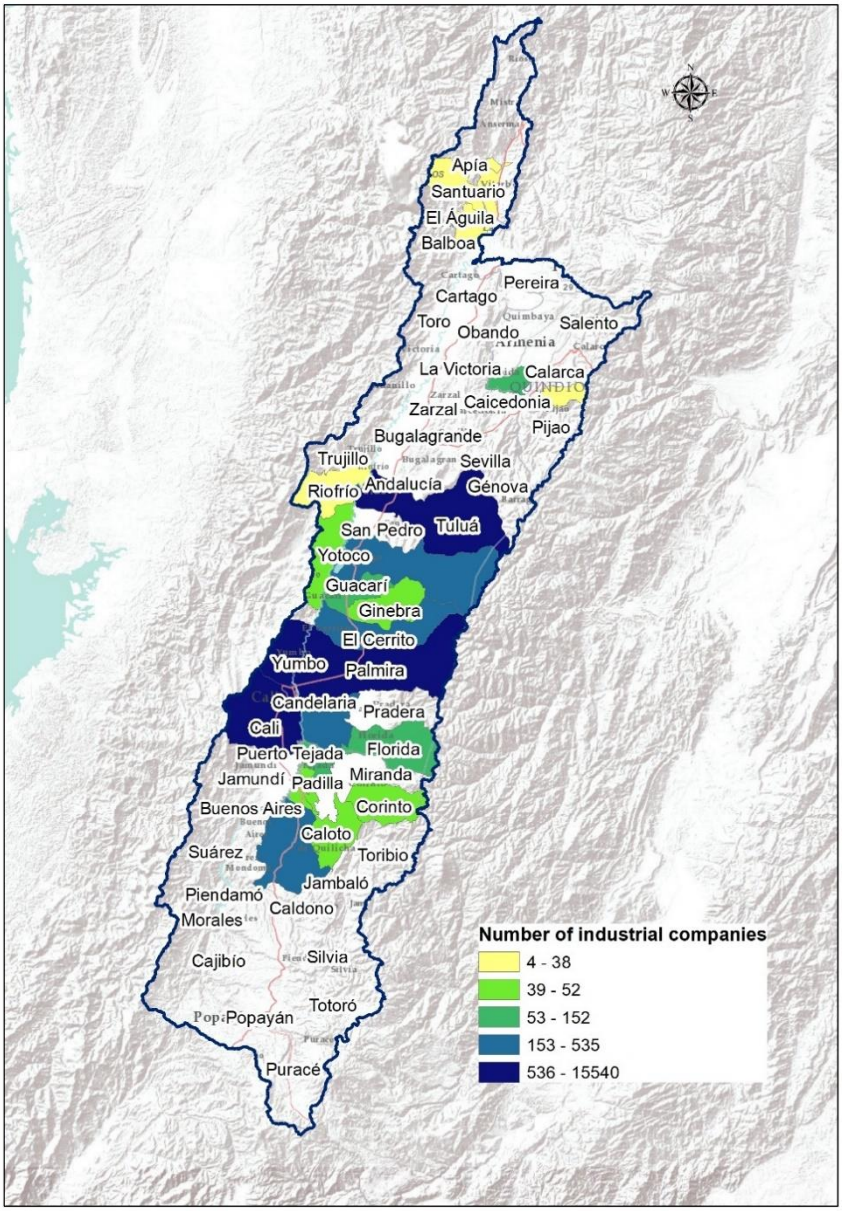


Figure 13. Location and concentration of industry in the UCRB (Donato and Haedo (2019), elaborated by Colombian Collaboratory)

The industrial activity of the UCRB encompass several economic sectors. Palmira, Yumbo, Cali, Puerto Tejada and Santander de Quilichao are among the top ten Colombian municipalities in paper production. Yotoco also has a similar ranking in the production of wood derivatives (except furniture). Pharmaceutical and botanical products are concentrated in Cali, Calarcá and Santander de Quilichao. Palmira also produces chemicals, and Caloto is representative of the food industry. Metals, rubber,

beverages, tobacco, and machinery manufacturing are produced in Yumbo; and Buga is leader in non-metallic minerals (Donato and Haedo, 2019).

Armed conflict and illegal economies

In the 1960s, a new type of armed movement emerged in Colombia, which broke away from the two-party struggle and proclaimed itself to be Marxist in orientation. In 1963, the National Liberation Army (ELN, Spanish acronym), and the Revolutionary Armed Forces of Colombia (FARC-EP, Spanish acronym) started their activities. The Popular Liberation Army (EPL, Spanish acronym) was created in 1964, and the 19th of April Movement (M-19, Spanish acronym) emerged from a dissidence of the FARC in 1973.

The area which connects the northern Cauca and the southern Valle with Tolima and Huila departments was the scene of the first FARC-EP demonstration. The next front was located in the mountainous area of the municipalities of Suárez and Buenos Aires (Western Range), because of its connection to the Naya River, as it allows access to the Colombian Pacific (Ante, 2020). The Garrapatas Canyon in the Western Cordillera was another zone of armed actors' disputes, because it facilitates the connection to the San Juan River and thus ensures an exit to the Pacific (CNMH, 2013).

Additionally, new armed actors appeared in the 1970s: cocaine traffickers. Salazar, Ciacedo and Vanegas (2021) argue that drug traffickers began their activities in the 1970s and expanded during the 1980s in the northern area of Valle department. Their top leaders were Orlando Henao, Iván Urdinola, Diego Montoya (called 'Don Diego') and Henry Loaiza (called 'El Alacrán'). They amassed their fortune by importing coca paste from Bolivia, Peru, Putumayo and Caquetá, smuggling it out with the support of the Mexican cartels of Tijuana and Sinaloa.

The traffickers made large fortunes that allowed them to undertake land purchases. According to Alejandro Reyes (2009), between 1980 and 1995, the largest such purchase took place in Valle del Cauca. The National Centre of Historical Memory (CNMH, Spanish acronym) (2014) reports that "In Toro, the expansion of the cattle frontier in the hillside area led to the disappearance of one small village, La Chica. All its plots were converted into a single cattle ranch". In Restrepo, Valle, some 800 hectares were converted into pastures, which affected water sources.

A series of violent deaths occurred between 1988 and 1994 in Trujillo, Bolívar and Riofrío (northern Valle). This was called the "Continuous Massacre" (CNMH, 2008) by relatives and humanitarian organisations, because of an estimated 342 victims. An article in *Periódico El Tiempo* (1991) described the Cauca River as "a grave"; it reported that of the 213 undocumented people found dead in the Cali metropolitan area, around 80 were found floating in the river. They were generally found in El

Hormiguero, Navarro and Juanchito, as well as in the pumping stations of the Floralia neighbourhood, and in a paper company in Yumbo. Some of these dead bodies came from localities in Cauca, such as Santander de Quilichao and Puerto Tejada. Other areas where the river yielded corpses were rural areas of Tulúa, Riofrío, Zarzal, Obando and Cartago, la Virginia (El Arenal), and the small village of Beltrán (Marsella) in Risaralda. Marsella's fire brigade retrieved the largest number of corpses in the Beltrán area, during the period of fighting between the Cali and the Medellín cartels (1982–1992). There are 327 unidentified bodies in the cemetery of this municipality.

In addition to the northern Valle, another area of the UCRB had a strong drug trafficking presence: Cali, where the so-called Cali Cartel was formed. From the mid-1970s, it dominated the cocaine market in New York, while the Medellín Cartel dominated the Miami and Los Angeles markets (El País, 1988). According to Betancourt (1998), the drug trafficking mafias created a close relationship with politicians because "*... as a result of their access to strategic information, politicians can guarantee to these organisations information on operations, judicial impunity, and laws that favour their activities. The mafia bosses, in exchange, can offer money or aid in kind for their campaigns*".

The war between the Cali and Medellín Cartels kept these two cities in a situation of extreme violence from the mid-1980s until the death of Pablo Escobar in 1993. Subsequently, the Rodríguez brothers were captured by the Colombian justice system in 1995. They were extradited to the United States in 2004, where they are still serving their sentences. Meanwhile, drug traffickers of northern Valle took over the space left by the Cali Cartel. It is said that these gangs left more than 1,000 dead in the Valle. However, the situation in the area worsened with the arrival of the United Self-Defence Forces of Colombia (AUC, Spanish acronym) in Valle del Cauca at the end of July 1999.

After committing various massacres in the centre of Valle, in 2000 a paramilitary group marched to Buenaventura, and others to Timba (Jamundí) and Buenos Aires (Cauca). They settled in the Timba farms, and from there they carried out military operations in the municipalities of Santander de Quilichao, Suárez, Caloto and Puerto Tejada. According to the CNMH (2018), in 2002 the Calima Bloc was present in almost all the municipalities of the UCRB.

María Teresa Ronderos (2015) comments that the paramilitaries hated communism, but also the national oligarchies. They massacred the civilian population, yet also carried out social work. Isabel Bolaños, who was a leader of the Self-Defence Forces, told Patricia Lara (2020) that as part of the social team of the Self-Defence Forces, "*I was involved in the construction of roads, schools, dams for electrification, health centres, bridges, recreation sites*" (p. 182). However, they also dispossessed peasants of their land, to keep it for themselves or to clear corridors for drug trafficking.

The AUC demobilisation process began in 2003 and ended in 2006. According to the CNMH (2018), the Calima Bloc demobilised on 18 December 2004 in the village of Galicia, Bugalagrande (Valle del Cauca): 564 people (24 women and 540 men) laid down their arms, and handed over 27 children under 18 years of age to the Colombian Institute of Family Welfare (ICBF, Spanish acronym).

The demobilisation of 38 fronts operating in the country created the false impression that paramilitarism in Colombia had disappeared. As a result, since 2006, especially in state circles, the term 'criminal gangs' (*bacrim*) has been used to designate those who engage in illicit activities, such as trafficking drugs, arms, fuel, people, as well as money laundering and kidnapping. However, as shown in Figure 14, the presence of all types of armed groups was registered in the UCRB in the year 2012.

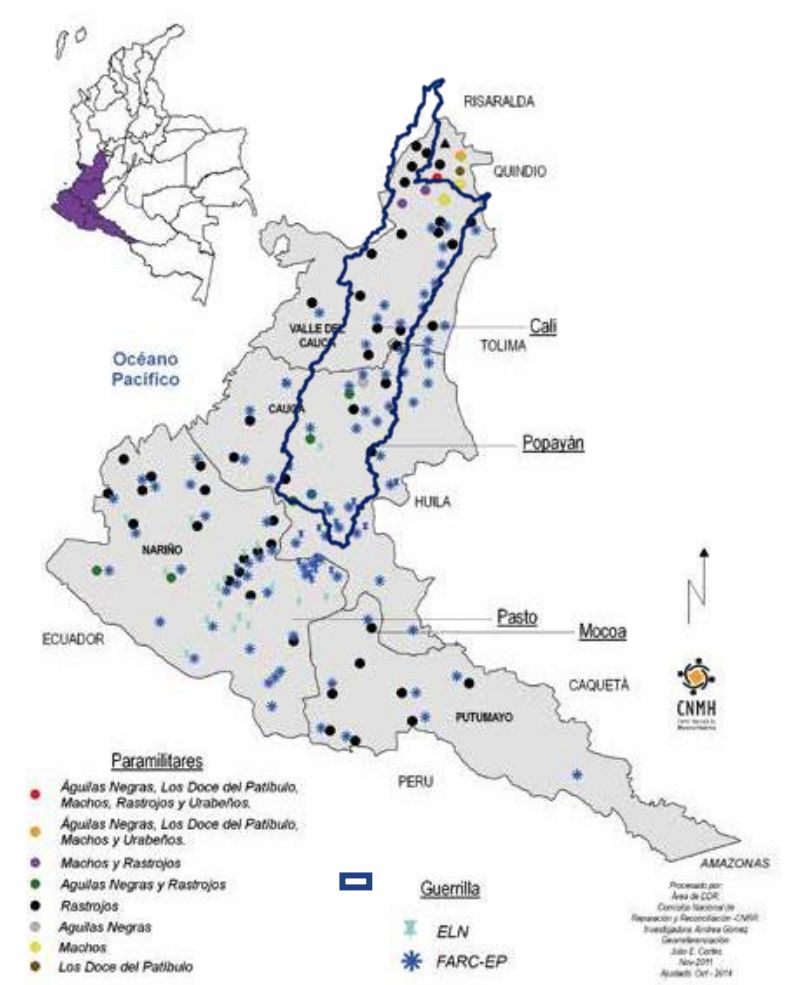


Figure 14. Presence of paramilitary groups, BACRIM and guerrillas: Southwest region of Colombia (2011) (National Centre of Historic Memory (2014), elaborated by Colombian Collaboratory)

The "Final Agreement to End the Armed Conflict and Build a Stable and Lasting Peace" was signed between the national government and the FARC-EP in 2016. However, in the UCRB, some paramilitary groups and dissidents of this guerrilla group have been reactivated; this has led to the assassination of

social leaders, as well as the reactivation of illegal activities in the territory (for a detailed analysis, see Figueroa-Benitez et al., 2023).

Mining

Social conflicts have been strongly linked to issues of access, control, and use of natural resources; especially soil, water, and minerals such as gold. There are three main ways in which mining activity contributes to water pollution: one is through mining waste that contains high concentrations of sulphides; this generates acidity when is exposed to the air. The second cause is the addition of elements such as cyanide, mercury and chromium, which are highly polluting; and the third is due to blasting (Contraloria General de la República de Colombia, 2013). The combination of the three generates the dissolution of toxic chemicals that are spread in water flows, groundwater and soil. The transformation and extraction of minerals in large volumes release pollutants, which give rise to geochemical processes. They can persist over thousands of years, producing a negative transgenerational environmental impact (Sentencia T 445 de Agosto del 2016, 2019).

The water footprint of mining is enormous. For instance, 530 to 1,060 litres of water are required per gram of extracted gold. The consumption of water far exceeds other basic food products; for instance, 17,000 m^3 of water per day is needed for spraying and loading coal. Based on the 70 to 80 litres of water per day consumed by an average inhabitant, it would be possible to supply two million people with the water consumed by coal (Sentence T445 of August 2016, 2019).

The Office of the Attorney General of the Republic of Colombia (2013) reported that pollution from both illegal and legal mining poses a risk to food sovereignty, and the environmental health of citizens, particularly marginalised communities with precarious economic incomes. The damage to ecosystems itself represents a huge environmental liability in terms of the provisioning of habitats and ecological niches, and the loss of water supply for the country's growing populations.

The extractivist economy is characterised, among other activities, by mining and logging megaprojects. These directly affect the indigenous, peasant and Afro-descendant peoples of the UCRB and their access to ecosystems, especially water. As shown in Figure 15, mining titles have been granted or are being applied for in many of the territories of black communities and indigenous reservations. This situation has sparked internal and external conflicts between communities and mining companies. There are also armed groups that pressure them to carry out mining megaprojects or illegal mining, which has caused constant violence (Sentence T445 de August del 2016, 2019; Defensoría del Pueblo, 2015).

Concerning mining, it has been reported that a percentage of mining is financed by and finances illegal groups, who use it to launder money from illicit-use crops, extortion, and land dispossession. In the mining area, the population has been threatened by gangs such as the Águilas Negras and Los Rastrojo. For example, an armed man killed six miners on the banks of the Ovejas River in 2010 (Defensoría del Pueblo, 2015).

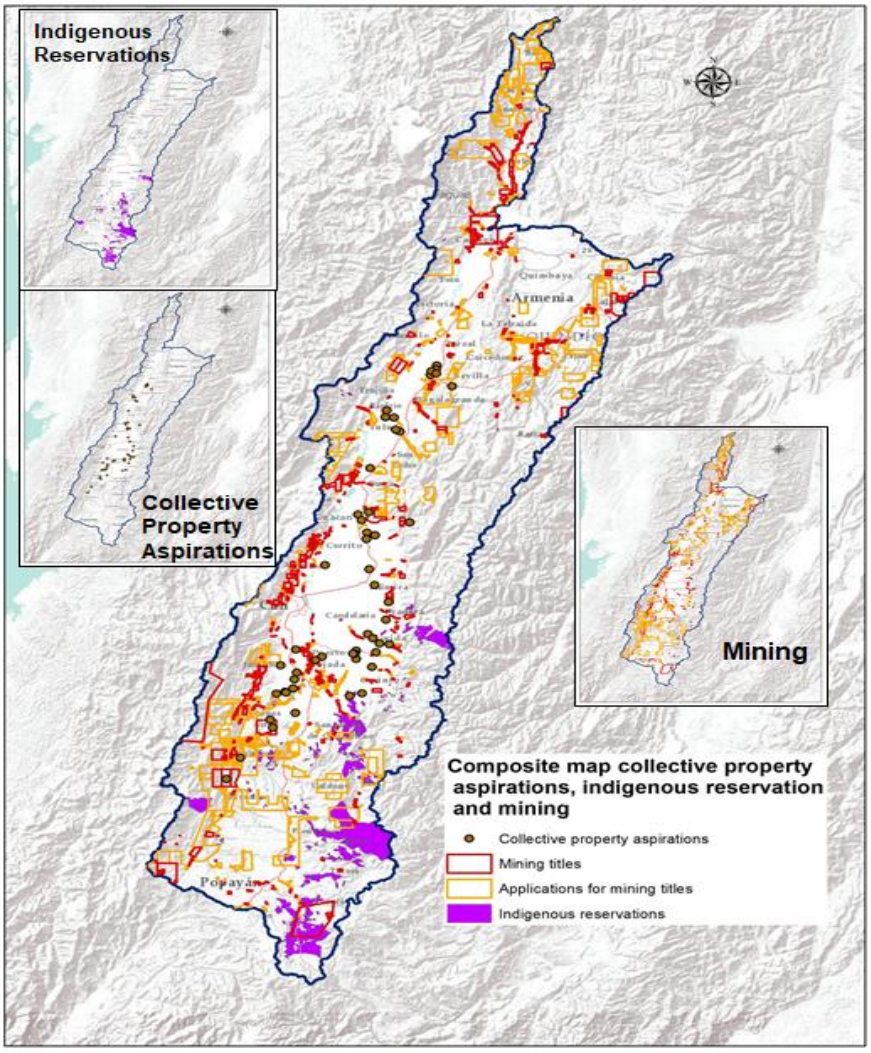


Figure 15. Contrast among mining activity, indigenous reservations, and aspirations for collective titling (Etnoterritorios (2021); Tierra Minada (2018), elaborated by Colombian Collaboratory)

Local and regional realities: Hidden aspects in the aggregated statistics of the UCRB

In the social–ecological dynamics of the UCRB, some activities generate great environmental impact in certain areas; however, they are hidden in macro-level analyses. An example of this situation is the illicit cultivation of marijuana in municipalities such as Corinto (Cauca). The cultivated area includes part of the municipalities of Caldono, Piendamó and Mondomo (Santander de Quilichao). Another case of

negative environmental impact at a local level is the small agro-industry of cassava starch extraction, which has been established in Mondomo over many years.

Corinto (Cauca) is one of the 15 PDET[13] municipalities in the UCRB (13 in Cauca Department and two in Valle). Marijuana crops for illegal and legal use are planted in the highlands of Corinto's mountains. The poorer population plant marijuana because it is easier to produce and more profitable. Plantations cover large areas, which negatively impacts the ecosystems, and also has negative social consequences. Nevertheless, this is one of the most important sources of economic income in the area.

The Corinto's marijuana-growing population have not been involved in the elaboration of the PDET. This programme has left most of the population without a contextualised crop substitution programme, because the prioritisation maps of this subregion were based on satellite surveys, and the visible regional crop was not marijuana but coca.

Regarding the cassava processing plants, they are located in the municipalities of Caldono, Piendamó and Mondomo (Santander de Quilichao). They have a positive impact on the local population, because they are practically the only ones that generate income through formal employment. However, they also have a negative impact on the water sources of the territory, due to their discharges with high levels of organic matter and cyanide. The harm to aquatic ecosystems also generates social damage. The negative effects not only depend on the producers, but also result from the lack of effective technical and state support. At the local level, the polluting effect of this agro-industry is high. However, when the UCRB's contamination is analysed, this industry does not seem to be considered.

Conclusions and the way forward

The term 'water security' was introduced to Colombia by NGOs that develop water protection and conservation processes with funding from international organisations. Nevertheless, most of the policy documents related to water do not mention it. However, nowadays there is a recurrent use of WS in oral discourses by private and public staff. At a community level, through the association of words, they identify WS as meaning the guaranteed supply of water for different uses, the conservation of basins, and ensuring water for other forms of life.

[13] The Development Programme with a Territorial Approach (PDET) has its origin in the point one (the Integral Rural Reform) of the Final Peace Agreement signed between the FARC-EP and the Colombian government in 2016. The programme is projected to last for ten years and includes 170 municipalities across the country, which were prioritised as the territories most affected by the armed conflict, with the highest rates of poverty, presence of illicit economies and government weakness (Garcia, 2020).

The implemented strategies for WS are similar to those proposed by the integrated water resource management approach; therefore, it could be said that they are interchangeable or overlapping terms. The main WS strategy is related to the generation of multi-stakeholder partnerships; this reinforces the idea of water governance as the involvement of various actors in decision-making processes.

A series of engagement processes have been generated between different types of actors, in order to achieve WS in Colombia. However, amongst these instances, the Basin Councils are the only ones who contemplate the participation of ethnic groups and the peasant population. This evidences the power asymmetries between the actors that are settled in the basin. Community organisations at the second level have also emerged, but they are not part of the institutional arena. As they are seeking to influence the governance of their territory, it is relevant to promote the participation of community organisations, and to strengthen their empowerment process in the UCRB.

The UCRB presents serious socio-ecological problems that lead to social conflicts over access, use and control of natural systems, especially water. This has increased poverty belts, social inequality, exclusion, and environmental racism, which are rife throughout the UCRB. The UCRB is also affected by processes such as: land and water grabbing, encouraged by the sugar cane monocrop; both legal and illegal mining; the water demand of the most populated urban centres; illicit crops; and the agro-industrial and industrial transformations of the ecosystem. All of these activities not only cause severe pollution; they also exacerbate social problems due to insufficient socio-environmental resilience. Moreover, they lead to the loss of food sovereignty and environmental health of the communities settled along the UCRB.

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ETHIOPIA

Critical Water Governance in the Central Rift Valley[14]

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Introduction

The CRV is one of the sub-basins of the Rift Valley Basin in Ethiopia, which is part of the Greater East African Rift System (Figure 16). It is situated in central Ethiopia, located between 7°00'–8°30'N and 38°00'–39°30'E, and shared by the Oromia Region and the Southern Nations, Nationalities, and Peoples' Region (SNNPR). With a total area of about one million hectares (10,000 km2), the sub-basin covers five administrative zones and 30 woredas (in Ethiopia, woreda, an equivalent to district, is the second-smallest administrative unit) in these two regional states. The CRV encompasses four large lakes: Lake Ziway, Lake Abijata (Abiyata), Lake Langano, and Lake Shalla. It also has rivers such as the Bulbula, Meki, and Katar. The lakes are fed by interconnected streams flowing from the western and eastern escarpments. The Central Rift Valley plays a vital role in the country's social, economic, and ecological systems. Furthermore, the diverse topographical conditions of the basin, with elevations ranging from about 1550 to 4200 m above sea level (masl), give rise to diverse ecosystems and biomes, including the lake ecosystems, lowlands dominated by acacia species, a mid-altitude tropical montane forest belt, and sub-afro-alpine and afro-alpine belts, all of which give rise to the occurrence of several agro-climatic belts. It, therefore, hosts unique flora and fauna biodiversity. In particular, it is recognized worldwide for its diversity of bird species (Sherefa, 2006).

The dominant livelihood system in the CRV basin is mixed agriculture (crop and livestock production). Historically, lowlanders were pastoralists (now mixed farmers), whereas the mid- and highlanders practice mixed rain-fed agriculture. In recent years, irrigation-based agricultural production systems, including commercial horticulture (flowers, fruits, and vegetables) production, small-scale vegetable

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farming, extensive irrigated cereal crop farming, and various industries (agro-industries, soda-ash manufacturing, wineries, etc.) flourished in the area. According to the data gathered from the respective woredas, the total population of the basin in 2021 is estimated at 3.2 million, with the highlands being more densely populated relative to the lowlands. The area is predominantly inhabited by the Oromo, Siltie, Guraghe, and other ethnic groups in the basin.

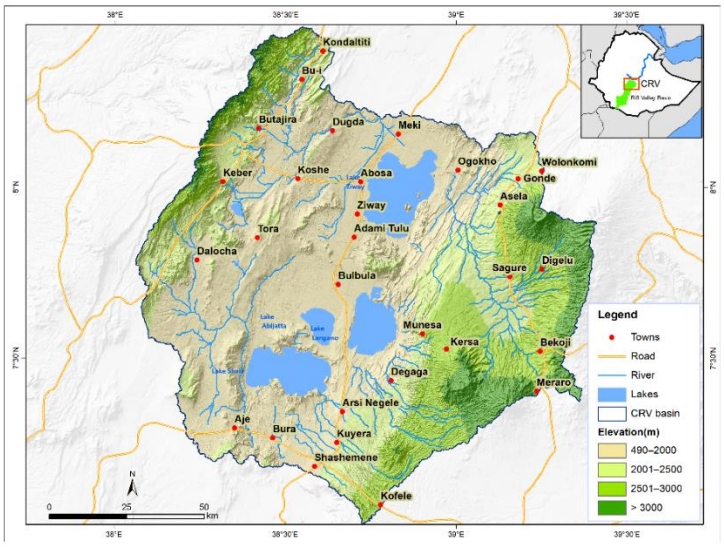

Figure 16. Location map of the Central Rift Valley sub-basin, Ethiopia

The CRV's inherently diverse geography and dynamic socio-cultural-political settings have driven the evolution of diverse water governance arrangements and reorganizations over the past several decades. The related features of the socio-ecological context—as reflected in the policy provisions, legal and regulatory frameworks, norms, institutional arrangements, power distributions, and complex networks and interactions of stakeholders—provide the basis for giving insights into water resource governance systems. The insights derived from the analysis of the elements and processes of the governance system can, in turn, be used to illustrate a range of narratives and discourses, which are then employed to assess the system's performance.

Competing discourses

Discourses and narratives are types of social practices in which various actors exercise their power to serve their interests. Actors may construct and employ discourses in an attempt to make or influence policy options. Such discourses may represent, construct, and transform the social reality of water. Accounts of reality inherently reflect certain dominant discourses and the power dynamics that maintain those discourses (Fairclough, 1992). Having such political dynamics at its center, this research adopts political economy and political ecology theories to frame the narratives, discourses, and debates on water/natural resource governance.

The political economy and political ecology theoretical frameworks were used to comprehend various environmental and economic issues as viewed by different political systems and ideologies. According

to Swyngedouw, political economic and political ecological perspectives on water suggest a close correlation between the management of water, including transformations of water in its hydrological cycle at multiple spatial and temporal scales and levels, and the intricate relationships of social, political, economic, and cultural powers (Swyngedouw, 2009). Scholars categorize non-human nature as a space of political significance that emerges from competitions among various social actors with political power asymmetries to secure access to and control over natural resources (Mathis and Rose, 2016; Vaccaro et al., 2013; Bryant and Bailey, 1997). The existence of power asymmetries between different actors influences the distribution of, access to, and control over vital natural resources such as water and land. Political ecology arguments revolve around actors' identification, their power relations, and the institutions governing access to and control over resources—in the case of this study, water resources. In other words, the study explores who has control over the resource, who the key actors are, who has more power and influence, and who are losers in terms of benefit-sharing. Discourses and narratives also vary due to the disciplinary backgrounds and experiences of discourse/narrative holders.

To frame these narratives, we did the following: (a) reviewed relevant literature accessed by an internet search using keywords including water resource management, water governance, water development, land degradation, water scarcity, and competition, in CRV; (b) reviewed policy documents on water, irrigation, agriculture, water users and cooperatives, and related sectors that were enacted and implemented by the successive governments of Ethiopia, including the present one (see Appendix A for policy and laws reviewed); (c) conducted intensive fieldwork and held 15 focus group discussions (FGDs) and 28 key informant interviews (KIIs) with water users (community elders, youth, and women), various experts, and officials; and (d) made extensive observations at the basin on three separate occasions in 2021 and 2022. The FGDs and interviews were focused on the nature of water uses, irrigation practices, types of local water users, actors' identifications and their power relationships, and resource scarcity and competition. Substantial secondary data on different aspects of water use and governance were also collected from thirty woredas in the CRV sub-region.

Typologies of Discourses and Narratives that Prevailed in the CRV Since the 1960s

There are dominant discourses and narratives of water resource management identified as having prevailed in Ethiopia in general and the CRV in particular since the late 1950s (see Figure 17 and Table 1). The late 1950s are considered the beginning of the water discourse, as that was when major hydrological resource potential studies commenced in the country during the periods of the First Five-year National Development Plan (1957–1961) and its successor, the Second Five-year National Development Plan (1962–1967). The types and arrangements of the water governance discourse and narratives are presented here along with the ideologies and the political economic policies adopted by

successive Ethiopian governments. Those are the Free-market Economic Policy of the Imperial Government (before 1974), the Command (socialist) Economic Policy of the *Derg (Derg*—is the provisional Military Council that deposed the Emperor Hailieslassies's regime in 1974 through the popular revolution and changed the imperial government's ideology to socialist ideology which reign from 1974–1991), and the Free-market-oriented but mixed economic policies since 1991. In each of these three periods, successive governments adopted specific national plans. The discourses and narratives on natural resource management in general and water resource management in particular were closely related to those ideologies and the accompanied national policies and plans.

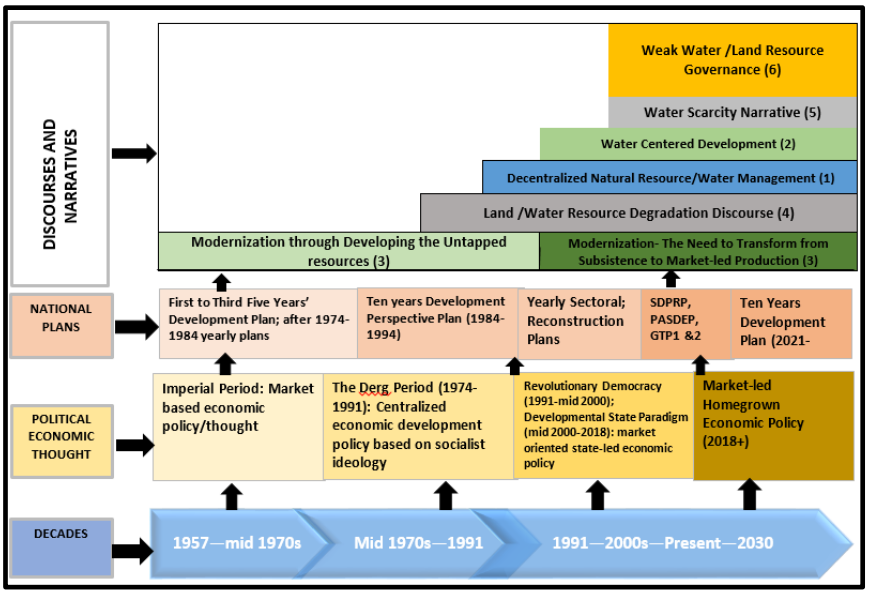

Figure 17. Timeline of water resource management discourses and narratives in Ethiopia (which are shaped by different political and economic systems of the period. Note: NR—Natural Resource; SDPRP—The Sustainable Development and Poverty Reduction Program (2002/03–2004/05); PASADEP—Plan for Accelerated and Sustained Development to End Poverty (2005/06–2009/10); GTP 1—Growth and Transformation Plan 1 (2010/11–20015/16); and GTP 2—Growth and Transformation Plan 2 (2015/16–2019/20). The color is to show the different discourses and their emphasis over time. The numbers in the bracket indicate the major discourses discussed in the preceding sub-sections).

The political ideology of the Imperial regime was semi-feudal and semi-capitalistic in nature. The dominant economic development policies at the time were free market economic policies where the private sector had a dominant space in economic life. In the latter half of this period, the government developed three successive five-year development plans (FYDPs) to guide the economic development path, including water resource management, starting in 1957 (see Appendix A). As a result, the institutions, including policies and laws, were favoring the construction of hydropower dams, and irrigation-based private commercial agriculture came into the picture. The major objective of irrigation

agriculture during that period was to produce highly needed sugar from sugarcane plantations and horticultural crops for the growing urban population and other products, such as cotton and tobacco, to supply raw materials for agro-industries. For example, the Dutch HVA Sugarcane Plantation Estate was established in the 1950s for sugar processing in the Wonji-Shoa and Methara areas; the upper Awash Agro-industry was established in the early 1970s for cotton, tobacco, and horticultural crop production; the Cotton Plantation was set up in the Middle Awash in 1960; Meki-Ziway Irrigation was established in CRV in 1967 (first as a dairy farm and then as horticultural farms); and Melak Sedi-Amibara Irrigation for cotton and banana plantations in 1971 (Girma and Awulachew, 2007). The major discourse of the period, therefore, revolved around how to use natural resources to modernize the country, fulfill the demands of the urban population, and supply raw materials for the infant agro-industries. Hence, this discourse has ensued to attract investors in the field and thereby provide preference for such modern agriculture, and there were a few questions of competition on water resource use.

During the period from mid-1974 to 1991, the *Derg* followed a socialist ideology. Consequently, the country adopted central planning principles, and hence the role of the private sector in the economy heavily declined. The private irrigation schemes were nationalized by the government, which also established new schemes. The government made efforts to explore the existing water potential in the country through various studies and to use the resources for national growth, i.e., to be self-sufficient in food, produce raw materials for agro-industries, and export for foreign earnings. The dominant discourse in that period was still modernization by investing in natural resource development, but only through public investment.

In this decade, drought and its impact forced the policymakers to invest in irrigation schemes in areas such as the Central Rift Valley basin, where surface water is readily available for development. In addition, the government, for the first time, identified land degradation as a major development challenge (a threat to survival) and embarked on campaigns for the natural resource conservation movement to curb land degradation with a motto of wisely using natural resources. Domestic water supply to urban and rural residents was also on the agenda of the government to satisfy the basic needs of the people based on the socialist principle of equitable distribution of benefits. In addition, fishery development in the CRV's fresh lakes is recognized as an important economic development component. Hence, modernization on the one hand and curbing land degradation on the other were the two major discourses around natural resources/water resources. Equitable economic development was also the goal of the regime.

Since 1991, major political economy ideas shifted from centralized economic development to liberal market-oriented. However, they were substantially led by state and parastatal institutions with a philosophy of "developmental state" principles. In this era, radical and dynamic changes have taken place. The main ones are: (a) a shift in government administrative structure from a "unitary" to a "federal" system; and (b) a shift from centralized economic policy to market-oriented policy. To affect these two major shifts, the government adopted several policy reforms in economic policy to attract the private sector. As a result, large- and small-scale commercial irrigation-based farms, agro-industries, lake-side resorts, and lodges were tremendously expanded in the CRV areas. This policy shift, coupled with the proximity of the CRV to major urban centers of the country, including Addis Ababa, and their accessibility to transport infrastructure (road and rail linking Addis Ababa and the Djibouti Port and air transport), attracted a large number of actors. The population size and urbanization also expanded in this period.

All these political, administrative, economic, and environmental changes attracted several actors into the basin, with several interests and competitions, leading to the abstraction of large volumes of water per year and other challenges. In parallel, these new developments led to the mushrooming of several discourses and narratives on water resource use in the basin. The dominant discourses include decentralization, water-centered development, market-led water resource development, water scarcity, land/water degradation, competition over water resource use, and weak water governance (please refer to Table 1).

The Decentralized Resource Development Discourse/Narrative

One of the main discourses shaping water governance and policies in Ethiopia is the decentralization discourse. Agrawal and Ostrom observe that "decentralization has emerged as a major strategy for many nation-states to achieve development goals, provide public services, and undertake environmental conservation" (Agrawal and Ostrom, 2001: 485). Proponents of decentralization argue that, unlike a centralized system, decentralized governance redistributes power, authority, resources, and accountability to lower levels of authority. It is a system of decision-making or a framework for participatory resource and political management at a regional level of administration (Ayenew, 2002; Khan, 2013; Kefale, 2014).

In Ethiopia, decentralized resource governance and development formally appeared in the post-1991 government with a set of policies that comprehend fiscal, political, and administrative changes following the 1995 Constitution (FDRE, 1995). The ideological justifications for choosing decentralization as a governance structure by the then Ethiopian People's Revolutionary Front (EPRDF)-

led government in 1991 include: a strong desire to achieve enhanced public participation through decentralized governance to break the poverty cycle in the country; empowering local communities; achieving consensual decision-making, equity, representation, accountability, and responsiveness; and serving as a means of preventing and containing ethnic conflicts and accommodating diversity (Zemelak, 2008).

Table 1. The identified discourses, narratives, and debates on water governance in Ethiopia (1990s to the present).

Discourse/ Narrative	Owner or Subscriber of the Narrative/ Discourse	Administrative Level of Concern of the Narrative/Discourse (Local to Global)	Implication for Water Governance
The decentralized water resource development narrative (1)	The ruling party, Ministry of Water and Energy (MoWE), and different regional states and their subordinate structures as well as respective political parties.	National, regional, zonal, woreda and *kebele* (*Kebele* is the lowest administrative unit) levels.	, Encourages community participation in water governance and promotes equity in distribution and management of water resources.
Water-centered development discourse (2)	MoWE, Ministry of Agriculture (MoA); Irrigation Agencies; Cooperatives, Water Users Associations (WUAs), and farmers who use irrigation.	The government at national and regional levels, as well as the diverse water users.	This discourse is brought about by the alarming national food insecurity issues, and, hence, the awareness that the rising demand for food cannot be met by rain-fed agriculture alone.
Modernization/market-led development discourse: Transition from subsistence to market-based water resource development (3)	MoWE, MoA, and offices at zonal and woreda levels; NGOs, and local-level water users (individuals and cooperatives).	From local, regional, national, and global levels to ensure food security and sustainable development in the country.	This transition requires huge quantities of water and has implications for water security.
Land/water resources degradation and climate change discourse (4)	MoA, MoWE, Environment, Forest, and Climate Change (EFCC), researchers, academicians, and local-level resource users (water).	From global to local level.	It has direct impact on water security since the aggravated environmental degradation negatively affects the present and future water security.
The water scarcity narrative (The Aral Sea syndrome in CRV) (5)	Mainly principal water users including local residents, irrigation, or water users' associations, industries/companies (flower farms, agro-industries, and other factories), livestock owners/farmers, and researchers.	The water scarcity problems are the concern of the local, regional, and national experts on water resource management.	The implications of water scarcity narratives to water security are direct, since when water scarcity intensifies, the water security problem at various levels will be aggravated.
Week water resource management institutions	Policymakers, practitioners, researchers/academicians, and local-level water users.	This narrative is the concern of all, including policymakers.	It argues that water insecurity and water crisis are the direct outcome of weak institutions and governance problems.

The 1995 Constitution is the bedrock for the new federal government arrangement and the process of decentralized natural resource management. Among the major provisions of the Constitution pertaining to decentralized natural resource management are: Article 40/3, which states "the right to ownership of rural and urban land, as well as of all natural resources, is exclusively vested in the State and in the peoples of Ethiopia…."; Article 51/11, on the powers and functions of the Federal Government regarding water resource management, stipulates "it shall determine and administer the utilization of the waters or rivers and lakes linking two or more States or crossing the boundaries of the national territorial jurisdiction"; and Article 52/2, which gives Regional States the power to "administer land and other natural resources in accordance with Federal laws". To ensure these provisions, particularly for managing water resources, the federal government and regional states established the Ministry of Water and Bureaus of Water, respectively. Furthermore, in accordance with the Constitution, the Federal Government issued a Water Resources Management Policy and Strategy in 1999 and 2000, respectively (MoWR, 2000) and several related laws (Proclamation no. 197/2000 on water resource management; Regulation No. 117/2005 on water resource utilization including permit and fee; Proclamation No. 534/2007 on the establishment of the River Basin High Council and River Basin Authorities; Regulation No. 253/2011 on the establishment of the Rift Valley Lakes Basin High Council and Authority; and Regulation No. 441/2018 on the establishment of the Basin Development Authority), while regional states set out the duties and responsibilities of the water bureaus.

Researchers (Mersha et al., 2016; Mersha, 2021; Ludi et al., 2013; Hailu et al., 2018), however, argue that although reforms for decentralization aim to increase the effectiveness of water sector activities, the government would not keep its promises when confronted with political, socio-economic, and legal contexts from different actors in the country. An analysis of the legal framework concerning water resources use and management reveals that existing laws lack sufficient clarity in terms of assigning mandates and responsibilities based on the administrative regional states and river (lakes) basins. The problem stems from interpreting the constitutional decree of Articles 51/11 and 52/2d, which place jurisdictional boundaries on the responsibility to administer and utilize the waters of rivers and lakes. Explicitly stated, Article 51/11 gives responsibility to the federal government for managing and administering water resources that link two or more regions and transboundary water resources (lakes and rivers), while Article 52/2d makes regional states responsible for water resources that are found within the geographical jurisdiction of those states. However, because water resources are functionally and physically linked, any activity upstream affects the downstream water resources (including the runoffs or tributary stream). Hence, dividing the water management activities using political/administrative boundaries, in general, is contrary to the principles of IWRM and basin development, both of which are pillars of Ethiopian water resource policy. Furthermore, the

subsequent laws enacted by the federal legislature and council of ministers have shown that mandates overlap the laws of regional states (e.g., Proclamation no. 197/2000 and Regulation no. 117/2005). One area of mandate overlaps concerns water permits. In this regard, the focus group discussion (FGD) and survey data of this study reveal that both the Rift Valley Lakes Basin Office and the two regions' water bureaus are granting water use permits for different sectors. For example, for large-scale irrigation (>3000 ha) and industries, the Basin Office and the Regional Government Investment Offices and other sector offices are involved in giving permits, while for small-scale irrigation (<200 ha) in both the Oromia and SNNP regions, zonal and woreda administrations and allied sector offices are granting permits (Key Informant Interview with the then Rift Valley Basin Development Authority and survey results, 2021). Hence, investors, developers, or anyone requesting permits must first find out which of the various departments will grant them a permit, which might prove difficult and could hinder transparency and accountability between those departments.

The effectiveness of decentralization can also be judged from the capacities of water management offices in their respective administrative tiers (in terms of budgetary allocation and management, technologies used, managerial capacities, operations, and maintenance of water infrastructure), where they are to be found ill-equipped in all aspects. Furthermore, field observations and the results of previous studies have identified serious weaknesses in these capacities (Hailu et al., 2018).

Water-Centred Development Discourse and Narrative

Another key discourse is associated with the grand narrative that Ethiopia has rich water resources. This narrative encourages putting water at the heart of development policies and economic modernization plans. Several researchers contend that although Ethiopia is rich in water resources (both blue and green), endowed with fertile soil, and has huge areas of agricultural land, it does not meet its food security (Cochrane, 2018; Berhanu et al., 2014; Awulachew, 2010). One plausible reason for Ethiopia's failure to achieve food security is the inefficient and insufficient utilization of its natural resources, particularly water resources. Since the 1950s, Ethiopia has had a vigorous interest in developing its water resources, as clearly stated in the three five-year economic development plans from 1957–1973 (during the Imperial period), the ten-year Perspective Plan of the period from 1984 to 1994 (during the socialist *Derg* period), the successive annual and five-year Growth and Transformation Plans from 1995–2021, and now the ten-year Perspective Development Plan for the period 2021–2030.

In these plans, the progression of water resources for agriculture, fisheries, energy generation, livestock, tourism, and enhancing the domestic water supply were aimed at propelling the growth of the country and advocating water-centered development. In this regard, planned modern irrigation

agriculture in the CRV started in the 1950s during the Imperial regime. Regarding overall CRV development, the Third Five-Year Development Plan (1968) remarks the following:

"Because of fairly rapid recent development in the Rift Valley lakes a systematic inventory of the land and water resources of the area will be undertaken early in the plan period to enable national land use planning. Such planning is urgently needed, in particular as it appears that some land uses may be competitive, such as lakeshore tourism, lakeshore agriculture, and the conservation of wildlife" (GoE, 1968: 113–114).

The 1984–1994 Ten-Year National Plan made clear its objective to transform the economy, along socialist lines of development: "The plan has set itself the lofty and difficult task of propelling Ethiopia out of the abyss of economic backwardness by enunciating appropriate development objectives and by creating favourable conditions for their realization" (GoE, 1984: 14), and "its broad goals are the structural transformation of the economy through the development of the country's productive forces and raising the living standard of the population" (p. 18). In the water sector, the plan was to use medium- and large-scale irrigation projects to develop 126,000 hectares of land, establish 1900 meteorological and 557 hydrological stations for improving the monitoring and investigation of the country's hydrological resources, and reach 13 million rural and 7 million urban inhabitants with water supply (altogether 47.6% of the total population at that time). The newly approved Ten-Year Development Plan (2021–2030) has a renewed commitment to use water as the major natural resource for national development.

Awulcahew argues that the development of water resources is a critical process that could enable the country to move higher up its development ladder. He further asserts that, if successful, irrigation in Ethiopia could sustain the agricultural development of the country by contributing up to ETB 140 billion to the economy and potentially ensuring the food security of 6 million households. For the period from 2002 to 2021, several five-year plans envisaged for the rapid growth of irrigated land were devised. As for the energy sector, the country's source of electricity derives mainly from hydropower through the construction of hydroelectric dams (Awulachew, 2010). In general, water development was considered a strategic resource for the development of the country. However, access and benefits from water resource development still failed to reach a considerable part of the population. In the CRV, irrigation agriculture was mainly in place to produce high-value horticultural crops for industry, for export, and, to some extent, for urban consumers.

The discourse of water-centered development is mainly prompted by the alarming national food insecurity and the food demand of an increasing population. The major argument here is that the

growing food demand cannot be met by conventional rain-fed agriculture alone. Furthermore, there is a growing demand for agricultural products to supply raw materials for agro-industries and for export to obtain foreign earnings. The hydropower needed to propel the economy is also given due attention. This discourse has implications for water security in two opposing respects. The first implication is that it imposes high pressure on the water resource by expanding irrigated agriculture to a degree that negatively affects water resources. The second implication is that it largely contributes to ensuring water security by meeting the growing demand for water and reducing the competition over it. This means it paves the way for enhanced utilization of the untapped water resource potential of the country, or, contrarily, it may contribute to water insecurity for some water users. Thus, to reduce the negative trade-offs of a water-centered development plan, appropriate water-conserving technologies and appropriate methods of utilization should be considered when forming that plan.

Market-Led Natural Resource/Water Resource Development Discourse/Narrative

Being well aware of the importance of agriculture, the government of Ethiopia has been implementing an Agricultural Development-Led Industrialization (ADLI) strategy since 1994, which makes agriculture the engine of other sector developments. The aims of the strategy are to improve the coverage and quality of agricultural extension services; promote better and more efficient use of land and water resources; enhance access to financial services, particularly for low-income citizens, including women and youth who have cooperative and financial plans; improve access to domestic and export markets; and provide rural infrastructure (Demes et al., 2010).

While putting ADLI into practice, the government has prepared and implemented several strategies and Five-Year Development Plans since 2001. These development strategies and policy frameworks have led to the implementation of the Sustainable Development and Poverty Reduction Program (SDPRP) from 2001 to 2005, the Program for Accelerated and Sustained Development to End Poverty (PASDEP) from 2006 to 2010, and the Growth and Transformation Plan (GTP) I (2010–2015) and GTP II (2016–2020) (Getachew, 2020). In all these strategies and plans, water sector development is emphasized and positioned as an engine of development.

Based on the different policy frameworks and implementation strategies, the government has encouraged export-oriented horticultural development, including floriculture, which essentially depends on intensive irrigation. The floriculture industry has grown from around 72 flower farms being active in 2009 (Gebreyesus and Iizuka, 2010) to 126 in 2018 (Horticulture Producer Exporters Association (EHPEA): http:/www.ehpea.org; accessed on 05 June 2022). The expansion of the floriculture industry and other export-oriented agricultural practices in the CRV has its own influence

on the water use and governance system since it increases the number of water users and actors involved in the basin. When there are more actors and water users, there are often more (mostly incompatible) interests and positions to start water competitions and conflicts.

In general, heavy water use as a means of production in such industries and in other types of economic activity in the CRV basin, including both large- and small-scale activities, aggravates existing water shortages and competition among actors. Water is considered an economic good or commodity because of its economic value. As a result, investments in water infrastructure, such as the construction of community dams and irrigation schemes, can act as a stimulus for local and regional development efforts. However, when there are diverse and sometimes incompatible water uses and users, it is imperative to follow the principle of giving priority to water use for economic development.

In conclusion, the urge to transition from subsistence-based to market-based natural resource development in general and water resource development in particular has its own effect on water governance. In the CRV basin, water resources are under increasing pressure due to competition and divergence among users, as well as climate change. Water for domestic use, livestock, fisheries, industries (floriculture, soda ash, breweries, etc.), irrigation practices, and the environment are some of the competing water uses and users in the CRV basin that have a bearing on increasing water shortages, competition, and conflicts.

Land/Water Resources Degradation Narrative

(i). Upland degradation discourse as an immediate cause of water degradation

Land degradation has become a prominent theme of policy discourse in Ethiopia since the 1970s. Since the mid-1970s, the problem of land degradation has been portrayed as a major threat to the country's survival. Since then, the Ethiopian Government and many stakeholders (such as the World Food Program in its Food for Work program, the World Bank, civil societies, and several donors) have embarked on interventions of different scales to reverse land degradation through land rehabilitation and conservation campaigns. Such discourse holders have argued and identified various causes and consequences of land degradation. Concerning the causes of land degradation, the discourse holders pinpointed a range of reasons: some believe that land degradation is the result of population increase and due to traditional land use systems; some argue that it is due to the unfair distribution of land for agriculture (the narratives in the 1970s and 1980s were due to landlordism, the eviction of indigenous people from fertile agricultural land to marginalized land); some argue that the major bottleneck is the absence of an effective land use policy and land use plan, etc. In general, each of the explanations above

on the causes of land degradation and the recommended solutions were the results of political and ecological thoughts of different periods.

As briefly described above, the CRV has diverse geo-ecology (diverse altitudinal and agro-climatic belts, distinct ecosystems, and rich biodiversity). Though this ecosystem is very important for its diversity, the basin is currently among the hotspot areas of soil, water, and biodiversity degradation in the country. Until the 1970s, this area was sparsely populated, and accordingly, there was little pressure on the ecosystems. For instance, a study by Meshesha et al. revealed that in 1973, dense acacia woodland and forestland covered about 44% of the area. In 2006, the forestland had diminished by 66.3% and the woodland by 69.2% (Meshesha et al., 2012). Several other studies covering the whole CRV or parts of the sub-basin reveal rapid land cover changes in the last five decades (Elias et al., 2019; Abera et al., 2019; Legesse et al., 2003). The major conversion of this land cover to cropland was undertaken by smallholder farmers and commercial agriculture through the introduction of large-scale livestock ranches, tourist lodges, and the expansion of urban settlements. Furthermore, the encroachment of cultivated lands into the montane and mid-altitude forests reached its highest level in the last three decades. These conversions become major causes of excessive soil erosion, flooding, and sedimentation at the Ziway, Langano, and Abijata lakes. Deforestation of ridges and water divide areas has particularly contributed to the formation of badlands and gullies of varying severity.

In addition to Land Use and Land Cover (LULC), several studies have revealed the sereneness of soil erosion and sediment yield, and climate change has affected the water resources of the basin in general and the lakes in particular (Meshesha et al., 2012). In addition, overgrazing and trampling due to a large livestock population have contributed to soil degradation (changes in soil bulk density, soil structure, soil porosity, etc.). Soil degradation (mainly soil erosion and sediment yield) from deforested steep slopes has been increasing over the years and has negatively affected the lakes in different ways (Seyoum et al., 2015; Belete et al., 2015; Aga et al., 2018; Aga et al., 2018). Notably, the hydrological effects of this rapid land conversion and the resultant land degradation are observed in the reduction of lake volumes. For example, Aga et al. (2019) modeled the amount of sediment deposition in the bed of Lake Ziway to be 2.039 million tons every year, which would contribute to the loss of the lake's water volume by 0.106% annually. Another study by Gadissa et al. (2018) concluded that the average annual sediment yield entering Lake Ziway was 431.05 tons/km^2 and 322.82 tons/km^2 for the Meki and Katar rivers, respectively.

In their historical area coverage assessment of Lake Abijata, Temesgen and his colleagues (2013) reported a 5.6% reduction of the lake's area in 1986 from the 1973 level, with no change until 2000 and then a 46% reduction in the period between 2000 and 2006; Wagaw et al. (2019) also revealed the

lake's retreat from 215 km^2 in 1980 to 87 km^2 in 2016, which in terms of water volume is a reduction from 1605 MCM to less than 400 MCM. One frequently mentioned reason for the shrinkage of the lake is the establishment of the Abijata Soda Ash Factory.

Our several interview results show that the most frequently mentioned reason is usually given by local residents (particularly the youth), who assert that the lake's water is "their water resource", and some experts agree that the lake's volume has dwindled because of the Soda Ash Factory. The Soda Ash Factory was established at the shores of Lake Abijata in 1989 and produces soda ash, a form of hydrous sodium carbonate (Na_2CO_3), by evaporating water pumped from the lake in artificially constructed ponds for the crystallization of trona. It has been reported that the factory was pumping about 1.5 million m^3 of water annually to produce about 10,000 tons of soda ash per year (Hengsdijk et al., 2007), which is <0.4% of the current lake volume. For several reasons, the factory halted its production for the last three years but now plans a resumption. Given the relatively small amount of annual abstraction and that the water is saline and never used for irrigation, domestic water supply, or animal watering, the reason given by local residents is doubtful. Their assertion is said to be motivated by politics, as the water has never been used by the residents, which is driven by the current political activism and also shows a sort of political power shift to the locals. On the contrary, livestock owners are happy with the extensive retreat of the lake, which yields large tracts of grazing land (Figure 18 shows a herd of livestock grazing on the shore of the lake; field visit, 2020). The FGD with Soda Ash Factory staff revealed that the shrinkage of the lake is due to smallholders and large-scale commercial farms over-abstracting water from Lake Ziway and the Bulbula river that drains into this terminal lake, heavy sedimentation of the lake from the upslope due to land cover changes, and climate change.

Figure 18. A herd of livestock grazing on an exposed part of the bed of Lake Abijata (note that the lake is saline) (Photo: Amare, 2020).

Expansion of grazing land by deforestation also causes soil erosion and sedimentation of the lakes. Overgrazing and large numbers of livestock cause the compaction and trampling of soils and result in low soil infiltration, high surface runoff/flooding, and topsoil erosion. The local community extracts salt soil from the shore to be sold as complementary feed for livestock, which, along with sand extraction (at the shore and in the Acacia woodland), leads to deforestation and sediment movement to the lake. All the above factors contribute to hydrological regime disruption.

In conclusion, many scientific studies and other opinions from experts and policymakers, and the stories/beliefs of the local population, argue that the landscape has greatly changed and the trend of land degradation persists year after year. They further reiterate that reversing land degradation is an urgent action needed to achieve the desired sustainable development.

(ii). Water pollution narrative

Water quality deterioration in the basin is a growing concern for many actors, particularly the local people, environmentalists, and local political activists. The study of Merga, Mengistie, Faber, and den Brink (2020) in Lake Ziway showed that nutrients, pesticides, and trace metals had accumulated there at an increasing rate. A report by Jansen and Harmsen (2011) also confirms the deterioration of water quality, particularly at the shores of Lake Ziway, where representative samples were mostly taken. Furthermore, the quality of groundwater samples was found to be “unsuitable for long term agricultural use due to their high salinity and sodium adsorption ratio, which has implications for soil permeability, as well as elevated bicarbonate, boron and residual sodium carbonate concentrations” (Godebo et al.,

2021). During the FGD, the local people, as well as some experts, express their concerns for the health of the people and livestock using water from streams and lakes in the lowlands due to possible contamination by agrochemicals, either from smallholder farmers or from leakages and discharges of polluted water from commercial floriculture.

Some experts expressed their worries over the increasing use of pesticides by smallholder farmers with no knowledge of the correct dosage and ways of using them or their consequences for human and livestock health, the long-term health of their farmlands, and the environment at large. In this regard, Mengistie et al. argue that farmers use pesticides without considering safety recommendations: "they use unsafe storage facilities, ignore risks and safety instructions, do not use protective devices when applying pesticides, and dispose containers unsafely" (Mengistie et al., 2017: 301). There is also a belief among many stakeholders that the floriculture companies are opaque in declaring the amount and type of agrochemicals they are using in their farms, and there is a general conviction that there is an overuse of pesticides to the detriment of all aspects of the community's health and environmental protection.

The Water Scarcity Narrative: The Aral Sea Syndrome in the Making

The German Environment Advisory Group in 1996 came up with the concept of Aral Sea Syndrome to depict unsustainable, uncoordinated, and over-utilized water resources for development derived from water bodies situated in arid and semi-arid environments, which eventually caused the drying up of such water bodies and the devastation of the ecosystem, an illustrative example being the rapid decline of the Aral Sea in Central Asia (Lüdeke et al., 2004). In the same line of argument, several researchers (Berhanu and Bisrat, 2020; Amenu et al., 2013; Van Halsema et al., 2011) labelled the CRV a freshwater-scarce sub-basin heavily affected by human activity that is threatened to collapse, despite the fact that it hosts several large and small lakes. This scarcity, they argue, is mainly due to a rapidly growing demand for and over-abstraction of water from the lakes, as well as from streams feeding the lakes, for various uses (domestic, irrigation, livestock, and industry). Other researchers attribute the water scarcity to climate change and variability and to upland degradation that contributed to the sedimentation of the lakes. They think that due to the rising demand, the water supply could dwindle faster and some lakes could dry up entirely.

Similarly, planners, environmentalists, and even the local community contend that the over-abstraction and uncoordinated utilization of Lake Ziway and Lake Abijata threaten the existence of these lakes. For instance, Lake Abijata's area decreased by 5.2% between 1973 and 2000 and by a further 46% between 2000 and 2006 (Temesgen et al., 2013). Likewise, the water level of Lake Ziway is falling because of increased irrigation for agriculture around the lake. Furthermore, over-abstraction is reported not only

at Lake Ziway and Lake Abijata but also at the Katar, Bulbula, and Meki rivers and the groundwater in many parts of the basin (Hengsdijk et al., 2007). Goshime and his associates reached the conclusion that "the amount of water withdrawal from the lake [Ziway] for irrigation water use is 37 million m^3 per year. This led to 0.36 m drop in the lake level which corresponded to 18 km^2 reductions in the lake surface area. This consequently resulted in a reduction of mean annual lake volume by 162 million m^3 from 1986–2000, which accounts for 23% of the total lake inflow from rivers" (Goshime et al., 2019: 67).

The concerns about the scarcity of water are also expressed by livestock herders, smallholder irrigation practitioners, the Soda Ash Factory, Abijata-Shala National Park, and residents who require it for domestic use. The Soda Ash Factory experts and the Abijata-Shalla National Park, for example, complain that the over-abstraction of water from Lake Ziway affects the outflow to the Bulbula River and later reduces the inflow of water to Lake Abijata. Livestock herders identify an insufficiency of water for their livestock as their chief problem, especially during the months from December to May.

Weak Institutions and Weak Water Use System Narrative

A record of official water laws in the country can be traced as far back as the 15th century with the adoption of *Fetha Negest* ("Justice of the Kings"), which sets down the earliest formal rules that constitute both spiritual (related to the faith of the Orthodox Church) and secular laws, of which the water issue is one. It was introduced in Ethiopia during the reign of "King of Kings" Zar'a Yaqob (1434–1468) (Arsano, 2007). However, in modern times, water institutions are descended from the attempt to institutionalize municipal water management in the 1940s and, more precisely, the adoption of the second written Constitution of the country ratified in 1955 (Haile Sellassie I University, 1969). Notwithstanding the long history of water institutions, they are today heavily criticized for their weak performance on the ground, for inadequately meeting the interests of those with growing demand for water resources, and for failing to take full advantage of the resource potential. This critique emerged from different perspectives. First, institutions in general and water resource governance in particular have frequently changed in the last six decades (see Appendix B). Second, there has been weak institutional coordination among different sectors directly or indirectly involved in the management of water resources (Bantider et al., 2021). Third, there is a lack of organizational capacity for water governance at all levels, from the local to the federal (Pascual-Ferrer, 2014). Fourth, there is a dearth of reliable long-term data on hydrometeorology and hydrology, as well as on the potential of the basin's water resources, as required for better planning. Fifth, the legal framework in which to manage the water resources lacks clarity, with several duplicated roles between different sector organizations and an absence of clear demarcation and mandates to regulate, allocate, protect, and develop the water

resources for both rural and urban users and various sectors. Sixth, the failure to prevent or mediate conflicts of different natures at different scales, including between the upstream and downstream users, where in this case there is a need to not only manage water resources but also protect the highland ecosystems and landscapes from degradation as they are primary sources of water.

The following points are presented in support of the argument for the weakness of institutions working on water:

First, researchers argue that institutional coordination is lacking for the effective implementation of water resources development, management plans, and IWRM (Abebe and Kassa, 2016). With reference to the spatial scale and administrative power relations, institutional interplay in the CRV follows two distinct principles: hydrologic and political administrative boundaries. Institutions under these two structures can also have horizontal and vertical interactions. Powers and responsibilities from both directions converge upwards until they intersect at the level of the MoWE, a national apex body for the administration of water resources. With regard to arrangements based on hydrological boundaries, the river basin development authority (RBDA) at a national level and the Rift Valley Basin Development Office (RVBDO) form the main structure, while the Regional Water Bureaus (RWBs) and the Zonal and woreda water offices form the lower parts of the structure according to the political-administrative system. These two power structures, according to the RVBDO experts, are, however, poorly integrated to implement IWRM. One vivid example rests on the issuance of permits for water resource use in the agriculture industry. While the regulation No. 441/2018 mandated the basin authority to issue licenses and permits, the Regional Bureaus of Water also have that authority vested in them through the constitution. Hence, there is a duplication of effort in this regard. Financing is another issue. Our fieldwork confirmed that the sector at regional, zonal, and woreda level are poorly financed. The RBO is basically financing a few works on watershed management to protect water bodies, which are far from adequate, and on planning activities.

Second, irrigation methods used by smallholder farmers are inefficient; they almost always use a furrow irrigation system, which is extremely wasteful (Jansen et al., 2007).

Third, interview results with Adami Tulu, East Meskan, and Ziway Dugda, the Woredas Department of Agriculture, and the field observations reveal that there is no regulation on where to use groundwater and how much water is to be abstracted from rivers. These farmers are usually contract farmers motivated more by profit than sustainable water resource use. There is no or very little effort to reduce soil erosion and sedimentation at the water bodies, both rivers and lakes, and there is no effective regulation to protect the water bodies from pollution from point and non-point pollution sources.

Major polluters are those involved in commercial floriculture and smallholder horticultural farms that use pesticides and weedicides. There is the contention by experts that the floriculture companies have a powerful say because they are privileged by the government because they are generating foreign currency. The woreda-level experts have neither the trained human power nor the institutional capacity to regulate and monitor non-point source polluters. Fourth, there is no or very little work conducted to improve water storage during the rainy months, from the small household scale to the community level and to the large-scale reservoir of water, in order to enhance the water availability element of water security.

Fifth, there is no clear and effective regulatory framework for mediating between upstream and downstream users and addressing the needs of the disadvantaged. In the policy, these things are addressed; nevertheless, their implementation at the grassroots is minimal.

Actors mapping and power relations

Experts and policymakers commonly say that in the CRV, there are multiple actors with unequal competing interests (Personal communication with the head of the Rift Valley Basin Office, 2021). In the context of the basin, several interdependent factors lead to the genesis of diverse discourses and narratives on water governance. Major factors, based on the data gathered from different relevant sources, include the following:

- New water users due to the flourishing of intensive irrigation both at the individual and cooperative levels, mostly for vegetable production for market; the beginning of the huge influx of tourist and hotel enterprises; the flourishing of flower farm companies (which as of 2021 covered 529 hectares with a water use rate of 7.3 million cubic meters (MCM)); the Castel Winery (453 hectares covered and 1.8 MCM water use rate); the establishment of nine agro-industries (11.8 MCM water use rate); packaged water and different industries; domestic users; and environmental flow requirements;
- The change of land use types and patterns, mainly from rain-fed to irrigation-based mechanized agriculture, such as the introduction of wheat production by irrigation during the dry seasons. According to the Munissa woreda Agriculture Office, about 218 hectares of land were taken up for irrigated wheat production in the 2020/21 production year during the dry season. This was due to the new direction given by the regional government to shift from fruits and vegetables to cereal crops, particularly wheat production, using irrigation in view of achieving local food security and self-sufficiency;

- The rise in water demand results from the increase in human and livestock populations. The human population of the CRV grew from 1.9 million in 1987 to 2.8 million in 2007 and was expected to reach 4.2 million in 2021 (Abebe and Kassa, 2016), an annual growth rate of around 3.6%. The current livestock population in the CRV basin is estimated at more than 9.5 million;
- Changing lifestyles: Many years ago, the lowland parts of the CRV basin were inhabited by pastoralist and agro-pastoralist communities that were heavily dependent on mobile forms of livestock production that were believed to be environmentally friendly. Following the move from a pastoral production system to sedentary agriculturalists, the communities' lifestyle has also changed fundamentally in respect of their dietary system (i.e., a major shift from the consumption of animals and animal products to cereals and cereal products), which is hugely dependent on plow farming. This lifestyle change enlarges the use of water resources in the basin to a degree believed to negatively affect the existing production systems and the natural ecosystems (CSA, 2016);
- There are conflicts between the upper stream and downstream water users at different rivers, among them the Akamuja, Katar, Bulbula, Yagullo, Hulluka, and Tullu-Dema rivers. One cause of such conflicts is the diversion of rivers and the abstraction of water by pumps upstream that minimize the volume of water flowing downstream (Figure 19). In these rivers, small-scale irrigation operators at the upper stream over-extract the water and affect downstream users.

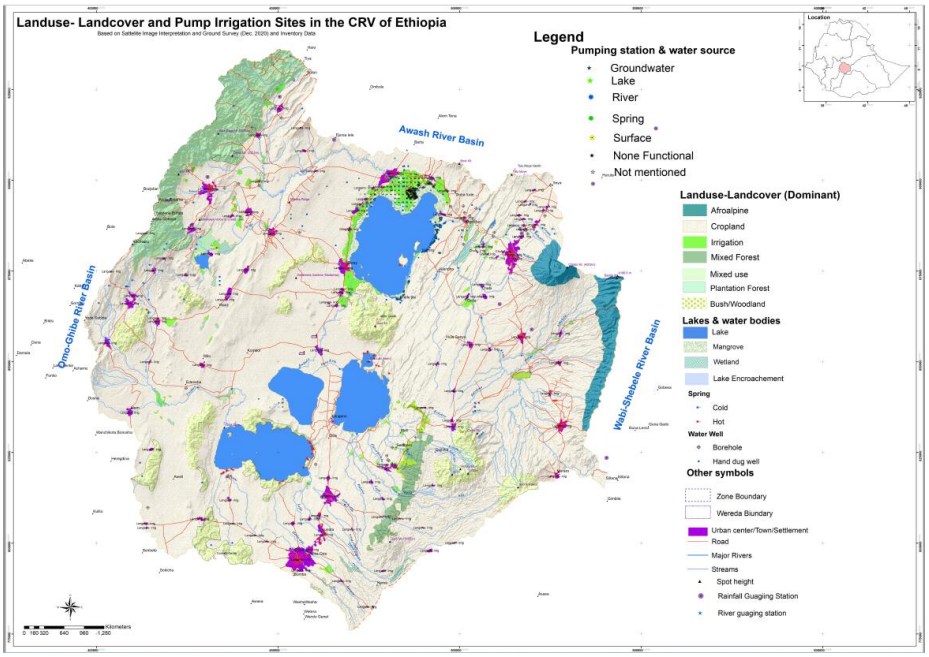

Figure 19. Water abstraction sites along rivers and around lakes in the upper CRV (note the distribution of pumping and diversion areas along the altitudinal gradients, showing the need for upstream-downstream negotiations).

The above factors lead to intense competition for water among the water users and types of water usage in the basin. Competitions lead to a mix of conflicting and cooperative interactions. The conflict mainly occurs when upstream users heavily consume water for irrigation, which seriously affects downstream users. An example is the dispute between the upstream and downstream water users in Meskan Woreda on the Yagulo River. The river has a low potential for irrigation during the dry season because it is mostly utilized by upstream water users. As a result, downstream farmers at the Agullo, Mori, and Jollie 2 and 3 kebeles use streams and underground water for their irrigation during the dry seasons since the volume of the Yagullo River decreases drastically. In this competitive water use environment, a clear allocation plan is unavailable; there is also a lack of effective governance of the water resource management, while the amount of water to be used every month and season is not fixed/planned according to the potential availability of water. Furthermore, given the intensified economic drive of the political-economic policy of the country, with the exception of domestic water supply, water use priority is given to investors. In addition, and emanating from poor investment in water supply, water insecurity is evident in many parts of the CRV where essential access to domestic water in the drier and lower-lying part of the sub-basin is unmet (see, for example, Figure 20 for a queue to obtain water for domestic use). However, different actors have cooperated to invest in and build communal water points (such as community ponds, deep underground water points, etc.) when the community is faced with acute water shortages, especially during some prolonged drought periods.

Figure 20. Rural water supply in Ziway Dugda woreda (photograph showing a line of yellow plastic jerrycans for domestic water, transported by a donkey cart from remote sources (photo by Taye Alemayehu, 2020)).

Problems and drivers

Intricate relationships between discourses offer explanations for the water security issues in the CRV (Figure 21). In line with decentralized water resource management in the CRV (decentralization discourse), bureaus and offices of water resource management have been established in the regional states following the administrative tiers of the country. In parallel, the Rift Valley Basin Development Office prioritised the hydrological boundary (basin development) approach over political administrative approach. These two systems of water resource management, however, were found to be incompatible with effective water resource management on several occasions. The limitations include mandate overlap and inconsistency in priorities. In this regard, researchers (Kefale, 2014; Mohammed and Inoue, 2012) contend that although decentralization is constitutionally guaranteed in Ethiopia, efficient and effective decentralization has neither been fully implemented nor brought better results than the centralized natural resources administration system. As discussed earlier, the existing laws lack sufficient clarity in terms of assigning mandates and responsibilities as appropriate to administrative regional states and river (lake) basins. Furthermore, in this decentralized political governance system, power and responsibilities were envisioned to devolve from the federal government down to the regional, zonal, and woreda levels; however, weak institutional capacity at the lower administrative

levels (in terms of trained human capacity and budgeting) has greatly impeded its success in delivering the expected good resource governance (Tefera, 2019).

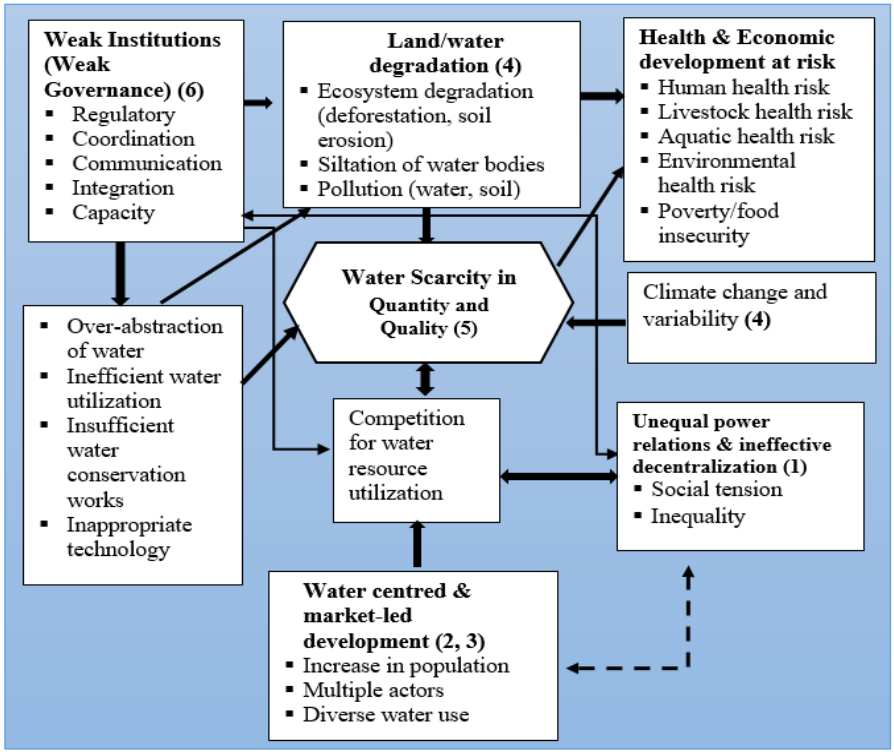

Figure 21. Interrelationships between and reinforced feedback on the dominant water resource management discourses and narratives in the CRV sub-basin (Institutions and governance are linked to all kinds of issues. Note that with the identified problems, the consequences of these interlinked problems would result in water and food insecurity. On the other hand, many of the problems could be solved by improving water and environmental governance. The dotted line indicates an indirect relationship. Numbers in the bracket indicate the major discourses and narratives (also linked to Figure 17).

The growing competing claims for water resources by multiple water users and the resultant conflicts between the different types of actors are mainly rooted in the existence of weak institutions and poor water governance and development in the CRV basin. To illustrate this claim, the sub-basin's demand for water supply for domestic use has never been met; the heavy abstraction of irrigation water in upstream areas (e.g., in Katar, Bulbula, Yagullo, Hulluka, and Meki rivers) usually leaves little for downstream users; irrigation water for dry-season wheat production is given priority by the government over vegetable crops against the preferences of farmers; and commercial flower farms are given disproportionate government support to produce these products for the export market than smallholder farmers. The idea of water governance is fundamentally about tackling such competitive

or potentially competitive situations where two or more actors/parties seek access to the same water resource (Cornforth et al., 2021). The existence of poor governance usually emanates from the performance of weak institutions and unfulfilled political commitments. The competitive interests among the different actors and water users can be dealt with by establishing well-designed and strong water institutions capable of realizing efficient and effective distribution and regulation mechanisms for access to, control over, and management of water resources.

The existence of weak formal institutions in general leads to environmental degradation, improper water management (including uncontrolled water abstraction), water pollution, and degradation of upland (water source) areas. Weak formal institutions would also have little capacity for managing the equity of resource distribution and would be unable to manage multiple interests and emerging conflicts. It is evident from the field assessments that customary local-level institutions are much better and more effective at tackling local-level conflicts arising from water resource usage. The building blocks of these customary institutions are the societies' cultural elements, such as norms, values, sanctions, principles, taboos, and rules that govern the access, control, use, and distribution of water resources. Therefore, in order to develop a sustainable system of water resource governance in an increasingly degraded environment and vulnerable climatic conditions, there is a need to establish robust institutional frameworks. There are also calls for collaboratory, customary, and statutory institutions to produce a sustainable system of water resource governance.

The water-cantered and market-led water resource development discourses obtained renewed interest, which led to the expansion of commercial irrigation farms for wheat and horticultural crops and the expansion of agro-industries through the establishment of agro-industrial parks. All these will abstract huge amounts of water from both surface and groundwater for different uses. This recent government policy exacerbates competition over water resources. These two discourses, which are backed by the regional and federal governments, are exacerbating the claim of the water scarcity narrative (a narrative shared by local residents and researchers) and the claim regarding the burden on environmental flow (a voice mainly from researchers and environmentalists).

Furthermore, the increasing trends of land degradation, siltation of lakes, abstraction of water, inefficient water utilization, and weak water management are related to land/water degradation discourses. Coupled with climate change and increased water abstraction, all sorts of degradation discourses mentioned above have aggravated the severity of water scarcity problems. The increasing competition for water resources and resulting conflicts have a direct bearing on social tensions and animosities that heighten polarized and asymmetrical power relations among the various actors. The competition would further lead to inequitable and inefficient water use systems. Extensive water

pollution caused by point and non-point pollution, such as discharges of untreated water from several flower farms, agro-industries, factories, and elsewhere, and the heavy application of pesticides and weedicides in commercial farms, pose a range of threats to human and animal health and the wider environment. There are also severe gully development and soil erosion challenges in the CRV basin as a result of long-term human activities. Anthropogenic forces that alter the physical landscape through environmentally unfriendly infrastructural development also cause considerable soil erosion, which has an adverse effect on surface water bodies. Accordingly, sediment control is an important consideration for catchment management planning in the CRV basin. Otherwise, the sedimentation of lakes and other water bodies and water pollution in the area will become worse than ever before.

Furthermore, water governance involves the procedures through which decisions are made. The decisions made by different actors are greatly influenced by the existence of power asymmetry among the various actors. The presence of such power asymmetries among conflicting parties affects the fairness of decisions on water distribution. This calls for developing governance mechanisms for just, equitable, and sustainable water resource use and management that would fulfil the water security needs of all.

There are concerns regarding the power relations and intensity of water conflicts in the CRV basin among different actors. For example, (a) power relations between the upstream and downstream water users increasingly became competitive and unfriendly, a situation that emanates from locational advantages and disadvantages for the upstream and downstream users. The upstream users exercise more power over those downstream users in abstracting water for irrigation without due consideration of the needs of downstream users. In this regard, there is no law mediating a water-sharing agreement between upstream and downstream users; (b) the other power emanates from the “rights” bestowed on the local residents through the principle of decentralization, where users who do not belong to the community are considered outsiders. This notion consecutively led to violations of the rights of those groups to access water. For example, the Soda Ash Factory at the shore of Lake Abaya was considered an outsider, and it was threatened by the local youth to stop production. A sense of “localism” is now observed in many places in the basin; (c) another power relation in water resource use is observed by being a member and non-member of the irrigation water user association, where the latter only receives the right to use water for irrigation based on the goodwill of the members; (d) the immense support that large commercial farms and agro-industries have received water use from the highest level of government (federal and regional) makes them highly powerful than woreda level regulatory institutions, thereby the latter unable to effectively monitor the water use. Such power relations and competitions over water use lead to the emergence of diverse socio-political voices and contestations

over the access and use of water resources through the different above-discussed discourses and narratives at various levels, from the community to the central government. A "battle" of discourses and narratives reflects the actors' power dynamics and their struggle to influence water governance in the CRV and in the broader socio-political context of Ethiopia. This line of thought, however, merits further research.

Furthermore, there is an unclear distribution of powers, duties, responsibilities, and rights levied on the different players in the relations between policymakers and/or decision-makers. The confusion emanates from the Constitution Articles 51/5, 52/2d, 40/3, and 92, which are relevant articles on land and natural resource management but not explicit on the power share as it concerns natural resource management. For instance, the Constitution indicates that the regional states shall have the right to manage natural resources, but for those shared by more than one state, the federal government will act. However, this does not indicate where exactly the trans-regional water flow starts because the trans-boundary streams first originate as small streams and tributaries in the uplands. In fact, in general, water sources are upland, and so the conservation of these areas is necessary. Any degradation in these uplands has serious consequences for the water flow downstream. The same issue can be raised with respect to groundwater, whose flow directions may not coincide with the surface watersheds. In general, since surface water flow starts from the upland and since lakes or major streams are functionally linked between the upland and valleys, administrative boundaries are not conducive to managing resources—particularly water at the watershed or in the basin—in a holistic manner. Healthy uplands are required because the water is fed by the uplands. Here there is confusion over who would have the ultimate right to water use when different users appear at one location: who gets first use and at what quantity? Regarding the different uses of water, Ethiopian Water Resources Management Proclamation no. 197/2000 Article 7(1), makes clear that domestic use takes precedence over all other uses. However, there is no metering on the rivers, and there is no restriction on the amount of extraction for other uses, and as a result, some rivers have dried up, causing a problem for residents.

Land/water degradation can be manifested as the long-term reduction or loss of at least one of the following conditions: biological productivity, ecological integrity, or value to humans. The major causes of land degradation in the CRV sub-basin are land use changes and unsustainable land management. These causes are considered direct human causes of land degradation, with agriculture the dominant sector due to its conversion of woody vegetation land into agricultural land, as well as low soil and water conservation practices. Meanwhile, a shift from pastoral and agro-pastoral production systems to sedentary ways of life, particularly in the lowland parts of the CRV basin, has

also brought land degradation. Land use changes should be considered where current agricultural patterns are no longer sustainable in terms of water consumption. Land/water degradation affects human health, livestock health, aquatic life, and the ecosystem altogether in multiple ways by interacting with social, political, cultural, and economic elements, including markets, technology, inequality, and demographic change. The prevalence of land degradation, the expansion of desertification, and reoccurring droughts have negative effects on the availability, quantity, and quality of water resources, which results in water scarcity.

The degradation of ecosystems in this basin due to the unwise use and overexploitation of resources with the intention to achieve short-term economic goals has had direct medium- and long-term negative effects on social welfare. The cause of ecosystem degradation and loss is often due to a failure to appreciate the full value of the functions provided by such systems. Therefore, in order to ensure the economic, environmental, and social benefits of sustainable development in the region, there should be a concerted, integral community development effort. This can be mediated by robust institutions not in isolation but holistically from a systemic integrative perspective.

Conclusion and the way forward

This report presented several interlinked discourses, narratives, and debates on water resource management in the context of overall natural resource management and its implications for water governance in the CRV basin. The discourses are: decentralization, water-centred development, market-led natural/water resource development, land/water resource degradation, water scarcity, and weak water resource governance. The narrative/discourse-holders range from local residents to international actors with diverse interests and powers. These actors, by way of their discourses and voices, have the potential to influence policymaking. The analyses of each of the discourses and narratives are strongly interlinked with each other as causes and effects. Some of the discourses have conflicting perspectives or priorities. Few of the discourses emanate from speculative data and information, while some are driven by political orientations such as “localism”. In conclusion, the presence of varied discourses and narratives implies the need to understand water resource development from multiple perspectives (resource base/endowment, socio-political arena, equity, market, and capacity) and from varied interests that need to implement a systems approach in the attempt to resolve the issue of water governance. A “proliferation” of competing discourses and narratives reflects the actors’ power dynamics and their struggle to influence water governance in the CRV and in the broader socio-political context of Ethiopia. This line of thought, however, requires further research.

The governance of natural resources in a wider context is an important consideration to improve the water security of the sub-basin amid alarming climate change, a growing population, and the rise in water demand from different sectors. Strengthening the capacities of institutions for resource governance in terms of budget, human resources, operations, and maintenance capacities is essential, as are clear and explicit laws, when seeking to improve water governance for sustainable development.

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INDIA

Critical Water Governance in the National Capital Territory of Delhi India[15]

Ashok Kumar, Nitin Singh, Ankush Nimbria, Vikas Kumar

Introduction

Water in India is governed by both central and state governments. Both tiers of governments make water policies that are implemented at state and local level. State governments are responsible for procuring water from various sources controlled by different states, if sufficient water is not available within a state; whereas it is left to urban local bodies to provide safe drinking water to individual households connected with the water networks. A large percentage of households in Indian cities lack such access; they are given potable water by public or privately owned tankers from government-built water facilities, but this is of poor quality and in low quantities. These households largely live in unauthorised areas developed without planning permission, or in slums that occupy public lands, as they have low income and little prospect of gaining regular employment due to limited education.

Multiple political and administrative jurisdictions populate the National Capital Territory of Delhi (NCTD). However, water is procured and supplied by the Delhi Jal Board (DJB), an organisation created by the NCTD under the Delhi Jal Board Act, 1998. One critical challenge for the Delhi government is that it has to procure almost all water from the neighbouring states; as a consequence, the threat of water insecurity continually looms large over the population of Delhi, as any supplier state can stop supplying raw water at any time due to political and other reasons. Thus, managing water in Delhi is not purely a

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technical enterprise, but largely a political activity that involves political management among states, to avoid inter-state conflicts over procuring raw water.

In addition, supplying potable water to households connected and unconnected to the water network also involves a great deal of political manoeuvring. One reason for the current state government's election was the chief minister's assurance that it would provide 20 kilolitres of potable water free of charge to the urban poor residents. In Delhi, water and power have recently become political issues used by political parties to succeed in state-level elections and re-elections.

The NCTD, or Delhi, is one of the megacities of India. Its population is expected to be over 20 million, densely packed over 1,483 square kilometres. Apart from the state government of the NCTD, there are three elected municipalities, one nominated municipal council, and the Delhi Cantonment Board. The DJB supplies water to households living in the three elected municipalities. The New Delhi Municipal Council and Delhi Cantonment Board get bulk water supplies from the DJB, which also provides bottled water, alongside private firms.

This chapter critically examines the governance of water in the NCTD by asking and answering several political economy questions: "Who has access to water through the water network?"; "Who is excluded from the water network, and how?"; "What are the means used to supply water to the households which remain unconnected to the water network?"; and "What water inequities persist in Delhi?"

Water governance in Delhi

The NCT of Delhi borders Haryana on the North, South and West sides, and with Uttar Pradesh on the east side, with total geographic area of 1,483 square kilometres. According to the 2011 Census, Delhi's population was 16.7 million, and is likely to exceed 20 million (see Figure 22).

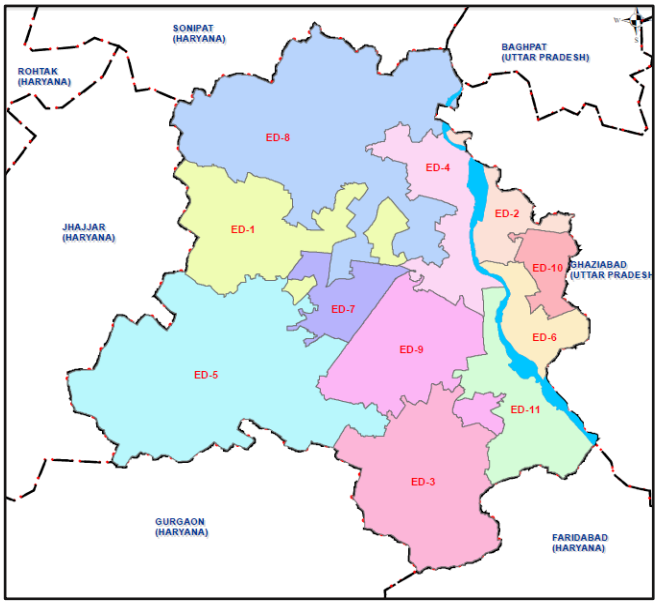

Figure 22. Districts in the NCT of Delhi (Geospatial Delhi Limited, Government of NCT of Delhi (2020))

Delhi's administrative structure was reorganised in the 69th amendment to the Indian Constitution. As a result, Delhi became a union territory as well as a state, leaving the Delhi Government with less political power. At present, Delhi is divided into 11 Districts and 33 Sub-divisions. As per the Census of 2011, there are 110 census towns and 112 villages in the NCTD. For local urban governance purposes, Delhi is divided into the North Delhi Municipal Corporation, South Delhi Municipal Corporation, East Delhi Municipal Corporation, New Delhi Municipal Council, and the Delhi Cantonment Board (see Table 2 and Figure 23).

Table 2: Population and area of various urban local bodies in Delhi (Ward level, Census of India (2011)

Urban Local Body	Population, 2011	Area in sq km
East Delhi Municipal Corporation (EDMC)	1,709,346	135.39
North Delhi Municipal Corporation (NDMC)	6,200,000	605
South Delhi Municipal Corporation (SDMC)	5,600,000	656.91
New Delhi Municipal Council (NDMC)	257,803	42.7
Delhi Cantonment Board	286,140	43
Total	14,053,289	1,436.18

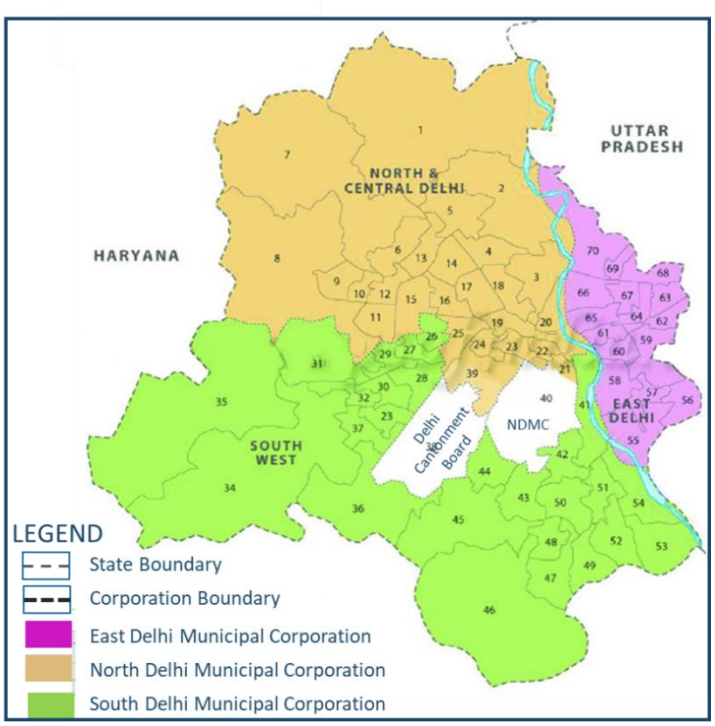

Figure 23. Urban local bodies in NCT of Delhi (Government of NCT Delhi (2020))

After India gained independence in 1947, Hindus and Sikhs moved from Pakistan in large numbers to resettle in other parts of India, resulting in high population growth in Delhi. Population growth of almost 350 per cent was observed in the city state during the two decades from 1941 to 1961 (Census of India, 1951 and 1961; also see Table 3).

Since 1961, Delhi's population has been growing steadily, and the urban area has also expanded over these decades (see Figure 24). Gross density of population has increased four times since 1941, indicative of an ever-rising demand for housing, water and sanitation services. As is well known, Delhi's slum population has also been increasing over the last seven decades.

Table 3: Population, Geographical Area and Density in the Delhi Urban Area, 1941 to 2011 (Dupont (2004))

Year	Population		Geographic area		Average Density in persons per hectare
	Number	Decadal Growth percentage	Area in Hectares	Decadal Growth percentage	
1941	695,686	-	17,431	-	40
1951	1,437,134	106.6	20,136	15.5	71
1961	2,359,408	64.2	32,655	62.1	72
1971	3,647,023	54.6	44,626	36.8	82
1981	5,729,283	57.1	54,078	21.2	106
1991	8,419,084	46.9	62,428	15.4	135
2001	12,791,458	51.9	79,192	26.8	162
2011	16,787,941	31.2	91,020	14.9	184

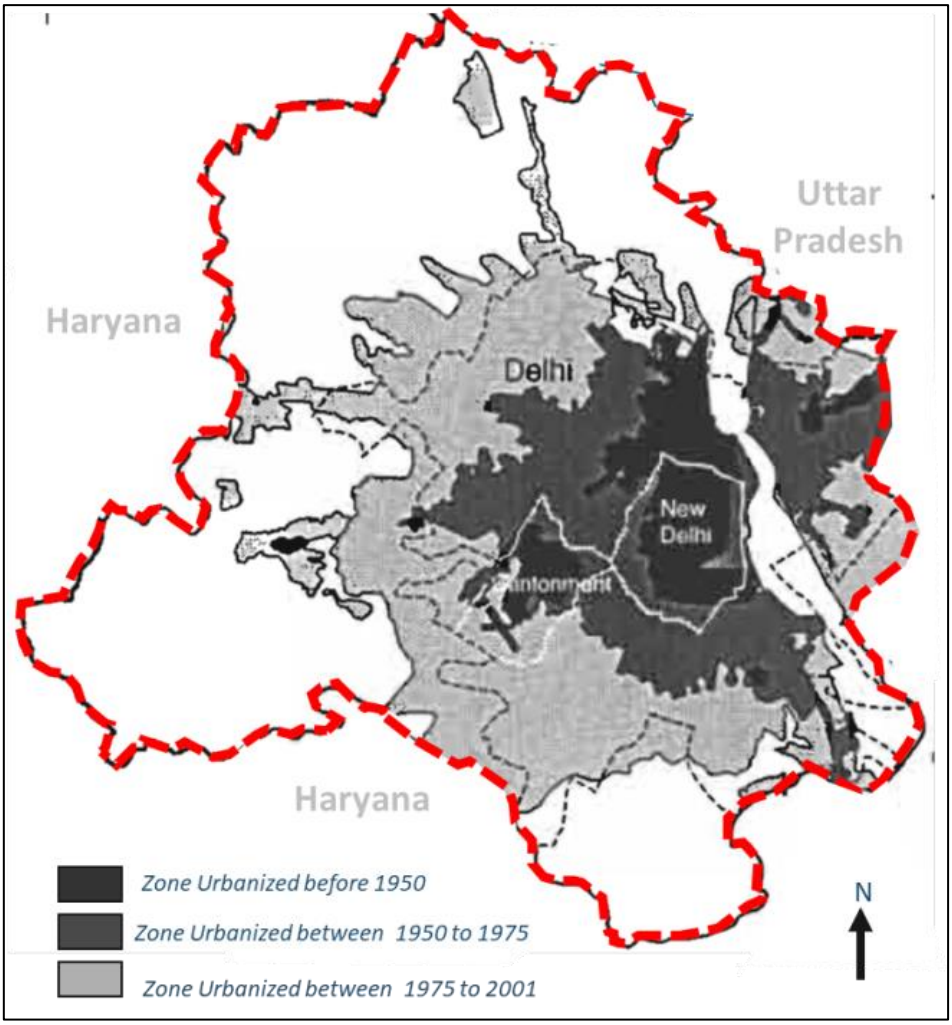

Figure 24. Spatial Expansion of the Urbanised Area in NCT Delhi, 2001 (Dupont (2004))

The physiography of NCT Delhi is dominated by the River Yamuna; the Aravali Hills and the plains located in the middle of the region are formed by alluvium soil deposits. Since ancient times, the Yamuna has been used as source of water for irrigation, drinking and other purposes. The river is also mentioned in the Hindu epic, the *Mahabharata*. However, the quality of water in the River Yamuna has rapidly deteriorated with rising levels of urbanisation in the megacity of Delhi, due to untreated liquid wastes.

The NCTD's natural drainage system is largely defined by the Aravalli foothills in the southern parts of the city. While the NCTD is part of the Yamuna river basin, according to the "Drainage Master Plan of NCT of Delhi", the city can be divided into three major natural drainage sub-basins: namely, the Najafgarh Sub-basin, spread over 63 per cent of the total area in the western side; the Barahpullah Sub-basin, covering 24 per cent of the total area on the southern side of the city; and the Trans-Yamuna Sub-basin, covering 13 per cent of the total area on the eastern side of Delhi (see Figure 25). Further,

Delhi is also divided into six drainage zones: (i) North Zone, (ii) West Zone, (iii) Central North West and South East Zone, (iv) Central South and South East Zone, (v) East Zone, and (vi) South Zone.

The Aravalli Hills, located in the southern and western parts of Delhi, form large green spaces for the megacity, acting as the lungs or breathing spaces for the city residents. A survey conducted in 2019 showed that the Aravalli Hills have a rich diversity of wildlife, with relatively high densities of mammals in non-protected areas.

According to Delhi Parks and Garden Society, Delhi has 1,009 enclosed water bodies, along with 201 natural drains. These are divided into two categories: traceable water bodies, numbering 969, and 40 non-traceable water bodies.

Out of the three sub-basins in Delhi, SPA Delhi has focussed on the Barapullah Sub-basin, which is located in the southern parts of Delhi on the western bank of the River Yamuna. The sub-basin is bordered by the Yamuna on the east, Haryana state on the south, and the Najafgarh Sub-basin on the northern and western parts. The total catchment area of the Barapullah Sub-basin is over 376 square kilometres, which forms 25.4 per cent of the total geographical area of the NCTD.

In this basin, over 193 square kilometres are urbanised, forming 52 per cent of the total geographical area of the Barapullah Sub-basin. Here, Barapullah Nallah or drain is the largest drain; it carries almost 80 per cent of storm water of this area and falls into the River Yamuna, along with a few other drains.

Barapullah Sub-basin is spread across five districts and 18 Delhi State Legislative Assembly Constituencies. According to the Delhi Development Authority (DDA), the sub-basin falls partially or fully within the six spatial planning zones, known as Zones A, C, D, F, J, and Zone O, which is the River Yamuna itself. The Barahpullah Sub-basin also lies within the administrative jurisdictions of North Delhi Municipal Corporation, South Delhi Municipal Corporation, and New Delhi Municipal Council (see Figure 26).

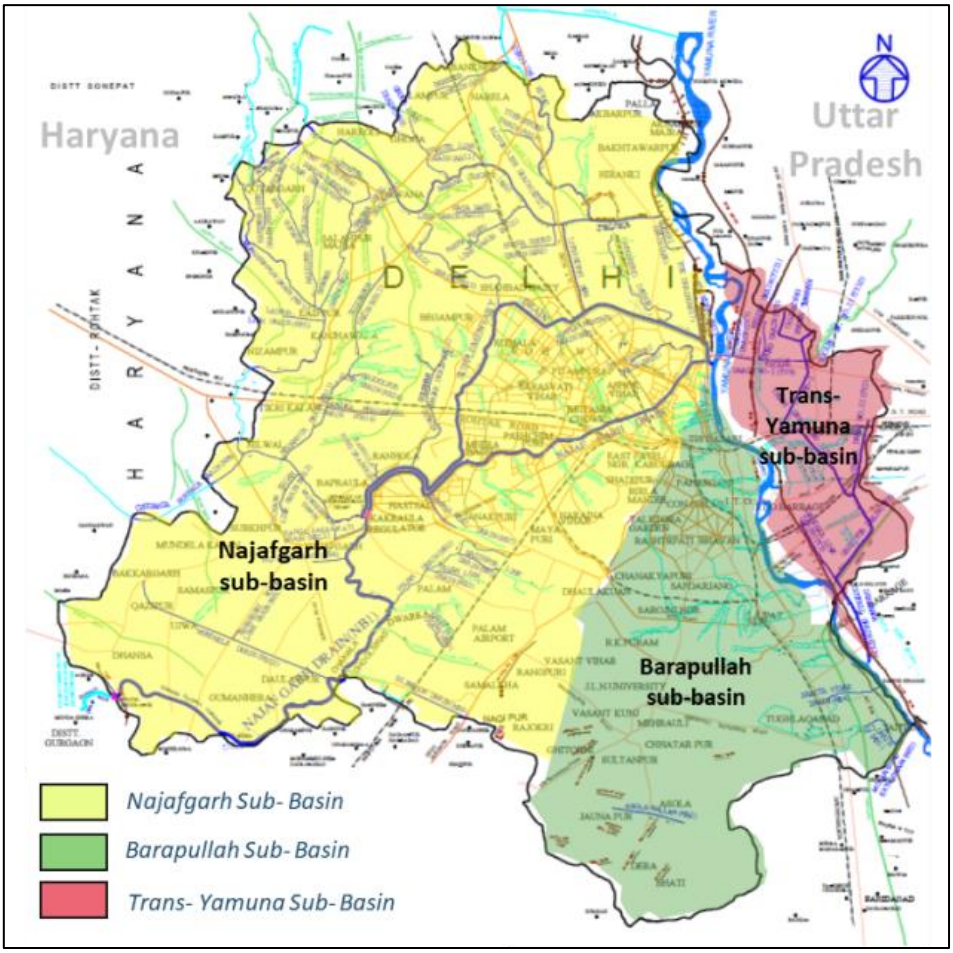

Figure 25. District Drainage in the Sub-basins of the NCT of Delhi (IFCD (Drainage Map) and Drainage Master Plan for NCT of Delhi (2018)).

According to the Census of India, 2011, the total population of the Barahpullah Sub-basin is approximately 3,389,000, which is 20 per cent of NCTD's total population. Population density in the sub-basin is 90 persons per hectare, and 175 persons per hectare in the urbanised area. Southern parts of the Barapullah catchment are located at a higher elevation than northern parts of the sub-basin, due to hilly areas in the former region. The general natural flow in the Sub-basin is south-easterly, towards the River Yamuna. The altitude difference across the sub-basin is 100 m, and the soil type is sandy and clayey throughout.

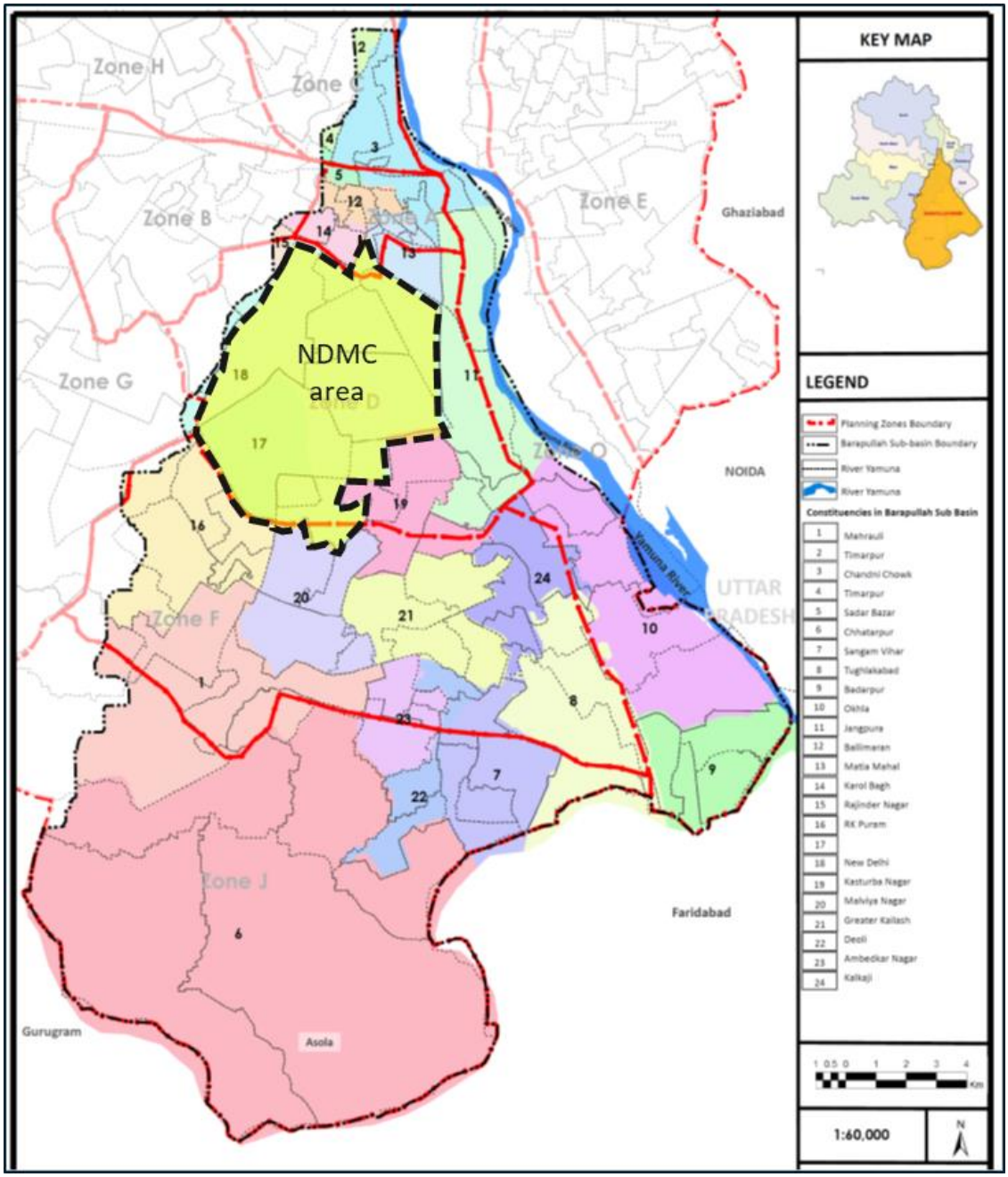

Figure 26. Administrative Limits of the Barapullah Sub-basin, 2021 (Compiled from various sources: DDA Planning Zones, Delhi Government GSDL Data (2020)).

Delhi Development Authority is responsible for spatial planning of the city, such as the preparation and implementation of development plans, and enforcement of development control regulations approved by the state (Kumar, 2021).

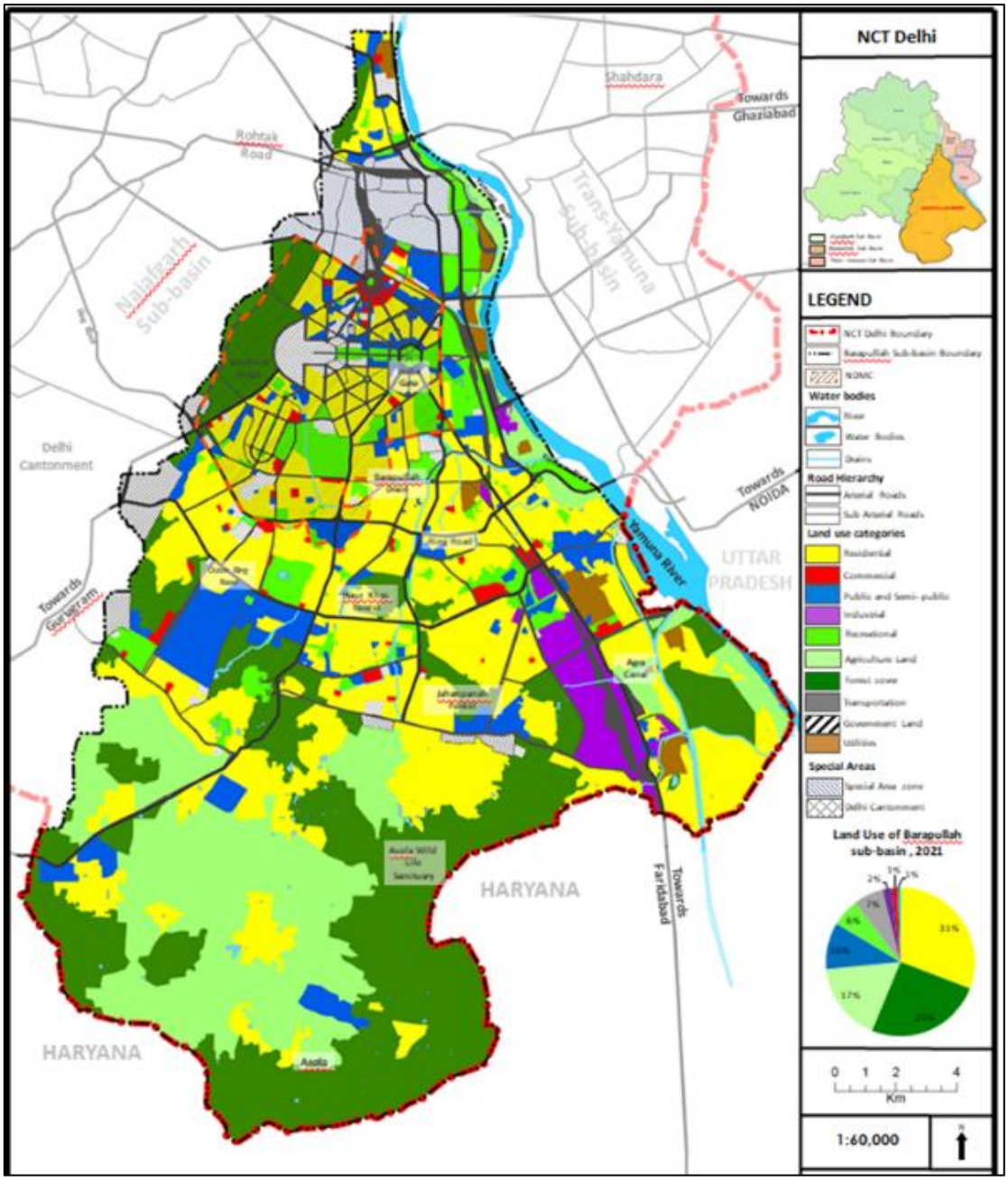

Figure 27: Land Use of Barapullah Sub-basin, 2021 (Compiled from various sources and DDA Planning Zones, Delhi Government GSDL Data (2021)).

The major land use in the Barahpullah Sub-basin is residential, followed by forests. It is interesting to note that this sub-basin has a good share of agricultural land, but with a lower proportion of water bodies (see Figure 27 and Table 4).

Table 4: Land use distribution in Barapullah Sub-basin

Categories	Area (in ha)	Percentage	UDPFI Guidelines	MPD, 2021
Residential	10,504.5	30.8	36–38	45–55
Commercial	370.3	1.1	5–6	4–5
Industrial	712.0	2.1	7–8	4–5
Public and Semi-Public	3,470.7	10.2	10–12	8–10
Recreational	2,041.0	6.0	14–16	15–20
Transportation and Communication	2,226.7	6.5	12–14	10–12
Total (A)	**19,325.1**	**56.7**	-	-
Forest	8,668.7	25.4	-	-
Agriculture	5,855.0	17.2		
Water bodies	231.8	0.7		
Total (B)	**14,755.5**	**43.3**	-	-
Grand Total (A+B)	**34,080.6**	**100**	**100**	**-**

Delhi is fortunate to have 1,009 water bodies, both small and large. Table 5 gives the number of enclosed water bodies spread across various constituencies in the Barahpullah Sub-basin. The southern district has 120 water bodies, or over 63 per cent, out a total of 191 in the sub-basin (see Table 5).

Table 5: Distribution of water bodies in Barapullah Sub-basin (Delhi Parks and Garden Society (2018))

S. No.	District	Constituency	Number of Water Bodies
1.	South	Chatarpur	120
2.		Mehrauli	
3.		Malviya Nagar	
4.		Ambedkar Nagar	
5.		Deoli	
6.	South East	Jangpura	30
7.		Kasturba Nagar	
8.		Kalkaji	
9.		Okhala	
10.		Tuglakabad	
11.		Sangam Vihar	
12.		Badarpur	
13.	New Delhi	New Delhi	29
14.		R K Puram	
15.	Central	Chandani Chowk	12
16.		Balimaran	
17.		Matia Mahal	
18.		Karol Bagh	
Total			**191**

According to Delhi Parks and Garden Society (2018), 31 per cent of water bodies are dry and 30 per cent have water. In the sub-basin, 10 per cent of water bodies are polluted due to untreated sewage

dumping, and 45 per cent are encroached upon by either built-up areas or permanent structures (see Table 6).

Table 6 : Status of water bodies in districts in Barapullah Sub-basin (Delhi Parks and Garden Society (2018))

S. No.	Districts	Status				
		Dry	Wet	Sewage	Encroached	Built-up Space
1	South	40	34	13	27	29
2	South East	3	2	1	2	5
3	New Delhi	15	11	3	10	7
4	Central	3	11	4	3	4
Total		**61**	**58**	**21**	**42**	**45**

The nature of governance structures and natural features is found to generate complexity, making this an interesting case to study. Multiple governments and an even greater number of private and third-sector players make the governance of water difficult to understand. In order to comprehend a part of this complexity, we have devised a strategy that involves the analysis of competing water discourses.

Competing discourses

The dictionary meaning of discourse is "a formal discussion of a topic in speech or writing" (Lexico, 2021). Hall (1992) defines a discourse as "a group of statements that provide a language for talking about (representing) a particular kind of knowledge about a topic" (as quoted by Allmendinger, 2009, p. 201) In psychology, Ian Parker defines discourses as all written texts and spoken interactions within formal and informal formats (Parker, 2015). In addition, the most powerful definition is provided by Michel Foucault, the French philosopher, who regards discourses as "ways of constituting knowledge, together with the social practices, forms of subjectivity and power relations which inhere in such knowledges and relations between them" (Foucault, 1980).

In the following account, an attempt is made to define competing water discourses in the NCTD.

Colonial water discourses in the National Capital Territory of Delhi

In last 800 years, water discourses in this megacity have altered occasionally, along with the changes in rulers and administrators of the city. Since the 13th century, Delhi has been at the centre of the Delhi Sultanate, Mughal Empire, and the British colonial regime. The city has always remained the seat of power, and this status still continues. With this historical significance, Delhi has attracted incomers and has remained a major city in the Indian subcontinent.

According to Kumar (2021), from the medieval period until the revolt of 1857, the residents of Delhi have relied upon the decentralised water supply system, where major sources of water included neighbourhood wells, individual wells, step wells (*baoli*), rivers and canals. During this period there was a sufficient quantity of good-quality water to meet the residents' demands. However, water equity was a concern, due to caste discrimination and the social status of individuals. After the 1857 revolt, much attention was paid to the sanitation needs of the 'Indians', following the sanitation proposals by the Royal Commission on the sanitary state of the British Indian Army in 1863. This resulted in the construction of a centralised water supply network for the first time. Unfortunately, the network's development in Delhi was selective in nature, and only cantonment and government areas were part of the modern water supply and sanitation systems. The rest of the city still continued to rely on the old systems, where sanitation meant manual scavenging and open defecation, which are both degrading practices for humanity.

Post-colonial water discourses in the NCTD from 1947 to 1998: Supply-side management

Until 1958, water and sanitation needs of the city were the responsibility of the Delhi Joint Water and Sewerage Board (DJW & SB). In 1958, the Municipal Corporation of Delhi (MCD) was established, and over the next 30 years, water and sanitation service provision was delegated to the Delhi Water Supply and Sewerage Disposal Undertaking (DWS & SDU), replacing DJW & SB (see Figure 28). According to Sheikh, Sharma and Banda (2015), DWS & SDU was under the control and monitoring of the MCD's Delhi Water Supply and Sewage Disposal Committee, which was one of the corporation's six statutory committees (also see Figure 28).

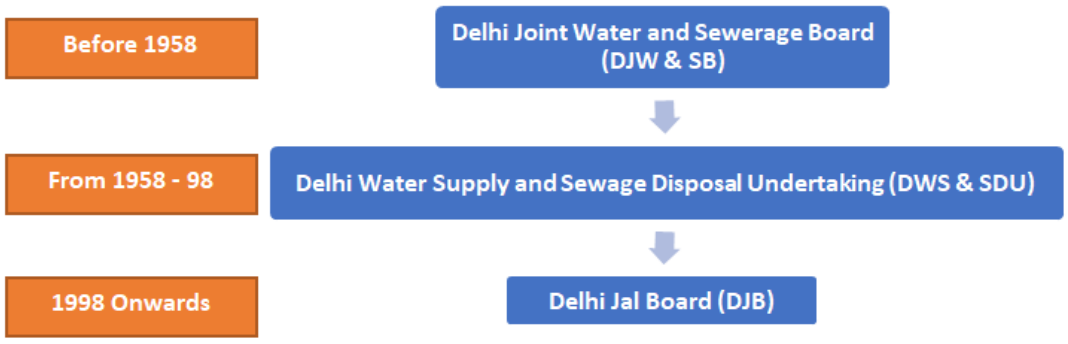

Figure 28: Chronology of Government Bodies providing Water and Sanitation in NCTD (Compiled from various sources (2021))

As noted earlier, after independence, Delhi witnessed a huge influx of population due to reasons such as refugees' resettlement, and migration from various parts of the country for employment

opportunities, etc. Under these circumstances, government bodies were struggling to estimate water and sanitation demands for the city (Sheikh, Sharma and Banda, 2015). The issue of underestimating Delhi's water and sanitation demand became evident in the Delhi Master Plan (DMP) of 2001, which reported that water and sanitation demands predicted in the Delhi Master Plan of 1962, for the year 1981, were short of the actual requirements (see Table 7).

Table 7: Demand–supply gap in water and sanitation of Delhi as per DMP-2001 (Delhi Master Plan (2001))

S. No.	Time	Water (MGD)	Sewer (MGD)	Remarks
1.	Earlier target fixed for 1981	250	200	✓ As per DMP-1962, the projected population of Delhi in 1981 was 4,586,000. However, the actual number was 6,220,000. ✓ As per DMP-2001, the projected population of Delhi in the year 2001 was 12,810,000. However, the census recorded 16,787,941 in 2001. ✓ With the per capita water supply norm being approximately 80 GPCD, water needs were much greater than estimated.
2.	Present requirement (1981)	496	397	
3.	Availability in 1981	253	118	
4.	Projection for 2001	1,127	902	

In 1962, Delhi had a total water supply of 60 million gallons per day (MGD). During the plan horizon of the Delhi Master Plan, until 1981, Delhi augmented its water supply to 190 MGD. In spite of the augmentation of sources in Delhi, the city's population was facing water shortages. Table 7 shows a large mismatch in the projected and actual population of Delhi for the year 1981, resulting in underestimation of water demand.

During the period of 1960–1980, the major source of water for Delhi was the River Yamuna, groundwater, and partial supply from the river Ganga in the trans-Yamuna area of Delhi (DDA, 1990). Water availability in Delhi was so low that the DMP-1981 had mentioned that no large-scale industries could be set up in the city (DDA, 1962). In order to address the problem of Delhi's water shortages, suggestions were made in the DMP-2001 to construct Tehri Dam, Kishau Dam, Lakhwar Vyasi and Giri Dams in the neighbouring states of Delhi. The dearth of water sources for Delhi can be understood from the fact that on 31 March 2001, Delhi Jal Board, the government water provisioning body, was producing 650 MGD of water, 87.5 per cent of which was procured from the neighbouring states (Planning Department, 2001; also see Table 8). These are some of the classic examples of water discourses prevalent in the second half of the 20th century, where emphasis was placed on the supply-side management.

In the wake of the neoliberal hegemonic movement that began in the 1980s, the world witnessed private sector participation (PSP) in the water sector. Water utilities were privatised in major Western countries, including the UK. In a series of events, India undertook liberalisation, privatisation and globalisation reforms starting in 1991. As a result, the Indian market was opened up for foreign private organisations, and various sectors witnessed large investments in the water supply and sanitation sectors.

Table 8: Proposed dams for construction to augment Delhi's water sources (Compiled from various sources (2021))

S. No.	Dam or Reservoir	State	Water Quantity for Delhi in MGD
1.	Renuka Dam	Himachal Pradesh	275
2.	Kishau Reservoir	Uttarakhand	372
3.	Lakhvar Vyasi Reservoir	Himachal Pradesh and Uttarakhand	135
Total			**782**

Water discourses in the NCTD from 1998 to 2012: Promotion of private sector participation in Delhi's water supply

The impact of economic reforms is evident in the National Water Policy of 2002, which stressed PSP in the planning, development and management of water resource projects (MOWR, 2002). Following the same trajectory, the Delhi Jal Board, immediately after its establishment in the year 1998, approached the World Bank for a loan. Arvind Kejriwal, then a major player in the Parivartan NGO, said at the Independent People's Tribunal platform: "The Delhi government approached the World Bank for a loan to improve its water sector. This whole process was going on in a secret manner till a few people like a workers' union of the DJB came to know something about it and started making noises. In November 2004, *The Asian Age* English newspaper came up with a story about the DJB's ongoing plan to privatise its water supply" (Kejriwal, 2007). He explained that this loan amount was meant for the selection of a consultant who would pave the way for PSP in Delhi's water sector. However, during the whole process, the World Bank was arm-twisting the DJB to select PricewaterhouseCoopers (PwC) – a consultant of the World Bank's own choice. This phenomenon was reiterated by 'Citizens Front for Water Democracy' member Vandana Shiva, who played a pivotal role in organising campaigns and demonstrations protesting against the DJB's privatisation. She opined that the World Bank's consultants, PwC, drew up proposals for privatisation including contracts for Sonia Vihar, water tariffs, a 24x7 scheme, and water legislation (Shiva, 2006).

The second major incident in this series of PSP events concerned the construction of Sonia Vihar Water Treatment Plant in 2002 by a global water giant, Ondeo Degremont, a subsidiary of Suez. This was one of the first major projects in the history of Delhi's water sector where a foreign private consultant was involved in the construction, as well as in the operations and management, of water supply-related infrastructure.

Another action to promote PSP in Delhi's water sector emerged from the preparation of the draft Delhi Water and Wastewater Reforms Bill, 2003. This bill was supposed to be the cornerstone of the PSP drive in Delhi. For Delhi's water and sewerage sector, this required "the constitution of a Regulatory Commission along with its reorganization, tariff rationalization, increase in avenues for PSP, and taking conducive measures for the development and management of the water sector in an efficient, commercial, economic and competitive manner in NCT of Delhi" (JSA: Advocates & Solicitors, 2003).

The Delhi Water Supply and Sanitation Project 2004 was a major landmark in a series of attempts to promote PSP projects in Delhi's water sector. The project was aimed at revamping the water supply networks in Delhi by dividing the whole city into various zones. However, due to mass protests and agitations against the ongoing PSP drive in Delhi, the project failed to see the light of the day.

In the coming years, the discourse on PSP in the water sector started to lose ground in the NCTD due to pressure from activists and politicians. This phenomenon was further bolstered by the National Water Policy of 2012, which suggested PSP in urban water utility with the regulated control of public representatives (Ministry of Water Resources, GOI, 2012).

Neo-liberalisation of water discourses in Delhi from 2012 to the present: Demand-side management

From the past experiences, it became clear that the NCTD's water and sanitation body had never been able to completely meet the residents' water demand. This dire reality was further aggravated by the burgeoning population, the impact of climate change on water resources, an improved standard of living, and other factors. The Economic Survey of Delhi 2012–13 reported that 85.5 per cent of Delhi's raw water was procured from outside the NCTD's administrative boundaries. At this time, the DJB started seeking long-term sustainable solutions to solve the problem of water dependency on other states in meeting its water requirements.

The very first step in this direction was taken with the idea of the DJB producing a 'Water Policy for NCT of Delhi'. Regarding the 'Draft Water Policy for Delhi, 2017', the CEO of the DJB started the task of preparing a water policy in 2011 to achieve water security in Delhi. The motivation for this ground-

breaking initiative was to avoid ad-hocism in the DJB's efforts in the water and sanitation sector, while there was change in the political governance of Delhi (INTACH, 2017).

Through another major step, the DJB has started to perceive 'treated wastewater' from Delhi's sewerage treatment plants (STPs) as a resource, which has the potential to solve Delhi's water demand problem in an efficient and sustainable manner. In 2020, the DJB was supplying water at the rate of 940 MGD, of which 720 MGD (80 per cent of supplied water) was being generated as wastewater. Out of this 720 MGD, approximately 650 MGD was being treated on a daily basis. The 'Draft Delhi Master Plan, 2041' proposes to lay a dual piping system in the proposed new residential areas of Delhi, which are expected to house 7,500,000 of Delhi's inhabitants (DDA, 2021). The treated wastewater will be supplied to the households of Delhi for non-potable consumption, and thus has the potential to meet Delhi's daily water demand–supply gap of 283 MGD.

Another DJB initiative to make people save water was the launch of the '20 Kilolitres Free Water Scheme'; this is based on a 'carrot and stick policy', which aims to motivate people to use water judiciously at the household level. Since very few households in Delhi have proper water meter connections, they pay a minimal fixed charge to the DJB. However, after the launch of this scheme, in order to benefit from a zero water bill, one requires a proper meter connection. This has caused a rise in water meter connections from 1,500,000 in 2015 to 2,500,000 in 2020, and 4 MGD of water was saved on a daily basis (Srivastava, 2020). Another benefit of this scheme was to facilitate the water demand assessment of an area, due to availability of water-use data once the water meters were installed. This in turn helped in designing and maintaining the water supply infrastructure more efficiently.

Since 1947, Delhi's water discourses have changed along with changes in political regimes, and the rising tide of water activism. After independence, water supply, as a basic service provision, became the primary responsibility of the state. After independence, government bodies responsible for water supply were trying to meet the demand by augmenting water sources. Despite various efforts, the water demand–supply gap in Delhi could not be filled because it depended on water from the neighbouring states. For far too long, the NCTD had been drifting without a strategic approach, depending on the Central Government and the Supreme Court to bail the city out of a water crisis (INTACH, 2017). However, exploring innovative policies and projects based on water demand management principles, rather than supply-side management, is the DJB's new path at the present time.

Actors mapping and power discourses

The peculiar administrative structure of the National Capital Territory of Delhi has made the governance of the megacity a complex affair. Unlike the other cities in the country, the NCTD serves as a union territory, a special-status state, and the nation's capital, which has led to interplay of multiple actors and their powers (Aggarwal and Haglund, 2019, p. 8).

The NCT of Delhi is governed by multiple actors. Starting from the top of the hierarchy, the constitutional head of Delhi is the Lieutenant Governor (LG), who is directly nominated by the President of India as advised by the central government. The LG of Delhi is responsible for carrying out the functions pertaining to entries 1 (Public Orders), 2 (Polices), and 18 (Land) of the State List (CPRI India, 2015, p. 3). Unlike other states, the Government of NCTD has a limited say in the entries 1 (Public Orders), 2 (Polices), and 18 (Land) of the State List (Bagchi, 2003, p. 4831). Last in the hierarchy are five urban local bodies, namely the Delhi Cantonment Board (DCB), New Delhi Municipal Council (NDMC), North Delhi Municipal Corporation (NDMC), East Delhi Municipal Corporation (EDMC), and South Delhi Municipal Corporation (SDMC). Here, 95 per cent of the area falls under the jurisdiction of three corporations, which were formed with the trifurcation of the Municipal Corporation Act of 1957. Both NDMC and DCB cover approximately 3 per cent of Delhi's total area respectively. The NDMC was established with the New Delhi Municipal Council Act of 1994, and the DCB through the Delhi Cantonment Board Act of 1914 (CPRI India, 2015, pp. 1–2; also see Figure 29).

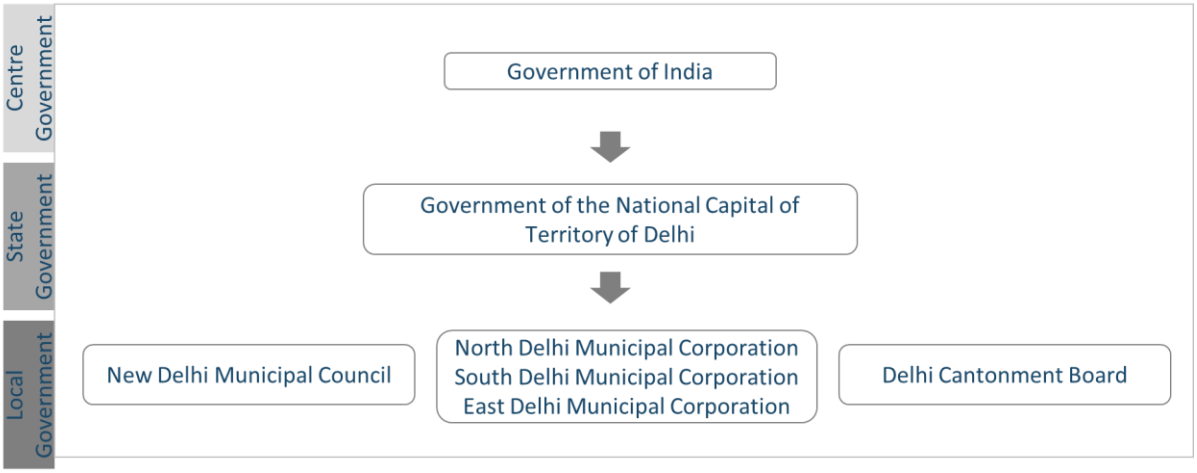

Figure 29: Hierarchy of the Government in the NCT of Delhi

In a similar vein, multiple actors in the hierarchy are involved in the administration of water in the NCTD. As explained in Saleth's study of water institutions in India (2006, p. 14), water administration includes

the organisational, regulatory, financial, managerial, and conflict resolution mechanisms involved in the water sector.

Organisational framework

At the national level, the Ministry of Jal Shakti was formed by merging two ministries, namely the Ministry of Water Resources, and the Ministry of Drinking Water and Sanitation; it is responsible for planning, development, allocation and management of the country's water resources by formulating policies. To date, three National Water Policies (1987, 2002 and 2012) have been framed by central ministries, to provide guidelines for states to formulate their own water policies (Delhi Jal Board, 2016, p. 9). The Ministry of Jal Shakti contains various organisations, which can be categorised under the headings shown in Table 9.

Table 9: Water Organisations within the Ministries (https://goidirectory.gov.in/ accessed on 26/08/2021))

S. No.	Category	Ministry of Jal Shakti
1.	Departments	Department of Drinking Water and Sanitation, Department of Water Resources, River Development and Ganga Rejuvenation
2.	Attached and Subordinate Offices	Central Ground Water Board, Central Water Commission, Upper Yamuna River Board, Central Soil and Material Research Station, Central Water and Power Research Station, Farakka Barrage Project, Ganga Flood Control Commission, Sardar Sarovar Construction Advisory Committee.
3.	Statutory and Autonomous Bodies	Brahmaputra Board Guwahati, Narmada Control Authority, National Institute of Hydrology, National Institute of Immunology, North Eastern Regional Institute of Water and Land Management.
4.	PSUs and Public Companies	National Project Construction Corporation Limited, National Water Academy, Water and Power Consultancy Services (India) Limited, Maharashtra Water Resource Regulatory Authority, Bansagar Control Board, Central Ground Water Board, North Western Region Chandigarh.
5.	Boards, Undertakings, Commission and Missions	Betwa River Board, Tungabhadra Board, Godavari River Management Board
6.	Others	Central Water Commission, National Hydrology Project, National Water Mission, etc.

These attached offices and statutory bodies are responsible for framing and executing policies and schemes, and providing technical assistance (Saleth, 2006, p. 14). For instance, the agreement between the states of Uttar Pradesh, Haryana, Rajasthan, Himachal Pradesh and the NCTD regarding the allocation of surface flow of the Yamuna, led to the formation of the subordinate office of the Upper Yamuna River Board. This Board is responsible for regulating the allocation of available flow, monitoring conservation and upgradation of quality of flow, and reviewing the watershed management plan, etc. (http://uyrb.gov.in/). This agreement also led to the involvement of various beneficiary states'

governments and their departments: for example, Haryana Irrigation and Water Resource Development, Uttar Pradesh Irrigation, and Uttar Pradesh Jal Nigam.

Other central ministries that have influenced the water sector in various ways are the Ministry of Environment, Forests and Climate Change, and the Ministry of Housing and Urban Affairs, etc. Similar to the Ministry of Jal Shakti, these ministries also have attached and subordinate offices, and statutory and autonomous bodies, such as the Delhi Development Authority, National Capital Region Planning Board, Central Public Works Department, Town and Country Planning Organization, and Central Pollution Control Board, etc. For example, the Delhi Development Authority controls the construction of drainage systems in a development area, greenscaping, formulating water-related building byelaws, planning water supply systems and disposal, and maintaining the lakes and wetlands in the NCTD (Delhi Jal Board, 2016, p. 100).

The legislative and managerial responsibility for water directly falls within the ambit of the GNCTD. Here, the main department handling both surface and groundwater is the Delhi Jal Board. The DJB was formed under the Delhi Jal Board Act of 1998, with the primary motive to provide water supply, sewerage, and drainage services within the NCTD. These include the treatment, supply and distribution of water through pipelines or other means, and managing the collection, disposal and treatment of sewage. The DJB is also responsible for regulating the exploitation of groundwater and drains, and promoting the conservation, recycling and reuse of water in the NCTD. Under special provisions, it also supplies bulk water to NDMC, the Military Engineering Services of the Cantonment Board (Delhi Jal Board, 1998). Along with the DJB, other departments are responsible for the construction, maintenance and management of water-related projects: namely, the Irrigation and Flood Control Department, Public Works Department, Delhi State Industrial and Infrastructure Development Corporation Limited, Delhi Tourism and Transportation Development Corporation, and Urban Development Department within the GNCTD (Delhi Jal Board, 2016, p. 99). For instance, the DJB, along with the Public Works Department, manages lakes and wetlands in the NCTD, while the Department of Irrigation and Flood Control is responsible for preventing the megacity from flooding by constructing bund walls, embankments, and trunk storm-water drains, and provides irrigation facilities through tube wells; it supplies treated effluent water, and maintains village ponds (Department of Irrigation and Flood Control, 2017). Complementing water-related projects, several other departments or organisations, such as Delhi Metro and the Forest Department, own large parcels of land.

At the local government level, all local bodies such as the NDMC, Delhi Cantonment Board, and the three municipal corporations of Delhi, also play an important role in enforcing water-related byelaws,

and dispensing several water consumption and disposal activities in their respective areas (Delhi Jal Board, 2016, p. 100).

As water is a state-level matter, the GNCTD is primarily responsible for funding, cost recovery, and management of all water-related activities in the NCT of Delhi. The GNCTD finances water development schemes either from its own revenues, or its share from centrally collected revenue proceeds, and borrowings from financial institutions and the private corporate sectors. In the NCTD's case, various water development schemes such as "Free lifeline water up to 20 kilolitres" were launched by the GNCTD (Economic Survey of Delhi, 2020–21, p. 234).

Multiple organisations are involved in the enforcement and monitoring of the NCTD's water-related projects. The DJB, along with the Central Ground Water Authority, Delhi Development Authority, and the three municipal corporations in Delhi, are the apex authorities, which regulate surface and groundwater for different purposes. Under the Delhi Jal Bard Act of 1998, clause 9 section (1a), the Board is prevented from supplying water to any premises that are constructed in contravention of the law. Similarly, the DJB, in consultation with the Central Ground Water Authority, also regulates the exploitation of groundwater in the NCTD (Delhi Jal Board, 1998). Furthermore, the municipal corporations of Delhi also enforce building byelaws pertaining to water, such as for rainwater harvesting structures and wastewater recycling plants, at household and community level.

Various arrangements exist for conflict resolution at different levels. In the case of inter-state water disputes, article 262 of the Indian Constitution makes provisions for conflict resolution. In compliance with article 262, the Parliament enacted the Inter-State Water Dispute Act of 1956, under which a number of tribunals can be set up to resolve water disputes among the states (Saleth, 2006, p. 17). Several interstate disputes in the NCTD were resolved through various boards, such as the Upper Yamuna River Board and Bhakra Beas Management Board (Roy, 2014, p. 9). There is also a possibility of contesting the implementation of tribunal awards, in the high courts and the Supreme Court of India.

The peculiar nature of the administration of water in Delhi has resulted in the interplay of multiple actors in the NCTD's water governance. This has resulted in facilitation, duplication, and sometimes delays in the working of the various organisations, which are analysed in the next section.

Problems and drivers

Access to safe, adequate and affordable potable water, and the provision of adequate sanitation services, form the basic public services for maintaining decent standards of human health. These

services are required to be ensured by the state governments for their citizens, for a healthy life. However, due to the complex governance structures of Delhi, and other political and economic hurdles, it has been difficult to achieve this on the ground. Hence, this part of the report summarises seven significant issues faced by Delhi that have been identified so far, and which pose challenges and obstacles to achieving water security in the NCTD.

Limited fresh water sources in Delhi, 2020

Given the high population concentration in the NCTD, its water sources are not sufficient to meet the city's water demand. The Yamuna, as the only river flowing through the administrative jurisdiction of Delhi, is a major source of raw water. Another major source of raw water is Delhi's groundwater resources. However, the contribution of groundwater is just 10 per cent of its total water supply; therefore, Delhi relies heavily on its neighbouring states to meet 90 per cent of its daily water requirements. The table below shows the quantities of water that Delhi procures from various rivers (see Figure 30 and Table 10).

Table 10: Sources of Water Supply in Delhi, 2020 (Economic Survey of Delhi (2020))

S. No.	Water Resource	Quantity in MGD	Per cent
1.	Yamuna River	389	41
2.	Ganga River	253	27
3.	Bhakra Dam	221	23
4.	Ground Water, Ranney Wells and Tube Wells	90	09
Total		**953**	**100**

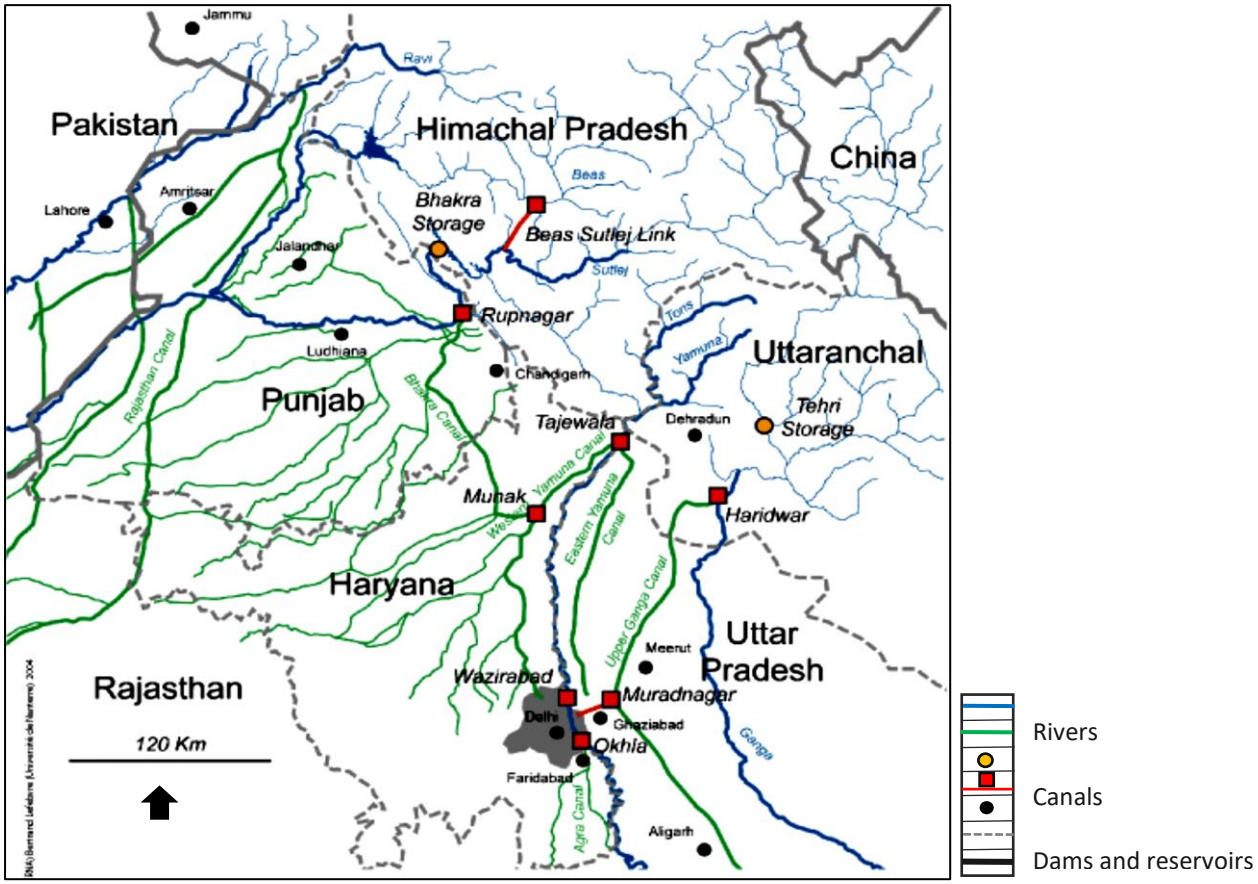

Figure 30: Water sources of Delhi at regional level (Maria, Augustin (2008). Urban Water Crisis in Delhi. Stakeholder's responses and potential scenarios of evolution, Iddri - fdees pour Ie debat N° 06/2008)

Lack of hydro-solidarity from Haryana: An upper riparian state of the River Yamuna

Since water is a state-level subject, the upper riparian states could play a major role in allocating water to neighbouring states. This is quite evident in the case of Haryana and Delhi, along with other states; this has led to inter-state water disputes in India, such as the Kaveri Water Dispute between the states of Karnataka and Tamilnadu.

As a result of the green revolution, Haryana's agricultural production and water demand for irrigation purposes have increased. Being an upper riparian state, Haryana significantly holds and manages water. However, due to the Yamuna Water Sharing Agreement of 1994, signed between riparian states of the River Yamuna, fair water allocation was decided between the states. Unfortunately, during the summer season when water demand is high, Haryana releases water into the Yamuna at below 10 cubic metres per second, and thus breaches the 1994 agreement.

Impact of upstream activities on Delhi's water security

The impact of upstream activities can be seen directly in the high concentration of ammonia in the River Yamuna. Panipat, a district in Haryana, is 85 km upstream of Delhi, and has over 2,000 textile dyeing units. These units use formaldehyde, volatile organic compounds (VOC), and other chemicals such as ammonia in various quantities. Most of these units are operating illegally and are not connected to the common effluent treatment plants (CETP). Therefore, they release ammonia directly through drains into the River Yamuna. During pre-monsoon, the amount of water in the Yamuna is less, and as a result the concentration of ammonia surges. In a similar manner, the DD-6 drain from Sonipat, and the DD-8 drain, X-Regulator from Rohtak, Haryana, release ammonia into the Yamuna, causing water pollution (see Figure 31).

Figure 31: Illegal Textile Units in Panipat, Haryana (Image by Dilip Banerjee (accessed on 25/05/2021)).

The Wazirabad, Chandrawal and Okhla Water Treatment Plants (WTP), which rely upon raw water from the Yamuna, are designed to treat water that has an ammonia level below 0.9 ppm. When there are high ammonia concentrations, these WTPs stop functioning. In these circumstances, raw water from the Munak Canal and Upper Ganga Canal is mixed with this high ammonia concentration water to dilute it.

Figure 32: News on Higher Levels of Ammonia in the River Yamuna, 2021 (Negi (2021); NDTV (2021))

On 13 April 2021, a press conference was given by Raghav Chadhha, Vice-Chairman of DJB, who stated that the ammonia level in the River Yamuna had reached 7.36 ppm, and the water level at Wazirabad pond dipped to 670 feet from the normal level of 674.5 feet; this impacted the functioning of the above-mentioned three WTPs (also see Table 11). Consequently, water supply was reduced in the north, central, south and west Delhi areas, which are supplied water from these WTPs. In his press conference, Chadhha also stated that the Haryana Government was responsible for this, and alleged that it was in contempt of the Supreme Court's orders.

Threat to infrastructure for carrying water to Delhi

The United States Environment Protection Agency (USEPA) regards water security as prevention against contamination of water by potential terrorists or malicious acts (Crisologo, 2008; Minamayer, 2008). The 102 km long Munak Canal brings 700 cusec of water to Delhi, which constitutes 70 per cent of total water from Haryana. Delhi's WTPs, such as Sonia Vihar, Okhla, etc., get raw water from this canal. In 2016, during the Jaat Reservation agitation, the Munak Canal was damaged by protestors to halt the water supply to Delhi; as a result, the Indian Army was called to protect the canal. Thus, supplying water from other states is a high-stakes activity.

Table 11: Difference in Water Production from Water Treatment Plants

Name of the WTP	Installed Capacity in MGD	Functioning at MGD	Gap in Production in MGD
Wazirabad	135	82	53
Chandrawal	92	72	20
Okhla	21	10	11
Total Difference in Water Production			84

High amount of non-revenue water in Delhi

Water distribution systems move in a linear fashion, from a water treatment plant through to the primary reservoir to households or secondary reservoirs, and then to different households. The general water supply network in Delhi is a classic illustration of this kind of water treatment and distribution system. During an interview with Ankit Srivastav, the Technical Advisor to the DJB, on 12 November 2020, it was highlighted that illegal tapping of the DJB's water supply pipelines is a major cause of non-revenue water (NRW) in Delhi.

After the installation of 3,000 flow meters in the DJB's water supply network, 200 illegal tappings were found in the main trunk line; they were serving unauthorised colonies and large settlements.

Settlements such as unauthorised colonies that benefitted from illegal tapping had 24/7 water supplies, and water use was found to be high due to activities such as car-washing, and water intensive factories, etc., located in these areas. Similarly, during water distribution from secondary reservoirs to households, 2,700 illegal tappings were identified. Out of 840 MGD of treated water from WTPs in Delhi, only 600 MGD reached primary reservoirs. Therefore, 240 MGD of treated water was unaccounted for. Pipeline leakages due to old infrastructure are another cause of non-revenue water. Overall, the share of NRW in Delhi is 40 per cent, which far exceeds the acceptable limit of 15 per cent.

Non-recognition of treated wastewater as a resource

Delhi has been witnessing a constant surge in its population over the years, because of which the city stands on the brink of a water crisis. Ankit Srivastav (2020) was quick to add that since Haryana and Uttar Pradesh are not providing additional water to Delhi, the water crisis was engineered by these two states, led by the opposition political parties.

The focus has shifted towards reusing treated wastewater in an attempt to conserve and make water accessible to all. On a daily basis, 500 MGD of water is being treated in Delhi, and the rest goes into the River Yamuna via drains. The DJB spends approximately 7–8 INR per kilolitre to 61 INR per kilolitre on sewerage treatment. Nearly 500 MGD of sewage is treated on a daily basis, out of which only 90 MGD is utilised, which accounts for only 18 per cent of total treated wastewater. The test of the treated water, which could be put to non-potable uses, is discharged into drains and the River Yamuna. Non-potable uses of this water, such as irrigation, have the potential to enhance water security in the NCTD by more efficient use of freshwater resources.

Poor health of the River Yamuna and its ecosystem in Delhi

Low awareness of the scarcity of potable water and its life-sustaining and economic value results in its mismanagement, wastage and inefficient use, as well as pollution, and reduction of flows below minimum ecological needs. The major source of pollution in the River Yamuna is the discharge of treated and untreated wastewater through 22 major drains (see Table 12).

The Central Pollution Control Board's data show that these drains contribute almost 90 per cent of the flow and 80 per cent of biological oxygen demand (BOD) load levels, respectively, in the River Yamuna. A 22 km stretch of the Yamuna in Delhi, from Wazirabad Barrage to Asgarpur Village after Okhla Barrage, which is less than 2 per cent of the river length, accounts for about 76 per cent of the pollution load in the river.

Table 12: Major Drains in the National Capital Territory of Delhi (Central Pollution Control Board)

S. No.	Name	S. No.	Name
1.	Najafgarh Drain	12.	Sen Nursing Home Drain
2.	Magazine Road Drain	13.	Drain No. 14
3.	Sweeper Colony Drain	14.	Barapullah Drain
4.	Khyber Pass Drain	15.	Maharani Bagh Drain
5.	Metcalfe Drain	16.	Kalkaji Drain
6.	Kudsia Bagh Drain + Mori Gate Drain	17.	Okhla Drain
7.	Moat Drain	18.	Tughlakabad Drain
8.	Trans Yamuna MCD Drain	19.	Shahdara Drain
9.	Mori Gate Drain	20.	Sarita Vihar Drain
10.	Civil Mill Drain	21.	LPG Bottling Plant Drain
11.	Power House Drain	22.	Tehkhand Drain

The water quality monitoring report for the River Yamuna indicates that the parameters are meeting the water quality criteria of 'C' class at Palla only, which is upstream of Wazirabad Barrage. The highest average of dissolved oxygen (DO) is 7.19 mg/l at Palla. The average of BOD ranges from 2.56 mg/l at Palla to 37.36 mg/l at Okhla Barrage after meeting Shadhara Drain. The high concentration of BOD and COD at these locations is due to the discharge of untreated wastewater, and the joining of various drains at points between Nizamuddin and Okhla (see Table 13). Water quality monitoring results of the drains indicate that most are yet to meet the standards regarding Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and Total Suspended Solids (TSS) (see Table 12).

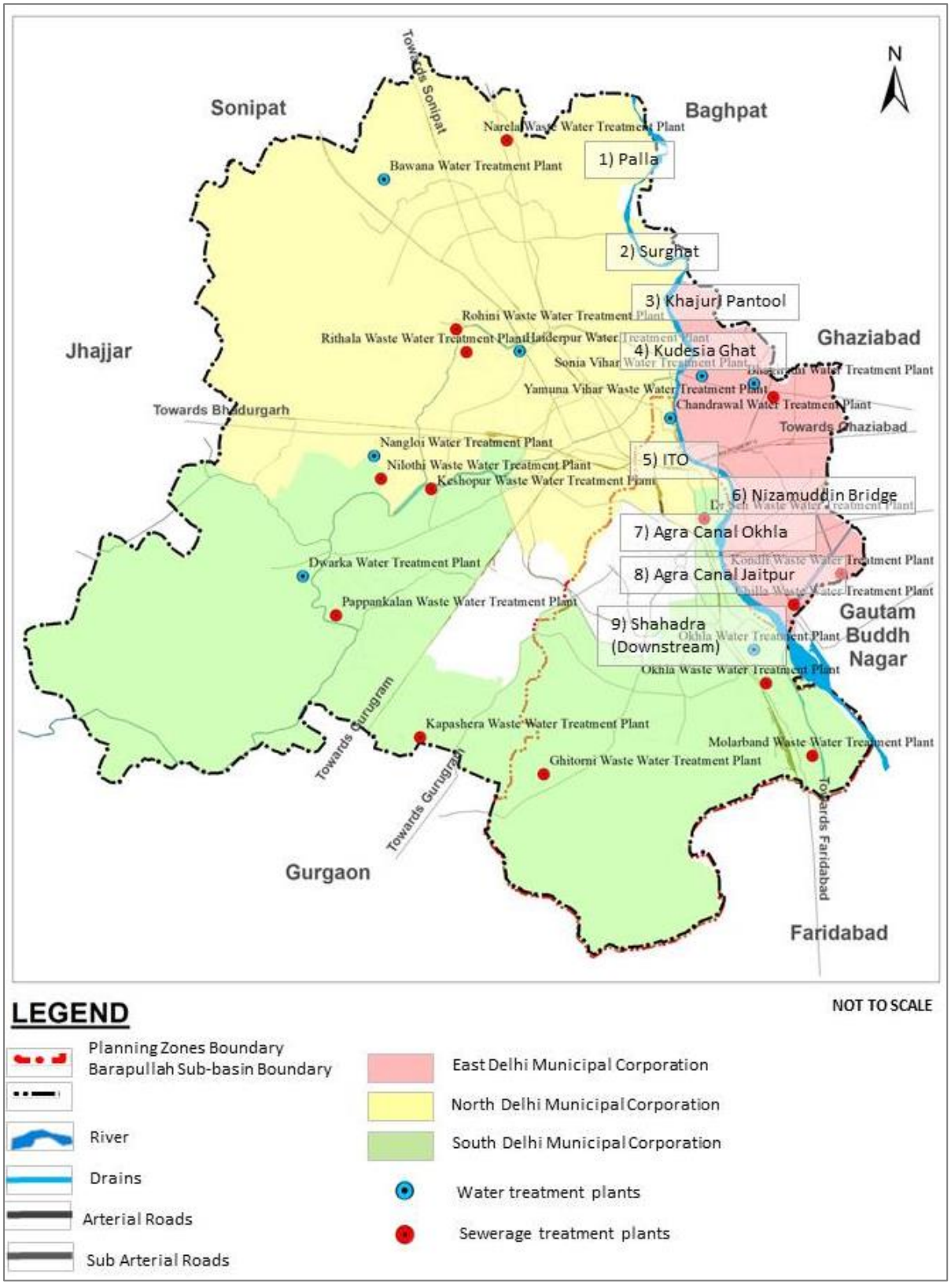

Figure 33: Location of Water Treatment Plants and Sewage Treatment Plants in Delhi, 2020

Table 13: Annual Average Water Quality in the River Yamuna, January 2020 to December 2020 (Delhi Economic Survey (2020))

S. No.	Location	pH (mg/l)	COD (mg/l)	BOD (mg/l)	DO (mg/l)
	Water Quality Criteria	6.5–8.5	-	3mg/l or less	5mg/l or more
1	Palla	7.73	9.73	2.56	7.19
2	Surghat	7.58	14.36	3.42	5.87
3	Khajori Paltoon Pool	7.31	96.00	30.27	1.40
4	Kudesia Ghat	7.41	77.64	27.45	2.30
5	ITO Bridge	7.49	72.36	24.91	2.00
6	Nizamuddin Bridge	7.42	66.36	21.91	2.08
7	Agra Canal Jaitpur	7.62	75.27	23.64	3.67
8	D/S Okhla Barrage (after meeting Shahdara Drain)	7.80	105.8	37.36	2.60
9	Agra Canal Okhla	7.53	75.27	24.20	1.50

Overall, we can say that the major challenges to achieving water security in Delhi include the megacity's complex water governance system, dependency on upper riparian and neighbouring states for raw water, and a poor water management system for supplying potable water to households.

Conclusions and the way forward

The population of the NCTD is likely to continue to increase in the near future, placing the megacity among the top ten most populated cities of the world. Thus, the demand for potable water will continue to surge. The quality of water in the River Yamuna is also likely to deteriorate, despite the fact that central and state governments are making large investments to cleanse the rivers Yamuna and Ganga. However, the rent-seeking behaviour of government officers needs to radically change before any improvements in water quality in these two rivers are expected.

Hesitancy to reuse wastewater after treatment is disastrous. However, if people and governments are adequately convinced of the need to reuse wastewater after treatment, this also presents a potential policy solution to water security. Another possible way to improve water security in Delhi is to make large investments, without rent-seeking, in building the water distribution network, and replacing the old pipes and other machinery. This could help to save as much as 30 per cent of the total treated water supplied by the Delhi Jal Board to connected households, and would thus meet a large proportion of potable water requirements. The reuse of treated wastewater for non-potable purposes, and reduction in non-revenue water, could eliminate Delhi's water shortage.

Political manoeuvring to reduce inter-state conflicts, and effective use of technologies, are two other policy initiatives that could enhance water security in Delhi. Informing users of how much water is supplied is important, and water flow meters could easily resolve this problem. Water decentralisation at the district level is equally important, to reduce non-revenue water and water inequity. Without measuring and knowing how much potable water is supplied in each district, expecting to reduce water inequities is a pipedream.

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MALAYSIA

Critical Water Governance in the Johor River Basin: the context[16]

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Introduction

As in other nations, water is crucial for sustaining Malaysia's economic development, but there appear to be trade-offs between economic growth and environmental sustainability. In Malaysia, both the federal and state governments play a vital role in water governance. The federal government is the highest governing authority in Malaysia, and most of its agencies are located in the capital, Putrajaya. Like the central government, they are better positioned to manage social and economic agendas, with the positive effects of economies of scale and transformation of states. Meanwhile, each state government in Malaysia has its respective state constitution, executive and legislative bodies; they mainly manage and oversee affairs happening within their state. For instance, land and water fall under state affairs; hence, the state of Johor has more authority to manage the Johor River.

The federal government also has particular roles in managing the Johor River through certain agencies, such as the Department of Environment and the Department of Irrigation and Drainage. In addition, we have identified all the water managers in the Johor River Basin, and further categorised them into 'main' and 'affiliates'. The main water managers are directly involved in managing river basins, both at the federal and state level, and each has its own scope and jurisdiction.

The state water authority is responsible for everything happening to the rivers in the state. It protects the rivers and prosecutes those who are involved in polluting the water resources. However, pollution incidents that occur along the riverbank fall under the jurisdiction of the Department of Environment

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(DOE). Meanwhile, agencies that indirectly make important decisions in managing the Johor River Basin are considered affiliates, which are all under the federal government. The primary aim of our study is to set up an integrated river basin management authority that can improve the locally led governance of the Johor River Basin, to further secure water resources in the basin.

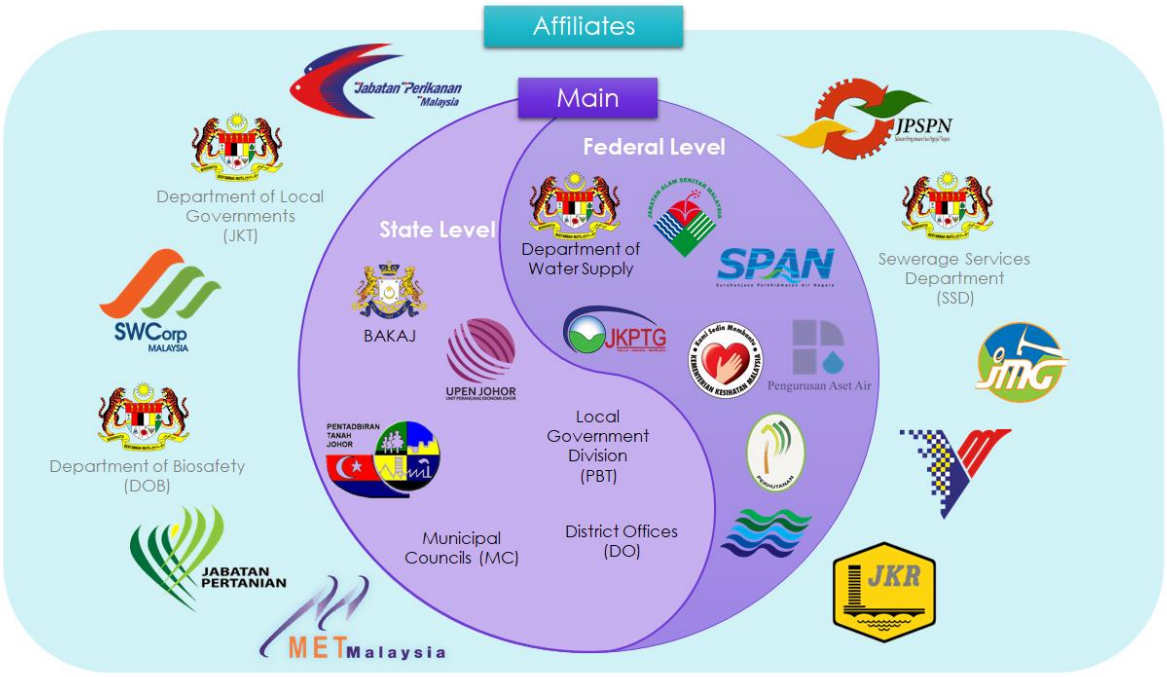

Figure 34. Johor River Basin: Water Managers

Water governance in the Johor River Basin

Malaysia is bordered by Thailand in the north and Singapore in the south. The Johor River Basin is located in the state of Johor, which is 30 minutes north of Singapore. The Johor River, also known as Sungai Johor, is one of the important drinking-water sources in the state; thus, water from the Johor River Basin is supplied both to the southern part of Johor and also to Singapore.

There is a standing agreement between Malaysia and Singapore on Sungai Johor, called the "1962 Water Agreement", which gives Singapore the provision to draw up to 250 million gallons of raw water per day from Sungai Johor.

The Johor River Basin constitutes about 40 per cent of the state of Johor, with an area of 2,600 square kilometres. The river spreads across the basin, with a length of 123 kilometres, and flows through four districts: Kota Tinggi, Pasir Gudang, Kluang, and Kulai. There are four dams built within the Johor River

Basin, namely the Linggiu Dam, Seluyut Dam, and Upper and Lower Layang Dam. The total capacity of all these four dams is 820 million square metres.

In addition, five water treatment plants with a total capacity of 1,840 million litres per day are in place to ensure water is being supplied to the southern part of Johor, and to Singapore. A barrage is constructed inside the Johor River Basin to prevent infiltration of saline water into the water treatment plants.

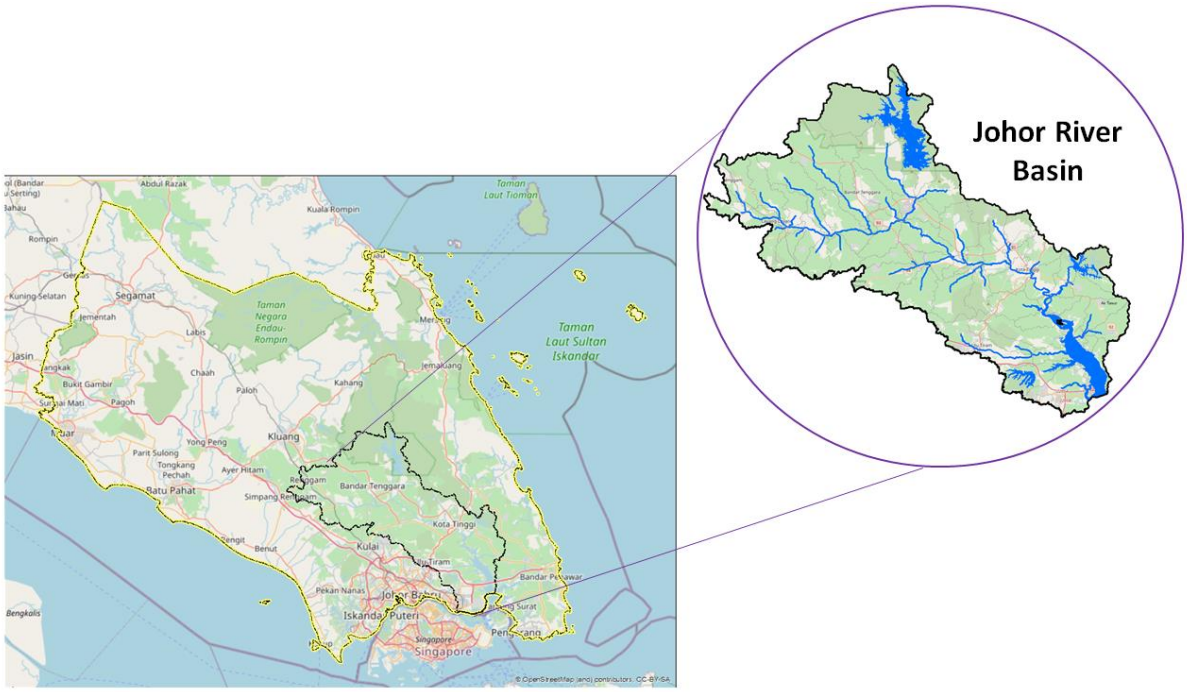

Figure 35. Physical Attributes of the Johor River Basin

Currently, there are 344,000 people of diverse communities living in the Johor River Basin, including three major ethnicities: Malay, Chinese, and Indian. There is a small group of indigenous people, locally known as the Orang Asli, living along the river and in the basin itself. They are specially protected by the government, whose Department of Orang Asli Development Malaysia has been established and entrusted to oversee their affairs.

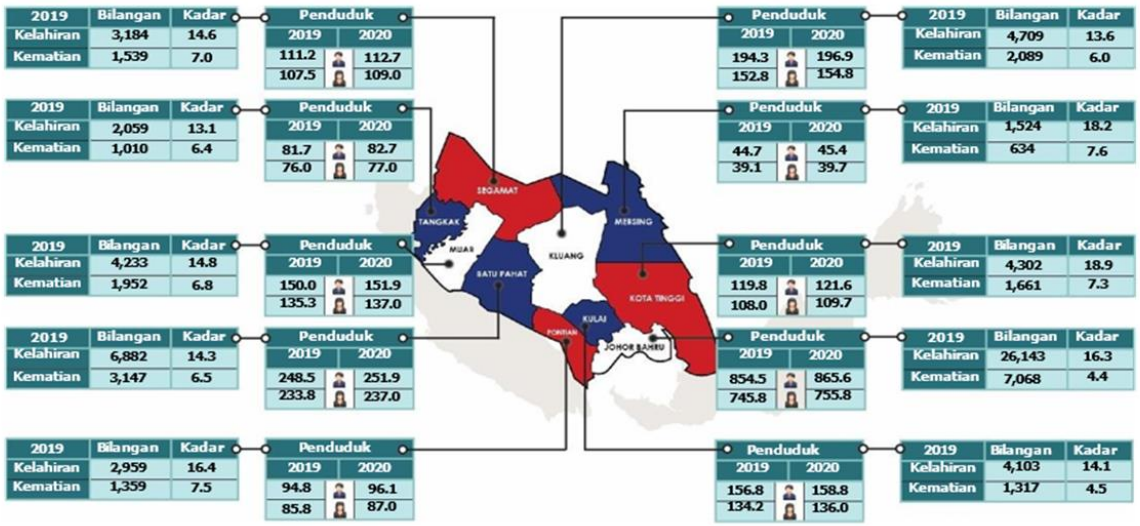

Figure 36. Map of Johor State and Land Area of each District (Department of Statistics Land and Mines Office, Johor State & *Poket Stat Negeri Johor* (2020))

Activities within the basin (Figure 37) include palm oil plantations, orchards, animal husbandry, fish farming, and sand mining along the river.

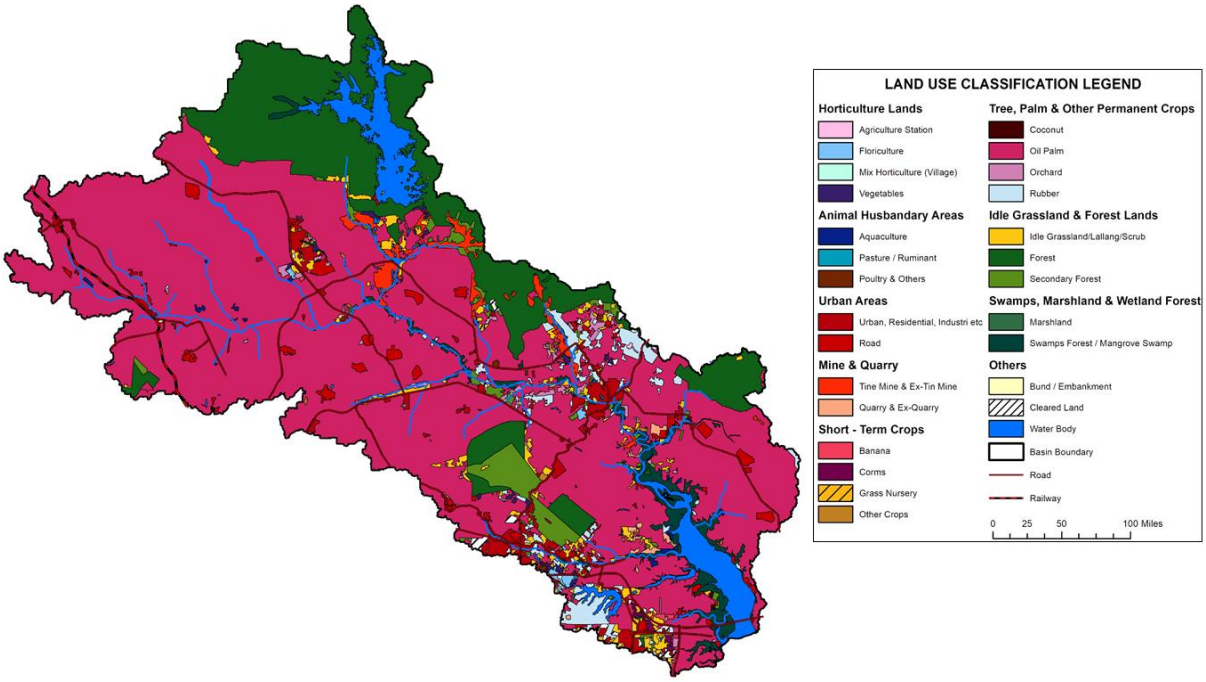

Figure 37. Land use and activities around the Johor River Basin (Department of Agriculture Malaysia; Department of Town & Country Planning Malaysia).

Johor is considered a consummate commercial agricultural state, where agriculture dominates the land-use scene. The National Water Resources Study (2000–2050) based on the review by the Kementerian Sumber Asli dan Alam Sekitar (Ministry of Natural Resources and Environment) in 2011

reported that the major pollution sources were effluent from oil palm and rubber processing mills, industrial estates, hog farms, and urbanised areas (Figure 38).

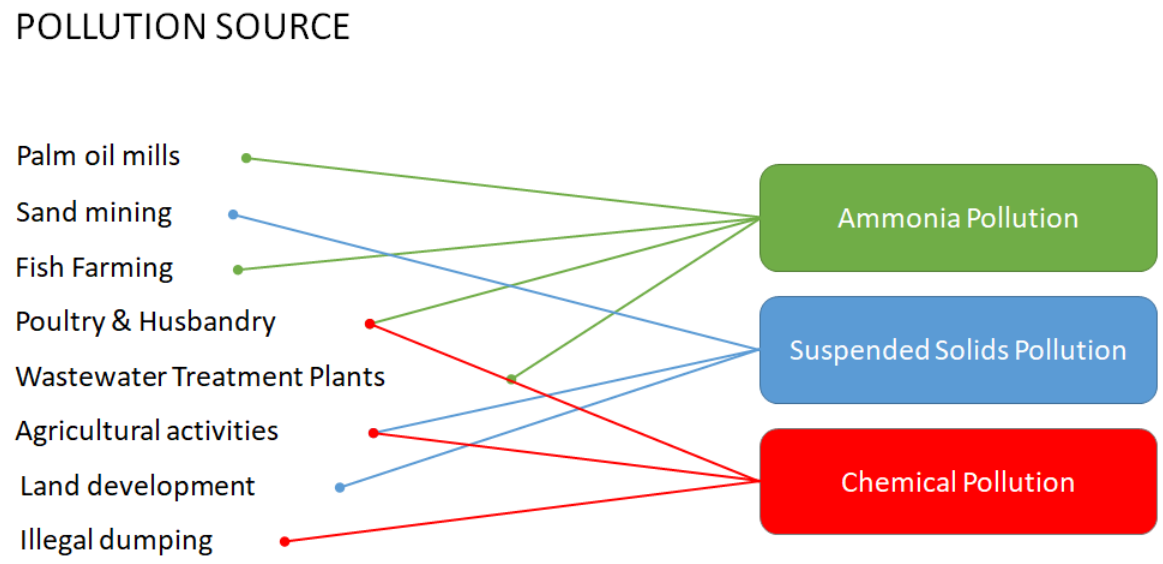

Figure 38. Pollution sources in the Johor River Basin

It is crystal clear that land use in the Johor River Basin is the critical element in water resource management, as human activities in almost all areas affect water resources. Examples of anthropogenic activities on land include using fertilisers and pesticides in agriculture, the discharge of effluent and emission of pollutants from factories, the disposal of sewage and sullage from settlements, and many more.

We examined water governance in the Johor River Basin by asking and answering several political and technical questions, such as: "Who has access to water through the water network and the full right authority?", and "How does pollution affect water supply and demand for the households and industry in or around settlements in Johor River Basin?"

Competing discourses

Competing discourses on water security

Water security is a concept that is gaining increasing interest across studies of various disciplines. The discourse on water security has continued among fields from the natural to the social sciences, providing various definitions of the term 'water security'. Bakker and Morinville (2013) defined it as an "acceptable level of water-related risks to humans and ecosystems, coupled with the availability of water of sufficient quantity and quality to support livelihoods, national security, human health, and

ecosystem services". UN-Water (2013) offered a similar definition that is widely used as the basis for much research, which is "the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability". Based on this definition, Capelli (2017) described four main dimensions of water security:

1. The physical availability of water resources.
2. The population's present and future physical and economic access to safe drinking water.
3. The freshwater quality issue.
4. Vulnerability to climate-related disasters and risks.

Based on these dimensions, the assessment and analysis of what constitutes water security and how to solve the complex issues of water will require system thinking. System thinking focuses on how the things being studied interact with other system constituents, including components such as elements, interconnections and functions.

Competing discourses in the regional context of the Johor River Basin

These dimensions are also discussed in water security discourses in the Southeast Asian region, where the Johor River Basin is located. Commonly, across the countries in this region, especially due to the geographic location and the similar geographic conditions between countries, the discourses often include water scarcity, water-related disasters, and transboundary relations. Geopolitically, while Malaysia applies the parliamentary democracy system, the countries adhere to different administrative systems that influence the considerations and decisions regarding water security.

Like other countries in the region, flooding and drought frequently occur in Malaysia, including the Johor River Basin areas. These issues are not considered new in Southeast Asia. However, their nature is changing, making it important to examine how to define, negotiate and manage the threats brought about by these issues (Chen & Trias, 2020).

Competing discourses in the local context of the Johor River Basin

The Johor River Basin is where the water supply resources are largely distributed in the state of Johor, which is the second-most populous state in Peninsular Malaysia. Although historically Johor has been

water-abundant, in recent years, with the increasing population growth and development, drought, and pollution, the state of Johor is facing water stress (Ewing & Domondon, 2016). Some of the threats identified in the Johor River that add to the water stress include disturbances from aquaculture development, pollution from palm oil industries, oil pollution from tanker and tank washing, and increased bunding of mangroves for conversion to palm oil estates. The reoccurring river pollution further endangers water security in Johor, which has caused water shortages on several occasions. There are limitations on legislation that involves water protection, particularly freshwater. The discourse on environmental protection needs to be amplified, as it has been reported that more than 40 per cent of Malaysian rivers are classified as slightly or heavily polluted. The Department of Environment is responsible for protecting the rivers, led by the Ministry of Environment and Water. However, the control of rivers at the source belongs to the state governments.

The complex political system in Malaysia adds to the discourse as an issue affecting water security, particularly in terms of governance. In discussing the Johor River Basin, we need to examine how the water management system is applied in the country. Malaysia applies the three-tier administrative system, which is shown in Figure 39.

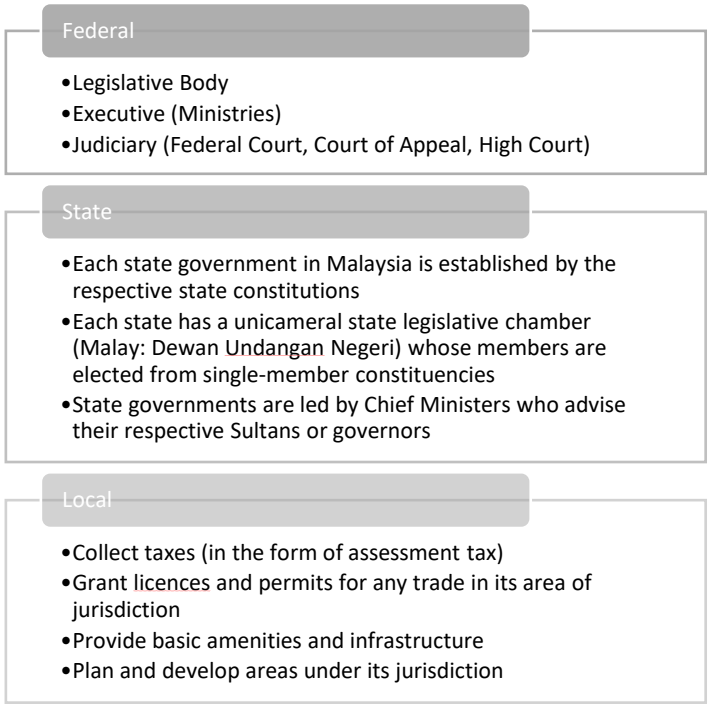

Figure 39. Three-tier Government in Malaysia (Presented in Governance Workshop, 2021).

The Federal Constitution, which was established in 1957 after Malaya gained independence from the British government, is the supreme law of Malaysia. Kim (2012) noted that before water reform, the federal government provided financial assistance, while state governments managed water supply and

regulations. The author further added that before reform, there was a lack of distinct separation of power between the responsibilities for formulating policy, regulating water provisioning, and supplying water, in which all those tasks belonged to the state government as the rightful owner of water sources (as specified under the Ninth Schedule of the Federal Constitution 1957). States, therefore, had the right to be involved in water businesses, allowing private operators to have more say in the matters relating to the tariff. Johor, as a state, has given exclusive rights to Ranhill SAJ Sdn Bhd as a provider of tap water in the state. Kim (2012) further described ongoing policy discourse debates regarding the need to retain public water authorities or open up water markets to private sector involvement. The claims against public water authorities point to their failure to deliver water effectively and economically, therefore these responsibilities were taken over by the private sector. The author noted that, on the other hand, others believe that water must not be treated as a commodity and should remain the property of the public. Therefore, it can be observed that even before the reform, the discourse on water, especially in governance, has often involved the topics of federalism, centralisation versus decentralisation, and public versus private. These matters continue to be a matter of discourse even after the reform, and persist to this day.

The reform started with the amendment of the Federal Constitution, particularly the ninth and tenth schedules, which the parliament approved in 2006 (Saimy & Yusof, 2013). This caused changes to the Federal List, State List, and Concurrent List. Water, which used to be solely under the State List, became included in the Concurrent List. The power given to the federal government through this change subsequently enabled the establishment of Suruhanjaya Perkhidmatan Air Negara (SPAN), or the National Water Services Commission, which acts as the national regulatory agency for the water sector. The present Legislative List in relation to water is excerpted from the ninth schedule, as summarised in Table 14 below.

Based on the Constitution's legislative list above, despite the reform, it can be observed that there are many items involving water in all Federal, State, and Concurrent lists; this makes it challenging to identify who holds power when making decisions regarding water, or other issues that may relate to water. Even after the reform, the provision of a tap water source is still licensed to Ranhill SAJ Sdn Bhd, with the company having recently renewed its licence for the next three years (Lim, 2020). In Selangor, another state in Malaysia that licensed its water supply to a private company, conflicts between the state government and the private operator remain unresolved.

Table 14. Water-Related Items in Federal, State, and Concurrent Legislative List (Ninth Schedule) of the Federal Constitution, 1957 (Amended 2006)

Federal List	Communications and transport - Regulation of traffic by land, water, and air, other than on rivers outside harbour areas wholly within one state. - Carriage of passengers and goods by land, water, and air. Federal Works and Power: Water supplies, rivers and canals, except those wholly within one state or regulated by an agreement between all the states concerned; production, distribution and supply of water power.
State List	State Works Subject to the Federal List, water (including rivers and canals but excluding water supplies and services); control of silt; riparian rights. Agriculture and Forestry Land Turtle and River Fishing
Concurrent List	Drainage and Irrigation Town and Country Planning Public Health and Sanitation Subject to the Federal List, Water Supplies and Services

Water discourses and federalism have been continuing since 1957, as the constitution is continuously amended. Up to 1964, just seven years after independence and after the formation of Malaysia – to include Sabah and Sarawak, and to exclude Singapore – there were already four changes made to the Federal Constitution (Sheridan, 1964). By 2007, 51 amendments had been made (Tham, 2007). At the time of writing this article, there are 117 amendments listed (Federal Constitution – List of Amendments, n.d.). Throughout the discourse, the questions to be asked and tackled include: "Can the Federal Constitution be used to enhance water security?"; "Who should have more say in the distribution of water supply: the federal government or state government?"; "How can the water management services be streamlined to be more efficient?"; and "How can we implement legislation and policies when different states have different water service providers?"

Another competing discourse on water security for the Johor River Basin relates to transboundary relations. Within Malaysia, through the Gersik River and Gemas River, Johor supplies to the state of Melaka (Lai, 2020; Malay Mail, 2020). Tensions between these states may occur if the water supply is disrupted, especially with different political parties governing the states. In other parts of Malaysia, there has been an ongoing dispute between Kedah and Pulau Pinang on the raw water charges for water extracted from the Muda River in Kedah (Mei et al., 2017).

Internationally, the state of Johor specifically supplies to neighbouring Singapore. A complex water policy relationship exists between both countries, which influences the politics – particularly as the

1962 Water Agreement entitles Singapore to draw, treat and import water from a Johor catchment until 2061 (Chuah, Ho and Chow, 2018). In return, Singapore needs to provide a fraction of the treated water (2 per cent of supply) for Johor's municipal use. Between Malaysia and Singapore, to increase the water supply yield to cater to the agreement, the Linggiu reservoir was built. Singapore acknowledges that Johor owns the Linggiu Dam. However, Singapore iterates that it had spent more than S$300 million on its construction and operational costs; compensation for the land used for the Linggiu Reservoir project, and the potential loss of revenue from logging activities; and a one-time payment for leasing that land for the remaining tenure of the 1962 Water Agreement (Ministry of Foreign Affairs Singapore, 2021).

Despite the continuous political tension, there seems to be bilateral support for continuing the Singapore–Malaysia water trade. However, water stress in Johor could potentially harm the diplomatic ties between the countries (Ewing and Domondon, 2016). It was reported in 2016 that the water level in the Linggiu Dam, which is a part of the Johor River Basin, had plunged to a historic low of 20 per cent following a dry spell. However, the recent monsoon surge has raised the water to a healthy level (usually reported as between 80 and 90 per cent) (Tan, 2021). Nevertheless, this illustrates how natural occurrences, such as drought and monsoon, need to be accounted for in maintaining water security. For water security, the discourse on transboundary relations not only relates to the political relationship between countries involved, but also transcends to include matters involving sustainability of the resources, and shared policies to mitigate impacts due to climate change.

Actors mapping and power relations

In terms of administration, Malaysia is a federal constitutional elective monarchy with the King as the head of state. The legislative power is separated between federal and state legislatures. Modelled on the Westminster system, the bicameral legislature consists of the lower house (House of Representatives) and the upper house (Senate) (Nachmany et al., 2015). The selection of the House of Representatives is based on parliamentary elections, which are held at least once every five years. Governance of the states is shared between the federal and the state governments, with different powers reserved for each, and the federal government has direct administration of the federal territories, as illustrated in Figure 40.

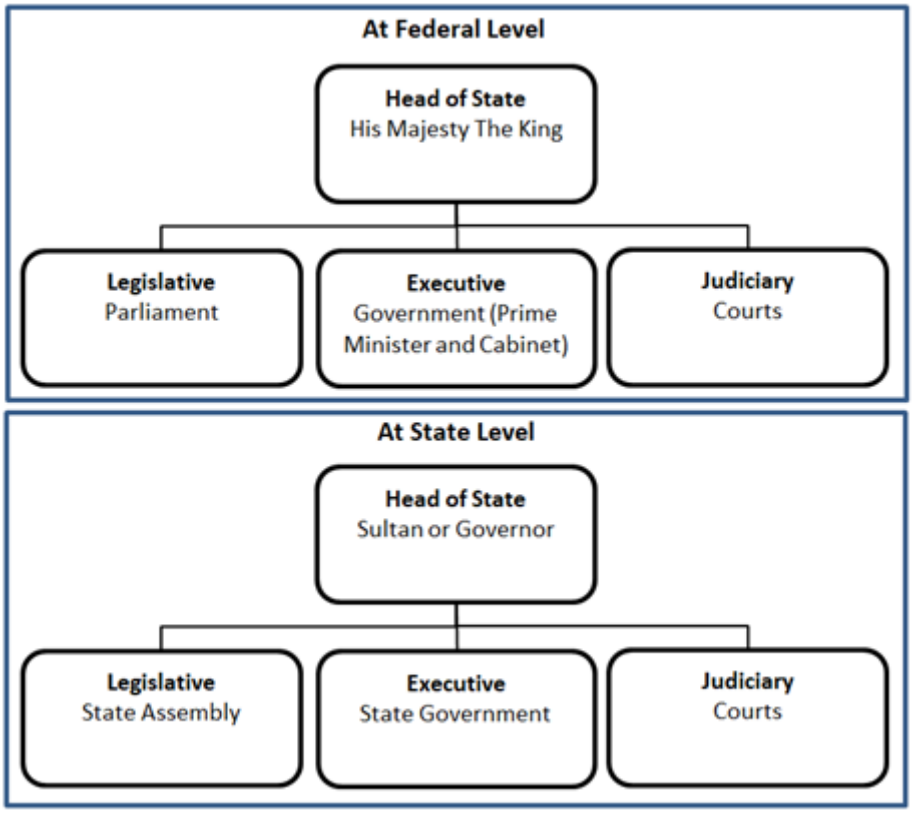

Figure 40. Governance Structure at Federal and State Level

Within the federal level, executive power is led by the prime minister, who leads the cabinet and the government. The Parliament of Malaysia is the ultimate legislative body in Malaysia, and mainly functions to pass, amend and repeal acts of law (Nachmany et al., 2015). At the state level, the State Legislative Assembly is elected from single-member constituencies and is led by the chief minister. Local authorities carry out lower-level administration, including city councils, district councils, and municipal councils, relating to local areas.

Organisational framework

In terms of the current state of water governance, water is a state matter, as set out in the Ninth Schedule, Article 74 of the Federal Constitution, which allows states to manage water resources through the gazette of water catchments and control of development in the river basin area. Figure 41 illustrates the current water governance in Malaysia and Johor, specifically within the federal stage, started before August 2021. Four leading key agencies involved in the water sector are the Department of Drainage (DID), Department of Environment (DOE), State Water Management Authority, and National Water Services Industry Commission (SPAN). DID mainly deals with the water infrastructural works, and has technical agency without legal authority in the management of rivers and other resources. The DOE's main responsibility is to prevent, eliminate and control pollution, and improve the

environment, consistent with the purposes of the Environmental Quality Act 1974 and the regulations thereunder (DOE, 2019). At the national level, the organisation has started being recognised as IWRM in the 9th Malaysia Plan (2005–2010), to promote a commitment towards integrated water resources management.

At present, water legislation is enforced by various water-related government agencies, and many of these laws are outdated, redundant or ambiguous (FAO, 2020). To resolve this fragmented issue, the federal government has set up the National Water Resources Council (NWRC) in 1999, under the chairmanship of the Malaysian prime minister. This has taken over all water resource functions, in order to coordinate the various stakeholders between the federal and state governments in managing the river basin (Mokhtar & Tan, 2004). Ministries related to water governance were restructured in March 2004, and were divided into three components (Rahman and Khalid, 2009):

1) Water for people: The Ministry of Energy, Water and Communication was established to improve the water supply services, which were previously under the Ministry of Works, and to organise sewerage work, which was formerly the responsibility of the Ministry of Housing and Local Government.

2) Water for the environment: The Ministry of Natural Resources and Environment functions to take charge of water for the environment.

3) Water for food: The Ministry of Agriculture and Agro-Based Industry is responsible for water service requirements for agriculture and food.

The establishment of the ministry and consolidation of key government agencies related to land, water and the environment within the ministry was an important move to improve land and water resource planning in the country (Sharip & Zakaria 2007). However, the jurisdiction is still shared with other ministries, such as water services monitoring and supervision (Ministry of Water, Energy and Communication), monitoring and safeguarding of water resources and natural resources (Ministry of Natural Resources and Environment), water research and development (Ministry Science, Technology and Innovation), drinking water quality (Ministry of Health), and water planning and development (Local Governments) (Mokhtar & Tan, 2004). In this regard, the Department of Environment still controls water pollution, while the Department of Irrigation and Drainage is be responsible for flood defence, drainage and irrigation. A new research department has been established, called the National Hydraulic Research Institute of Malaysia (NAHRIM), to conduct research and development in the water industry (Rahman & Khalid, 2009).

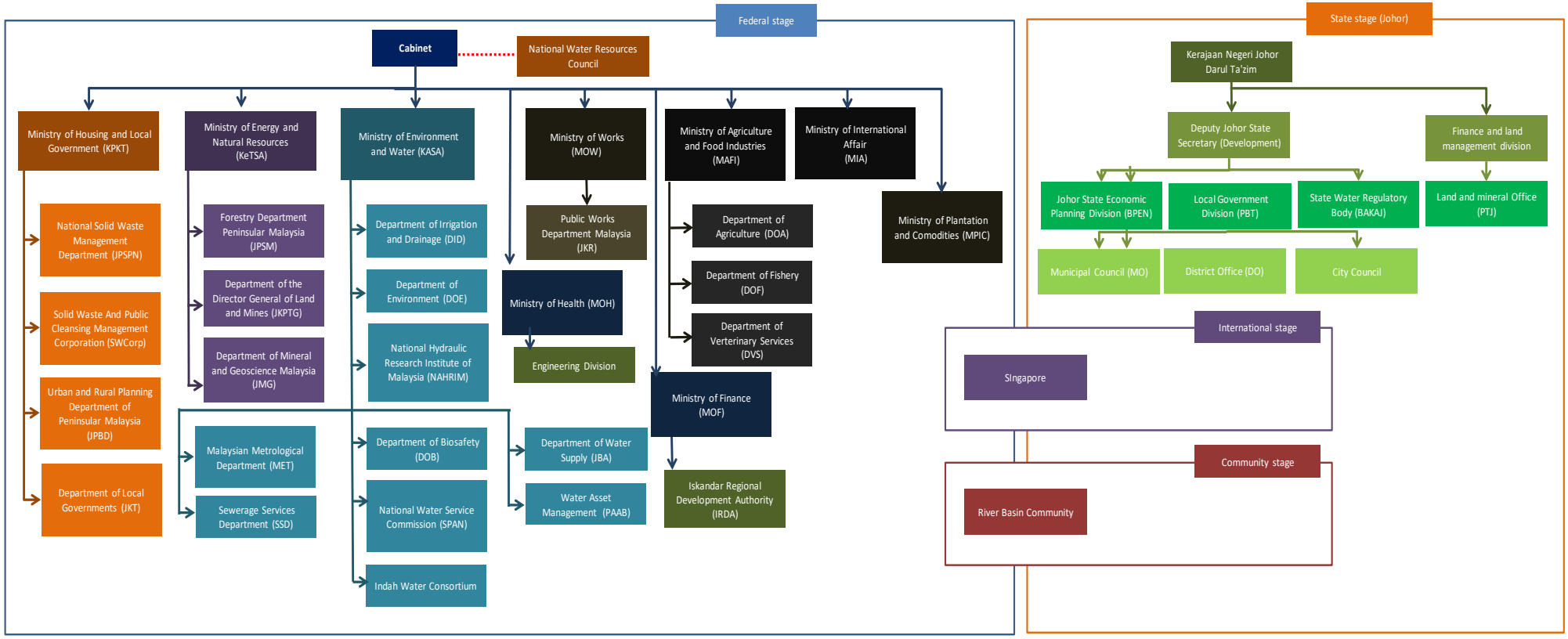

Figure 41. Water governance in Malaysia at the federal level before August 2021

Water law is the legislative framework to provide a structure for both development objectives and mainstreaming of water resource concerns. The national legislation needs to be coordinated and braced to support the environmental perspective in water management, and other relevant sectoral policies and legal arrangements (Leendertse, Mitchell and Harlin, 2008). The Federal Constitution of Malaysia 1957 demarcated executive, administrative and legislative boundaries, divided between the prevalent three-tier government system: federal, state, and local government (municipal and district authorities). The design of the Malaysian Constitution applied a written and supreme constitutional model, with broad jurisdictions granted to the Federal Parliament (Khalid et al., 2012). Both federal and state government agencies implement water-resource management tasks in Malaysia (Mokhtar & Tan, 2004). Their interest in water-related matters can be recognised in terms of three elements:

1. The planning, development and management of the water resource aspect.
2. The protection and conservation of water aspect.
3. The land-use control and watershed management aspect.

The jurisdiction and legislative power in water distribution between federal and state governments follows the Legislative Lists of Federal Constitution, which comprise the Federal List, State List, and Concurrent List (EPU, 2004). Figure 42 (WEPA, 2020) shows the current legislation related to water protection in Malaysia. The figure highlights three stages, which are general law, specific area/state, and specific sector. Several states, such as Selangor, Sabah and Sarawak, have created legislation to promote water resource sustainability. In Malaysia, federal government agencies generally are responsible for the research, planning and development of water resources, while state governments deal with operation and maintenance, and water supply infrastructure development. Clause 11, in particular, states the federal government powers cover “water supplies, rivers, and canals”, and exclude those matters within “one State or regulated by an agreement between all the States concerned; production, distribution, and supply of water power” (Khalid et al., 2012). Clause 11 also grants the federal government power over water which flows through the boundaries of two states or more, or a case of negotiation impasse if the river is shared between two or more states (Kader, 2004; Khadir et al., 2012). The federal government also has jurisdiction over certain water-based projects in the state, such as hydropower generation, navigation within ports, marine fisheries, and mining. Under Clause 6, the state government has full jurisdiction on water if the “water source is wholly within the territory of a State” (Kader, 2004; Khalid et al., 2012).

Moreover, drainage and irrigation have been specified under the Concurrent List, and thus fall under federal and state governments' jurisdiction. Also, under Article 76 of the Constitution, the federal government has the power to enact any law under the State List to achieve uniformity, in agreement with an international treaty, or simply at the state's request. These regulations, however, will not be effective without state legislature approval.

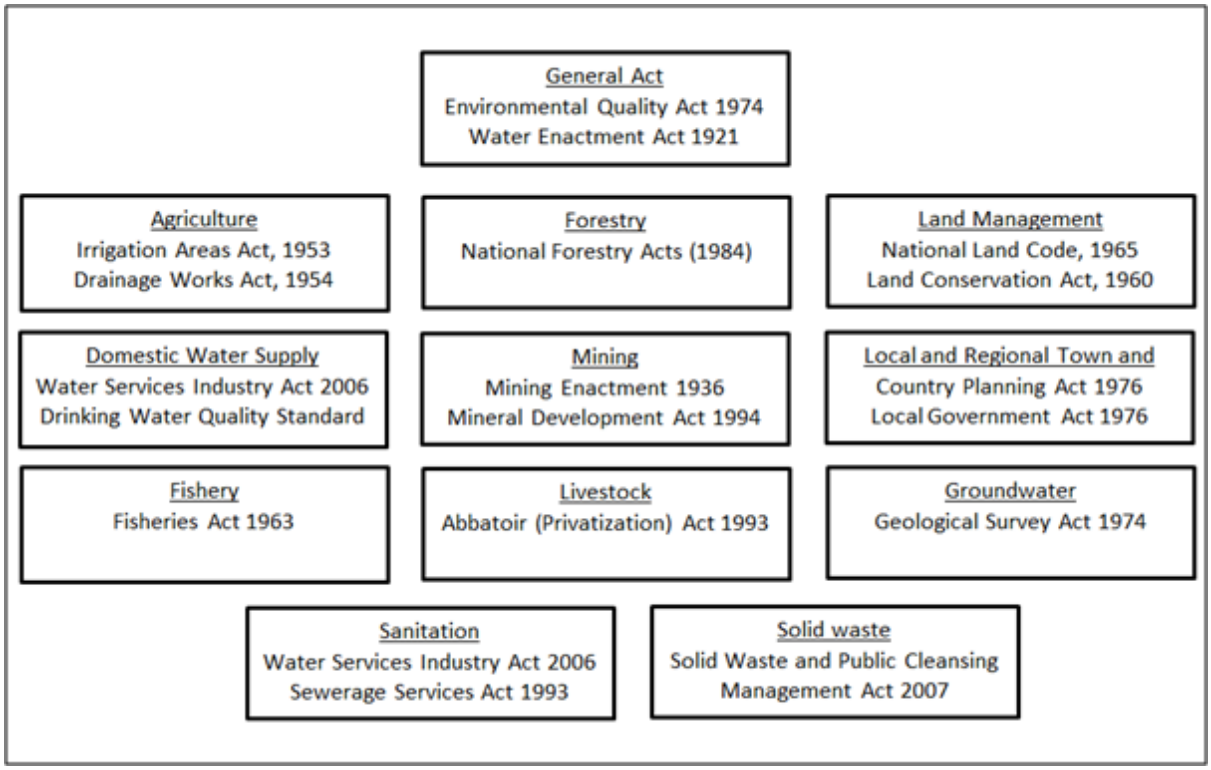

Figure 42. Legislative System for Water Quality Management in Malaysia (edited from WEPA 2020)

Issues and drivers

Water governance plays a vital role in enabling a country to secure its water resources. Looking critically at Malaysia's present water governance system, the problems and drivers of water governance in the Johor River Basin are summarised in Table 2.

Table 15. Issues and Drivers of Water Governance in the Johor River Basin

Issues	Drivers
· Governance structure · Water law coverage · Management (i.e.: high NRW, unsustainable water tariffs, and management approach) · Community awareness	· Climate change · Anthropogenic development · Pollutions · Political changes

Issue: Governance Structure

The shadow of British colonialism can be observed in Malaysia's present water governance structure. It was found that even before Malaysian independence in 1956, decisions made during British colonialism directly impacted the present water governance framework, as well as urban planning and development (Padfield et al., 2016). The British colonial administration had introduced a new water supply system to Malaya (Ching, 2012), in which local engineers were given training on developing water and sanitation treatment plants. However, this introduction challenged the equality between people living in urban and rural areas, in terms of accessing clean water, adequate sanitation services, and medical facilities (Tajuddin, 2012). The decisions made on site selection for developing these new water systems were heavily influenced by the British colonists' personal economic interests, creating massive discrepancies between these two areas (Padfield et al., 2016). Additionally, as a strategy to consolidate individual Malaysian states' power over water matters within their borders, the British colonial administration introduced the Water Act in 1920. The implementation of this Act strengthened the legitimisation of state authority in water governance, which led to the present-day inequalities and decentralisation of water sectors in Malaysia.

Following in the footsteps of British colonialism, Malaysia practises a parliamentary democracy system with a federal constitutional monarchy, which has contributed to the two primary levels of the water governance system in Malaysia: federal and state. Enshrined in the 1957 Federal Constitution, water resources fall within the State Legislative List and federal territories. State governments are responsible for the development, operation and maintenance of water supplies. The federal government provides funding to state governments to pay for water supply infrastructure for the state that joins the water supply restructuring scheme, and cases of a river basin that involve state boundaries. The State Water Regulatory Body also mainly involves the state government in managing water resources. The shared responsibility for water resource governance, due to different federal and state authorities creating multiple jurisdiction layers, may contribute to fragmented governance, and thus highlights the lack of coordination and integration between the governmental stakeholders.

The federal government recognised the efforts made in restructuring and transforming the water services industry by establishing the National Water Services Commission (SPAN), which serves as the national regulatory agency for the water services industry. Using the Water Services Industry Act (WSIA) 2006 as a regulatory tool, SPAN is responsible for the provision of licences, supervision and monitoring of the water services industry. Both Acts legitimised the federal government to manage all affairs

related to water supply, from extraction to distribution and sewerage services, through the establishment of SPAN. The Acts mandated the privatisation of all water service providers that had operated as part of the state government before this (Chee et al., 2020). The action caused a shift of authority when setting the water tariffs from the state government to the federal government, thereby weakening the linkage between water tariff rates and political pressure to keep the water tariff low (Chee et al., 2020). In addition, restructuring the water services industry in Malaysia led to the establishment of Pengurusan Aset Air Berhad (PAAB) – a national water asset company wholly owned by the Minister of Finance Malaysia, which aims to balance out the discrepancies of water services infrastructures among states in Peninsular Malaysia. PAAB is mainly responsible for developing the nation's water infrastructure in Peninsular Malaysia and the Federal Territory of Labuan, using competitive financing sourced from the private financial market. The water assets are then leased to state water operators licensed by SPAN for operations and maintenance, with lower loan interest rates (Piapakaran, 2019). However, this restructuring creates power struggles and conflicts between the federal and state governments, including that of Johor State. The transformation requires the state government to hand over its power over water supply to the federal government and adhere to the federal government's planning. This means that PAAB can acquire state water infrastructures and transform state operations into asset-light entities and pure service providers. This has led to a significant shift of power over water supply matters from the state government to the federal government, which causes conflicts between the two parties.

Issue: Water Law Coverage

Due to the historical development of the legal system in Malaysia, various authorities have been established to deal with multidimensional environmental management; this has resulted from taking a piecemeal approach towards environmental legislation in Malaysia, with an abundance of water laws established across different sectors and levels, and involving various mandated bodies. The sectoral-based water legislation causes overlaps and redundancies, thus complicating the enforcement process and creating a conflict of interests between related authorities.

As was discovered during the Stakeholder Engagement Workshop in February 2021, the main issues faced in the Johor River Basin regarding coverage of the current water laws are overlapping functions, quantum, and effluent limits. The Department of Environment Malaysia released the Environmental Quality Act 1974 as a means of improving environmental quality at the national level, by monitoring the effluents discharged by industry premises to the environment. At the same time, Johor State Regulatory Body (BAKAJ)'s source of power is the Johor Water Enactment 1921, established to protect

and control water sources, including rivers, and to prosecute polluters who threatened the water quality of main water sources in the state. Both laws overlapped with one another, which caused complications in the enforcement process (Metro News, 2017).

If a pollution incident occurs, a group containing both federal and state-level law enforcers would need to work together to solve the issue at hand and determine which law should be used for imposing penalties and/or punishments on the offenders. Furthermore, the scale of the project affects the quantum of water laws enforced. In the case of sand mining activities in the Johor River Basin, the Department of Environment Malaysia has the right to enforce the company to conduct an Environmental Impact Assessment (EIA) study only when the scale of said activity is greater than 20 hectares. This loophole encourages companies to conduct sand mining in a small-scale project instead, to save costs and time. Moreover, as mentioned previously, the current water legislation was established based on different sectors. Some of the established water laws were also found to be outdated, resulting in discrepancies in defining effluent limits. There was found to be no clear value of the effluent limits for activities related to agriculture and livestock. Related laws such as the Abattoirs Act 1993 only required the company to protect the water, without stating the effluent limit.

Another example was given by the Chairman of State Works, Rural and Regional Development Committee, named Datuk Hasni Muhammad, in Metro News (2017). He highlighted that under the Environmental Quality Act 1974, factories were allowed to release ammonia at a level of up to300 ppm in rivers, but existing water treatment plants could only sustain 1.5 ppm. All these cases indicate the poor coverage of existing water laws in protecting our water resources.

Issue: Management

For better and more efficient water resources management, good water governance and legislation are crucial for Malaysia to tackle its water issues (Saimy and Yusof, 2013). As previously discussed, the current water governance in Malaysia is fragmented; and coupled with the inadequacy of existing water laws to protect our water resources, there is a pressing need to scrutinise the current practice of water resources management.

High non-revenue water (NRW) loss is a sign of poor water management (Lai, Ngai and Roy, 2017). NRW is the difference between the volume of water supplied in the water distribution system and the volume of water billed to the water consumers. It demonstrates the inefficiency of operations by the water operators, leading to unnecessary wastage of water and financial resources. As a developing country, Malaysia is known for its exceptionally high NRW (Lim et al., 2021). As highlighted by Lim et al. (2021),

NRW rates in Malaysia increased alarmingly since 2014, reaching approximately 5,929 million litres per day in 2017. NRW in Malaysia is influenced by the deterioration of pipe network, system pressure, illegal connections, metering inaccuracies, and billing inefficiencies (Teo, 2009). Recognising the severity of the NRW issue and its role in achieving sustainable water management, the federal government carried out numerous initiatives and allocated a significant amount of funding to replace outdated water meters and improve public infrastructure (Mohamad Yazi et al., 2017). Academy of Sciences Malaysia (2015) pointed out that from the RM1 billion the federal government invested in tackling the high NRW issue, the national reduction of NRW was merely 1.33%.

Unsustainable water tariffs in Malaysia have also contributed to the high NRW rate (Frauendorfer and Liemberger, 2010; Lim et al., 2021), with a wide range of water tariffs across all states in Malaysia. Some water supply entities may not gain any profits from their daily operations, and thus experience a revenue deficit that leads to the industry's inability to cover the costs of water abstraction, purification and transportation (Nur Syuhada, Mahirah and Roseliza, 2020). Rahman (2014) revealed that the water bill for an average Malaysian family is only about 10% of its electricity bill. However, revising the water tariff is a highly socially sensitive issue in Malaysia (Chee, Ngai and Roy, 2017; Chee et al., 2020); it would bring political risk to the political body that governs Malaysia, as the politicians may lose votes (Ching, 2012). In the case of the Johor River Basin, revising the water tariff is a delicate process, as there is an ongoing transboundary water supply between Malaysia and Singapore that requires political stability and good international relations between the countries. Ching (2012) highlighted that the policy of subsidising domestic water tariffs in Malaysia contributed towards higher water consumption among Malaysians compared with other countries in the region. Although increasing the water tariff would be a good strategy to solve the issue, it would cause an uproar among the public, as the water tariff is viewed as a major socio-economic concern and essential driver of living costs (Chee et al., 2020). Furthermore, in light of the shift towards an asset-light regime, funding is limited by statutory constraints due to the prolonged transitional periods. This aggravates the water services providers' capability to cover their operational costs, including those in Johor State.

Top-down and supply-oriented approaches have always been the way water resources are managed in Malaysia (Chan, 2004). However, in the case of the Johor River Basin, these approaches have created conflicts between the community and government. For instance, as a long-term adaptation measure to drought, the Johor State Government decided to construct a barrage at the Johor River to prevent saltwater intrusion into water catchment areas during dry seasons and high tides. Saltwater intrusions can cause various complications, including disruption at water treatment plants, and thus impede the water supply services. As the Johor River is the main water source supporting the water demand of

other local basins and Singapore, there was a pressing need for the barrage to be in place. Nonetheless, certain communities living along the Johor River were dismayed by the construction of the barrage, particularly the fishermen whose incomes are dependent on the river. They expressed their concerns about the deterioration of marine life in the area due to the construction of the barrage, and damage to their crops due to overflowing floodwaters caused by rising river water levels (Tan, 2018).

Similar scenarios can be observed at other locations in Malaysia. According to a case study at Pahang, Malaysia, on the Pahang-Selangor Raw Water Transfer project (Reza, 2017), the federal-level policymakers are aware of the deterioration of water quality at the river and its impact on the local community due to the dam constructions. However, in their opinion, the national or regional interest to ensure the water supply at Klang Valley, Selangor, outweighed the environmental degradation issues happening at the local level in Pahang, and therefore they continued to operate the Pahang-Selangor project. They claimed that national or regional policy may not always encompass all local issues, and that these issues were the responsibility of the relevant local authorities. Additionally, since the nature of the local issues was environment-oriented, they fell under the jurisdiction of other departments, not theirs, as their objective is to ensure a sustainable water supply. This indicates gaps in the current management practices – particularly between the government and community at the grassroots level – in terms of communication, engagement, or even the incorporation of community voices in the decision-making process.

Issue: Community Awareness

Community plays an important role in protecting water resources, as most water-related issues occurring are localised and affect only certain groups of communities. Their opinions and perspectives provide important feedback for the government regarding policies, plans and programmes for development and implementation.

Focus group discussion during the Stakeholder Engagement Workshop in February 2021 revealed the current community discourses in Malaysia from the perspectives of government agencies and local state water providers. Firstly, it was believed that the communities in Malaysia think that water protection initiatives fall solely under the authorities' responsibilities, as they have the power to enforce and make laws. Chee, Ngai and Roy (2017) revealed that their respondents expected water service providers and government agencies to play a bigger role in reducing NRW rates. This community discourse perhaps results from the top-to-bottom approach practised by the government in managing water resources. Secondly, the community perception that "tap water comes from the dam, instead of the river nearest to us" persists, although schools and various media have been promoting relevant

education to the public. The participants expressed strong interest in identifying the core issues within community awareness, to further understand why this perception continues. Both community discourses indicate inadequate community awareness of the importance and seriousness of water management, protection, conservation and security. Many studies (Chan et al., 2003; Saimy and Mohamed Yusof, 2013; Chee, Ngai and Roy, 2017; Md Khalid et al., 2018; Rahman et al., 2020; Ahmed, Mokhtar and Alam, 2020) highlighted the importance of community participation for water resources management and policy planning, formulation and implementation. However, to achieve this, it is crucial to promote relevant education that would create and raise the awareness of the community beforehand. For instance, Chee, Ngai and Roy (2017) discovered that the majority of their respondents did not understand what non-revenue water (NRW) is, and therefore lacked awareness of the seriousness of the NRW issue, which then hindered public participation in the management of NRW. Last but not least, political intervention may also prevent relevant water law enforcers from imposing legal actions on the industry involved.

Drivers

In the Johor River Basin context, the drivers that have inflicted the most stress on water management and governance are climate change, anthropogenic development, pollution, and changes in politics. The climate in the basin is classified as a tropical monsoon climate (Tan et al., 2015). From November to February, the basin experiences the Northeast monsoon. Tan et al. (2015) highlighted that flooding events in the Johor River Basin usually occur around December and January, when the highest rainfall and peak streamflow have been recorded. The most recent occurrence of flooding was in January 2021: around 1,000 people were evacuated after heavy rainfall on the morning of 1 January (Channel News Asia, 2021). These flooding events devastated the basin, causing damages to infrastructures, disruption of water supply services, loss of businesses, and harm to the ecosystem in the region.

Meanwhile, from May to August, the Johor River Basin experiences the Southwest Monsoon. During this time, the basin undergoes its dry season, when drought tends to occur. These drought occurrences heavily threaten the water levels in dams, thus hindering the water supply services. In short, flood and drought occurrences, due to the extreme weather brought by the monsoon season over the region, threaten the water availability within the basin (Tan et al., 2019). This situation is further exacerbated by the global climate change scenario, as it amplifies the intensity of both occurrences within the basin (Tang, 2019). This finding is in agreement with Mohammed et al. (2018), who underlined climate change's contribution to abnormal rainfall patterns and increased temperature, thus aggravating the water availability of a region.

Additionally, the rapid growth of population and development in the Johor River Basin threatens its water availability. These developments lead to a significant increase in the anthropogenic activities within the basin; this drives more changes in the land-use activities, and thus alters the hydrological regime (Tan et al., 2015) and water quality (Pak et al., 2021). Currently, the major land-use types in the JRB are oil palm, forest, and rubber plantations (Tan et al., 2015). Discharges from various land development, industrial and agricultural activities cause various types of pollution at the river (Wang et al., 2019). These pollution occurrences not only disrupt the ongoing water distribution and transfer services to other basins and to Singapore (Rahman, 2021); they also jeopardise the surrounding biodiversity and the health of water consumers (Wang et al., 2019), as the Johor River a vital water resource for Johor State and Singapore (Tan et al., 2014). Furthermore, the Water Agreement 1962 between Johor and Singapore utilised the Johor River as a shared water resource. Therefore, a change in politics may complicate the existing water governance in Malaysia and harm the good relations maintained between Johor and Singapore.

Conclusion and the way forward

The Johor River Basin is geographically located in an area with diverse economic activities, social and cultural influences, and political dynamics. From this report, we can conclude that the structure of water governance in Malaysia is centred around federal–state conflicts. The same applies to the Johor River Basin, which supplies water not only to the state of Johor, but also to areas beyond its boundaries. Influenced by the division of federal and state, the governance structure is also affected by the debates on privatisation versus public, and decisions on the tariff. Through our work, we have also discovered that some of the laws regarding water contain discrepancies and are outdated. Unsustainable water tariffs due to non-revenue water use will continue to be a problem if no action is taken. We have also identified the gaps in management, particularly between the government and communities at the grassroots level, especially in communicating the policies across the different levels. The stress to water security is further driven by climate change, anthropogenic development, pollution, and changes in politics.

The complex network, which involves various institutions, programmes and action plans in the Johor River Basin, hinders coherent and efficient action. We recommend enhanced collaboration between actors with shared common values, and integration at all levels as a way forward. We believe that public participation should also be increased to build a stronger relationship, and introduce collaborative initiatives between the government and the community. The governance architecture should also be

shaped by improved strategic planning, institutional reforms, equitable policy alignment, and strong political decisions concerning water.

By using the Johor River Basin as the basis for our study, the Malaysian Collaboratory strives towards establishing a better governance architecture, in order to remove existing gaps in water governance, and to increase water security amid threats from the climate change crisis.

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CONCLUSION

The way forward: problem focus and analysis

After contextualising water governance, as shown in Figure 2, we move to the next stage of the research: problem focus and analysis. In this stage, we build upon the critical conceptual framework by focusing on the analysis of the power dynamics in shaping the discourse, decisions and policies, and practices concerning water governance. We aim to incorporate an explicit recognition of power and context into water governance. In social science, power is generally defined (among other definitions) as the ability to influence the behaviour of people, norms and institutions. However, power is not evenly distributed among actors, which creates asymmetric power relations; and this asymmetric distribution influences water allocation. Hence, asymmetrical power greatly contributes to shaping water governance and determining who gets water, and how much.

Lukes conceptualised the three dimensions of power: overt or material power; covert or bargaining power; and structural or ideational power (see Table 16) (Lukes, 2004; see also Kashwan et al., 2019; Zeitoun and Warner, 2006). We adopt this conceptualisation of power to investigate how water security discourses are constructed, and how they shape decision-making processes, water policies and governance. In so doing, we seek to capture not only those visible, material capabilities of actors involved in water governance, but also those invisible powers that influence agendas, discourses, knowledge and ideas. We will explain and discuss this aspect in greater detail in the next report. In particular, we expect to reflect on different dimensions of power in each case study.

Table 16: Three dimensions of power (Lukes, 2004)

Overt power	The ability to possess and to mobilise capabilities
Covert power	The ability to control of the rules of the game
Structural power	The ability to control and shape ideas (discourses-values): “power over ideas”

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