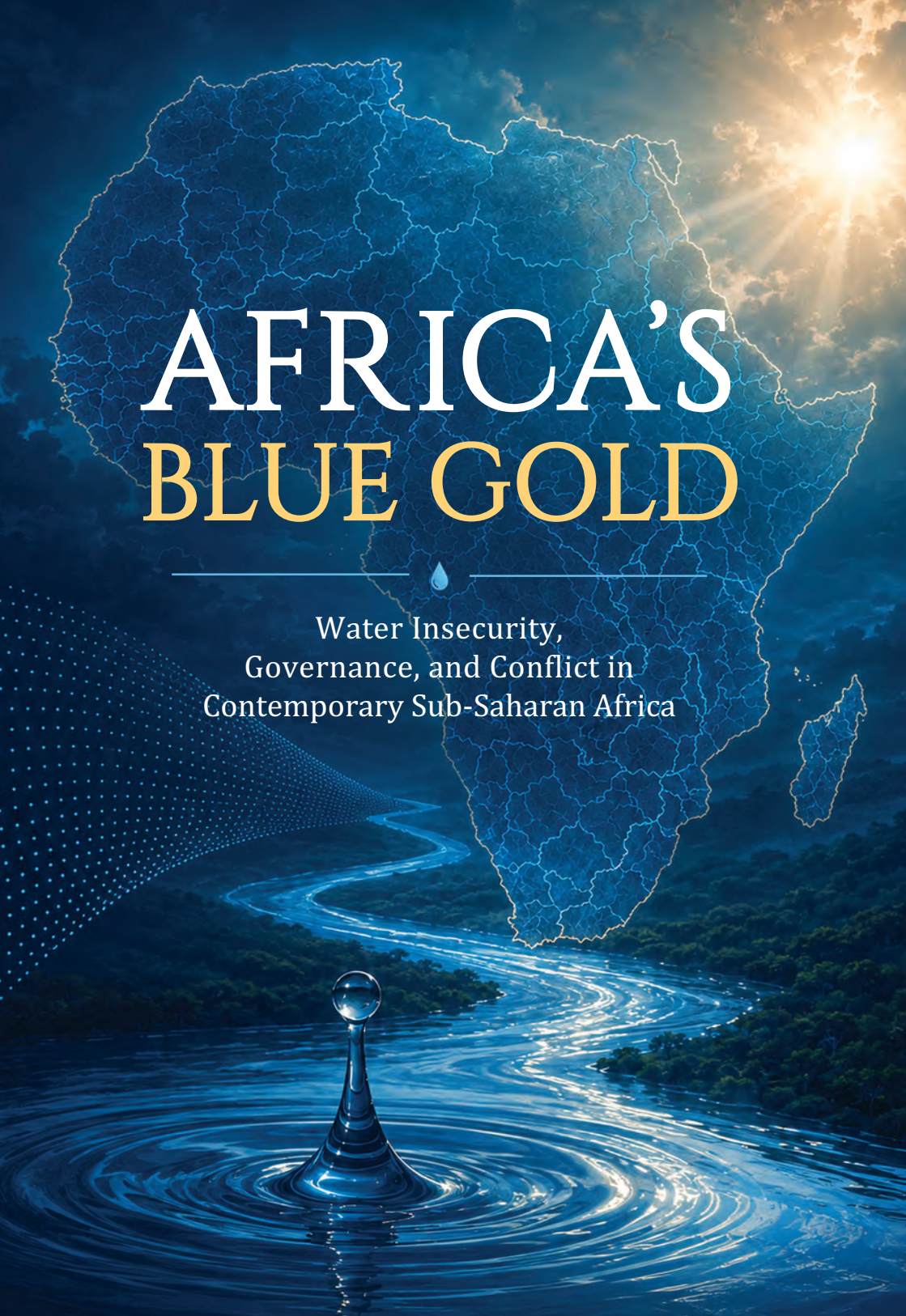
AFRICA'S
BLUE GOLD
Water Insecurity,
Governance, and Conflict in
Contemporary Sub-Saharan Africa

INSTITUTE FOR AFRICAN STUDIES
OF THE RUSSIAN ACADEMY OF SCIENCES

NIGER DELTA UNIVERSITY

AFRICA'S BLUE GOLD

WATER INSECURITY, GOVERNANCE, AND CONFLICT IN CONTEMPORARY SUB-SAHARAN AFRICA

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This collective monograph explores water insecurity in contemporary sub-Saharan Africa as a core challenge for development, governance, conflict prevention, and regional cooperation. The volume combines concrete case studies on public health risks from unsafe water and poor sanitation, transboundary water management in the African Great Lakes and the Zambezi and Orange–Senqu river basins, and governance failures around Lake Chad and the Dasin Hausa Dam. It also analyzes the climate–water–conflict nexus in the Sahel, agro-pastoral clashes in Mali, hydro-hegemony dynamics in the Niger Delta, and municipal or community water governance failures in South Africa. Together, the authors demonstrate that water insecurity across the continent cannot be simplified to physical scarcity alone. Instead, its daily impacts are produced by the complex interaction of weak institutional capacity, broken infrastructure, environmental degradation, political inequality, and a lack of public trust, which shapes how states, local communities, and regional bodies actually manage water resources under severe uncertainty.

The book is intended for researchers, policy analysts, and postgraduate students working in African studies, development politics, environmental sociology, and conflict resolution.

The present book is a result of a collaborative research project between the Institute for African Studies of the Russian Academy of Sciences (Moscow, Russia), the University of the Free State (Bloemfontein, South Africa), and Niger Delta University (Wilberforce Island, Bayelsa State, Nigeria).

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ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ
БЮДЖЕТНОЕ УЧРЕЖДЕНИЕ НАУКИ
ИНСТИТУТ АФРИКИ
РОССИЙСКОЙ АКАДЕМИИ НАУК

УНИВЕРСИТЕТ ДЕЛЬТЫ НИГЕРА

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Голубое золото Африки: проблемы водной безопасности, управление водными ресурсами и конфликты в современной Африке южнее Сахары. – М.: Институт Африки РАН; Остров Уилберфорс: Университет Дельты Нигера, 2026. – 218 с.

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Коллективная монография посвящена водной небезопасности в современной Африке южнее Сахары как системному вызову для развития, государственного управления и регионального сотрудничества. На материале конкретных кейсов рассматриваются проблемы доступа к чистой воде, трансграничного управления водными ресурсами, состояния инфраструктуры, климатических изменений и связанных с ними локальных конфликтов. Авторы показывают, что водная небезопасность в Африке не сводится к физическому дефициту воды. Ее масштабы и последствия определяются сочетанием слабости институтов, изношенной инфраструктуры, деградации окружающей среды, политического неравенства и дефицита общественного доверия.

Издание адресовано исследователям, политическим аналитикам, аспирантам и магистрантам, специализирующимся на африканистике, политологии развития, экологической социологии и конфликтологии.

Настоящая книга является результатом совместного научного проекта Института Африки РАН (Москва, Россия), Университета Свободного Государства (Блумфонтейн, Южная Африка) и Университета Дельты Нигера (Остров Уилберфорс, штат Байелса, Нигерия).

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CONTENTS

List of Abbreviations 7

Introduction 9

Part I. WATER INSECURITY, DEVELOPMENT, AND HUMAN VULNERABILITY

Chapter 1. Water-, Sanitation-, and Hygiene-Related Diseases in Sub-Saharan Africa from a Continental Comparative Perspective: Natural and Anthropogenic Factors of Transmission 19

Chapter 2. Water Crisis and the Challenges of Transboundary Water Resources Management in the African Great Lakes Region 38

Part II. TRANSBOUNDARY BASINS, HYDROPOLITICS, AND REGIONAL COOPERATION

Chapter 3. Water Resources Governance Across Borders: The Zambezi River Basin 61

Chapter 4. Managing Water Scarcity in Southern Africa: The Orange–Senqu River Basin in Comparative Perspective 84

Chapter 5. Political Will and Water Governance Failures: Lake Chad and the Dasin Hausa Dam in Nigeria 102

Part III. WATER, CONFLICT, AND DOMESTIC GOVERNANCE

Chapter 6. The Sahelian Nexus: Climate Change, Water Insecurity, and the Rise of Conflict 121

Chapter 7. Agro-Pastoral Clashes in Mali: Land, Water, and the Politics of Rural Conflict 135

Chapter 8. Power Dynamics and Water Conflicts in the Niger Delta: Hydro-Hegemony in an Extractive Region 146

Chapter 9. Municipal Water Governance and Local Instability in South Africa 170

Chapter 10. Hydropolitics and Minority Autonomy: Orania and Afrikaner Civil Society Organizations 185

Conclusion 204

Notes on Contributors 213

СОДЕРЖАНИЕ

Список аббревиатур 7

Введение 9

Раздел I. ПРОБЛЕМЫ ВОДНОЙ БЕЗОПАСНОСТИ, РАЗВИТИЕ И УЯЗВИМОСТЬ НАСЕЛЕНИЯ

Глава 1. Заболевания, связанные с водой, санитарией и гигиеной, в странах Африки южнее Сахары в континентальном сравнительном контексте: природные и антропогенные факторы передачи 19

Глава 2. Водный кризис и проблемы управления трансграничными водными ресурсами в регионе Великих Африканских озер 38

Раздел II. ТРАНСГРАНИЧНЫЕ БАССЕЙНЫ, ГИДРОПОЛИТИКА И РЕГИОНАЛЬНОЕ СОТРУДНИЧЕСТВО

Глава 3. Управление водными ресурсами в трансграничном контексте: бассейн реки Замбези 61

Глава 4. Управление дефицитом воды на Юге Африки: бассейн Оранжевой–Сенку в сравнительной перспективе 84

Глава 5. Дефицит политической воли и проблемы управления водными ресурсами: озеро Чад и плотина Дасин-Хауса в Нигерии 102

Раздел III. ВОДА, КОНФЛИКТЫ И ВНУТРЕННИЕ МЕХАНИЗМЫ УПРАВЛЕНИЯ

Глава 6. Сахельский узел: изменение климата, проблемы водной безопасности и рост конфликтности 121

Глава 7. Столкновения земледельцев и скотоводов в Мали: земля, вода и политическое измерение сельских конфликтов 135

Глава 8. Властные отношения и водные конфликты в дельте Нигера: гидрогегемония в нефтедобывающем регионе 146

Глава 9. Муниципальное управление водным хозяйством и локальная нестабильность в ЮАР 170

Глава 10. Гидрополитика и автономия меньшинства: Орания и африканерские организации гражданского общества 185

Заключение 204

Сведения об авторах 213

LIST OF ABBREVIATIONS

ABAKIR	Lake Kivu and Ruzizi River Authority
AfDB	African Development Bank
AGSA	Auditor-General South Africa
AHO	African Health Organization
AQIM	Al-Qaeda in the Islamic Maghreb
AU	African Union
B-BBEE	Broad-Based Black Economic Empowerment
CAR	Central African Republic
CSO	civil society organization
DHD	Dasin Hausa Dam
DRC	Democratic Republic of the Congo
DSS	decision-support system
DWS	Department of Water and Sanitation (South Africa)
EAC	East African Community
ECGLC	Economic Community of the Great Lakes Countries
ECOWAS	Economic Community of West African States
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FDI	foreign direct investment
GDP	gross domestic product
HRBA	human-rights-based approach
HYPREP	Hydrocarbon Pollution Remediation Project
IBWT	Inter-Basin Water Transfer
IPCC	Intergovernmental Panel on Climate Change
IOC	international oil company
IWRM	Integrated Water Resources Management
JNIM	Jama'at Nusrat al-Islam wal-Muslimin
LCB	Lake Chad Basin
LCBC	Lake Chad Basin Commission
LHWC	Lesotho Highlands Water Commission
LHWP	Lesotho Highlands Water Project
LHWPT	Lesotho Highlands Water Project Treaty
LTA	Lake Tanganyika Authority
LVBC	Lake Victoria Basin Commission
LVFO	Lake Victoria Fisheries Organization
MNLA	National Movement for the Liberation of Azawad

MOJWA	Movement for Oneness and Jihad in West Africa
MSIOA	Multi-Sector Investment Opportunities Analysis
NBA	Niger Basin Authority
NBI	Nile Basin Initiative
NDDC	Niger Delta Development Commission
NGO	non-governmental organization
NOSDRA	National Oil Spill Detection and Response Agency
NRW	non-revenue water
NTU	National Taxpayers Union
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
ORASECOM	Orange–Senqu River Commission
ORC	Orania Representative Council
OSRB	Orange–Senqu River Basin
PPP	public-private partnership
PWC	Permanent Water Commission
RAS	Russian Academy of Sciences
SADC	Southern African Development Community
SAPP	Southern African Power Pool
SDG	Sustainable Development Goal
SDN	Stakeholder Democracy Network
SSA	sub-Saharan Africa
SVP	Shared Vision Process
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
UNOPS	United Nations Office for Project Services
UNPD	United Nations Population Division
WASH	water, sanitation, and hygiene
WHO	World Health Organization
WMO	World Meteorological Organization
ZACPLAN	Action Plan for the Environmentally Sound Management of the Common Zambezi River System
ZAMCOM	Zambezi Watercourse Commission
ZAMWIS	Zambezi Water Information System
ZRA	Zambezi River Authority
ZRB	Zambezi River Basin

INTRODUCTION

Access to clean water is recognized as a global development priority under United Nations Sustainable Development Goal 6 (SDG 6), which targets universal and equitable access to safe water and sanitation by 2030 (United Nations Department of Economic and Social Affairs, 2015). This institutional commitment is further reinforced by the ongoing International Decade for Action (2018–2028) (United Nations General Assembly, 2016), operating under the theme "Water for Sustainable Development". In tandem, the African Union (AU) designated 2026 as the year of Assuring Sustainable Water Availability and Safe Sanitation Systems (African Union, 2026). Such initiatives are vital, given the stark reality that 400 million Africans lack access to safe water, while over 800 million are deprived of safely managed sanitation and hygiene services (United Nations Population Fund, 2026). This crisis is projected to worsen due to rapid population growth, accelerating urbanization, climate change, and deteriorating infrastructure – challenges that are further compounded by poor governance. Unequal access can contribute to local or interstate tensions where institutions, land rights, and political inclusion fail to mediate competing claims.

To address these dynamics, the Institute for African Studies of the Russian Academy of Sciences (Russia), the Centre for Gender and Africa Studies at the University of the Free State (South Africa), and Niger Delta University (Nigeria) convened the international conference *Africa's Blue Gold: Water Conflict, Climate Resilience and Transboundary Cooperation* on 24 September 2025. The present collective monograph grew out of that academic initiative.

Existing academic literature often separates technical issues like sanitation and infrastructure from the hard politics of transboundary relations, environmental justice, and local conflict. This fragmentation explains why we fail to see why similar environmental pressures lead to totally different results – pushing states toward cooperation in one region, sparking communal violence in another, or driving demands for infrastructural autonomy somewhere else. This volume addresses this gap by analyzing the concrete political and institutional mechanisms that shape how water insecurity plays out on the ground.

Research on water insecurity spans several overlapping fields. Scholars increasingly argue that clean, reliable water depends not only on engineering solutions, but also on institutional capacity and local conditions. As Pahl-Wostl (2007, 2009) notes, adaptive water governance is an ongoing process of institutional learning and multi-level coordination, rather than just a set of technical solutions. Recent research has sharpened this argument by focusing on why good policies fail on the ground. Adom and Simatele (2024) show that clean water is blocked by a toxic mix of fragmented bureaucracies, underfunding, broken pipes, and institutional corruption.

This disconnect is equally sharp at the regional level. Examining nine sub-Saharan basins, Anghileri et al. (2024) demonstrate that scientific assessments rarely align with the actual political priorities of riparian states. Russian African studies complement this governance perspective by placing greater emphasis on water infrastructure as a component of economic development and state capacity. Fituni (2012) links hydrological resources with investment and development potential; Grishina (2022) examines the combined effects of natural conditions, infrastructure, sanitation, and institutional capacity; Morozenskaya (2024) highlights the financing and administration of water services; and Volkov et al. (2025) connect water provision with technology transfer and professional training. These works show that water insecurity emerges from the failure to convert resources, investment, technology, and formal policy into reliable public services.

Another crucial body of literature focuses on transboundary waters. Shared rivers are arenas of intense political struggle. Scholarship has long proved that signing a treaty or setting up a river-basin organization does not guarantee fair water sharing. Zeitoun and Warner's (2006) hydrohegemony framework remains essential here, as it exposes how deep imbalances in political, economic, and engineering power dictate who gets water, who controls data, and who captures the benefits. In reality, cooperation and conflict constantly coexist within the same basin (Zeitoun & Mirumachi, 2008; Mirumachi, 2015). Recent research shifts this debate

toward actual institutional performance. Mndzebele (2025), for instance, emphasizes that working river-basin institutions are critical for preventing local resource wars. Focusing on the Incomati Basin, Zikhali-Nyoni (2025) shows that while third-party mediators can help balance regional inequalities, they routinely bring their own economic and political agendas to the table. The contemporary literature therefore asks not only whether cooperation exists, but whose interests it serves, how it affects national planning, and whether it changes the distribution of risks and benefits.

A more critical body of literature firmly roots water insecurity within political ecology and environmental justice. From this viewpoint, water scarcity is rarely a purely natural phenomenon; it is actively manufactured through political choices about infrastructure investment and pollution. Sultana (2011), for example, highlights how the daily struggle to secure water is socially unequal, tied directly to broader structures of control and exclusion. Olley et al. (2024) link sustainable water management directly with environmental justice, stakeholder collaboration, and actual implementation capacity. Meanwhile, Matimolane (2026) demonstrates how governance failures and systemic corruption reproduce water insecurity on the ground, despite strong constitutional and policy commitments. Bhanye (2026) pushes this further, conceptualizing water access, drainage, and flood adaptation as contested arenas where marginalized urban residents must constantly negotiate their socio-political status.

Finally, the debate on climate change and conflict offers crucial insights, especially as it moves away from environmental determinism. Early arguments often painted drought, falling rainfall, or resource scarcity as direct triggers for violence, but contemporary research demonstrates that environmental stress only fuels conflict when it collides with political realities. In the African Sahel, these include land-tenure disputes, constrained pastoral mobility, institutional decay, and armed competition. Benjaminsen's (2008) work in northern Mali, for instance, challenged the myth of supply-induced scarcity. Later, Benjaminsen and Ba (2019) illustrated how pastoral grievances turn violent primarily when corrupt institutions gatekeep access to land and grazing. McGuirk and Nunn (2025) identify a concrete mechanism where rainfall shocks force transhumant herders to shift their mobility, creating conflict risks in nearby farming areas. Konečná (2025), looking at recent water conflicts across the continent, likewise concludes that physical scarcity is never enough by itself. Rather, heavy agricultural dependence, socioeconomic inequality, political instability, and poor infrastructure determine if water disputes escalate into violence. Charbonneau (2024) further argues that "climate security" in the Sahel is a deeply politi-

cized arena. Climate and water stress must therefore be treated as elements of a broader political causal chain rather than as independent drivers of violence.

Methodologically, this volume does not impose a single analytical framework on its contributors. Instead, it is organized as a thematically structured collective work in which each author addresses the volume's core questions through the methodological approach best suited to their case and evidence base. The book does not claim to provide an encyclopedic map of every major basin, country, or water-related problem in sub-Saharan Africa (SSA). Where the analysis uses a wider Africa-wide statistical frame, it does so to establish a continental comparative baseline rather than to shift the volume's analytical focus away from SSA. The case studies were chosen because they illustrate the different mechanisms through which water insecurity shapes politics, society, and local institutions. Instead of focusing on every region, this volume prioritizes variation across subregions and multiple governance levels. Across these cases, the volume develops a unifying argument: water insecurity in contemporary SSA is fundamentally shaped by infrastructure, state capacity, power imbalances, and public trust.

This comparative design requires several terminological distinctions. Water insecurity is the broadest concept: it denotes uncertainty in safe, reliable, and affordable access to water for social and ecological systems. Water scarcity refers to limits in physical availability. Water stress describes pressure on available supplies when demand, seasonal variability, pollution, or infrastructure weakness reduces effective access. Water governance refers to the formal and informal arrangements through which water is allocated and contested. Hydropolitics denotes political bargaining over the allocation, use, and control of water, including the institutions, infrastructure, information, and power relations through which these choices are made. In this volume, the term covers both interstate relations in shared basins and political struggles involving subnational authorities, communities, companies, and other non-state actors. Such relations may reproduce wider asymmetries rooted in colonial legacies, external finance, or unequal corporate power, although hydropolitics is not treated here as a synonym for neocolonialism. Hydro-hegemony is used more narrowly for asymmetrical control over water resources and decision-making.

Part I, *Water Insecurity, Development, and Human Vulnerability*, establishes the human and developmental dimensions of the problem. Chapter 1 examines water-, sanitation-, and hygiene-related diseases across sub-Saharan Africa, using a wider continental statistical frame where necessary. Chapter 2 turns to the African Great Lakes and considers the management

of shared water resources, regional institutions, infrastructure, fisheries, environmental pressures, and investment mechanisms.

Part II, *Transboundary Basins, Hydropolitics, and Regional Cooperation*, shifts the analysis to shared river systems and major infrastructure projects. Chapter 3 examines governance in the Zambezi River Basin, including basin institutions, infrastructure planning, data sharing, and benefit distribution. Chapter 4 analyzes the Orange–Senqu River Basin in comparative perspective, with particular attention to scarcity, interstate asymmetry, regional institutions, and the Lesotho Highlands Water Project. Chapter 5 considers Lake Chad and the Dasin Hausa Dam in Nigeria as cases in which regional and domestic water governance intersect with infrastructure planning and implementation.

Part III, *Water, Conflict, and Domestic Governance*, examines how water-related pressures become embedded in political and social conflict. Chapter 6 addresses the climate–water–conflict nexus in the Sahel, while Chapter 7 focuses on agro-pastoral clashes in Mali. Chapter 8 applies the concept of hydro-hegemony to water conflicts and environmental degradation in the Niger Delta. Chapters 9 and 10 turn to South Africa, examining respectively municipal water governance and local instability, and water self-management in Orania and among Afrikaner civil-society organizations.

The comparison spans multiple scales of governance, from households and municipalities to states and transboundary basins. It encompasses markedly different combinations of physical availability, infrastructure, institutional capacity, and political power. This analysis demonstrates that water insecurity is a layered problem, which directly affects human security while testing the ability of states and regional organizations to coordinate across borders and sectors. Ultimately, it becomes embedded in wider conflicts over resources and governance. The book's main strength lies in how it connects these levels, linking everyday human vulnerability directly to state capacity and transboundary power asymmetries.

* * *

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Part I

WATER INSECURITY, DEVELOPMENT, AND HUMAN VULNERABILITY

Chapter 1

WATER-, SANITATION-, AND HYGIENE-RELATED DISEASES IN SUB-SAHARAN AFRICA FROM A CONTINENTAL COMPARATIVE PERSPECTIVE: NATURAL AND ANTHROPOGENIC FACTORS OF TRANSMISSION

Introduction

One of the most serious challenges for the biosphere amid global population growth is the contamination of water bodies with pathogenic microflora, which poses a threat to people living nearby. This problem is linked to the waterborne transmission of diseases and the spread of unsanitary conditions, which are themselves a result of a shortage of safe water due to the pollution of the hydrosphere. The issue is especially acute on the African continent, characterized by a high population growth rate.

As of 2024, Africa's population exceeded 1.5 billion people, equivalent to 18.6% of the global population (United Nations Population Division [UNPD], 2024b). During the same period, the population growth rate in Africa was 2.3%, far surpassing the global average of 0.9% (UNPD, 2024a). If the trend continues, Africa's share of the world's population will reach 21% in 2035 and 26% in 2050 (Abramova, 2022, p. 8). The continent's area is 30.3 million km², including islands ("Africa," 2022), constituting 20.3% of the world's land area ("Earth," 2023). However, not all African territories are populated. For example, the Sahara Desert, which occupies approximately a quarter of the continent, is largely unsuitable for living. Consequently, Africa's population is distributed unevenly.

Africa has also experienced rapid urbanization. The average level of urbanization in Africa is estimated at 45%, with significant disparities among countries, ranging from 91% in Gabon to 14.8% in Burundi (Galal, 2023). Thirteen of the world's 100 largest metropolitan areas are located in Africa: Cairo (Egypt, 22.6 million inhabitants), Johannesburg (South Africa, 15.5 million), Lagos (Nigeria, 14.5 million), Kinshasa (the Democratic Republic of the Congo (DRC), 13.5 million), Luanda (Angola, 10.9 million), Dar es Salaam (Tanzania, 7.9 million), Onitsha (Nigeria, 7.2 million), Addis Ababa (Ethiopia, 7.2 million), Khartoum (Sudan, 7.1 million), Nairobi (Kenya, 6.9 million), Accra (Ghana, 5.8 million), Abidjan (Côte d'Ivoire, 5.8 mil-

lion), and Alexandria (Egypt, 5.5 million) ("World Urban Areas," 2025, pp. 21–22).

Overcrowding creates problems related to water use, which can be divided into two categories: supplying the population with water (suitable for drinking and safe for domestic use) and providing sanitation (ideally, including the treatment of wastewater). SDG 6 envisages ensuring the availability and responsible management of water and sanitation for all by 2030 (United Nations Department of Economic and Social Affairs, 2015).

Methodology

Although the monograph focuses on sub-Saharan Africa, this chapter uses an Africa-wide statistical frame where necessary. This approach is justified by the structure of many international public-health datasets and statistical indicators on water, sanitation, and hygiene, which often provide comparable data for African countries as a whole. It also allows North African countries to serve as a useful comparative benchmark. The chapter's primary concern, however, remains SSA, where water-, sanitation-, and hygiene-related disease burdens are especially acute and where the governance, infrastructure, and public-health problems examined in the rest of the volume are most directly concentrated. North African cases are therefore used mainly for comparative contrast and do not change the geographical focus of the book. The analysis is based on a comparison of data summarized in tables.

Statistics on the access of African households to water sources and sanitation, as well as population figures by country, are provided by the United Nations Children's Fund (UNICEF). Population density is calculated by dividing the population of each African country by its land area. Data on average annual precipitation in African countries are published by the World Bank. Information on cholera incidence and mortality, as well as the number of typhoid fever cases, is sourced from the World Health Organization (WHO). Data on the prevalence of amoebiasis are drawn from a study by Cui et al. (2019). The principal areas of trachoma proliferation are indicated on the website of the American NGO International Trachoma Initiative. Information on the spread of helminthiases is derived from the multinational study "Prevalence and intensity of soil-transmitted helminth infections of children in sub-Saharan Africa" (Sartorius et al., 2021, p. 56).

Following the presentation of the data, the chapter identifies countries characterized by an unfavorable sanitary and epidemiological situation, determines the factors conducive to the proliferation of pathogenic microflora, and assesses their influence on the anthropogenic pollution of the hydrosphere and disease transmission. During the research, the influence of

certain indicators (such as urbanization) on disease proliferation was not identified. These indicators were subsequently excluded from the text and tables to avoid overcomplication.

Factors of anthropogenic pollution of the hydrosphere with pathogens

One of the main measures aimed at preventing contamination is providing the population with access to clean water and sanitary facilities, as well as promoting hygiene practices (primarily handwashing). The WHO points out the significant progress achieved by African countries in these areas, which, however, remains insufficient to attain SDG 6 by 2030 (World Health Organization [WHO], 2023a).

Table 1. **Total population and population density, access to water and sanitary facilities in African countries, long-term average precipitation in African countries, 2022**

Country	Total population, million people	Average population density, people per km^2 of land area	Access to water				Access to sanitary facilities				Precipitation, mm per year
			% of population								
			At least basic	Limited	Unimproved	Surface water	At least basic	Limited	Unimproved	Open defecation	
Algeria	44.9	18.9	95	5	<1	<1	86	11	3	<1	89
Angola	35.6	28.6	58	9	19	14	52	22	9	17	1,010
Benin	13.4	116.8	67	8	22	3	19	20	12	49	1,039
Botswana	2.6	4.5	93	5	2	<1	81	5	9	5	416
Burkina Faso	22.7	82.8	50	29	21	<1	25	33	8	34	748
Burundi	12.9	464.0	62	19	15	4	46	13	40	1	1,274
Cabo Verde	0.6	150.0	90	7	3	<1	82	7	2	9	228
Cameroon	27.9	58.7	70	14	12	4	43	17	36	4	1,334
CAR	5.6	9.0	36	27	34	3	14	16	45	25	1,343
Chad	17.7	13.8	52	13	28	7	13	5	19	63	322
Comoros	0.8	421.1	80	11	9	<1	36	13	51	–	900
Côte d’Ivoire	28.2	87.4	73	8	13	6	37	27	15	21	1,348

Country	Total population, million people	Average population density, people per km^2 of land area	Access to water				Access to sanitary facilities				Precipitation, mm per year
			% of population								
			At least basic	Limited	Unimproved	Surface water	At least basic	Limited	Unimproved	Open defecation	
Djibouti	1.1	47.4	76	15	7	2	67	7	10	16	220
DRC	99	42.4	35	24	33	8	16	18	54	12	1,543
Egypt	111	110.8	99	<1	<1	<1	98	2	<1	<1	18
Equatorial Guinea	1.5	53.6	65	3	26	6	66	10	21	3	2,156
Eritrea	3.4	28.0	52	18	13	17	12	10	11	67	384
Eswatini	1.2	69.0	73	11	7	9	64	22	14	<1	788
Ethiopia	123.3	108.5	52	28	16	4	9	8	65	18	848
Gabon	2.4	9.0	87	8	3	2	50	29	19	2	1,831
Gambia	2.7	238.9	86	8	6	<1	48	12	40	<1	836
Ghana	33.5	140.5	88	6	2	4	29	45	10	17	1,187
Guinea	13.9	56.5	71	12	8	8	31	29	33	7	1,651
Guinea-Bissau	2.1	58.2	62	15	22	<1	28	18	46	8	1,577
Kenya	54	93.0	63	9	9	19	37	24	33	6	630
Lesotho	2.3	75.9	74	11	10	5	50	21	13	16	788
Liberia	5.3	47.6	75	10	5	10	23	26	16	35	2,391
Libya	6.8	3.9	>99	<1	<1	<1	92	7	<1	<1	56
Madagascar	29.6	50.4	53	5	31	11	15	21	30	34	1,513
Malawi	20.4	172.2	72	21	5	2	49	26	22	3	1,181
Mali	22.6	18.2	84	5	11	<1	50	17	28	5	282
Mauritania	4.7	4.6	78	9	13	<1	56	10	8	26	92
Mauritius	1.3	650.0	>99	<1	<1	<1	95	4	<1	<1	2,041
Morocco	37.5	84.0	87	2	11	<1	88	2	10	<1	346
Mozambique	33	41.3	63	10	17	10	37	5	38	20	1,032
Namibia	2.6	3.2	86	7	4	3	36	13	14	37	285
Niger	26.2	20.7	49	20	28	3	16	10	9	65	151
Nigeria	218.6	236.6	80	4	11	5	47	16	19	18	1,150

Country	Total population, million people	Average population density, people per km^2 of land area	Access to water				Access to sanitary facilities				Precipitation, mm per year
			% of population								
			At least basic	Limited	Unimproved	Surface water	At least basic	Limited	Unimproved	Open defecation	
Republic of the Congo	5.8	17.0	74	10	9	6	21	34	37	8	1,646
Rwanda	13.8	524.7	65	20	10	5	74	14	10	2	1,212
São Tomé and Príncipe	0.2	200.0	77	20	<1	2	48	6	4	42	3,200
Senegal	17.3	88.0	86	3	11	<1	60	17	15	8	686
Seychelles	0.1	250.0	96	<1	4	-	>99	<1	<1	<1	2,330
Sierra Leone	8.6	118.9	65	7	17	11	23	35	26	16	2,526
Somalia	17.6	27.6	58	29	12	1	41	17	21	21	282
South Africa	59.9	49.1	94	3	1	2	78	14	8	<1	495
South Sudan	10.9	16.8	41	37	14	8	16	9	15	60	900
Sudan	46.7	24.9	65	29	4	2	37	8	38	17	250
Tanzania	65.5	69.1	61	16	11	12	31	19	44	6	1,071
Togo	8.8	154.9	71	6	13	10	19	28	14	39	1,168
Tunisia	12.4	75.8	97	2	1	<1	97	2	<1	<1	207
Uganda	47.3	195.8	59	25	11	5	21	17	58	4	1,180
Zambia	20	26.6	68	6	19	7	36	22	36	6	1,020
Zimbabwe	16.3	41.7	62	15	16	7	35	31	17	17	657

NB: Regarding water, the basic level means access to drinking water from an improved source, provided the collection time does not exceed 30 minutes for a round trip, including queuing. The limited level refers to access to drinking water from an improved source for which the collection time exceeds 30 minutes for a round trip, including queuing. The unimproved level is access to drinking water from an unprotected dug well or an unprotected spring.

Concerning sanitation, the basic level implies the use of improved facilities that are not shared with other households. The limited level means the use of an improved facility shared with other households. The unimproved level refers to the use of pit latrines without a slab or platform, hanging latrines, or bucket latrines.

Sources: compiled on the basis of data provided by the United Nations Children's Fund (UNICEF, 2023) and the World Bank (World Bank, 2023).

Table 1 demonstrates that the majority of African countries face problems related to providing the population with safe water. The most severe situation is observed in Madagascar (42% of the population uses unimproved sources or surface water), the DRC (41%), the Central African Republic (CAR) (37%), Chad (35%), Angola (33%), Equatorial Guinea (32%), Niger (31%), Eritrea (30%), Kenya (28%), Sierra Leone (28%), Mozambique (27%), Zambia (26%), Benin (25%), Tanzania (23%), Togo (23%), Guinea-Bissau (22%), South Sudan (22%), Burkina Faso (21%), and Ethiopia (20%).

As seen in *Table* 1, most African countries have inadequate access to sanitation facilities. These include Ethiopia (83% of the population practices open defecation or use unimproved sanitation facilities), Chad (82%), Eritrea (78%), South Sudan (75%), Niger (74%), the CAR (70%), the DRC (66%), Madagascar (64%), Uganda (62%), Benin (61%), Mozambique (58%), Sudan (55%), Guinea-Bissau (54%), Togo (53%), Comoros (51%), Namibia (51%), and Tanzania (50%).

The data presented above indicate that African countries suffer from severe problems regarding access to clean water and sanitation facilities. This creates conditions for the contamination of the hydrosphere with pathogenic organisms and the proliferation of dangerous diseases. The situation with sanitary facilities is particularly critical, as a significant part of the population uses primitive toilets, which lead to water pollution, especially during rainy seasons, or practices open defecation.

Within the context of researching waterborne disease transmission, it is pertinent to consider precipitation levels in African countries. An analysis of annual precipitation (in mm) will help to test the hypothesis that a humid climate is conducive to the proliferation of pathogenic microflora, particularly in water.

Based on annual precipitation, four climatic zones can be distinguished: arid (less than 200 mm of rainfall per year), semi-arid (200–400 mm), semi-humid (400–800 mm), and humid (exceeding 800 mm). As can be inferred from Table 1, there are 5 countries in the arid zone, 10 in the semi-arid, 8 in the semi-humid, and 31 in the humid zone.

Classification of water-related diseases

Infectious diseases are transmitted through several routes. Contamination may occur through direct contact between humans, through the air via droplets, through water, food, or fomites, or by vector transmission (through insect bites) (National Geographic, 2023). Waterborne diseases are among the leading causes of mortality globally. The World Health Or-

ganization estimates that diarrhea alone claims 1 million lives annually, with the highest fatality rates observed in Africa (WHO, n.d.). For comparison, the number of deaths caused by vector-borne diseases all over the world is estimated as 700 thousand per year (WHO, 2024c). An important target of public healthcare is to eliminate or minimize transmission of diseases. This pertains to a wide spectrum of illnesses that are either propagated through water or spread due to a lack of clean water.

Nwabor et al. (2016, p. 3) classify water- and sanitation-related diseases, endemic to SSA, into the following categories. “Diseases which are often waterborne” are cholera, typhoid fever, hepatitis A, amoebiasis, giardiasis, and dracunculiasis. “Diseases which are often associated with poor hygiene” are bacillary dysentery, enteroviral diarrhea, paratyphoid fever, pinworm, scabies, skin sepsis, trachoma, and conjunctivitis. “Diseases which are often related to inadequate sanitation” are ascariasis, trichuriasis, and hookworm. Schistosomiasis is believed to be “a disease with part of the parasite’s life cycle in water.”

Cholera is a severe acute diarrheal infection that can be fatal within hours if left untreated. It is caused by the ingestion of contaminated food or water (WHO, 2024b). The danger of cholera is linked to its high transmissibility, which creates a significant risk of epidemics.

According to the WHO, cholera outbreaks affected 20 African countries to varying degrees, with approximately 415,000 reported cases and 7,393 deaths from 1 January 2022 to 30 September 2024 (resulting in a case fatality rate of 1.8%). As shown in *Table* 2, major epidemics were reported in the DRC, Malawi, Ethiopia, Mozambique, Nigeria, Zimbabwe, Zambia, Cameroon, Kenya, and Comoros. Outbreaks occurred in Tanzania, Burundi, South Sudan, South Africa, Niger, Uganda, the Republic of the Congo, and Togo. Isolated cases were detected in Ghana and Eswatini.

An article published in The Lancet Global Health notes that cholera transmission follows a seasonal pattern in most African countries, with outbreaks typically occurring during the rainy season in regions with moderate climatic temperatures (Perez-Saez et al., 2022, p. 837). However, researchers at the Rostov Anti-Plague Institute suggest that dry weather can also drive outbreaks by forcing populations to use water from contaminated sources (Menshikova et al., 2018, p. 90). Cholera vaccines are primarily deployed in affected areas. The protection provided by vaccination lasts for two years, although some residual immunity may persist for up to five years (WHO, 2017).

Typhoid fever is an acute infectious disease characterized by symptoms of general intoxication, damage to the internal organs, and a rash. Typhoid fever is caused by *Salmonella enterica* serovar Typhi (*Salmonella* Typhi)

(Mikhaylov, 1994, vol. 1, p. 227). The case fatality rate varies from 3.5% in Ghana to 9.3% in Madagascar (Marks et al., 2024, p. 606).

Table 2. **Cholera cases and deaths in the WHO African region from 1 January 2022 to 30 September 2024**

Country	Infected	Deaths	Case fatality rate, %
DRC	96,102	1,113	1.2
Malawi	59,427	1,773	3.0
Ethiopia	56,108	708	1.3
Mozambique	49,013	179	0.4
Nigeria	38,359	1,084	2.8
Zimbabwe	34,550	719	2.1
Zambia	24,315	754	3.1
Cameroon	20,650	484	2.3
Kenya	12,666	209	1.7
Comoros	10,462	152	1.5
Tanzania	7,237	121	1.7
Burundi	2,186	12	0.5
South Sudan	1,471	2	0.1
South Africa	1,401	47	3.4
Niger	732	18	2.5
Uganda	170	15	8.8
Republic of the Congo	63	0	0
Togo	37	3	8.1
Ghana	6	0	0
Eswatini	2	0	0
Total	414,957	7,393	1.8

Source: WHO (2024d).

Table 3. **Reported typhoid fever cases in African countries in 2020–2024**

Country	Reported cases				
	2024	2023	2022	2021	2020
Algeria	15	0	0	n/a	n/a
Angola	875,468	787,946	690,110	572,509	497,258
Benin	n/a	n/a	n/a	n/a	n/a

Country	Reported cases				
	2024	2023	2022	2021	2020
Botswana	0	0	0	n/a	0
Burkina Faso	n/a	n/a	n/a	n/a	205,670
Burundi	6,110	4,251	n/a	9,624	n/a
Cabo Verde	n/a	n/a	n/a	0	n/a
Cameroon	n/a	n/a	n/a	n/a	n/a
CAR	0	8,732	n/a	974	36,697
Chad	n/a	n/a	n/a	n/a	n/a
Comoros	0	0	n/a	0	n/a
Côte d'Ivoire	2,986	118,589	n/a	138,475	139,429
Djibouti	0	13	57	n/a	n/a
DRC	n/a	2,024,731	n/a	17,761	n/a
Egypt	188	7,982	n/a	n/a	n/a
Equatorial Guinea	1,568	n/a	n/a	n/a	n/a
Eritrea	n/a	n/a	n/a	n/a	n/a
Eswatini	n/a	n/a	0	0	n/a
Ethiopia	n/a	n/a	1,009,802	n/a	n/a
Gabon	n/a	n/a	n/a	n/a	n/a
Gambia	0	0	0	0	n/a
Ghana	0	0	118,986	612,050	0
Guinea	n/a	n/a	n/a	n/a	n/a
Guinea-Bissau	0	0	7	n/a	1,647
Kenya	69,881	75,659	64,230	2	n/a
Lesotho	n/a	163	n/a	n/a	0
Liberia	n/a	n/a	0	n/a	n/a
Libya	0	n/a	0	n/a	n/a
Madagascar	54,860	n/a	n/a	n/a	n/a
Malawi	n/a	n/a	n/a	n/a	n/a
Mali	n/a	278,516	n/a	n/a	n/a
Mauritania	0	n/a	n/a	0	0
Mauritius	0	n/a	0	n/a	n/a
Morocco	n/a	n/a	n/a	n/a	n/a
Mozambique	n/a	n/a	n/a	n/a	n/a

Country	Reported cases				
	2024	2023	2022	2021	2020
Namibia	9	0	4	0	1
Niger	3,646	1,970	0	0	n/a
Nigeria	n/a	n/a	n/a	n/a	n/a
Republic of the Congo	n/a	25	n/a	n/a	441
Rwanda	94	n/a	842	916	74
São Tomé and Príncipe	n/a	n/a	n/a	801	n/a
Senegal	n/a	n/a	17,660	n/a	n/a
Seychelles	0	0	0	0	0
Sierra Leone	47,828	59,184	63,305	65,984	n/a
Somalia	n/a	n/a	n/a	n/a	n/a
South Africa	123	141	n/a	949	927
South Sudan	298,714	6,754	252,227	852	n/a
Sudan	n/a	n/a	n/a	n/a	n/a
Tanzania	n/a	177,164	166,290	228,675	n/a
Togo	n/a	n/a	n/a	n/a	289
Tunisia	12	n/a	27	20	438
Uganda	21,502	91,710	94,574	203,050	n/a
Zambia	n/a	56	n/a	82	n/a
Zimbabwe	242	0	135	135	n/a

Source: WHO (2024a).

As shown in *Table* 3, the absence of incidence data from 11 countries over a five-year period hinders the formation of a complete picture. A difficult epidemiological situation is observed in the DRC, Ethiopia, and Angola. In West Africa, a major outbreak of typhoid fever occurred in Ghana, with a high number of cases also reported in Mali, Burkina Faso, Côte d'Ivoire, and Sierra Leone. In East Africa (excluding Ethiopia), the situation is somewhat better, although a significant number of cases are still detected in Uganda and Tanzania.

To combat typhoid fever, the WHO recommends that typhoid-endemic African countries conduct mass vaccination campaigns (WHO, 2019). However, several challenges impede these efforts: traditional typhoid vaccines have limitations (such as a protection duration of only three years, reduced efficacy for children, and inefficacy for infants); remote rural areas have limited healthcare coverage; and funding is often insufficient for mass

vaccination campaigns (Imran et al., 2017, p. 37). While newly developed conjugate vaccines have successfully overcome these efficacy gaps in young children, global rollout remains gradual due to financial and logistical barriers.

Viral ***hepatitis A*** is an acute infectious disease accompanied by pronounced intoxication, jaundice, and other symptoms of liver impairment. It is usually transmitted via the fecal–oral route, including person-to-person contact and the consumption of contaminated food or water (Mikhaylov, 1994, vol. 1, pp. 138–139). The case fatality rate for hepatitis A ranges from 0.3% to 0.6% for children and adults under 50 years old, and from 1.8% to 5.4% for adults aged 50 and above (Patterson et al., 2019, p. 2). The prevalence of hepatitis A is estimated to be high in SSA and Sudan, and intermediate in other North African countries (Pedersini et al., 2016, p. 222).

According to the African Health Organization (AHO), up to 90% of children under 10 years of age in countries with unsatisfactory sanitary conditions and poor hygiene practices experience asymptomatic hepatitis A infection and subsequently acquire lifelong immunity. The AHO recommends universal childhood vaccination in countries with an intermediate level of endemicity of hepatitis A. It notes, however, that vaccine use is limited in high-endemicity countries, as most adults have already developed natural immunity (Africa Health Organization, 2025a).

Amoebiasis is a protozoal (caused by simple microorganisms) disease, characterized by a protracted course, ulcerative lesions of the colon, and the formation of abscesses in various organs (Mikhaylov, 1994, vol. 1, pp. 122–123). The intestinal form, also known as amoebic dysentery, is the most common manifestation of the infection (Mikhaylov, 1994, vol. 1, p. 123). Amoebiasis ranks as the second leading cause of death from parasitic diseases worldwide, after malaria, claiming over 100 thousand lives annually (Lyashchuk et al., 2023, p. 73). A study in Abidjan reported severe complications in 92% of patients, with a 15% mortality rate attributed to late diagnosis (Nasrallah et al., 2022, p. 1136). According to researchers from the Federal Scientific Agroengineering Center, cysts of the pathogen (Entamoeba histolytica) can persist in the environment for prolonged periods and are relatively resilient to chemical disinfectants, including alkalis, chloric compounds, phenols, and aldehydes (Lyashchuk et al., 2023, p. 76).

Amoebiasis is widespread in different regions of Africa, although insufficient data availability hinders a comprehensive epidemiological overview. The highest reported prevalence estimates for amoebiasis caused by *Entamoeba histolytica* infection in Africa are recorded in Kenya (64.1%), South Africa (28.9%), and Ethiopia (26.6%). To a lesser extent, the pathogen is present in Angola (18.9%), Nigeria (18.5%), Ghana (15.9%), Madagascar

(9.8%), Uganda (9.1%), Egypt (6.6%), Mozambique (6.1%), Sudan (5%), Senegal (4.1%), Tanzania (3.6%), and Tunisia (1.4%) (Cui et al., 2019). This distribution demonstrates the extensive propagation of amoebiasis across the African continent, with foci in East, Southern, and West Africa.

Trachoma is a chronic infectious disease affecting the conjunctiva and cornea, characterized by tissue infiltration, the development of follicles (bubble-shaped formations), and subsequent scarring (Mikhaylov, 1994, vol. 2, p. 225). It remains a public health problem in 32 countries and is responsible for blindness or visual impairment of approximately 1.9 million people worldwide. Blindness resulting from trachoma is irreversible. The infection spreads through direct or indirect contact with ocular or nasal discharges from an infected person, particularly young children (WHO, 2025).

The Trachoma Atlas, managed by the American NGO "International Trachoma Initiative," identifies endemic areas in the DRC, Sudan, the CAR, and South Sudan. High incidence of trachoma is recorded in Angola, Niger, Nigeria (areas in the North East), Chad, and Ethiopia (Trachoma Atlas, 2025). To prevent trachoma, the WHO recommends facial cleanliness and environmental improvement, specifically, enhancing access to water and sanitation (WHO, 2025). Currently, no vaccine is available against the causative agent of trachoma (Chlamydia trachomatis) (Pollock et al., 2024, p. 835).

Helminthiases represent a group of diseases caused by parasitic worms (helminths) (Ilyinskikh, 2012, p. 41), including dracunculiasis, enterobiasis, ascariasis, trichuriasis, hookworm, and schistosomiasis.

Dracunculiasis (Guinea-worm disease) is a debilitating parasitic illness, typically transmitted through drinking water contaminated with water fleas (copepods) that carry the parasite's larvae ("The WHO," 2023), which penetrate the intestinal wall and migrate through blood and lymph vessels. The final stage of the disease is characterized by the emergence of a blister on the skin that contains a mature female worm, causes intense pain and burning, and subsequently ruptures, forming a painful ulcer (Isentaev & Taraskin, 2017, p. 1080). In June 2023, WHO Director-General Tedros Adhanom Ghebreyesus stated that humanity is on the brink of eliminating dracunculiasis. He elaborated that approximately 3.5 million cases were registered in 21 countries in 1986, when the Program to Eliminate Dracunculiasis was launched. In 2022, only 13 human cases were reported worldwide ("The WHO," 2023).

Soil-transmitted helminthiases, including ascariasis, trichuriasis, and hookworm, are among the most widespread neglected tropical diseases (Sartorius et al., 2021, p. 52). According to the AHO, these parasites infect

approximately 1.5 billion people worldwide, with a significant proportion residing in Africa (Africa Health Organization, 2025b).

Research on the prevalence of helminthiases among children, published in The Lancet Global Health, includes a distribution map. It indicates widespread transmission of soil-transmitted helminthiases across SSA in 2018, with the most severe situation in Angola, Cameroon (coastal and southern areas), the DRC, Equatorial Guinea, Ethiopia, Gabon, Lesotho, Madagascar, Nigeria (particularly, southern areas), the Republic of the Congo, South Africa, and Tanzania (Sartorius et al., 2021, p. 56).

Significant progress has been achieved in combatting helminthiases in SSA. Their prevalence among children aged 5 to 14 years old decreased more than threefold, from 44% in 2000 to 13% in 2018, attributable to mass drug administration, improved sanitation, and economic development (Sartorius et al., 2021, p. 52). It is noteworthy that the eggs of *Ascaris lumbricoides* and *Trichuris trichiura* are highly resistant to common chemical disinfectants (Lyashchuk et al., 2023, p. 74).

Schistosomiasis (bilharzia) is an acute and chronic parasitic disease caused by blood flukes (trematode worms). The two main forms are intestinal and urogenital schistosomiasis. Infection occurs through contact with freshwater contaminated with the parasite's larval forms (cercariae) (WHO, 2023b). Schistosomiasis is endemic in nearly all African countries, with the exception of Algeria, Morocco, and Tunisia, which have interrupted transmission through the sustained efforts of public authorities and medical services (Aula et al., 2021, p. 9). In Egypt, where schistosomiasis has been documented for over 5 thousand years, prevalence among high-risk groups such as fishers and agricultural workers has been reduced to 3–10% in 29 endemic villages (Barakat, 2013, p. 425). The highest number of schistosomiasis cases is reported in Nigeria (29 million), followed by Tanzania (23 million), and the DRC (15 million) (Aula et al., 2021, p. 10). High incidence is also reported in Ghana (Aula et al., 2021, p. 17).

Conclusion

Based on the data presented in the tables, the following conclusions may be drawn. Establishing a direct correlation between individual factors and the outbreak of epidemics proves extremely difficult. However, it is evident that countries with precarious sanitary and epidemiological situations face significantly higher risks of disease proliferation. These countries typically experience a combination of risk factors, including a humid or, in some cases, semi-humid climate, and a substantial proportion of the population lacking access to clean water and/or modern sanitation facilities. Consequently, they

suffer from epidemics of cholera and typhoid fever, as well as high incidence rates of hepatitis A, helminthiases, and other waterborne diseases.

Prime examples include the most populous countries of SSA: the DRC, where 41% of the population lack access to clean water and 66% lack modern sanitation facilities, with annual precipitation of 1,543 mm; Ethiopia, with corresponding figures of 20%, 83%, and 848 mm; and Nigeria, with 16%, 37%, and 1,150 mm. Similar combinations of risk factors are observed in other high-risk countries: South Sudan (22%, 75%, 900 mm), Mozambique (27%, 58%, 1,032 mm), Tanzania (23%, 50%, 1,071 mm), Zambia (26%, 42%, 1,020 mm), Zimbabwe (23%, 34%, 657 mm), Angola (33%, 26%, 1,010 mm), and Côte d'Ivoire (19%, 36%, 1,348 mm). In each case, the figures refer respectively to the share of the population without access to clean water, the share lacking modern sanitation facilities, and average annual precipitation. This list of high-risk countries is not exhaustive because comparable public-health data are unavailable for some states. Mali represents a climatic exception: although it is a semi-arid country, with annual precipitation of 282 mm, it nonetheless reports a significant number of typhoid fever cases.

High or medium population density is another contributing condition for disease proliferation. The most illustrative examples of how "overcrowding" contributes to epidemics are Burundi (464.0 persons per km²) and Comoros (421.1 persons per km²), and, to a lesser extent, Uganda (195.8 persons per km²) and Malawi (172.2 persons per km²). Conversely, countries with low population density, such as Namibia (3.2 persons per km²), Botswana (4.5 persons per km²), and Mauritania (4.6 persons per km²), do not exhibit similarly elevated levels of waterborne disease transmission. It must be noted, however, that the available data are insufficient to establish a direct relationship between population density and national disease incidence.

The contamination mechanism operates as follows. Rainfall facilitates the entry of human waste into water bodies, which are often directly used for drinking and domestic purposes. The hot climate, conducive to the proliferation of pathogenic microflora in the hydrosphere, further exacerbates the situation, creating ideal conditions for epidemic outbreaks. The absence of sewage systems compounds the problem, as wastewater is often discharged into gutters, the contents of which are "washed out" into the environment during the rainy season. Consequently, the hydrosphere becomes contaminated with various pathogens and unsuitable for human use.

Furthermore, the lack of water treatment capacity creates a shortage of safe water. This forces inhabitants to either reduce their water consumption – increasing the risk of diseases associated with poor hygiene and in-

adequate sanitation – or to use water from unprotected sources, risking infection with waterborne and parasitic diseases. Concurrently, widespread poverty significantly limits the population's capacity to treat water independently, underscoring the state's responsibility for the centralized provision of clean water. The situation is further aggravated by limited hygiene awareness and practices among some population segments, stemming from insufficient awareness of their importance.

Considering population density as a factor amplifying the pollution of the hydrosphere with pathogenic microflora, and given the ongoing rapid population growth in many African countries, the urgency of addressing water- and sanitation-related diseases is likely to increase. The current pace of work aimed at providing populations with clean water and sanitation is insufficient to achieve SDG 6 by 2030. Achieving these targets will require systematic work and multibillion-dollar investments in infrastructure, including laying pipeline networks and constructing water-treatment facilities, sewerage systems, and wastewater-treatment plants.

Under these circumstances, prioritizing public health is paramount. Vaccination is one strategy for combating infectious diseases; however, the case of typhoid fever demonstrates its limitations, such as the need for regular revaccination and variable efficacy in children. For the water- and sanitation-related parasitic illnesses discussed here, vaccines are generally absent. It should also be noted that a lack of resources, particularly in SSA, often prevents health services from achieving high vaccination coverage.

In this context, universal access to safe water remains a central public health priority, which necessitates the adoption of modern technical solutions. The potential to leapfrog traditional developmental stages by directly implementing technological innovations could represent a significant advantage for African countries.

The difficult climatic conditions – high humidity and temperatures conducive to the spread of pathogens, coupled with the resistance of some to conventional disinfectants – dramatically increase the need for efficient water treatment. Modern water treatment technologies utilize various methods to eliminate harmful microorganisms. Chemical methods involve the use of strong oxidizers, silver ions, and other substances. Physical methods include ultraviolet radiation, gamma radiation, thermal treatment, and ultrasound (Grishina, 2022, p. 127). One particularly promising experimental development is the vortex sonoplasma device patented by Russian scientists, which utilizes active plasma particles to destroy harmful chemical compounds and microorganisms, making it suitable for water decontamination (Abramov et al., 2021).

This analysis underscores the significant potential for cooperation between the Russian Federation and African countries in the field of water treatment and sanitation, which could substantially contribute to the achievement of SDG 6.

In a broader sense, environmental or biological exposure does not turn into a public health crisis by itself. Instead, the burden of disease grows when environmental shifts intersect with weak structural conditions – such as poor sanitation, failing water networks, weak health institutions, and unequal access at the household level. This chapter highlights the core argument of the book: environmental and health shocks become a social problem only because existing systems decide who is protected and who is left vulnerable.

The public-health mechanisms discussed here provide a human baseline for *Chapter* 2 on the African Great Lakes, where safe water, sanitation, wastewater treatment, and basin cooperation appear as regional governance problems rather than only as health concerns.

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Chapter 2

WATER CRISIS AND THE CHALLENGES OF TRANSBOUNDARY WATER RESOURCES MANAGEMENT IN THE AFRICAN GREAT LAKES REGION

Introduction

The water crisis in East Africa, particularly in the basins of the African Great Lakes, including Lakes Victoria, Tanganyika, Kivu, and others, poses an environmental threat to socioeconomic stability in countries of the region. Achieving their stated goals of reducing poverty and accelerating economic growth requires coordinated and consistent action to improve water resources management. Addressing these challenges requires a shift from ad hoc responses to water crises to a strategic management paradigm and constructive regional cooperation, which is impossible without the effective functioning of permanent regional coordination bodies within integration associations – namely the East African Community (EAC) and the Economic Community of the Great Lakes Countries (ECGLC) – acting in coordination with the relevant national water management and environmental protection agencies of partner countries.

Strengthening water security in African countries depends on the effective use of their significant water resource potential, primarily through the development of transboundary cooperation. The efforts of the African Great Lakes region's countries are focused both on jointly maintaining existing ecosystems and on more efficient economic development of water resources. This is becoming an increasingly urgent task as affirmed by the 2026 United Nations University Institute for Water, Environment and Health report on "global water bankruptcy" (United Nations University, 2026).

At the same time, institutional coordination alone is insufficient unless supported by long-term investment mechanisms, including public-private partnerships (PPPs), which enable cooperation between public authorities and private investors to finance and operate large-scale, socially significant water infrastructure projects. In addition to creating new infrastructure, PPPs facilitate the attraction of private investment to existing facilities.

The importance of transboundary water resources management

Currently, one in three people in Africa faces water insecurity. In 2024, 68% of the population of sub-Saharan Africa, or 840 million people, had access to basic improved water (compared to 59% in 2014), but only 53% (44% in 2014) in rural areas. Across the region, about 70% of people lacked basic sanitation services (World Bank, 2025). This results in high rates of disease, reducing the population's ability to work and worsening the socioeconomic situation.

African economies exhibit enormous demands on water, yet less than 5% of cultivated land is currently irrigated, and only 10% of the continent's hydropower potential is utilized. Transboundary water basins (aquifers, river and lake basins) cover 62% of Africa's total area, the highest proportion of any continent. The majority of Africa's population lives within these basins (African Development Bank [AfDB], 2022, p. 3). Improving their living conditions and significantly strengthening African countries' water security overall depends on the efficient use of their significant water resource potential, largely through the development of regional economic cooperation.

Currently, the principal regional organizations relevant to the Great Lakes region include the Economic Community of the Great Lakes Countries – in accordance with the 1976 Convention signed by Burundi, the Democratic Republic of the Congo (DRC), and Rwanda – and the International Conference on the Great Lakes Region, enshrined in the 2004 Declaration (12 core and 7 co-opted participating countries). The main instrument for managing shared water basins in Africa is, as a rule, intergovernmental water resources agreements, and the main coordinator for water cooperation and the receipt of relevant external assistance is the African Ministers' Council on Water, established in 2002. Cooperation between neighboring states in the development and management of transboundary water resources, including surface and groundwater, is crucial for achieving mutually beneficial outcomes and opening up new opportunities for national and regional socioeconomic development. Joint water management institutions face several core challenges, including ensuring water security, meeting growing water demand, mitigating and adapting to climate change, and achieving the UN Sustainable Development Goals related to water. Meeting these goals requires promoting the equitable and sustainable use of water resources and the preservation of aquatic ecosystems for future generations.

Meanwhile, in Africa, only 29% of transboundary river basins and less than 10% of transboundary aquifers are subject to coordinated joint man-

agement agreements (AfDB, 2022, p. 3). Furthermore, most such agreements make fixed assumptions about future water quantity and quality and do not take into account the increasing variability of water resources caused by climate factors and pollution. Moreover, in the case of uncoordinated transboundary water management, member states of regional economic associations may become more vulnerable to water stress and shortages, which may increase the risk of cross-border tensions.

According to international law, each country exercises sovereignty over natural resources within its own territorial boundaries. The exploitation of transboundary resources often leads to conflicts between countries due to differing economic and, often, political interests in these resources. These problems are also common among the member countries of the East African Community, which encompasses several transboundary river basins and the African Great Lakes of Victoria, Tanganyika, Kivu, Albert, Edward, Turkana (formerly Lake Rudolf, an endorheic lake), and Malawi (also known as Lake Nyasa). All of these lakes are shared by more than one riparian state, with each country's water management regulated by its own set of laws. Consequently, there is an urgent need to address the numerous issues that arise in the shared management and regulation of water resources by countries located in these lake basins, as well as within the region as a whole. Thus, in 2014, a memorandum of understanding was signed between the ECGLC and the EAC in Arusha, Tanzania, aimed at establishing a permanent framework for cooperation to coordinate efforts and provide mutual assistance in this area (Muigua, 2018).

Transboundary water resources management in the Lake Victoria Basin

The basin of Lake Victoria, the world's second-largest freshwater lake by surface area (over 68,000 km^2), whose total drainage area is 194,000 km^2, contains approximately one-third of the EAC's water resources. It is used by approximately 45 million people and is a transboundary resource shared by Tanzania (49%), Uganda (45%), and Kenya (6%). Rwanda and Burundi are part of the lake's upper drainage basin, as the Kagera River, which flows through their territories, drains into Lake Victoria (World Bank, 2018).

In accordance with the Protocol on Sustainable Development of Lake Victoria Basin, signed by three riparian states on 29 November 2003, at the EAC Council of Ministers meeting and ratified in 2004, the Lake Victoria Basin Commission (LVBC) was established as an EAC agency. The Proto-

col, which covers both groundwater and surface water in the lake, outlines the general mandate of the commission: integrated water resources management, support, and coordination of the activities of various actors in the field of sustainable development and poverty reduction in the Lake Victoria Basin. The stated goals include accelerating economic growth, poverty eradication, achieving sustainable use of natural resources, environmental protection, ensuring safe navigation, conducting scientific research, and implementing industry projects.

The Commission, which is responsible for monitoring the application of laws and regulations and promoting the implementation of the tasks assigned to the participants, consists of a Sector Council (the decision-making body), a Coordination Committee (with the functions of implementing decisions), sectoral committees, and a secretariat headed by an executive secretary. The Sector Council includes the ministers responsible in the partner countries for water resources, fisheries, agriculture, transport, the environment, and natural resources, as well as the ministers of foreign affairs and the ministers of internal security, and the Sector Council also cooperates with other Sector Councils of the EAC (Scheumann & Neubert, 2006, p. 60).

The LVBC's effectiveness in water resource management is hampered by a number of unresolved issues related to its status as an intergovernmental rather than supranational body. Consequently, member states (Kenya, Uganda, Tanzania, Rwanda, and Burundi) prioritize their national development goals over regional objectives and basin management projects. Consequently, each country can approve a national agricultural or industrial project (related, for example, to wastewater discharge) without proper consultation and compliance with LVBC guidelines. At the same time, member states are often slow to ratify regional agreements in various areas and adopt them into national legislation. This creates an ambiguous enforcement system, which remains the sole responsibility of national structures and weakens regional enforcement mechanisms. Furthermore, the LVBC lacks direct authority to enforce regulations and cannot fine companies for non-compliance. Moreover, since the LVBC is part of the EAC structure, coordinating its decisions within the Community can be a lengthy process. The LVBC interacts primarily with the ministries of water and environment in EAC partner countries, with limited influence over the decisions of the ministries of finance, agriculture, and energy, which directly impact the development of the basin's ecosystem (African Great Lakes Inform, 2022).

Chronic underfunding is another critical challenge for cooperation. The LVBC must rely on contributions from partner countries and donor fund-

ing, which can be unpredictable and tied to specific projects, limiting long-term planning. Managing a complex transboundary ecosystem requires expertise in hydrology, ecology, digital technologies, and other fields, making it difficult to recruit qualified technical staff. The lack of a unified, real-time monitoring system for water quality and quantity across the basin also needs to be addressed. Since each country operates its own monitoring programs using different standards, frequencies, and technologies, the effectiveness of joint management is reduced. Furthermore, even when effective regional policies are developed, their implementation often fails at the local government level due to a lack of community engagement, awareness, necessary financial resources, and political motivation. Consequently, the LVBC has limited capacity to ensure the practical application of its mechanisms on the ground (African Great Lakes Inform, 2022).

As a result of numerous legal, institutional, organizational, and climate-related challenges, the ecological condition of the lake and the state of its resources continue to deteriorate. Key issues include pollution, climate change, the emergence and spread of invasive species, and overfishing. The lake is effectively in a state of ecological crisis, suffering from severe pollution due to the dumping of untreated industrial and household waste, especially plastic, from major cities such as Kisumu (Kenya), Kampala (Uganda), and Mwanza (Tanzania), as well as agricultural fertilizers and chemicals, petroleum products, and other harmful substances, including from car washing on the shore. This leads to eutrophication – the oversaturation of the water with various chemical compounds, which promotes the rapid growth of harmful algae, such as cyanobacteria, which produce microcystin, a toxin dangerous to humans and animals. Water pollution contributes to the spread of cholera, typhoid, diarrhea, and other dangerous infections that are detrimental to the health of residents. Many existing wastewater treatment plants are outdated, overburdened, or lack the chemicals and equipment required for treatment. Due to rapid population growth outpacing infrastructure development, access to clean water is a serious challenge for coastal communities. The LVBC can draw attention to this problem, but lacks the authority to compel municipalities to build and maintain adequate treatment facilities (“Pollution threatens over 40 million lives,” 2025).

As a result of climate change over the past several decades, the average surface water temperature in the lake has risen, leading to increased evaporation, altered river flow patterns, and a decrease in the lake’s water level. Projected further temperature increases could exacerbate this situation. Climate change is also increasing algal blooms and reducing oxygen levels in the water, leading to massive fish kills. Lower water levels are hamper-

ing shipping and the operation of hydroelectric power plants (critical for Uganda), ports, and exposing water intake pipes. Furthermore, sudden increases in rainfall in recent years have contributed to shoreline erosion and flooding, forcing populations to abandon their homes, damaging coastal infrastructure, and inundating sanitation facilities, exacerbating the pollution problem. The rapid spread of invasive water hyacinth, which impedes navigation, clogs filters and hydroelectric power plant pipes, blocks river outlets, and depletes oxygen, killing other aquatic organisms, remains unresolved. The use of pesticides to control it can kill fish ("Lake Victoria is at Risk," 2020).

The Lake Victoria Fisheries Organization (LVFO), a regional organization established in 1994 and a specialized EAC institution since 2000 (headquartered in Jinja, Uganda), oversees fisheries cooperation and management. In 2016, the LVFO charter was amended to expand its mandate to cover all EAC fisheries and aquaculture resources and open membership to all EAC partner states. The overall objective of the organization is to promote cooperation between contracting parties, to agree on national measures for the sustainable use of fisheries and aquaculture resources, and to develop and adopt measures for their conservation, monitoring, and research (Food and Agriculture Organization of the United Nations [FAO], 2025a).

However, the LVFO is unable to prevent ongoing conflicts over fishing rights and illegal fishing practices. National security services are often deployed to resolve disputes, such as those between Ugandan and Tanzanian fishermen. Approximately 1 million tons of fish are harvested from the lake annually. Pressure on fish stocks is exacerbated by poaching and overfishing. The loss of over 200 species of cichlids and other native fish species (e.g., the African lungfish, Protopterus aethiopicus), along with declining fish catches and fisheries income, threatens the livelihoods of millions of people (Odada et al., 2004).

The widespread extinction of native fish species, including cichlids, was caused by the widespread introduction of the Nile perch (a predatory fish introduced to the lake in the 1950s to increase productivity). This disrupted the lake's food web and contributed to biodiversity loss. Furthermore, illegal fishing practices, including the use of small-mesh nets, contribute to the catch of smaller fish, hindering population recovery. Overgrazing and deforestation along the shores also negatively impact aquatic communities, leading to soil erosion and increased water turbidity, destroying natural water filters and fish spawning grounds.

Although the LVBC coordinates efforts to control mechanical, biological, and chemical pollution, a unified strategy is difficult to implement due to the differing national capacities and priorities of participating countries.

As a result, the damage threatens not only fish stocks and biodiversity, but also the livelihoods and health of millions of people in East Africa. Scientists have called for closer collaboration between Kenya, Uganda, and Tanzania to conserve the lake's biodiversity ("Lake Victoria: Pictures Show," 2016).

Thus, Lake Victoria faces a growing water crisis linked to water pollution, climate variability, unsustainable exploitation of fisheries resources, and management issues, and exacerbated by conflicts and tensions between countries (especially over fishing rights and the use of other lake resources). Overcoming this crisis requires comprehensive improvement and strengthening of regional cooperation, significant investment, and a shift to perceiving the lake as a vital and fragile ecosystem, not simply a resource to be exploited. Resolving the tension between regional ecosystem management and national sovereignty requires enhancing the effectiveness of the LVBC. This, according to experts, requires:

– Granting greater powers to the LVBC by partner countries, with the use of legal mechanisms to ensure compliance.

– Transitioning from donor funding based on individual projects by international organizations and sponsors to sustainable funding from partner countries, as well as projects within the framework of PPPs.

– Creating a joint transparent data system by participating countries.

– Developing national policy frameworks for agriculture, energy, and trade that take into account measures to protect against negative impacts on the watershed.

Until these fundamental governance issues are addressed, the LVBC will continue to struggle to effectively address the worsening water crisis in the Lake Victoria Basin (East African Community [EAC], 2022).

Transboundary water resources management in Lake Tanganyika

Lake Tanganyika, one of the oldest freshwater lakes in the world, is home to unique biodiversity. The lake basin, including all rivers flowing into it, covers 231,000 km^2, and its maximum depth reaches 1,471 m, making it the second-deepest lake in the world after Lake Baikal. It contains a significant share of the world's unfrozen surface freshwater, thereby serving as an invaluable strategic natural resource. The lake basin is shared by the DRC (45%), Tanzania (41%), Burundi (8%), and Zambia (6%) (African Great Lakes Inform, 2022).

To promote cooperation on sustainable natural resource management and the protection of the lake's biodiversity, the Lake Tanganyika Authority (LTA) was established in 2008. The legal and institutional basis of the

Lake Tanganyika Agreement is the Convention on the Sustainable Management of Lake Tanganyika (hereinafter "the Convention"), signed in 2003 and ratified by all four riparian states by 2005. The LTA (headquartered in Bujumbura, Burundi), responsible for implementing the Convention, consists of a Ministerial Conference, a Coordinating Committee (national focal points), and a Secretariat.

The objective of the Lake Tanganyika Agreement is to ensure the sustainable use of the lake's resources and biodiversity to maintain ecosystem stability, primarily for the benefit of communities living near the lake. Article 5 of the Convention contains a provision that Lake Tanganyika, like any other relevant facility, must be used exclusively for peaceful purposes in accordance with the UN Charter, and that this fundamental provision must not be violated even during international or internal armed conflicts (Bukuru & Solntsev, 2017).

Riparian states are obligated to comply with the Lake Tanganyika Fisheries Management Framework Plan, promote broad community participation in fisheries management, prevent pollution, conserve rare and endangered species and populations of flora and fauna that are part of the lake basin, exercise the right of free navigation, and prevent the danger of pollution from vessels flying their flags. However, they are not obligated to grant freedom of navigation to warships of another contracting state. The Convention and the LTA are supported by key protocols concerning:

– Fisheries management.
– Pollution control.
– Biodiversity conservation.
– Navigation.

The LTA faces significant obstacles in its operations. Primarily, this is due to limited funding. The LTA Secretariat is underfunded and understaffed, relying on donor projects from the United Nations Development Programme (UNDP), the EU, and others rather than sustainable core funding from member states (Lake Tanganyika Authority [LTA], 2022). Furthermore, participating countries are often reluctant to cede authority over their territorial waters. Harmonizing national laws and common regulations regarding fishing gear, quotas, and pollution standards remains a complex task. Scientific monitoring of the lake's ecosystem is insufficient. Countries have varying research capacities, making it difficult to develop a unified, evidence-based understanding of changes in water reserves, fisheries, pollution levels, and other factors. Further complicating matters, periodic conflicts and political crises in the region, particularly in Burundi and eastern DRC, impede stable long-term water resource management and the development of a blue economy (AfDB, 2022).

However, transboundary management is essential to jointly address a number of complex issues:

– fishing requires joint stock assessments and quota agreements. Illegal fishing using prohibited nets, dynamite, and light attraction methods, as well as cross-border fish smuggling, lead to overexploitation of resources, such as the famous Lake Tanganyika sardine (kapenta) and other fish species. Oversight and enforcement of illegal activities are limited. The situation is further complicated by the fact that over 10 million people directly depend on the exploitation of the lake's resources for food and income. Therefore, restrictions on fishing require finding solutions to provide alternatives, otherwise they will encounter strong resistance from local communities;

– preserving the unique ecosystem is crucial (the lake is home to over 2,000 species, approximately 600 of which are endemic). Habitat destruction, invasive species (such as the water hyacinth), and pollution threaten this unique evolutionary richness by leading to biodiversity loss. Municipal wastewater from Bujumbura and Kalemie (Tanganyika Province of the DRC), mining discharges (primarily heavy metals from the Copper Belt of the DRC), agricultural runoff, sedimentation from deforestation, and industrial waste pose serious threats with transboundary impacts that harm the ecology of all neighboring countries;

– the need to combat the effects of climate change, which is causing rising water temperatures in the lake, remains urgent. This alters stratification and nutrient cycling, with consequences for the entire food chain. Changing precipitation patterns also affect water levels in the lake, and riparian communities are beginning to experience water shortages (Phiri et al., 2023).

Countries party to the Convention, with the assistance of international institutions, are making efforts to combat the water crisis. Donor-funded integrated lake management projects, such as the United Nations Development Programme–Global Environment Facility project on Lake Tanganyika, are helping to improve collaboration, establish co-management structures with local communities, and implement best practices in ecosystem conservation measures. For example, in Tanzania, promoting energy-efficient stoves to reduce wood consumption helped reduce its consumption from 15 m^3 to 5 m^3 per month; in the Lufubu River (Zambia), a project reduced the sedimentation rate due to pollution from 159 tons per day to 115 tons per day; in Burundi, a pilot project to collect and treat wastewater in the capital, Bujumbura, led to a significant increase in the volume of treated wastewater entering the lake, from 6,000 m^3 to 11,000 m^3 (United Nations Development Programme, 2017).

One of the significant projects in the region is PROFISHBLUE, launched by FAO and the Southern African Development Community in 2024. Its objectives include improving fisheries management, enhancing food security, facilitating intraregional trade, and increasing jobs by creating value chains in fisheries. The project includes joint assessments of Lake Tanganyika fish stocks, training specialists, developing skills, and strengthening regional cooperation. It complements other FAO and EU initiatives – the LATAFIMA (Lake Tanganyika Fisheries Management) project and the FISH4ACP sustainable fisheries and aquaculture project (FAO, 2025b).

On 16 December 2021, the LTA Ministerial Conference endorsed the Regional Charter on Sustainable Fisheries Management as a normative document containing agreed-upon specific management measures targeting three commercial fish species of Lake Tanganyika and committed to its implementation. The Charter has been adopted and endorsed by riparian states. However, its successful implementation will require a robust monitoring regime that provides social and scientific verification of progress at the national and regional levels. National and international non-governmental organizations (NGOs) and agencies working on fisheries management and biodiversity conservation are also actively engaged (Vershinin & Ntindekure, 2025).

On 26 February 2025, in Dar es Salaam, the governments of Burundi, the DRC, Tanzania, and Zambia launched the 5-year, $14.5 million project "Conserving Biodiversity, Sustainable Land Management, and Enhancing Water Security in the Lake Tanganyika Basin" (also known as Tuungane, or "Let's unite") to assess and address transboundary threats to the biodiversity of the Lake Tanganyika Basin. Supported by the United Nations Environment Programme (UNEP) and funded by the Global Environment Facility, the project highlights several priority areas, including promoting sustainable livelihoods to reduce reliance on fisheries, protecting critical ecological areas, and restoring degraded landscapes in the basin. "Through this transformative project, we are taking concrete steps to reverse biodiversity loss, promote sustainable fisheries, and restore the health of the lake for present and future generations," said LTA Executive Director S.T. Mukanga (UNOPS, 2025).

Tuungane is being implemented by the United Nations Office for Project Services (UNOPS), with the Lake Tanganyika Authority as a strategic partner. This project builds on the principles of cooperation and partnership established by the states parties to the Convention. It is estimated that if current environmental pressures continue, Lake Tanganyika's biodiversity could decline by 20% by 2050. To reverse this trend, increased funding for conservation measures, stronger national policy enforcement,

and community engagement in environmentally sound practices are needed. The success of this project could serve as a model for transboundary cooperation in environmental conservation. The creation of protected areas plays a key role in this regard, as envisioned, for example, by the Tanganyika Blue Economy Initiative, which aims to establish a network of protected areas, including a "Blue Economy Growth Pole" in freshwater bodies.

In this regard, a crucial step is empowering communities to co-manage resources through Fisheries Management Committees in Zambia and Beach Management Units in the DRC. These community-based organizations, with the support of local governments, develop their own fisheries rules and regulations to protect fish spawning grounds, prohibit illegal fishing practices, and promote sustainable fishing practices ("Preserving Lake Tanganyika," 2025). These structures work closely with local governments to enforce regulations, monitor fish populations, and educate the public about the importance of resource conservation. By fostering a sense of ownership and responsibility, these groups ensure the active and meaningful participation of local communities in the management and protection of their resources.

Thanks to these efforts, illegal fishing has declined, and fish populations are beginning to recover. The Tuungane Project, with the participation of the LTA, governments, and NGO partners, also identified 28 coastal key biodiversity areas for the lake to focus additional conservation efforts on, and compiled a map of the entire lake. As noted above, the Tuungane Project and its partners aim to conserve more than 40,000 hectares of the lake, including a third of its key biodiversity areas, and benefit 100,000 fishermen by 2030 ("Restoring Balance to Lake Tanganyika," 2024).

The Lake Tanganyika Transport Corridor is a key factor in the regional economic integration of the four riparian countries across all aspects: trade cooperation, infrastructure integration, freedom of movement of citizens, cross-border investment, and collaboration. Currently, restrictive non-tariff barriers persist in the countries of the Lake Tanganyika region, which discourage local producers and traders from actively participating in trade cooperation. In matters of trade and transport, the way out of this impasse lies in coordinating the joint efforts of the countries in the region, in particular by promoting the development of intraregional value chains and supporting networks of smallholder farmers and traders. Given that agriculture plays a significant role in the economies of these countries, it is advisable to develop value chains in agribusiness (for example, in the food industry), while simultaneously creating supporting cluster structures such as vocational education, universities, chambers of commerce, transport facilities, and

promoting specialized logistics services ("Lake Tanganyika: Turning corridors," 2021).

Transboundary management of Lake Tanganyika, a crucial instrument for cooperation and based on a legal framework, faces serious obstacles in its implementation, including a lack of political will, limited financial investment, and limited operational capacity on the part of member states. A lack of cooperation in management will lead to the destruction of this unique freshwater ecosystem. The future of the lake depends on a successful transition from a project-based, fragmented approach to a truly integrated, sustainably financed, and scientifically sound system of cooperative management that will balance environmental conservation with the well-being of the millions of people who depend on it.

To improve transboundary management of Lake Tanganyika it is necessary to:

– establish a trust fund for reliable financing by member states of key transboundary management functions;

– harmonize national laws with the protocols to the Convention, particularly with regard to illegal fishing and environmental pollution;

– start conducting joint resource monitoring and creating a common, open-access database on catch volumes to inform participating countries;

– organize joint maritime patrols and information exchange to combat illegal fishing and fish smuggling;

– monitor the health of the entire ecosystem, including rivers and land-based sources of pollution;

– integrate country-specific aquaculture programs to reduce pressure on wild fish stocks, and coordinate tourism and agricultural development.

Transboundary management of the Lake Kivu and Ruzizi River basins

In 2022, the LTA signed a Memorandum of Understanding with the Lake Kivu and Ruzizi River Authority (ABAKIR) to expand cooperation in environmental protection, pollution control, and resource management. ABAKIR was established in 2014 under an international convention signed by Burundi, the DRC, and Rwanda and is mandated to promote integrated water resources management in the Lake Kivu and Ruzizi River basins. ABAKIR's activities are aimed at harmonizing the legal frameworks of the participating countries, coordinating water use, and protecting the environment, based on the "Agreement for the Conservation and Sustainable Development of the Lake Kivu Basin" (2007), signed by Rwanda and the DRC (SHER Consult, 2020).

Lake Kivu, located on the border between Rwanda and the DRC, is a critical transboundary water resource facing challenges such as pollution, overfishing, deforestation, and the effects of climate change. However, a critical challenge is preventing a catastrophic release of natural gas (methane and carbon dioxide) dissolved in the lake's deep waters by carefully managing the lake's stratification and gas concentrations. Continuous joint monitoring is necessary to track the lake's complex dynamics, the rate of gas replenishment, and the impacts of its extraction. Harnessing the lake's vast methane reserves, estimated in the literature at tens of billions of cubic meters, for electricity generation is crucial for the energy needs of both countries, but must be done in a manner that does not increase the risk of limnic eruption (Kalinichenko, 2024).

Efficient use of the lake's resources requires cooperation between the riparian states, and a number of initiatives are being implemented to address these challenges. Among these is the European Union-funded Tanganyika and Kivu Water Management Project, in which ABAKIR and LTA participate. The project focuses on monitoring the environmental status, climate change impacts, and biodiversity of Lakes Kivu and Tanganyika, and includes the establishment of a transboundary monitoring system and the construction of environmental and climate monitoring centers. ABAKIR, along with LVBC and LTA, is also involved in the EAC4Nature Project, launched by the EAC in 2025 with the support of the EU and the German Federal Ministry for Economic Cooperation and Development. The project aims, inter alia, to support the integrated water resources management of Lake Kivu and the Ruzizi River, integrate environmentally friendly solutions into regional policies, strengthen the institutional capacity of water management authorities, and improve resource monitoring and information exchange (EAC, 2025).

Armed conflict and political instability significantly complicate the situation in the Great Lakes region, leading to a cumulative annual loss of over 12% of regional GDP between 2000 and 2020. In the DRC, armed conflicts in the east of the country have reduced overall economic growth by 2–3 percentage points annually due to devastation in the mining, agricultural, and trade sectors. For example, cargo throughput at the port of Goma fell by more than 40% between 2022 and 2024, negatively impacting trade with Burundi, Rwanda, and Uganda.

Instability hinders the implementation of long-term, costly integration projects, including in water management. Foreign investors are reluctant to invest in risk zones, as evidenced by the significant decline in foreign direct investment (FDI) inflows to the Great Lakes region (by 28% between 2021 and 2023) – mainly due to high security risks and the lack of

institutional guarantees (United Nations Conference on Trade and Development, 2024), which negatively impacts the overall competitiveness of the region.

Opportunities for using public-private partnerships

The region's domestic economic situation is exacerbated by a persistently insufficient volume of investment available to stimulate the private sector, both through FDI and the mobilization of domestic savings. This is compounded by difficulties in reducing public expenditure (including by downsizing the army and government apparatus, selling off most of the ministry and department vehicle fleet, and transferring state-owned enterprises to private ownership) and insufficient measures to increase budget revenue by increasing tax collection (sales tax, profit tax, personal income tax, and strengthening control over customs duties). Issues of development financing through official development assistance and the participation of international organizations and foreign donors (the African Development Bank, etc.) in water projects remain insufficiently coordinated (Morozenskaya, 2024a, pp. 63–72).

In these circumstances, PPPs, which offer the opportunity for private investors to co-finance projects, are becoming an increasingly promising tool for attracting investment in infrastructure projects. This enables the implementation of national and regional infrastructure projects even in the absence of sufficient budgetary funds, a characteristic of all countries in the African Great Lakes region.

PPPs are a modern institutional mechanism that enables governments to address pressing social issues and promote the development of African entrepreneurship. Under PPPs, public and private stakeholders (both local and foreign) are able to provide basic services to the population by financing joint projects in infrastructure sectors and subsectors, including water resources management. In Africa, the provision of such services is typically strictly regulated by governments, which maintain low water prices, hindering investment in this sector. In this regard, PPP projects implemented with the participation of multinational companies in the field of water management contribute to increasing the efficiency of using budgetary funds (Morozenskaya, 2024b, pp. 163–177).

Meanwhile, PPP projects in infrastructure sectors – including water management in SSA – have persistently suffered from underfunding for decades. This is partly attributable to the lack of clarity in budget legislation concerning the planning and allocation of funds for such projects, particularly concession agreements. Moreover, the legal framework for select-

ing PPP projects based on their feasibility and efficiency is often absent, and competition among potential investors remains limited (Pashkova & Tambo, 2018, pp. 247–248). African governments are trying to improve the situation by developing long-term, capital-intensive water programs and implementing reforms in the sector. One of the goals of these reforms is the introduction of market mechanisms to increase the efficiency of the water sector and stimulate private investment from both local and foreign sources.

Regarding PPP projects in Africa, many have been implemented within water management. In particular, besides mobilizing additional sources of private financing and management, they can also improve the efficiency of budgetary spending.

The productivity and financing of public water companies operating in African countries are insufficient to meet the existing financial and technological challenges. The high level of water loss in the distribution networks and water tariffs that are too low do not ensure the independence of the budget of these companies, as well as the maintenance or construction of infrastructure facilities. Although PPPs may be useful in water distribution, water supply, and sanitation, these sectors present serious difficulties. On the one hand, in this sector the greatest benefits from PPP can be obtained, and on the other hand, these projects are the most difficult from the point of view of commercial and financial structuring. Thus, while the PPP model may be suitable for water purification, it is not always equally suitable for water distribution, because it is necessary to take into account a broader and more complex set of risks.

Water distribution is characterized by high transport costs, storage requirements, and sensitivity to social and political pressures. The high cost of transportation makes the creation of a competitive market for water and sanitation services particularly difficult. In addition, this heavily regulated sector is one of the oldest, with worn-out and hard-to-reach key water and sewerage facilities. The task of studying their condition and forecasting the amount of investment needed to service them is complex and requires laborious and costly research.

The funding required for Africans' access to improved water sources was estimated in 2000–2015 at $16.5 billion a year (about 2.6% of the continent's total GDP). For many countries, these costs have been prohibitive. Focusing on low-cost technologies, governments have solved many problems related to water and water supply. According to AfDB estimates published in 2014, water-sector spending at that time was estimated at $3.6 billion, including $2.7 billion wasted due to inefficiency in production. A good example of this inefficiency is unprofitable pricing for services: average tariffs are about $0.67 per m^3, below the cost-recovery threshold of

more than \$1 per m^3. The inefficiency of operational activities of water companies is estimated on the continent's scale at an additional \$0.9 billion per year, which prevents the expansion of the services market. However, even if inefficiencies in production and operational activities are eliminated, the overall financing gap in the water sector will remain and will continue to be \$7.8 billion a year (1.2% of GDP) (AfDB, 2014, p. 57).

In recent years, investments in water supply and sanitation in Africa have increased to \$10–19 billion annually, with annual deficits ranging from \$11 billion to \$20 billion. To address this problem and achieve SDG 6, the Continental Africa Water Investment Programme was established in February 2021 at the 34th AU Summit. Its goal is to increase investments to \$30 billion by 2030 (Volkov et al., 2025, p. 49).

Overall, it should be noted that the PPP projects implemented in Africa, despite the difficulties noted, have shown that private management can improve operational performance and help mobilize additional investment under appropriate regulatory and contractual conditions.

Conclusion

East African countries are striving to strengthen mutual cooperation in the area of shared water resources management for development. Their efforts are aimed both at jointly maintaining existing ecosystems and at more efficient economic development of water resources. However, as the renowned Russian Africanist L.L. Fituni rightly noted, although African governments and regional actors often give priority to the second area, international donors are generally more inclined to finance the first, often conditioning the provision of aid on its mandatory targeted use (Fituni, 2012, pp. 160–176). In this situation, the strategic importance of long-term agreements on the exploitation of lakes and their basins is expected to increase. This trend is likely to unfold within AU frameworks and regional Great Lakes mechanisms, including the Kigali Declaration on the African Great Lakes (LTA, 2022).

This is becoming especially necessary as the world enters an "era of global water bankruptcy," as stated in a report prepared by the United Nations University for the 2026 UN Water Conference, scheduled to be held in Abu Dhabi, United Arab Emirates, in December 2026. Key factors include chronic groundwater depletion, the over-allocation of water resources, land and soil degradation, deforestation, and environmental pollution. The report notes, in particular, that 50% of the world's large lakes have lost some of their water reserves since the early 1990s, and terms such as "water stress" and "water crisis" no longer capture the processes occur-

ring in many regions of the world. We are now talking about a post-crisis state characterized by an irreversible loss of natural water capital (United Nations University, 2026).

Overcoming the water crisis, let alone "water bankruptcy," is impossible without a comprehensive approach (AfDB, 2022) that includes:

– strengthening transboundary institutions and implementing existing agreements;

– massive investments in water infrastructure and technology at both the national and international levels;

– improving domestic water resource management and combating corruption;

– adapting to climate change through the implementation of progressive and efficient technologies;

– considering demographic and economic trends in long-term planning;

– establishing new water-testing laboratories to expand the monitoring area for both qualitative and quantitative parameters, using automatic monitoring buoys for continuous data collection, including hydrometeorological data;

– using satellite imagery and new remote monitoring methods;

– a partnership of water resource management specialists with universities and research centers, including through the Global Water Partnership annual training program "Developing Capacity in Water Governance and International Water Law in Africa," which has been in effect since 2015 (Global Water Partnership Africa, 2018).

Sustainable socioeconomic development of the riparian countries of the African Great Lakes region is based on water security, which is vital for creating adequate living conditions and maintaining public health, food and energy production, industrial development, preserving biodiversity, and ecosystem resilience. Transboundary cooperation promotes the reduction of water risks, the restoration of ecosystems after droughts and floods, the implementation of more cost-effective solutions to wastewater disposal and treatment problems, and the development of a blue economy.

The Great Lakes cases show that having plenty of freshwater does not guarantee security on its own. Regional institutions only work when they are backed by domestic implementation, stable financing, shared data systems, and local community participation. Where these links are missing, ecological pressures directly hurt local people – leading to disease, loss of livelihoods, declining fisheries, and a collapse of public trust. Therefore, we should evaluate regional cooperation not just by the treaties or commissions it creates, but by its actual impact on the communities living around the lakes.

The governance problems discussed in this chapter also provide a regional background for the basin-level analyses of the Zambezi in Chapter 3 and the Orange–Senqu in Chapter 4.

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Part II

TRANSBOUNDARY BASINS, HYDROPOLITICS, AND REGIONAL COOPERATION

Chapter 3

WATER RESOURCES GOVERNANCE ACROSS BORDERS: THE ZAMBEZI RIVER BASIN

Introduction

Transboundary water governance is one of the structural conditions of Africa's political economy. Transboundary river basins cover about 62% of the continent's total land area; apart from island states, every African country has at least one international river in its territory, and ten African basins are shared by four or more countries (Namara & Giordano, 2017, p. viii). Water management therefore belongs simultaneously to infrastructure planning, food security, public health, energy policy, environmental protection, and regional diplomacy. The Zambezi River Basin (ZRB) offers a revealing case study, as these issues converge here.

The Zambezi is Africa's fourth largest river basin after the Congo, Nile, and Niger. It drains about 1.37 million km² and crosses eight Southern African Development Community (SADC) member states: Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia, and Zimbabwe (World Bank, 2010b, p. 13; ZAMCOM, 2019, p. 25). Its political geography is highly uneven. Zambia accounts for 41.6% of the watercourse area, Angola for 18.5%, Zimbabwe for 15.6%, Mozambique for 11.8%, Malawi for 8.0%, Tanzania for 2.0%, Botswana for 1.4%, and Namibia for 1.2%. The basin covers 93.4% of Malawi's national territory and 76.8% of Zambia's, while its share in Botswana, Namibia, and Tanzania is small by area but institutionally relevant (ZAMCOM, 2019, p. 26). Legal equality among riparian states is one thing; the practical asymmetries of geography, demography, hydrology, infrastructure, and administrative capacity are quite another – and they consistently override the principle.

Water scarcity is an inadequate shorthand for the Zambezi. The basin contains significant water resources, major wetlands, large reservoirs, hydropower installations, and agricultural potential. Mean annual discharge at the outlet is estimated at 4,134 m³/s, or about 130 km³ per year. Water is nevertheless uneven in space and time. Rainfall may reach about 1,400 mm per year in parts of the Upper Zambezi and around Lake Malawi, while parts of southern Zimbabwe receive about 500 mm per year.

Northern tributaries contribute disproportionately to river discharge: the Upper Zambezi contributes about 25%, the Kafue 9%, the Luangwa 13%, and the Shire 12%, together accounting for roughly 60% of Zambezi River discharge (World Bank, 2010b, p. 4). The analytical question is how riparian states turn variable water availability into reliable and equitable water security.

Demographic pressure sharpens that question. The Zambezi Watercourse Commission (ZAMCOM) estimated the population of the Zambezi Watercourse area at more than 47 million in 2017, roughly 28% of the total population of the eight member states, with about 85% of the basin population concentrated in Malawi, Zimbabwe, and Zambia (ZAMCOM, 2019, p. 25). Recent assessments indicate that this pressure has intensified significantly, with the total population residing within the watercourse area rising to approximately 51 million people (African Development Bank, 2025). The social distribution of this population matters as much as its size. ZAMCOM reports that 64.8% of the watercourse population is rural and largely dependent on rain-fed subsistence agriculture, while 96.5% of agricultural activity by area is rain-fed (ZAMCOM, 2019, pp. 30–31). These figures should discipline any discussion that treats water governance mainly as a problem of dams, energy, and large-scale irrigation. The everyday water economy of the basin remains strongly rural.

Climate change makes this problem harder to manage. ZAMCOM projects delayed rainy seasons, shorter and more intense rainfall events, and reduced runoff under future climate conditions (ZAMCOM, 2019, p. 47). The Intergovernmental Panel on Climate Change's Sixth Assessment Report reaches a compatible conclusion for Southern Africa, identifying declining mean annual rainfall in the summer rainfall region under high-emissions scenarios and increasing drought risks as major regional concerns (IPCC, 2022, pp. 1328–1329). These projections affect the operating environment of hydropower, irrigation, rural water supply, floodplain agriculture, fisheries, and water-quality management. They do not determine political outcomes, but they raise the cost of weak coordination.

The institutional architecture of the basin has advanced considerably. ZAMCOM was established as an intergovernmental organization in 2014; the agreement creating it was signed in 2004 and entered into force in 2011 (ZAMCOM, 2018, p. 1). The Agreement defines the Commission's objective as the equitable and reasonable utilization of the water resources of the Zambezi Watercourse, together with efficient management and sustainable development. ZAMCOM's functions include collecting and disseminating data, coordinating management and development, advising member states, supporting harmonization of national water policies, and cooperating with

SADC and other institutions (ZAMCOM, 2004, pp. 4–5). The mandate is substantial. Its effect depends on state compliance, technical capacity, finance, data quality, and political trust.

This chapter treats the Zambezi as a case of governance under uneven abundance. It uses a single-basin case study based on official basin documents, World Bank and ZAMCOM assessments (in particular, the World Bank's Multi-Sector Investment Opportunities Analysis – MSIOA), regional legal instruments, and secondary literature on Southern African hydropolitics. The chapter examines how water insecurity is produced within a basin that has significant resources and formal mechanisms of cooperation. The main argument is that the central governance challenge lies in the gap between formal cooperation and effective basin-wide management. That gap appears in uneven water availability under climate stress, interdependence among water uses, and the difficulty of making regional institutions influence national planning.

An uneven basin: physical geography, settlement, and livelihoods

The ZRB is legally framed as a shared watercourse, yet internally it consists of 13 major sub-basins corresponding to the river's main tributaries and catchments (World Bank, 2010b, p. 13). That technical fact carries political weight. Planning across 13 hydrological units requires compatible data systems, comparable sectoral priorities, and the capacity to link upstream land use with downstream water security.

This institutional complexity is compounded by a dual territorial asymmetry: states not only hold vastly unequal shares of the basin area, but they also differ fundamentally in how much of their national territory relies upon the watercourse. Hydrology further reinforces these imbalances. The World Bank reports a basin mean annual precipitation of 956 mm, with wetter conditions in the Upper Zambezi, Kabompo, Shire/Lake Malawi, Lungúe Bungo, Luangwa, and Zambezi Delta sub-basins, and lower figures in Kariba, Cuando/Chobe, Barotse, Mupata, and Tete (World Bank, 2010b, p. 4). ZAMCOM summarizes the range as less than 500 mm per year in arid zones and more than 1,500 mm in subtropical zones (ZAMCOM, 2019, p. 27).

The physical structure of the basin gives it considerable development potential. Most of the basin lies on a high plateau, generally between 800 and 1,450 m above sea level, with most area between 1,000 and 1,300 m (World Bank, 2010b, p. 13). Lake Malawi covers about 28,000 km² and is identified by the World Bank as Africa's third largest freshwater lake (World Bank, 2010b, p. 4). The basin also includes Lake Kariba, Lake Cahora Bassa, large

floodplains, swamps, and the Zambezi Delta. ZAMCOM identifies catchments, rivers, tributaries, lakes, wetlands, and the delta as core natural resources, with Lake Malawi, Lake Kariba, and Lake Cahora Bassa among the major water bodies (ZAMCOM, 2019, p. 27).

Population geography adds another dimension. In 2017, about 85% of the basin population lived in Malawi, Zimbabwe, and Zambia (ZAMCOM, 2019, p. 25). ZAMCOM gives the watercourse population by country as 16.6 million in Malawi, 10.6 million in Zambia, 10.5 million in Zimbabwe, 6.5 million in Mozambique, 2.1 million in Tanzania, 0.9 million in Angola, 0.08 million in Namibia, and 0.02 million in Botswana (ZAMCOM, 2019, p. 26). Population distribution therefore does not mirror territorial share: Malawi's basin area is smaller than Zambia's, but its basin population is the largest. The political weight of the river comes from people as well as water.

The social geography remains predominantly rural. In 2017, the rural population share in the watercourse was 65.3%, down from 69.9% in 2007. Country-level rural shares remained high: 83% in Malawi, 68% in Zimbabwe, 67% in Mozambique, 67% in Tanzania, 58% in Zambia, 54% in Angola, 51% in Namibia, and 42% in Botswana (ZAMCOM, 2019, p. 26). Urbanization is important, but it has not displaced rural dependence on water, land, fisheries, wetlands, and seasonal rainfall. Furthermore, a declining rural percentage can coexist with growing absolute numbers of rural people and with continuing pressure on land and water systems.

Livelihoods in the basin are strongly tied to small-scale agriculture. ZAMCOM estimates that 65–70% of the population living in the watercourse is engaged in small-scale, rain-fed agriculture, which it describes as the principal economic activity in terms of the number of people involved. The same document notes that this activity is often poorly reflected in formal GDP because of low investment and the informal character of rural production (ZAMCOM, 2019, p. 27).

The World Bank's basin assessment offers a more detailed perspective on regional livelihood structures. In the Barotse Floodplain, households typically combine crop farming, livestock, fishing, and natural-resource use; wetlands buffer external shocks and support seasonal income and subsistence. The assessment reports that wetlands in the Barotse Floodplain generated an average annual net financial return of US$405 per household, with 83% for home consumption; fish accounted for 43% of total value and 73% of household cash income, while floodplain grazing and crop production accounted for 29% and 22% (World Bank, 2010b, p. 52).

The basin's economic sectors depend on water in different and sometimes competing ways. Hydropower depends on storage and regulated flow. Irrigation depends on abstraction, timing, and infrastructure. Floodplain

farming often depends on seasonal inundation. Fisheries require habitat and water quality. Tourism depends on flow and ecological integrity. Mining and industrial activity can increase demand and degrade quality. ZAMCOM identifies the principal formal economic activities as hydropower generation, commercial agriculture, tourism, and small-scale agriculture, most of it rain-fed (ZAMCOM, 2019, p. 27).

Water-use figures make the tension visible. ZAMCOM reports that the largest non-natural "user" of water in the watercourse is net evaporation from the Kariba and Cahora Bassa reservoirs, accounting for 84.6% of consumptive use. Irrigation accounts for 12.69%, while human consumption, urban use, and industrial use together account for 2.71%. Total current withdrawals are estimated at about 12% of total average flow, which ZAMCOM interprets as evidence that the watercourse remains largely undeveloped (ZAMCOM, 2019, p. 28). However, a basin may have low aggregate withdrawals and still contain communities with poor access to safe water, weak sanitation, drought exposure, or dependence on degraded wetlands.

Land degradation links water to catchment management. ZAMCOM reports that 51% of land in the Zambezi Watercourse is moderately degraded and 14% highly degraded, leaving 35% not degraded (ZAMCOM, 2019, p. 28). These figures underline a basic governance point: water management cannot be separated from land management. Degradation affects runoff, sedimentation, infiltration, grazing, floodplain productivity, and rural livelihoods.

Pressures on water security: climate, demand, and the quality of access

Water security in the ZRB is not determined by aggregate water availability, but depends on timing, infrastructure, institutional governance, and climate resilience. The basin's pressures arise from climatic variability, rural poverty, infrastructure gaps, competing sectoral demands, uneven capacity among states, and the condition of local service systems. The basin has significant water, but lacks a consistently reliable system for turning that water into secure livelihoods, public health, and resilient development.

The first pressure comes from the social structure of water dependence. ZAMCOM's figures on rural population and rain-fed agriculture make clear that smallholder farming is central to basin water security (ZAMCOM, 2019, pp. 30–31). Rain-fed agriculture is often treated in planning documents as a residual category outside the formal water economy of reservoirs, abstractions, and municipal systems. However, in social

terms, rain-fed farming is one of the basin's most important water uses, even when it is not counted like withdrawals from rivers and reservoirs.

ZAMCOM notes that rain-fed agriculture is a larger cumulative "user" of water than irrigated agriculture, although this water is not included in the runoff-based hydrological balance of the watercourse. A strategy focused only on river abstraction, large storage, and formal irrigation can leave the majority of water-dependent livelihoods weakly protected. Rainwater capture, soil-moisture retention, conservation tillage, mulching, intercropping, terracing, and small-scale storage may have less political visibility than large dams, but they are directly relevant for poverty reduction and food security across dispersed rural communities (ZAMCOM, 2019, pp. 47–48).

Climate variability makes rural dependence more precarious. The Zambezi Watercourse is exposed to floods and droughts, and climate change is expected to intensify. ZAMCOM reports that rainfall is estimated to decline by 10–15% by 2100, with delayed onset of the rainy season and shorter, more intense rainfall events; runoff is estimated to decrease by 26–40% by 2050 (ZAMCOM, 2019, p. 47). The IPCC identifies decreasing mean annual rainfall in Southern Africa's summer rainfall region under high-emissions scenarios and links higher temperatures to evaporation, aridity, and drought risk (IPCC, 2022, pp. 1328–1329).

The 2024 El Niño crisis showed how quickly climatic stress becomes a regional governance issue. In May 2024, SADC reported that El Niño-induced drought and floods had affected more than 61 million people in the region and launched a regional humanitarian appeal of at least US$5.5 billion (SADC, 2024, p. 3). The ZRB should not be equated with the whole SADC region, but several Zambezi riparians – especially Malawi, Zambia, Zimbabwe, and Mozambique – are exposed to drought and flood shocks that quickly become food-security, energy, and public-health shocks.

Hydropower illustrates this interdependence. With about 5,000 MW of developed capacity and additional projects identified, hydropower is one of the basin's major resources (World Bank, 2010b, p. 72). It supports national grids, regional power trade, and the Southern African Power Pool. It also increases the political salience of storage and flow regulation. The Kariba and Cahora Bassa reservoirs are central to this system, and their evaporation losses dominate consumptive water use in the basin (ZAMCOM, 2019, p. 28). Energy security is therefore water security by another name.

Hydropower development requires explicit trade-off analysis. ZAMCOM identifies agriculture and hydropower as the two main water-using sectors and stresses that balanced investment requires carefully determined trade-offs between water uses, especially energy and food production (ZAMCOM, 2019, p. 31). Hydropower production may require regu-

lated flows; floodplain farming and fisheries often depend on seasonal inundation; irrigation increases dry-season abstractions; downstream ecosystems require environmental flows; and urban centers need reliable water quality and supply. The uses cannot all be maximized simultaneously without redistributing costs.

Irrigation creates a similar problem for food security. ZAMCOM reports that of an estimated 5.2 million hectares of arable land in the watercourse, only 183,000 hectares – 3.6% – were equipped for irrigation (ZAMCOM, 2019, p. 31). The World Bank gives a similar picture: cultivated land in the basin was estimated at about 5.205 million hectares, while equipped irrigation area was 182,637 hectares (World Bank, 2010b, p. 101). The developmental case for expanding irrigation is clear. It can reduce exposure to rainfall variability, support commercial agriculture, stabilize food production, and create rural income. Irrigation also increases consumptive use and can reduce downstream dilution capacity, with implications for water quality and disease risk (World Bank, 2010b, p. 146).

Water quality is the most easily underestimated dimension of Zambezi water security. The World Bank warns that pollution from cities, farms, and mines threatens human and animal health. Currently, the large volume of water in the rivers dilutes pollutant concentrations, although it does not eliminate contamination or prevent disease transmission. However, if countries withdraw too much water for projects like irrigation, this natural cleaning effect will weaken, sharply increasing health risks (World Bank, 2010b, pp. 145–146).

Mining adds localized but serious pressure. Industrial activity is concentrated in urban and mining areas such as Kitwe, Ndola, Lusaka, and Kafue in Zambia, and Bulawayo, Gweru, Kwekwe, and Harare in Zimbabwe. The World Bank also records planned coal-related development in Mozambique's Tete Province, including the Moatize coal mine and associated thermal-power infrastructure, with planned abstraction of 9–18 m^3/s from the Zambezi River and estimated consumption of 1.4 m^3/s for the mine and power plant (World Bank, 2010b, pp. 143–145). These are planning estimates, but they point to a broader issue: extractive development can increase both water demand and pollution risk in areas where monitoring and enforcement may be uneven.

Domestic and urban water demand is small in volumetric terms and large in social significance. The World Bank notes that reliable data on domestic and institutional water use were not readily available from most urban centers in the basin, so water-use figures had to be estimated and modeled (World Bank, 2010b, p. 143). That data gap is itself a governance fact. Urbanization, aging infrastructure, and limited maintenance finance

can produce acute water insecurity where aggregate basin withdrawals remain low.

Groundwater is the missing layer in much basin analysis. The World Bank notes that a portion of domestic and urban water use in the ZRB is derived from groundwater and that groundwater was not overused at basin scale in the MSIOA baseline. The basin assessment identifies sparse groundwater monitoring networks and scarce functioning water-quality stations, recommends priority improvement of groundwater data, and later notes that groundwater monitoring systems are sparse or nonexistent in most riparian countries (World Bank, 2010b, pp. 143, 152, 163, 168). Indeed, such thin knowledge becomes a governance risk.

The cumulative picture is the accumulation of partially governed risks. The Zambezi's challenge is a sequence of linked stresses that become harder to manage when institutions treat them separately.

From bilateral control to basin-wide governance: institutional architecture

The institutional history of the Zambezi began with infrastructure, especially hydropower. Colonial and postcolonial governments first treated the river as an energy asset, then gradually framed it as a shared ecological and development system. This sequence explains why cooperation has often been strongest where the task is concrete and bilateral, and weaker where the task is basin-wide and politically intrusive.

The earliest durable arrangement centered on the Kariba Dam infrastructure – a massive hydroelectric scheme and reservoir straddling the border between Zambia and Zimbabwe. Through the Zambezi River Authority Act of 1987, Zambia and Zimbabwe modernized their shared water governance. The legislation officially replaced the colonial-era Central African Power Corporation with the newly established Zambezi River Authority (ZRA), while updating its governing body into the Council of Ministers. The Authority's functions included operating, monitoring, and maintaining the Kariba Complex; investigating possible new dams; collecting and processing hydrological and environmental data; regulating water levels in Kariba and other reservoirs owned by the Authority; and making recommendations for effective use of the waters and resources of the Zambezi River (Government of the Republic of Zambia, 1987, pp. 1–2, 7, 9). This was the initial stage of transboundary water management in the region.

The ZRA model had real strengths. It was legally constituted and linked to a physical asset requiring regular coordination. Scholars describe the ZRA as a relative success because Zambia and Zimbabwe shared interests

at Kariba, the arrangement avoided a classic upstream-downstream asymmetry, and the organization had a clear mandate centered on dam operation (Scheumann & Neubert, 2006, pp. 38–39). It shows that coordination is easier when the problem is operationally bounded and the parties are few.

The attempt to move beyond asset-based bilateralism began with ZACPLAN, the Action Plan for the Environmentally Sound Management of the Common Zambezi River System. The agreement was signed in Harare in May 1987 by Botswana, Mozambique, Tanzania, Zambia, and Zimbabwe; it remained open for accession by Angola, Malawi, and Namibia ("Agreement on the Action Plan," 1987, arts. 1–5). ZACPLAN aimed to promote environmentally sound water-resources management and avoid possible future conflicts through coordinated action across the common river system (Agreement on the Action Plan, 1987, Annex I, paras. 4, 10, 13–14). Its foundation was sound – the basin needed shared assessment and environmental management – yet its institutional form was weak.

Scholars characterize ZACPLAN as a loose framework program rather than an operational regime; it contained ideas and project proposals but lacked binding commitments on implementation, institutional viability, and financing. The intended independent organizational structure did not materialize, financial commitments remained insufficient, and implementation was impeded by weak structure and funding (Scheumann & Neubert, 2006, p. 40). The lesson is that cooperation is likely to stall when governments endorse cooperative language while avoiding the fiscal, legal, and bureaucratic obligations required to make it work.

The broader SADC framework created a more favorable legal environment. The ZAMCOM Agreement refers to the 1997 UN Convention on the Law of the Non-Navigational Uses of International Watercourses and the 2000 SADC Revised Protocol on Shared Watercourses (ZAMCOM, 2004, pp. 1–2). The Zambezi regime therefore belongs to a wider Southern African effort to normalize principles such as equitable and reasonable utilization, prevention of significant harm, consultation over planned measures, environmental protection, and information exchange. The difficulty lies in turning these principles into operating procedures.

ZAMCOM marked the main shift from programmatic coordination to a standing basin institution. The Agreement was signed in Kasane, Botswana, on 13 July 2004, and entered into force on 19 June 2011, after six of the eight member states deposited ratification instruments with the SADC Secretariat (ZAMCOM, 2019, p. 18). The Agreement establishes ZAMCOM as an international organization with legal personality. Its objective is to promote equitable and reasonable utilization of the water resources of the Zambezi Watercourse, together with efficient management and sustainable develop-

ment. Its functions cover data collection and dissemination, coordination and harmonization, advice to member states, dispute avoidance, public awareness, cooperation with SADC and other institutions, and support for harmonizing national water policies and legislation (ZAMCOM, 2004, pp. 3–5).

The institutional design is conventional and consequential. ZAMCOM consists of a Council of Ministers, a Technical Committee, and a Secretariat. The Council is composed of ministers responsible for water-resources management and development in each member state, meets annually in ordinary session, and makes decisions by consensus (ZAMCOM, 2004, pp. 5–7). Consensus protects smaller riparians and reinforces diplomatic legitimacy. It can also slow decision-making and make implementation vulnerable to the least committed participant.

The substantive principles of the Agreement are demanding. Article 13 requires equitable and reasonable management and use, with the Technical Committee instructed to consider geographic, hydrographic, hydrological, climatic, ecological, social, economic, and environmental factors; the dependent population in each state; existing and potential uses; effects on other states; conservation needs; and alternatives of comparable value. Article 14 requires member states to take precautionary and preventive measures to avoid significant harm, including harm to human health and safety; prevent, reduce, or control pollution; coordinate management plans; promote effective water use; and prevent disputes (ZAMCOM, 2004, pp. 14–16). These provisions turn ZAMCOM into more than just a consultation forum.

The data and information regime is among the strongest parts of the architecture. The 2016 Rules and Procedures for Sharing of Data and Information aim to ensure that relevant and quality-assured data are shared in a timely manner so member states can make informed planning and management decisions. The Rules specify hydrology, meteorology, water quality, socioeconomic data, environmental data, and planning instruments as categories to be shared. They define public and internal access levels and assign National Focal Institutions the task of submitting data to the Secretariat through ZAMWIS, the Zambezi Water Information System (ZAMCOM, 2016, pp. 3–8).

Reliable shared data are a precondition for transboundary governance. At the same time, the Rules show why this base remains politically sensitive. Ownership of originally supplied data remains with the source institution, internally shared data require controlled access, and ZAMCOM and member states cannot guarantee the correctness or accuracy of data provided through ZAMWIS (ZAMCOM, 2016, pp. 5–6).

The Strategic Plan for the Zambezi Watercourse 2018–2040 adds a programmatic layer. It is described as the primary plan under the ZAMCOM

Agreement, incorporating the Commission's programs and activities and providing a framework for project identification, categorization, and prioritization. The Plan has four components: infrastructure development to enhance water, food, and energy security; livelihood support to reduce rural poverty and poverty-driven degradation; environmental management and protection; and integrated management and protection of water resources (ZAMCOM, 2019, pp. 8, 18). This structure is sensible because it refuses to reduce water governance to engineering or environmental protection.

The Zambezi regime has therefore evolved through three overlapping logics. The first is bilateral infrastructure management, exemplified by the ZRA and Kariba. The second is programmatic basin cooperation, exemplified by ZACPLAN. The third is legal-institutional basin governance, embodied in ZAMCOM, the Agreement, the Strategic Plan, and the data-sharing rules. The record is not a linear success story. It is a gradual move from fragmented cooperation toward a more mature architecture whose effectiveness still depends on implementation, financing, and national political alignment.

Benefit sharing and the politics of distribution

The Zambezi is often presented as a promising site for benefit sharing. The basin connects hydropower, irrigation, flood management, environmental flows, fisheries, tourism, urban supply, and regional energy trade, and it has a more developed institutional framework than many African transboundary basins. Benefit sharing, however, does not remove asymmetry or eliminate distributive conflict.

Scholars distinguish four types of cooperative gains: benefits to the river, through improved ecological management; benefits from the river, through more productive water use; reduced costs because of the river, through lower political tension and avoided conflict; and benefits beyond the river, through broader regional integration and economic cooperation (Sadoff & Grey, 2002, pp. 392–393). The framework remains useful because it shifts attention away from volumetric allocation alone. In a basin where water availability and development priorities differ, asking how much water each state receives is too narrow. The larger issue is how the basin can generate and distribute a wider basket of benefits without concealing costs.

The MSIOA provides the economic argument substance. Coordinated operation of the existing hydropower system could increase firm energy from 22,776 GWh/year to 24,397 GWh/year, a gain of 7.1%, while average energy would remain almost unchanged. The value of additional generation

from coordinated operation of existing hydropower facilities was estimated at US$585 million over 30 years. Under a development pathway that includes the Southern African Power Pool (SAPP) hydropower plan, environmental flows, and coordinated operation, the analysis found that coordinated operation could offset the 9% reduction in firm energy associated with environmental-flow requirements and still produce a 23% gain in firm generation (World Bank, 2010a, pp. 22, 26, 30). Cooperation is therefore economically productive, not merely normatively attractive.

This finding is important for a basin where hydropower is central to national and regional energy policy. The World Bank estimated that implementation of the SAPP hydropower development plan would require US$10.7 billion over approximately 15 years and would produce about 35,300 GWh/year of firm energy and about 60,000 GWh/year of average energy, enough to meet all or most of the estimated 48,000 GWh/year demand of the riparian countries (World Bank, 2010a, p. 34).

The limits of benefit sharing become visible once aggregate gains are disaggregated. The World Bank analysis compares national and basin-wide development scenarios; it does not provide a full distributive settlement among states, sectors, and communities (World Bank, 2010a, pp. 1–2). The additional value created by cooperation must be allocated through rules that specify beneficiaries.

Kariba illustrates both the strength and the historical ambiguity of infrastructure-based benefit sharing. Kariba was built before contemporary participatory environmental governance had institutional force. Later management through the ZRA created a bilateral arrangement between Zambia and Zimbabwe in which costs and benefits were ultimately allocated on a 50:50 basis after earlier disputes over perceived imbalances. Scholars classify the case as an example of a jointly owned dam on a border river, where costs are shared in relation to benefits (Hensengerth et al., 2012, pp. iii, 30, 33). Drawing on World Commission on Dams material, the same study notes that the number of people to be resettled in the Kariba project rose from 29,000 to 57,000 while the resettlement budget remained unchanged; Tonga communities on both banks lost highly productive alluvial fields and were cut off from one another across the reservoir (Hensengerth et al., 2012, pp. iii, 24, 30, 33).

The distinction between international and local benefit sharing is therefore essential. Hensengerth et al. argue that benefit sharing in shared-river dam projects should not be reduced to interstate allocation; negative social and environmental effects should be avoided or fully compensated, and donor support should be conditioned on full accounting and compensation of such costs (Hensengerth et al., 2012, pp. 3, 34). It seems that much re-

search on water politics incorrectly focuses only on what governments obtain, neglecting the local communities directly impacted by dam-related losses such as resettlement and environmental decline.

The proposed Batoka Gorge Hydro-Electric Scheme shows how current these questions remain. The project is planned as a bilateral Zambia–Zimbabwe development on the Zambezi main stem downstream of Mosi-oa-Tunya (Victoria Falls) and upstream of Kariba. A World Bank-supported Hydropower Sustainability Assessment Protocol note describes it as a project with a 181-meter-high and 720-meter-long roller-compacted concrete gravity arch dam, two surface power plants of 1,200 MW each, total installed capacity of 2,400 MW, estimated annual generation of 10,215 GWh, a reservoir storage volume of 1.39 billion m^3, and a surface area of 23 km^2 (World Bank, 2018, pp. 6–7).

The governance risks of the project are visible. The 2018 sustainability note reports several gaps against Basic Good Practice in communications and stakeholder engagement, including the absence of a program to maintain stakeholder engagement over the project life span and delays in environmental and social assessment and resettlement planning (World Bank, 2018, pp. 9–10). If local communities receive information late, are rarely consulted, or see livelihood restoration as a mere bureaucratic checkbox, the project will fail politically, regardless of its technical or economic viability. This highlights that effective stakeholder engagement and benefit sharing are crucial for project success.

Irrigation creates a different distributive problem. Irrigation benefits are localized and tied to land, tenure, markets, and water abstraction. The World Bank scenario analysis found that implementation of all identified national irrigation projects would expand the equipped irrigation area in the basin by about 184% (World Bank, 2010a, pp. 34–35). Expansion could create employment and increase agricultural output, especially where rain-fed farming leaves households exposed to rainfall variability. It also increases consumptive use and may reduce downstream flows during dry periods.

All in all, a rigorous benefit-sharing approach for the Zambezi would require four conditions. Cooperative gains must be identified quantitatively where possible, as the MSIOA attempted to do for hydropower, irrigation, and environmental-flow scenarios. The distribution of gains and costs must be specified by state, sector, and social group. Environmental and social costs must be included in the net-benefit calculation before financing and operating rules are agreed. Affected communities must participate in defining acceptable trade-offs. These requirements constitute the foundational parameters necessary for any valid benefit-sharing framework.

The implementation gap: authority, data, and national planning

Legal and planning documents of the Zambezi Basin use the vocabulary expected in contemporary transboundary water governance: equitable and reasonable utilization, prevention of significant harm, sustainable development, information exchange, environmental flows, stakeholder participation, and benefit sharing. Indeed, the basin has moved beyond institutional absence, yet ZAMCOM must still shape decisions made by national ministries, utilities, and local authorities before those decisions become facts on the river.

Article 13 of the ZAMCOM Agreement requires equitable and reasonable management and use and directs decision-makers to consider geographic, hydrographic, hydrological, climatic, ecological, social, economic, and environmental factors; dependent populations; existing and potential uses; conservation and development needs; costs of measures; and alternatives of comparable value. Article 14 requires precautionary and preventive measures to avoid significant harm, including harm to human health and safety; it also requires pollution control, coordination of management plans and planned measures, effective water use, and dispute prevention (ZAMCOM, 2004, pp. 11–13). These provisions set the legal discipline under which national plans should be assessed.

The Agreement also reveals the constraint. ZAMCOM is not a supranational water authority with executive power over infrastructure or national development plans. Its strength lies in coordination and gradual construction of common standards. The Strategic Plan makes this division of labor explicit: implementation occurs through activities for which member states are responsible individually or jointly, and activities for which ZAMCOM and its organs are responsible. Infrastructure projects are to be undertaken at transboundary or member-state level depending on their nature (ZAMCOM, 2019, pp. 65–66).

These limits matter because hydrological effects cross borders faster than policy harmonization. ZAMCOM's mandate is strongest where member states want a basin-level platform and weakest where a national project has strong domestic support but uncertain regional effects. The treaty provides a framework for scrutiny but does not necessarily provide leverage.

Data sharing is the principal test of that leverage. The 2016 Rules and Procedures seek timely exchange of relevant and quality-assured data so member states can make informed planning and management decisions. The categories include hydrology, meteorology, water quality, socioeconomic data, environmental data, and planning instruments. Access is tiered: some data may be public, while other information is shared internally

through National Focal Institutions under controlled conditions (ZAMCOM, 2016, pp. 4–6). The design recognizes that water data are technical, political, and sometimes commercially sensitive.

Ownership of originally supplied data remains with the source institution, while data generated through ZAMCOM processing belong collectively to member states. Internally shared data can be accessed only through designated government channels and may require nondisclosure arrangements. The Rules also state that ZAMCOM and member states cannot guarantee the correctness or accuracy of information provided through ZAMWIS, and users rely on it at their own risk (ZAMCOM, 2016, pp. 5–6).

The World Bank's Implementation Completion and Results Report for the Zambezi River Basin Management Project confirms that this issue has practical consequences. The project supported the Strategic Plan and ZAMWIS decision-support system (DSS), and the World Bank rated the overall outcome satisfactory; it also found that ZAMWIS-DSS was being used for regular data sharing, updating basin plans, national planning, notification of planned measures, and report generation. At the same time, the report notes that some basin countries were not fully prepared to support the transboundary planning discourse during preparation of the Strategic Plan, that reluctance persisted in sharing certain river-basin data, including water-permit information, and that planning remained focused on national plans and projects rather than joint infrastructure (World Bank, 2019, pp. 11–13). This is the political dimension of the implementation gap.

The Strategic Plan itself reflects this tension. It is ambitious and organized around infrastructure investment, livelihoods support, environmental resources, and water-resources management (ZAMCOM, 2019, pp. 41–55). Yet the World Bank completion report described the plan as infrastructure-centric and noted that it did not strategically prioritize some recommended activities from legal equivalence and notification-procedure work. It also warned that sustainability could be at risk without policy agreements on sharing the benefits from infrastructure development, and that weak integration of notification procedures with ZAMWIS-DSS could result in inadequate technical analysis of infrastructure projects (World Bank, 2019, p. 12). The plan provides a framework for assembling and prioritizing investments, but it needs more legal and political power to actually govern the basin.

The Strategic Plan estimates the cost of the investment framework in the project inventory at US$28 billion, while noting that full costing was not yet available for several projects. It also states that even full development of planned projects would not be sufficient to close the long-standing infra-

structure gap and meet socioeconomic and environmental demands over the next two decades (ZAMCOM, 2019, p. 63). Building infrastructure is definitely necessary for the region's future. However, the danger is that countries will rush to build dams and pipes before setting up the fair rules and environmental protections needed to manage them properly.

Project preparation is one such condition. The Strategic Plan states that infrastructure preparation is complex, takes years from conception to commissioning, and requires expertise that is generally scarce in member states of the Zambezi Watercourse. ZAMCOM proposes to support member states with project preparation, financing, transaction management, and independent integrated economic analysis, while making clear that ZAMCOM will not directly prepare member-state-level projects (ZAMCOM, 2019, pp. 59–60). The Commission must improve the quality of projects it does not own and influence financing decisions it does not control.

Notification of planned measures is another critical point. ZAMWIS-DSS was designed partly to support notification by assessing whether planned infrastructure could have adverse effects on the watercourse or other member states, including hydrological, environmental, social, and economic consequences (World Bank, 2019, p. 11). This function is exactly what a basin organization should provide. It works only if states submit information early, provide sufficient detail, and accept basin-level technical review as legitimate.

Environmental flow governance exposes the same issue. The Strategic Plan proposes environmental impact guidelines, environmental operating rules, environmental flows, in-stream monitoring, and monitoring costs covered through project levies. It also states that environmental requirements can be met without adversely affecting hydropower, irrigation, and water supply only if high levels of operational cooperation are maintained among different users in the watercourse (ZAMCOM, 2019, p. 53). A dam may comply at approval and still fail the river through poor operation. Environmental governance therefore requires continuous coordination.

Domestic institutional fragmentation makes coordination harder. Water management in member states is divided among agencies responsible for water, energy, agriculture, environment, land, mining, finance, and local government. Tourism, rural development, and disaster management add further institutional layers. ZAMCOM can support harmonization of national laws and policies, and the Strategic Plan identifies policy and legislation support as part of its water-resources management component (ZAMCOM, 2019, pp. 54–55). In other words, where national water re-

sponsibilities are dispersed across sectoral bureaucracies, transboundary cooperation is weakened before it reaches the regional level.

Financing compounds the problem. The Strategic Plan identifies three principal financing needs: infrastructure and livelihood-support projects; non-infrastructure activities under environmental protection and water-resources management; and funding for ZAMCOM and its organs. Infrastructure financing varies by sector, project phase, institutional model, and national or transboundary character, making it difficult to aggregate at watercourse scale (ZAMCOM, 2019, pp. 63–64).

External financiers and private sponsors are part of this implementation gap. For Batoka Gorge, the World Bank supported studies and transaction advisory work rather than committing to finance construction; transaction advisers examined eight possible development structures across the public-private continuum, Zambia and Zimbabwe appointed the African Development Bank as lead financial arranger in 2017, and the two governments later moved toward a Build-Operate-Transfer model (World Bank, 2019, pp. 7–9).

Mphanda Nkuwa in Mozambique points in the same direction from a different institutional angle. The Government of Mozambique selected a consortium of EDF (40%), TotalEnergies (30%), and Sumitomo Corporation (30%) as a strategic partner for a 1,500 MW run-of-river project on the Zambezi, with EDM and Hidroeléctrica de Cahora Bassa holding 30% of the project and the consortium holding 70% (TotalEnergies, 2023, p. 1). Independent reporting in 2025 described the project as backed by World Bank support through concessional funding, partial risk guarantees, and political-risk insurance, while also noting concerns about Mozambique's debt exposure (Associated Press, 2025). These arrangements are not evidence that private finance bypasses governance automatically. They show that the governance arena shifts toward guarantees, concession design, and risk allocation. ZAMCOM's basin-wide tests become weaker if they enter only after financiers and national authorities have already defined the project's commercial logic.

Public participation remains one of the least settled elements. The Strategic Plan refers to consultation through National Stakeholder Coordination Committees, a Joint Project Steering Committee, the Basin-wide Stakeholders' Coordination Committee, and the Zambezi Basin Stakeholders' Forum (ZAMCOM, 2019, pp. 9–10). These mechanisms matter, but attending initial planning meetings is not the same as having a real say in design, resettlement, or water-sharing rules. If a management system fails to connect local, real-world experiences with its official planning, it will never be truly accepted by the people. Without this deep community trust, the entire project remains fragile.

Conditions for resilient cooperation in the Zambezi Basin

The Zambezi already has the basic architecture of modern transboundary water governance: a commission, a strategic plan, data-sharing rules, a decision-support system, a regional legal environment, and a record of bilateral infrastructure cooperation. Moving on to the next stage depends on whether these instruments affect the decisions made by states and project authorities.

A first constraint concerns timing. The ZAMCOM Agreement requires equitable and reasonable utilization and asks member states to consider hydrological, climatic, ecological, social, economic, and environmental factors, dependent populations, existing and potential uses, conservation needs, and alternatives of comparable value (ZAMCOM, 2004, pp. 11–12). This checklist has practical value only if it is used while a project is still open to revision.

The World Bank records progress in the use of ZAMWIS-DSS for data sharing, basin-plan updating, national planning, notification of planned measures, and report generation. It also records reluctance by some states to share certain river-basin data and a continued focus on national projects (World Bank, 2019, pp. 11–13).

A second constraint is data quality. While the 2016 Rules and Procedures define the categories of information to be shared and the channels through which ZAMWIS operates (ZAMCOM, 2016, pp. 4–8), the system's utility depends on data integrity. Ultimately, metadata standards, quality-control protocols, independent technical reviews, updating obligations, and clear rules regarding information withholding determine whether shared data can withstand politically sensitive decisions. While hydrological uncertainty is inevitable, avoidable uncertainty – driven by deficient monitoring or selective disclosure – remains a fundamental governance failure.

Climate risk is another test of operational depth. ZAMCOM's climate projections and the IPCC's regional assessment point to the need for stress testing of dam operating rules, irrigation scheduling, drought preparedness, flood management, and water-quality planning (ZAMCOM, 2019, p. 47; IPCC, 2022, pp. 1328–1329). The weakness of many basin strategies lies in the distance between the climate paragraph in a planning document and the rules that guide decisions.

The development agenda also has a rural-water-security component that is easy to understate. The basin's rural population and rain-fed agricultural profile make soil-moisture management, small-scale storage, local water-supply maintenance, drought-resistant farming systems, floodplain liveli-

hood protection, and rural sanitation central to water security (ZAMCOM, 2019, pp. 30–31, 47–48). These measures are less visible than large infrastructure, but they address the settings in which water insecurity is experienced most directly.

ZAMCOM's functional authority is best understood without exaggerating its mandate. The Strategic Plan is explicit that ZAMCOM is not an infrastructure-implementing agency; member states implement projects, while ZAMCOM provides support (ZAMCOM, 2019, pp. 15–17, 59–60). Its technical assessments can become more consequential if financing, licensing and notification procedures give them weight.

Financing reveals the practical limits of basin planning. The Strategic Plan's project inventory is large, and ZAMCOM recognizes that project preparation and transaction management are often weak links in moving from strategies to physical infrastructure (ZAMCOM, 2019, pp. 59–60, 63). Many infrastructure plans fail not because the needs are wrongly identified, but because project preparation, safeguards, financing, procurement, and implementation capacity are weaker than the political announcement. As private sponsors and external financiers become more important, basin-level review has to enter the process before commercial structures are effectively settled.

While structural challenges remain, the Zambezi does not require a single authority capable of commanding eight states; rather, it needs a more enforceable chain between knowledge, consultation, planning, financing, and operation. As of 2026, that chain remains incomplete. Data are shared but unevenly trusted. Plans are ambitious but implementation remains national. Benefit sharing is recognized but not yet sufficiently distributive. Climate risk is acknowledged but not fully embedded in operating rules. The point is not to invent new principles, but to make existing ones harder to ignore.

Conclusion

The ZRB challenges oversimplified narratives regarding water resource management in Africa. It is not defined by absolute physical scarcity, yet formal cooperation has not solved the politics of shared water. While the basin boasts significant hydrological assets and a standing transboundary institution, it simultaneously faces severe socioeconomic vulnerabilities, climate exposure, and a persistent gap between regional planning and national implementation. Its analytical value lies in this contradiction: Africa's "blue gold" depends on governance capacity, not possession alone.

The chapter has described the Zambezi as a case of uneven abundance. Water is available, but unevenly distributed in space, time, quality, and institutional reach. Some sub-basins contribute disproportionately to flows;

some states are more territorially and demographically embedded in the basin; some sectors are politically visible while others remain weakly represented. Hydropower and irrigation dominate formal development planning, while rain-fed smallholder agriculture, rural water supply, floodplain livelihoods, fisheries, sanitation, and water quality often enter the discussion later. A rigorous analysis of the basin must integrate these social dimensions into its core framework.

The Zambezi Watercourse has a real infrastructure deficit, and hydropower, irrigation, water-supply systems, flood-management works, and catchment interventions are part of any plausible development pathway (ZAMCOM, 2019, pp. 42–44, 63). The point is to treat infrastructure as a distributive instrument. Dams, irrigation schemes, and flood-control measures redistribute benefits, risks, authority, and ecological change. The central question is not whether infrastructure should be built, but under what rules, with what environmental flows, with what safeguards, and with what basin-level accountability.

The same caution applies to benefit sharing. The MSIOA shows that coordinated hydropower operation can create measurable gains (World Bank, 2010a, pp. 22, 26, 30). That finding matters because it challenges narrow allocation politics. Yet basin-wide gains can coexist with local losses, uneven national benefits, ecological damage, or delayed compensation. Benefit sharing becomes analytically useful only when it is distributive. Otherwise, aggregate gains conceal uneven costs.

The institutional record of the ZRB is both substantial and unfinished. At its core, the foundational ZAMCOM Agreement establishes the primary legal parameters for transboundary cooperation, codifying principles of equitable utilization, the prevention of significant harm, environmental protection, and systematic information exchange. This legal baseline is operationalized by dedicated data-sharing rules that mandate the flow of hydrological information between national institutions and the centralized ZAMWIS platform. Furthermore, the basin's long-term developmental trajectory is guided by a comprehensive Strategic Plan spanning until 2040, which targets infrastructure deployment, livelihood support, and resource management. While these frameworks represent major institutional milestones, they function as enabling conditions for cooperation rather than successful final outcomes.

A distinction must be made between institutional presence and executive governing authority. ZAMCOM's mandate is primarily coordinative and advisory; while the commission facilitates multilateral convening, data analysis, planning support, and policy harmonization, it lacks the statutory power to execute infrastructure projects or direct domestic agencies. As

outlined in the Strategic Plan, project implementation remains under the jurisdiction of sovereign member states, either individually or bilaterally, with ZAMCOM acting strictly as a specialized support mechanism. Consequently, this decentralized structure inherently accounts for the persistent gap between regional planning and national execution.

Climate change significantly amplifies the institutional risks associated with this implementation gap. The basin is inherently characterized by high hydrological variability, manifesting in frequent floods, prolonged droughts, and pronounced spatial disparities in precipitation. Regional climate modeling and broader environmental assessments indicate that future atmospheric conditions will exacerbate vulnerabilities across critical sectors. While these environmental stressors do not automatically trigger transboundary conflict, they severely diminish the operational margin for substandard institutional coordination.

The Zambezi therefore challenges both alarmist and complacent interpretations of African hydropolitics. Alarmism exaggerates the likelihood of interstate water conflict and misses the dense institutional work already taking place. Complacency treats treaties, commissions, and data platforms as evidence that cooperation has been secured. The basin supports neither view. Cooperation is real, economically valuable, and institutionally organized. It remains shallow where it does not alter investment decisions, operating rules, data practices, and distributive outcomes.

For the wider argument of Africa's Blue Gold, the Zambezi offers a broader lesson. Water insecurity in Africa is often produced not by the absence of water, but by the failure to connect water resources to institutions capable of managing inequality, uncertainty, and competing development claims. In the ZRB, cooperation is a real institutional field, but it remains contested. The decisive test will come with the next severe drought or major investment decision that forces trade-offs. The question is whether ZAMCOM's assessments can affect that decision before the trade-offs are fixed, or whether the basin will again be governed after the fact.

The next chapter examines the same institutional problem under conditions of sharper scarcity and greater structural asymmetry. If the Zambezi demonstrates the politics of uneven abundance, the Orange–Senqu shows how scarcity, dependence, and unequal bargaining power make cooperation even more explicitly distributive.

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Chapter 4

MANAGING WATER SCARCITY IN SOUTHERN AFRICA: THE ORANGE–SENQU RIVER BASIN IN COMPARATIVE PERSPECTIVE

Introduction

Hydropolitical dynamics in transboundary river basins are increasingly shaped by the convergence of climatic variability, demographic pressures, and intensifying economic demands (Arfa et al., 2025, p. 1). In water-scarce regions, these interacting stressors extend beyond physical shortages to reshape the institutional and political frameworks through which water is allocated and controlled. Scarcity, therefore, operates not only as an environmental condition but as a governance stress test, revealing the extent to which states can manage shared resources under conditions of uncertainty. This is particularly significant in transboundary contexts, where water management becomes inseparable from questions of cooperation, sovereignty, and regional stability (Schwartzstein, 2021; Hasan et al., 2025, p. 1).

The translation of water scarcity into hydropolitical tension is contingent upon underlying structural and institutional conditions. Factors such as population density, dependence on water-intensive sectors like agriculture, and weak or fragmented governance systems create environments in which scarcity is more likely to intensify competition (Bréthaut et al., 2021, p. 465). However, these pressures do not act in isolation. Climate change, urbanization, pollution, groundwater depletion, and the expansion of hydraulic infrastructure collectively deepen water stress while simultaneously exposing inequalities in access and control. In this sense, scarcity becomes a function of management capacity: where governance systems are robust, adaptive, and cooperative, pressures can be mitigated; where they are weak, scarcity is more likely to manifest as conflict. This underscores the critical role of institutional arrangements – such as transboundary agreements and river basin organizations – in mediating outcomes (Petersen-Perlman et al., 2017).

Across Africa, transboundary river basins illustrate how water scarcity is negotiated within complex political and developmental contexts. The OSRB, together with the Nile River Basin and the Niger River Basin, exemplifies regions where increasing water stress intersects with competing

national priorities. Yet these basins should not be understood solely as potential flashpoints of conflict. Rather, they represent critical arenas in which governance systems are tested, and where cooperative mechanisms can either constrain or enable sustainable resource management. In Southern Africa in particular, the management of shared watercourses increasingly reflects the capacity of institutions to balance national development objectives with regional equity and ecological sustainability.

The OSRB provides a focused case through which these broader dynamics can be examined. Its hydrological variability, combined with uneven patterns of water demand and economic dependence, highlights the limitations of approaches that treat scarcity as a purely technical problem. Instead, it illustrates the necessity of coordinated, multi-level governance strategies that integrate policy, institutional cooperation, and long-term planning. By situating the OSRB within the wider Southern African context, this chapter advances the position that managing water scarcity requires strengthening governance frameworks, enhancing regional cooperation, and aligning water allocation with both developmental and ecological priorities under conditions of increasing stress.

Hydropolitics

The governance of transboundary water resources has emerged as one of the defining global challenges of the 21st century, particularly in regions where climatic volatility, economic dependence, and political inequalities converge (Blacketer et al., 2022, p. 615).

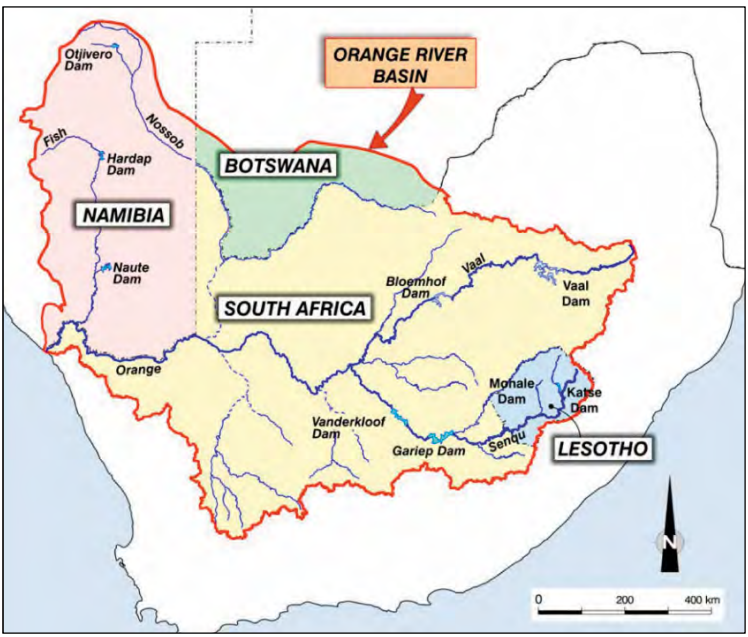
Elhance (2000, pp. 207–218) conceptualizes hydropolitics as "the systematic study of interstate conflict and cooperation concerning transboundary water resources." He further posits that hydropolitical relations are shaped primarily by two factors: the rate of change within the hydrological system and the institutional capacity to absorb such change (Elhance, 2000, p. 202). While concise and analytically useful, Elhance's formulation is limited by its strong state-centric focus, overlooking the role of non-state actors and the complexity of multi-level interactions.

To address this limitation, Meissner (2015, p. 6) provides a broader interpretation, defining hydropolitics as the "transnational interaction, through norm creation and utilization, among numerous state and non-state actors, ranging from individuals to collectives regarding the authoritative allocation, use, and perception of domestic and international water resources." This expanded understanding is particularly pertinent to the African context, where the enforcement capacity of many states over shared water agreements remains weak. Meissner's inclusive approach opens con-

ceptual space for traditional communities, civil society organizations, and private sector entities to participate meaningfully in water governance, thus shifting the discourse from one centered solely on state sovereignty to one emphasizing cooperative, multi-actor engagement.

The Orange–Senqu River Basin: An overview

The Orange–Senqu River Basin occupies a strategically significant position within Southern Africa's hydrological and political landscape (Kistin & Ashton, 2008, p. 386). Originating in the Maloti Mountains of Lesotho, where it is known as the Senqu River, the basin traverses South Africa, delineates part of the border with Namibia, and ultimately flows into the Atlantic Ocean. Encompassing an estimated catchment area of 1 million km^2, the basin provides livelihoods for approximately 20 million inhabitants (Renoka, 2024) (see *Map* 1).



Map 1. The Orange–Senqu River Basin
Source: Jacobs (2010, p. 96).

The OSRB's relevance extends well beyond its geographical boundaries. Its waters underpin key industrial sectors, sustain agricultural economies, and supply major urban centers across South Africa and Namibia

(García-Sala, 2023). However, the basin is simultaneously one of the most water-stressed and heavily engineered systems on the African continent (Mueller et al., 2021, pp. 458–459). This chronic scarcity, coupled with ecological degradation and growing demand, has transformed the OSRB into a focal point of hydropolitical contention.

Hydropolitical dynamics in the Orange–Senqu River Basin

The Orange–Senqu River Basin provides a vivid example of the intersection between environmental, demographic, and political processes that produce intricate hydropolitical dynamics. As a shared river system sustaining millions across four countries, its governance is continuously shaped by competing interests, unequal access to resources, and changing ecological conditions (Kistin & Ashton, 2008, p. 386; Bréthaut et al., 2021, p. 464).

Population growth and water demand. Population expansion represents one of the most powerful drivers of hydropolitical pressure in Southern Africa. The region's population is growing at a rate of roughly 2–3.5% per year (Bensen, 2022), and the OSRB alone supports close to 20 million inhabitants. Rapid urbanization and industrialization have compounded this demographic surge, heightening water demand across domestic, agricultural, and energy sectors.

In Lesotho, the urban sprawl surrounding Maseru has strained municipal water systems, while in South Africa, Gauteng's industrial complex, which is heavily reliant on water transfers from the OSRB, faces recurrent supply challenges. As population densities intensify, competition for water between agricultural, industrial, and urban users becomes unavoidable (Renoka, 2024). Percival and Homer-Dixon (1998) describe water as a "rivalrous good," wherein one group's consumption directly limits the availability for others, creating a fertile ground for contestation within and between riparian states.

From a hydropolitical standpoint, population growth interacts directly with governance capacity. Van Schaik and Dinnissen (2014, p. 33) contend that when rapid demographic expansion coincides with weak or unstable political systems, the probability of interstate conflict over natural resources rises sharply. Within the OSRB, this risk is intensified by economic inequality, that is, South Africa's advanced institutional and financial capacity contrasts sharply with the dependence of Lesotho and Namibia on external investments and diplomatic cooperation. This asymmetry has produced a hierarchical dependency across the basin.

At the local level, population pressures exacerbate socio-ecological stress. As Homer-Dixon (1999, p. 112) notes, environmental scarcity driv-

en by demographic change is a structural global challenge. In the OSRB, such scarcity threatens agricultural sustainability, rural livelihoods, and regional stability, making equitable water management a matter of both development and security.

Degradation and depletion of water resources. The OSRB is one of the most environmentally degraded basins in Southern Africa (Orange–Senqu River Commission [ORASECOM], 2008, p. 129; Renoka, 2024). Decades of intensive use, land degradation, industrial pollution, and agricultural expansion have compromised its ecological integrity. Large dams and inter-basin transfers have substantially altered the basin's natural hydrology, disrupting flow regimes, sedimentation patterns, and water quality (Mueller et al., 2021, pp. 458–459).

Consequently, the basin now exhibits reduced land productivity, biodiversity loss, and increased sedimentation caused by soil erosion and unsustainable land-use practices. Agricultural runoff, mining waste, and untreated urban effluents further deteriorate water quality, creating a self-perpetuating cycle of environmental decline. Each attempt to address scarcity through infrastructure projects tends to intensify ecological disruption (Mueller et al., 2021, pp. 458–459).

The basin's extensive dam network exemplifies this paradox. Projects such as the Lesotho Highlands Water Project (LHWP) and South Africa's Gariep and Vanderkloof Dams demonstrate how water infrastructure functions as both a developmental asset and a geopolitical tool. While these projects stimulate economic growth, they also produce what Veilleux (2013, p. 1) terms "hydrosocial vulnerabilities," including environmental degradation, social displacement, and marginalization of local communities. Thus, environmental degradation in the OSRB is not merely an ecological concern but a reflection of broader political and governance challenges.

Uneven distribution and institutionalized inequality. Marked disparities characterize water distribution among the OSRB's riparian states. South Africa consumes over 63% of the basin's freshwater, Namibia roughly 1.3%, and Lesotho, despite being the source, only 0.2% (Renoka, 2024). Botswana's marginal overlap with the basin provides mainly potential future supply. These disparities reflect both hydrological realities and entrenched political-economic hierarchies (Meyer, 2013, p. 30).

As Kistin and Ashton (2008, p. 391) observe, the OSRB constitutes a "complex hydropolitical system" in which shared water resources bind states into interdependence. While frameworks such as the 1986 Lesotho Highlands Water Project Treaty (LHWPT) symbolize cooperation, unresolved disputes like those between South Africa and Namibia over border demarcation continue to expose regional fragilities (Turton et al., 2004, p. 99).

The most persistent hydropolitical tension in the OSRB stems from this asymmetrical distribution of water and benefits. The LHWPT, although framed as a partnership, effectively entrenched Lesotho's role as a water supplier rather than a co-manager (Earle, 2005, p. 60). Its provisions privilege South Africa's urban-industrial needs over Lesotho's domestic and agricultural priorities. Consequently, Lesotho's water scarcity is structural, driven by dependency rather than physical shortage (Kistin, 2012, p. 42; Kistin & Ashton, 2008, pp. 391–393). This dynamic reflects what Homer-Dixon (1999) identifies as the deeper distributional roots of resource-based conflicts.

Climate change and environmental security. Climate change represents one of the most significant destabilizing forces within the OSRB. The basin lies in a region characterized by hydrological extremes, oscillating between droughts and floods (Earle, 2005, p. 60). Projections from the Intergovernmental Panel on Climate Change (IPCC) and the World Meteorological Organization (WMO, 2024) indicate that Southern Africa may experience temperature rises of up to 4°C and precipitation declines of 10–20% by the 2040s.

These shifts will profoundly affect water availability and quality. Diminished rainfall and heightened evaporation rates will reduce river flows and reservoir levels, while extreme weather will amplify flooding risks. Beyond environmental impacts, such variability undermines social and political stability. Swain and Krampe (2011, p. 17) caution that climate-induced water insecurity can erode institutional legitimacy, strain diplomatic ties, and inflame domestic tensions across riparian states.

Hydropolitical systems and governance frameworks

In transboundary river basins, the governance of shared water resources is fundamentally determined by the institutional arrangements that regulate interactions among riparian states (Azizi & Leandro, 2025, pp. 2–3). The OSRB illustrates how governance structures can simultaneously promote and constrain cooperation. Over the past seven decades, an intricate network of bilateral and multilateral institutions, treaties, and commissions has emerged, designed to advance the equitable and sustainable use of the basin's waters. However, these frameworks also reveal a persistent tension between formal cooperation and substantive equality, demonstrating both the progress and limitations of hydropolitical governance in Southern Africa (Deribe et al., 2024, p. 8).

A long-standing history of interstate rivalry and evolving institutional responses distinguishes the OSRB from other African river systems

(see *Fig.* 1). Since the 1950s, riparian states have engaged in negotiations through bilateral and multilateral treaties, project-based initiatives, and technical committees to manage the basin's waters (Jacobs, 2010, pp. 100–101).

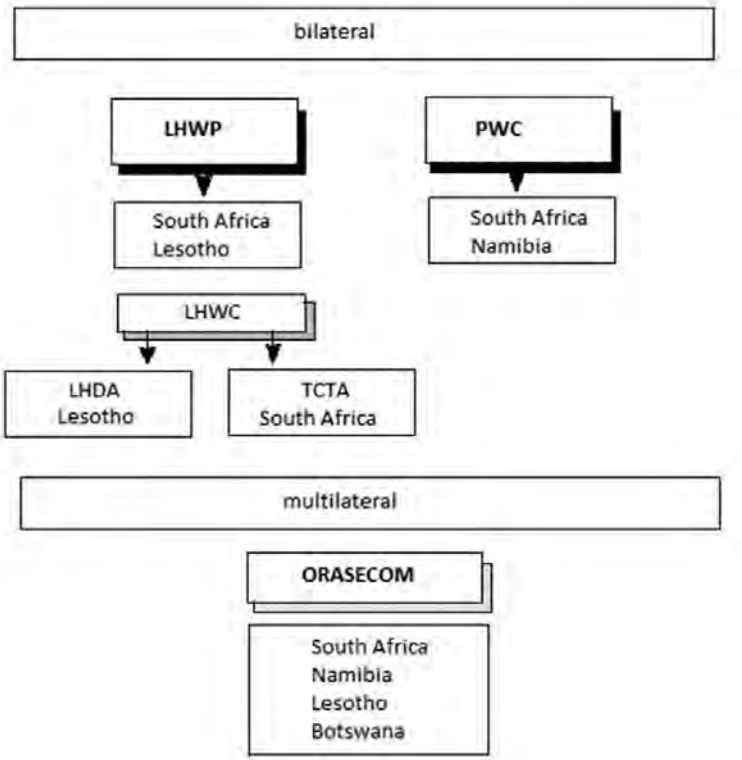


Fig. 1. Overview of the Orange–Senqu Basin governing institutions
Source: Kistin (2012, p. 24).

This cooperative structure has been significantly influenced by the political histories of riparian relations and the domestic contexts of the respective national regimes. Additionally, policy-making at both national and basin levels is shaped by a broader global framework of legal and environmental norms (Jacobs, 2010, pp. 100–101). Among the most important legal instruments governing the OSRB are the bilateral treaties among the four riparian states, the 2000 Southern African Development Community (SADC) Revised Protocol on Shared Watercourses, and the multilateral Orange–Senqu River Commission (ORASECOM) agreement (Raadgever et al., 2008, p. 10; Jacobs, 2010, p. 114; Kistin, 2012, p. 42).

Evolution of cooperative mechanisms in the basin. The evolution of hydropolitical cooperation within the OSRB can be traced to the mid-20th century when both colonial and postcolonial governments recognized the strategic significance of the basin. Early collaborative efforts were largely bilateral and project-specific, prioritizing engineering solutions to water scarcity rather than holistic, ecosystem-based management (Jacobs, 2010, p. 114).

During the 1950s and 1960s, South Africa, then the regional hegemon, initiated large-scale water infrastructure projects to support industrial expansion in its arid interior. Because much of this water originated in Lesotho, bilateral collaboration between the two states became inevitable. These early engagements laid the foundation for what would later become the Lesotho Highlands Water Project (LHWP), which remains central to bilateral hydropolitics in the OSRB (Tempelhoff, 2017, p. 194).

Thus, the governance history of the OSRB reflects a gradual transition from fragmented bilateralism toward institutionalized multilateralism. However, the coexistence of overlapping institutional frameworks has generated complexity and, at times, competition among mandates, hindering overall coherence (Sebastian, 2008, p. 147).

Regional regimes: SADC Protocol and its implications. At the regional scale, the SADC Protocol on Shared Watercourses provides the principal legal foundation for cooperative water governance in Southern Africa. Initially signed in 1995 and revised in 2000 to align with the 1997 United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses, the protocol constitutes a significant milestone in regional hydropolitical development.

The revised protocol articulates fundamental principles, including equitable and reasonable utilization, the obligation not to cause significant harm, and the requirement for prior notification and consultation on planned measures. Article 2(b) specifically commits member states to “advance the sustainable, equitable, and reasonable utilization of shared watercourses” (SADC, 2000).

Within the OSRB context, the SADC framework has served as both a normative and legal reference point, embedding cooperation as a regional obligation. It has also facilitated the harmonization of national water policies under the paradigm of Integrated Water Resources Management (IWRM), providing a platform for policy dialogue, technical capacity building, and coordination of donor activities (Raadgever et al., 2008, p. 10).

Multilateral cooperation through ORASECOM. The establishment of the ORASECOM in 2000 marked a watershed moment in the institutional evolution of basin governance. Created under the SADC Revised Protocol, ORASECOM serves as a joint mechanism through which the four riparian

states being Lesotho, South Africa, Namibia, and Botswana manage and develop the basin's water resources (Sebastian, 2008, p. 147).

The founding agreement draws explicitly on international legal instruments such as the 1997 UN Watercourses Convention and the Helsinki Rules on the Uses of the Waters of International Rivers, affirming ORASECOM's intent to align regional practices with global standards of transboundary water governance (Southern Times, 2015).

Functionally, ORASECOM's mandate includes joint data collection, hydrological monitoring, strategic planning, and facilitation of dialogue around new infrastructure projects. It also promotes IWRM principles and environmental stewardship through technical studies and transboundary diagnostic analyses (ORASECOM, 2008). Perhaps its most significant contribution lies in building trust and fostering institutional learning among riparian governments (Sebastian, 2008, p. 147).

Nevertheless, ORASECOM faces several structural constraints. It operates primarily as an advisory entity without enforcement authority, lacks sufficient financial autonomy, and depends heavily on external funding, particularly from the European Union and the Global Environment Facility. Furthermore, the persistence of parallel bilateral arrangements often sideline ORASECOM from critical decision-making regarding major infrastructure projects.

Bilateral regimes and project-based agreements. Despite multilateral efforts, bilateral cooperation continues to underpin water management in the OSRB. These arrangements, typically project-specific, reflect pragmatic responses to local conditions while also revealing entrenched power asymmetries.

The 1986 Lesotho Highlands Water Project Treaty between Lesotho and South Africa remains the most prominent example. Conceived as a mutually beneficial initiative, it enables Lesotho to generate hydroelectric power and export surplus water to South Africa's industrial centers. The treaty established the Joint Permanent Technical Commission, later restructured as the Lesotho Highlands Water Commission (LHWC), to oversee its implementation (Kistin & Ashton, 2008, p. 396).

However, the LHWP also exposes structural inequities. While Lesotho benefits through royalties and hydropower generation, South Africa retains control over water volumes, pricing, and timing of transfers. The project's environmental and social costs, including community displacement and ecosystem alteration, have raised questions of governance and equity (Veilleux, 2013, p. 1). Thus, the LHWP exemplifies both the potential and the limitations of bilateral cooperation in transboundary water management. The implementing bodies for this binational project include the Lesotho

Highlands Development Authority in Lesotho and the Trans-Caledon Tunnel Authority in South Africa.

A similar dynamic is evident in the 1992 bilateral agreements between South Africa and Namibia, which created the Permanent Water Commission (PWC) and the Vioolsdrift–Noordoewer Joint Irrigation Authority. These institutions coordinate irrigation and water-sharing efforts along the lower Orange River. While such mechanisms have strengthened technical collaboration, unresolved border demarcation issues continue to strain political relations (Heyns, 2004, p. 8).

The institutional architecture of the OSRB reveals both notable progress and persistent limitations. On one hand, initiatives such as ORASECOM, the LHWC, and the PWC represent substantial achievements in dialogue, joint planning, and cooperative management. On the other hand, structural inequality, sovereignty concerns, and capacity disparities constrain their effectiveness.

As Jacobs (2012, pp. 100–101) observes, formal treaties do not automatically foster genuine cooperation. Effective governance depends on political will, mutual trust, and institutional capability to address resources unequally distributed among the OSRB's riparian states. While South Africa's dominance provides stability and technical expertise, it can simultaneously curtail equitable participation by smaller states. Thus, cooperation within the basin remains largely procedural rather than transformative.

To move toward more equitable governance, the strengthening of ORASECOM's legal authority, enhancement of its financial independence, and institutionalization of community participation in decision-making are critical steps.

The institutional and political ecology of cooperation

While institutional frameworks such as the ORASECOM and the SADC Protocol on Shared Watercourses provide the formal architecture for cooperation, the underlying hydropolitical reality of the OSRB is far more complex. It is shaped by a multi-layered web of political, economic, and social dynamics that extend beyond the technical domain of water governance. The basin's challenges stem not only from hydrological scarcity but also from entrenched asymmetries in economic and political power among riparian states, particularly between upstream countries such as Lesotho and downstream hegemons like South Africa. These asymmetries influence decision-making authority, infrastructure development priorities, and the distribution of costs and benefits associated with large-scale water transfer schemes.

Moreover, institutional fragmentation persists across national and sectoral boundaries, where water governance is often siloed from energy, agriculture, and industrial policy, thereby constraining integrated basin management. Domestic political imperatives – such as economic growth, energy security, and rural development – frequently intersect, and at times conflict, with regional commitments to equitable and sustainable water sharing. In addition, historical legacies of colonial water allocation, coupled with evolving regional geopolitics, continue to shape contemporary negotiation dynamics and trust deficits among basin states. Climate variability and increasing demand further intensify these pressures, amplifying uncertainties and exposing the limitations of existing cooperative mechanisms.

Consequently, the governance of the basin cannot be fully understood through institutional analysis alone; it requires a critical appreciation of the broader hydropolitical landscape in which formal agreements operate. This includes recognizing the role of informal power relations, strategic state behavior, and the influence of external actors such as international financiers and development partners. A nuanced understanding of these structural and political undercurrents is therefore essential for identifying viable pathways toward more equitable, adaptive, and resilient water governance in the basin.

Power asymmetries and negotiation politics. Transboundary river basins frequently mirror the geopolitical hierarchies among their riparian states, and the OSRB exemplifies this pattern. South Africa's economic and political preponderance within Southern Africa profoundly shapes hydropolitical relations in the basin. As the most industrialized, water-dependent, and institutionally capable riparian, South Africa exercises disproportionate influence over both the technical and diplomatic dimensions of transboundary water management (Jacobs, 2012, p. 120).

This dominance manifests across several levels. Economically, South Africa possesses the capital resources, technical expertise, and infrastructure necessary to initiate and manage large-scale water projects such as the LHWP. Politically, its control of downstream demand and its position as a major funder of regional initiatives give it considerable leverage in setting the policy agenda. Even within multilateral frameworks like ORASECOM, South Africa's superior institutional capacity enables it to influence the formulation of priorities and the direction of technical programs.

Conversely, Lesotho, though geographically positioned as the "water tower" of the basin, lacks the financial and political capacity to harness its hydrological endowment independently (García-Sala, 2023). This asymmetrical relationship has entrenched patterns of dependency in which smaller riparian states rely on South Africa's investment and technical support, thereby reinforcing the basin's structural inequalities.

Policy implications: comparative lessons from the Nile and Niger basins

This section extends the analysis beyond the OSRB by drawing comparative insights from the Nile River Basin and the Niger River Basin. These cases offer critical lessons on the causes and management of transboundary water disputes, as well as on the institutional reforms necessary to enhance equity and resilience. Through this comparative lens, the discussion identifies practical strategies that can guide the OSRB toward more adaptive and cooperative water governance.

The Nile River Basin, shared by eleven riparian states, which are Burundi, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Tanzania, Uganda, the Democratic Republic of the Congo (DRC), Sudan, and South Sudan, extends over approximately 6,700 km, making it the longest river in the world (Kameri-Mbote, 2007, p. 1; Chesire, 2010, p. 13).

The Nile's governance history demonstrates how colonial-era treaties can institutionalize inequality. The 1929 and 1959 Nile Agreements, which allocated nearly 90% of the river's flow to Egypt and Sudan, excluded upstream countries from meaningful access to water resources (Wolf, 1996, p. 3; Shapland et al., 2025, p. 13). This arrangement parallels the OSRB, where South Africa's dominance and Lesotho's dependence echo the asymmetrical power relationship between Egypt and Ethiopia. In both basins, such historical inequities continue to shape modern hydropolitical dynamics.

Institutionally, the Nile Basin Initiative (NBI) offers several lessons for the OSRB. First, the NBI's broad regional framework, which includes ten member states, while Eritrea participates as an observer, underscores the importance of a comprehensive, multi-stakeholder platform. ORASECOM could strengthen its legitimacy by incorporating civil society organizations, local governments, and private-sector actors to ensure that cooperation extends beyond state elites.

Second, the NBI operates under a transitional institutional model, allowing incremental progress toward a binding legal convention. This flexibility contrasts with rigid treaty arrangements such as the LHWPT, which often reinforce structural inequities. Revisiting such bilateral treaties within the OSRB to include adaptive review clauses could foster more equitable outcomes.

Third, the NBI demonstrates that institutional design alone cannot guarantee cooperation. Sustained political dialogue facilitated by the AU and international development partners has been critical in maintaining engagement among Nile riparians. Similarly, the OSRB could benefit from periodic high-level summits among heads of state to reinforce

ORASECOM's authority and visibility. Additionally, developing an open-access knowledge platform could promote transparency and foster scientific cooperation across the basin.

Overall, the Nile experience illustrates that sustainable transboundary water governance requires both institutional adaptability and political commitment. For the OSRB, this implies moving beyond reactive coordination toward proactive transformation anchored in trust-building and equitable power redistribution.

The Niger River Basin spans ten countries, which are Guinea, Côte d'Ivoire, Mali, Burkina Faso, Algeria, Benin, Niger, Chad, Cameroon, and Nigeria, and represents one of the most ecologically and politically diverse basins in Africa (Aich et al., 2016, p. 3). Despite recurring droughts, land degradation, and political instability, the Niger Basin Authority (NBA), established in 1980 and later restructured, has shown considerable resilience through its focus on participatory governance and joint planning (Niasse, n.d.).

The NBA's Shared Vision Process (SVP), initiated in the early 2000s, transformed basin management from a fragmented, project-oriented approach into a coherent model of integrated development. From the Niger Basin's experience, three major lessons emerge that are relevant to the OSRB. First, the NBA's SVP explicitly links water governance with energy security, food production, and environmental protection, the so-called "Water–Energy–Food Nexus." By embracing a similar framework, ORASECOM could integrate sectoral policies and promote cross-border synergies that support sustainable development.

Second, the NBA's increasing focus on community-based watershed management and participatory irrigation schemes contrasts with the OSRB's largely state-centric approach. Introducing bottom-up participation across the OSRB could enhance legitimacy, reduce conflict potential, and align policy implementation with local realities.

Third, the Sustainable Development Action Plan of the NBA integrates climate adaptation into agriculture, infrastructure, and ecosystem restoration. This provides a model for developing an OSRB Basin Climate Resilience Strategy, aligning national adaptation efforts and promoting regional preparedness for hydrological variability.

Policy and governance lessons for the OSRB

Drawing from these comparative insights, three interrelated principles identified in World Bank research emerge as anchors for effective transboundary water cooperation.

First, robust national water management systems must precede successful regional collaboration. Strengthening domestic institutions through enhanced technical expertise, policy development, and local implementation capacity lays the groundwork for equitable regional engagement.

Second, legitimacy is indispensable to sustainable cooperation. Technical or elite-driven solutions that exclude local stakeholders risk generating conflict rather than consensus. True cooperation must therefore extend beyond governments to involve civil society, community leaders, and marginalized groups. Establishing a Basin Stakeholder Forum under ORASECOM could institutionalize participatory governance by bringing together representatives from local communities, academia, the private sector, and non-governmental organizations. Such a platform would democratize hydropolitics, promote transparency, and align with the AU's Agenda 2063, which emphasizes inclusive and citizen-driven development.

Third, effective water governance requires specialized technical expertise. The adoption of advanced technologies such as remote sensing, satellite-based water monitoring, Geographic Information Systems, and hydrological modeling is essential for evidence-based decision-making. Appointments to key water governance positions should be based on merit and technical proficiency rather than political patronage, ensuring that scientific competence guides regional water management.

Together, these strategies reflect a paradigmatic shift from managing scarcity toward cultivating cooperation. They envision the OSRB as a model of African transboundary governance transforming water from a contested resource into a shared foundation for mutual prosperity, ecological resilience, and regional integration. Ultimately, the comparative lessons underscore the need for a shift from control-oriented governance toward benefit-sharing and adaptive cooperation.

Conclusion

The OSRB represents one of Africa's most intricate and instructive cases of transboundary hydropolitics. On the one hand, it exemplifies successful regional cooperation through frameworks such as ORASECOM and large-scale infrastructural linkages connecting mountainous Lesotho, industrial South Africa, and arid Namibia and Botswana. On the other hand, this cooperation remains constrained by structural asymmetries, competing national priorities, and environmental pressures that are likely to intensify under climate change. The central problem is therefore not simply the absolute availability of water, but its distribution among states, sectors, and users under conditions of unequal economic and political power.

These distributive tensions are reinforced by ecological degradation. Unsustainable agricultural practices, industrial pollution, large dams, and inter-basin transfers have affected water quality, agricultural productivity, and natural flow regimes (ORASECOM, 2008; Mueller et al., 2021, pp. 458–459). Infrastructure can alleviate scarcity, but it also redistributes benefits and costs. The LHWP illustrates this contradiction particularly clearly: it has generated substantial economic and infrastructural benefits while simultaneously reinforcing Lesotho's dependence on a system designed largely around South Africa's industrial and urban water demand.

The basin's future stability will therefore depend less on the existence of formal agreements than on whether cooperation becomes more substantively equitable. ORASECOM, the SADC framework, and bilateral agreements have created a durable institutional basis for managing shared waters, but South Africa's economic dominance, Lesotho's infrastructural dependence, and Namibia's downstream vulnerability continue to shape bargaining power within the basin. Moving from resource control toward benefit-sharing will require more inclusive participation, greater attention to the distribution of infrastructure gains and risks, and decision-making capable of incorporating ecological and social costs alongside national development priorities.

The Orange–Senqu case demonstrates that environmental pressure matters politically through infrastructure, power imbalances, and public trust. Water scarcity alone cannot explain the politics of the basin. Instead, the decisive factors are unequal control over infrastructure and investment, disparities in bargaining power, and the limited authority of regional institutions over national decisions. This dynamic mirrors the findings in Chapter 3 on the Zambezi and Chapter 2 on the Great Lakes, where formal institutional design matters less than its ability to influence actual allocation and investment decisions. It also points forward to Chapter 5 on Lake Chad and the Dasin Hausa Dam, where the central problem shifts from the design of cooperative institutions to political will and delayed implementation.

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Chapter 5

POLITICAL WILL AND WATER GOVERNANCE FAILURES: LAKE CHAD AND THE DASIN HAUSA DAM IN NIGERIA

Introduction

This chapter examines the interaction between climate-related stress and weak implementation capacity in Nigeria through two cases: the proposed recharge of Lake Chad and the long-delayed Dasin Hausa Dam (DHD). These cases represent two scales of water governance failure. Lake Chad is a regional hydropolitical problem involving several riparian states, while the DHD is a domestic flood-control and water-management project linked to the release of water from Cameroon's Lagdo Dam and flooding along the Benue and Niger Rivers. Political will is understood here as the willingness and capacity of political authorities to translate an acknowledged public problem into sustained decisions, budgetary commitments, interagency coordination, and implementation. It is not reduced to rhetorical support, campaign promises, or the formal existence of a project proposal. In this sense, a deficit of political will becomes evident when governments recognize a problem but fail to carry decisions through to financing, construction, maintenance, or institutional coordination. In the present chapter, this deficit is traced through repeated policy recognition, delayed financing, failure to complete infrastructure projects, and weak interagency coordination.

The chapter uses retrospective documentary analysis and a problem-solving perspective to examine why the two projects have remained largely unrealized despite their repeated appearance in public debate. It focuses on official statements, reports, media materials, and secondary literature on Lake Chad, the Benue River system, the Lagdo and Dasin Hausa dams, flooding, displacement, and regional insecurity. The argument is deliberately narrower than a general claim about Africa as a whole: in the Nigerian cases examined here, climate-related risks have been made more destructive by delayed implementation, weak coordination, and the use of major water projects as political promises rather than sustained development commitments.

Political will and climate change as seen in Lake Chad and the Dasin Hausa Dam

The dominant narrative holds that Lake Chad has shrunk by more than 90% since 1960, with its attendant impact on livelihoods, conflict, and forced migration (Ifabiyi, 2013; GIZ, 2015; Sayan et al., 2020; Mohanty et al., 2021). Although some scholars argue that changes in Lake Chad reflect a centuries-long pattern of natural contraction and expansion, so nature should be allowed to take its course (Magrin, 2016; Anthony, 2023), a prominent proposed solution, which has the support of the UN, has been to resuscitate Lake Chad through the Transaqua Inter-Basin Water Transfer from the Ubangi River, which is a tributary of the Congo River in the Democratic Republic of the Congo (DRC).

Similarly, there has been increased flooding in Nigeria in the past 15 years that has been attributed to climate change, with the worst of these floods occurring in 2012, 2020, and 2022, and with the Niger Delta area being worst hit. The 2022 floods that saw 70% of this region under water raised the issue of the Dasin Hausa Dam, whose idea was conceived in the late 1970s. The building of the DHD became a necessity since the Lagdo Dam in Cameroon, conceived at the time, was expected to release water occasionally, the effect of which would be increased flooding in Nigeria for the period, along the route of the Benue River and in the Niger Delta (This Day, 2025). The concept of the DHD therefore was to accommodate the waters released from the Lagdo Dam, hence it was meant to be two and half times the size of the Lagdo Dam. While Cameroon commenced building its Lagdo Dam in 1977 and completed it in 1981, the Nigerian government only carried out feasibility studies for the DHD in 1982, and nothing has been done ever since irrespective of the damage that the release of water from the Lagdo Dam caused in 2012 (Igidi, 2014; Rasheed, 2018; Thomas, 2022; Kolade, 2023). The damage was enough to prompt a call to action; unfortunately, the DHD has only been mentioned during presidential election campaigns, as witnessed in 2023 (“Atiku promises,” 2022; Vanguard, 2022). The idea behind the DHD was to control flooding on the Benue River, and by extension the wetlands of the Niger Delta, through which the Benue empties into the sea as the larger Niger River (Ogunkoya, 2022; Odifa, 2022).

Beyond controlling flooding and other effects of climate change, the gains of addressing Lake Chad and the DHD have been argued to be numerous, and these include irrigation for farming, the production of hydroelectricity in a region with ailing power generation, the sustenance of livelihoods, improving the socioeconomic life of the region, and the consequent reduction of

crime and conflict (Onuoha, 2010; Nextier SPD, 2019; Owonikoko, 2020; Vichi & Mangano, 2020; Thomas, 2022). The central question therefore is, why successive governments have failed to move these projects from planning to implementation. One thing is certain, and that is, the inertia of the ruling class exacerbates the effect of climate change.

The Lake Chad Basin

Lake Chad was historically described as one of Africa's largest lakes and the largest in Central and Western Africa (Higgins, 2020), although its surface area and relative ranking have varied substantially over time. It is a crucial freshwater resource that is shared by Cameroon, Niger, Nigeria, and Chad. For thousands of years, Lake Chad played an important role in trade, development, and cultural exchange between people living north and south of the Sahara. In the 1960s, it was a major location for freshwater fish production and served as a primary water source for irrigation (Olowoyeye & Kanwar, 2023). Unfortunately, the lake has significantly decreased in size, from around 22,000 km^2 in 1963 to less than 1600 km^2 (Olowoyeye & Kanwar, 2023). This has had a profound humanitarian impact, leading to displacement, poverty, and hunger for millions of people. The security situation is also dire as groups like Boko Haram exploit the grievances and poverty in the region to make it unstable and insecure (Comolli, 2018). The high level of insecurity in areas around the lake now compounds efforts at resuscitation (Olowoyeye & Kanwar, 2023).

Scholars like Cervigni et al. (2016) have argued that climate change continues to have a significant impact on the Lake Chad region. The considerable decrease in the size of Lake Chad has been attributed to rising temperatures in the Central Sahel. Furthermore, reduced rainfall and shorter rainy seasons, along with an increase in dry days, are indicators of desertification, which has affected the forest area in the Lake Chad region (Boko et al., 2007). Furthermore, the rivers that provide water to the lake, such as the Chari, Logone, and Komadugu-Yobe, are also experiencing drought as a result of climate change. According to Zhu et al. (2019), one proposed solution is to replenish these rivers with water from other rivers in the region. However, Mahmood et al. (2019) and Nour et al. (2022) argue that this approach could cause further ecological harm, as it might result in the drying up of those other rivers. Consequently, the region has experienced increased agricultural crises, water disputes, and depletion of soil nutrients, thus exacerbating the vulnerability of its inhabitants (Okpara et al., 2015). As the lake dries up, sand dunes develop and connect, leading to the spread of the desert which affects farming, fishing, herding, and other natural re-

sources (Lemoalle et al., 2012). Poor infrastructure, such as dykes, dams, and irrigation canals, along with the lack of vegetated dry land, have exacerbated the effects of climate change. The resulting decline in soil productivity and negative impact on agricultural yields and aquatic flora and fauna pose significant challenges for the people of the Lake Chad region. Crawford et al. (2018) corroborate this stance in stating that the environmental crisis has reached a point where opportunities for economic and social recovery have diminished and the damaging impacts of the shrinking Lake Chad have caused heightened conflict, instability, and insecurity in the region.

The Lake Chad Basin Commission (LCBC) was established in 1964 to manage water resources in the basin and facilitate regional integration, peace, security, and development, as well as initiatives by the riparian states, along with various local, national, and international interventions to address climate change, poverty, and insecurity among the population reliant on the lake's resources. The LCBC approved numerous feasibility studies aimed at reviving the lake, including the Transaqua Inter-Basin Water Transfer project and a master plan for the Lake Chad Basin (Jedwab et al., 2023). The government of Nigeria initiated several policies and programs with the goal of addressing the issues surrounding Lake Chad. In Nigeria, these policies included the National Policy on the Environment in 1991, Energy Policy in 2003, National Forest Policy in 2006, and National Policy on Climate Change and Response Strategy in 2012. The essence behind their formation was to promote climate change justice (Federal Ministry of Power, 2003; Federal Ministry of Environment, 2006; Federal Government of Nigeria, 2012). Unfortunately, global attention on the Lake Chad region has been on issues such as violent extremism and climate-induced changes like irregular migration, and their impact on human security (Adelphi, 2019; Wakdok & Bleischwitz, 2021). In 2017, to address some of the suffering in the region, humanitarian aid for the Lake Chad region worth $1.5 billion, and an additional $67 million were raised during the Lake Chad conference in 2018 (United Nations, 2017; United Nations Office for the Coordination of Humanitarian Affairs, 2018). However, the huge challenges facing the region make it difficult to determine the actual impact of this aid. Furthermore, international policy analysts argue that the security-oriented approach of international organizations has led to insufficient interventions and inadequate attention to the underdevelopment and vulnerability of the region (Organisation for Economic Co-operation and Development, 2021; United Nations Development Programme, 2022).

Thus, the Lake Chad Basin continues to face severe drought, and as the population grows, the consequences of famine, water distribution problems,

and disease will increase significantly. The inability of the LCBC and national policies to effectively achieve their intended objectives in resuscitating the lake may be attributed to patrimonial state institutions, neopatrimonial power relations, conflicts among elites, and struggles for control of state resources. On the other hand, the Lake Chad problem remains unsolved largely because most of the policies formulated by state governments have not been implemented and do not align with their stated visions. The position of this chapter aligns with the latter view and contends that solving Lake Chad's problem has been a matter of political will. Consequently, the crisis remains unresolved primarily because the political will required to address it has been lacking. Despite more than 50 years of discussions and international donor forums, including debates on the floor of the UN, little substantial progress has been achieved. Addressing the crisis has remained confined to the realm of rhetoric, while the practical problems persist and socioeconomic deprivation worsens.

Political will deficit: knowing the problem and impact

Political will involves coordinated efforts by national and regional governments, efficient policy implementation, and global cooperation. However, this appears to be lacking in the governments of the Lake Chad Basin. Efforts in the Basin have been fragmented and inconsistent due to governments prioritizing national interests over collective action, leading to ineffective interventions. Nigeria has initiated multiple programs to address the Lake Chad crisis, but political instability, corruption, and conflicting national priorities have undermined these efforts. Chad's political environment is characterized by authoritarianism and limited civic involvement. The government recognizes the importance of Lake Chad but lacks the political commitment to drive meaningful change; rather it focuses on maintaining political control instead of promoting regional cooperation (Hansen, 2021).

When it comes to shared resources, the absence of a cohesive policy framework across neighboring nations leads to fragmented and inefficient governance. For example, a prevalent characteristic of the Lake Chad Basin is its economic benefits in agriculture. The involvement of inhabitants in agriculture and fisheries is often driven by limited economic diversification and lack of alternative livelihoods. Due to this reliance, societies frequently overuse their natural resources in an effort to maximize their short-term financial rewards. Overuse of resources such as logging has resulted in considerable environmental degradation, and overfishing in biodiversity loss (Okpara et al., 2015).

A further factor exacerbating the issue is the lack of a cohesive strategy for adaptation and mitigation of climate change among the riparian states of Lake Chad. Different national objectives have made it difficult for countries in the area to establish and execute cohesive policies despite the obvious evidence of climate change consequences such as the lake's declining water levels. The current state of affairs emphasizes the necessity of regional collaboration and the creation of an all-encompassing policy framework that unites the objectives and endeavors of all impacted nations. The volatility and differing degrees of commitment from member nations have made it difficult for the LCBC, which was founded to encourage collaboration among the countries surrounding the Lake Chad Basin, to carry out its purpose. The failure of the governments whose territories lie within the Lake Chad Basin to execute policies on the use of resources like agriculture and fishing highlights the lack of political will and coherence in policy to address challenges in the basin.

The conventional understanding of the shortfall in political will suggests that it impacts specific policies or programs. However, it is crucial to recognize that the consequences of political will deficit extend beyond policy and security matters. It has been most profound in the program of resuscitating Lake Chad through the Transaqua project.

Political will deficits in responses to the Lake Chad crisis

The most widely discussed proposal for recharging the lake is the Transaqua Inter-Basin Water Transfer (IBWT) project, which consists of pumping water from the Ubangi River, which is a tributary of the Congo River. The process entails pumping water from the Ubangi River to Lake Chad through IBWT, a pumping transfer via the Palambo Dam and a gravity transfer through a diversion of the Kotto River (PAMACC, 2018; Freeman, 2023). The IBWT project, which involves a 2,400 km canal between the Congo River and Lake Chad, is meant to provide irrigation for an area between 50,000–70,000 km^2 and provide electricity for much of the area through the building of dams. It is also argued that the recharging of the lake will reduce insecurity in the region, for as has been noted, the drying up of the lake has changed the social, economic and political dynamics of the region.

Interestingly, IBWT is dependent on the Congo River, of which the Ubangi River is a tributary. The Republic of the Congo and the DRC are not Lake Chad riparian states, but their position is consequential because the proposed transfer depends on water from the Congo–Ubangi system. Both governments have opposed the project, citing environmental concerns (PAMACC, 2018; Freeman, 2023).

Contrary to most international media reports, IBWT was conceived in the late 1970s, with its first blueprint published in 1982 (Vichi, 2010). This project involves the construction of a 2,400-km-long navigable channel from the Ubangi River in the Congo Basin to the lake. This canal will transfer 100 billion m^3 annually, which constitutes 5% of the annual flow of the Congo River, to Lake Chad (Sayan et al., 2020). In recharging Lake Chad, water from the Ubangi River in the Central African Republic will be carried up to the Chari River system (one of the two sources of Lake Chad) through a dam in Palambo and will be fed into the lake. The benefits of the project are huge, as noted by Freeman (2023):

TRANSAQUA is the only project capable of transforming about 25% of the surface of the African continent by producing agricultural and livestock products sufficient for the domestic market and for export; to stop the advance of the Sahara and save Lake Chad; to produce large production of hydroelectric energy in the heart of Africa, … to create a river and road axis of about 2,400 km …. It has been calculated that the TRANSAQUA project could produce in the heart of the African continent around 30 billion kw/h per year using only 6–8% of the water of the Congo River subtracted from dispersion in the ocean.

IBWT has the backing of the African Development Bank. It was estimated at $50 billion in 2002 and going by inflationary trends, its estimated cost in 2024 would be approximately $86.7 billion. In 2004, Nigerian President Olusegun Obasanjo pledged $2.5 million to fund over half the cost required for feasibility studies as Nigeria spearheaded LCBC efforts in drawing international attention to the project. In December 2016, a Memorandum of Understanding (MoU) was signed by the LCBC and a Chinese construction firm PowerChina to undertake feasibility studies and construction (Vichi et al., 2016; Celani, 2017). In 2018, an international conference involving all eight countries of the LCBC was held, with the feasibility studies of IBWT still in the pipeline. The multidisciplinary feasibility study covers the following nine major terms of reference: geopolitical survey; canal route; canal volume; canal length (per segment); canal navigability; energy provision/utility in the region; agricultural and zootechnical study; environmental study; and socioeconomic study (see Vichi, 2010). Freeman (2023) goes as far as arguing that if the implementation of IBWT had been diligently pursued at conception, it would have brought about economic transformation in the LCBC area and possibly averted terrorism in the region.

Beyond the dominant narrative of IBWT as the solution to the problem of Lake Chad, there are counter-narratives. The first one claims that the resuscitation of Lake Chad can be done from the Benue River in Nigeria

(Bello & Adebosin, 2023). Two major advantages here are that the Benue River route is shorter and, secondly, it circumvents the problem of diplomatic bottlenecks and external approval. Another view, advanced by French experts, challenges the construction of IBWT and holds that the drying up of Lake Chad is alarmist. This school contends that the hydrology of the lake is unstable and erratic, resulting in alternating periods of contraction and expansion that are in part dictated by periods of drought or heavy rains (Magrin, 2016; Anthony, 2023). The summation of this position is that the IBWT project is unnecessary and would be devastating to the ecosystem of the Lake Chad Basin. In all these, political elites across the riparian states have virtually been mute, when they should have been most active in ascertaining the veracity of these positions. Rather, their voices are only heard at events to raise funds for IBWT. Over three decades of fundraising have passed, yet no action has been taken on construction, while poverty and insecurity grow in the region.

Given the counter-narratives surrounding the drying up of Lake Chad, external interests also deserve attention. Marcello Vichi, who revived the debate on the future of Lake Chad and developed the Transaqua concept, was Italian. Bonifica, the company for which he worked and which was initially associated with the project, was an Italian state-owned firm. The company later contracted to implement the project is a Chinese state-owned enterprise. This explains the interest of the Italian and Chinese governments in Transaqua. At the same time, the potential disadvantages of the project for the DRC and the wider politics of the Congo Basin may help explain why some French scholars and experts have been prominent among those challenging the narrative of a dying Lake Chad and questioning the necessity of Transaqua. The Lake Chad debate is therefore shaped not only by hydrological evidence, but also by external interventions and interests. This raises a more important question: what have the riparian states themselves achieved? Between these competing external narratives, what data have they generated through sustained and extensive research into their own water basin? The absence of such a locally grounded evidentiary base points to a serious deficit of political will.

The Dasin Hausa Dam and the damage of lethargic political will

The Benue River meets with the Niger River at Lokoja in Nigeria's Middle Belt, and together, both rivers flow as one – the Niger River – toward Nigeria's south and empty into the sea through the Niger Delta. So, the volume of water on this stretch from the confluence is much larger than the stretch where both rivers run individually. Where the Benue River rises

from the Adamawa Plateau of northern Cameroon down to the confluence, it holds a greater volume of water than the Niger River, which flows from the Fouta Djallon highlands of Guinea (World Bank et al., 1992; African Development Bank, 2018). On the route of the Benue is the Lagdo Dam, which was built to control flooding around the plains and towns on its path. When the Lagdo releases water as is occasionally expected of dams in order to release pressure and control water levels, the released water empties into the Benue and increases the volume further, causing severe flooding and damage on its route (Egbejule, 2024; "Nigeria," 2024). The floods worsen at Lokoja and the route to the ocean where the waters from the Niger would have merged with the enlarged waters of the Benue River.

To curtail the flooding that the release from the Lagdo Dam would cause, the Nigerian government opted to build a dam two and a half times the size of the Lagdo Dam. This was the DHD, and its waters would be released, when necessary, yet gently and in the heart of the dry season when the rivers are at their lowest. This was meant to be the major function of the DHD – to protect lives, livelihoods, and protect as well as promote agriculture across 13 of Nigeria's 36 states affected by the flood from the Lagdo Dam (Oloninirun, 2022; The Nation, 2022; Fita et al., 2025). In recent years, the DHD would have served as a buffer against climate change (Kolade, 2025) – an issue that was not top of the agenda at the time. However, given the very heavy rains of the past three decades (Salack et al., 2018; Thompson, 2024; United States Environmental Protection Agency, 2025), it would now be performing that primary function. Beyond these primary functions, it would provide jobs, bolster the economic potential of Adamawa State, and boost Nigeria's hydroelectric power generation (Modo, 2023; Infrastructure Concession Regulatory Commission, 2025; Kolade, 2025). While Cameroon completed the building of the Lagdo Dam in 1981, four years after the plan was inaugurated, Nigeria approved the plans for the DHD in 1983 and four decades after, the project has not been completed. The 2012 flooding experienced in Nigeria was accentuated by the release of water from Lagdo Dam. It destroyed farmlands along the Benue, submerged the town of Lokoja and every other town on the path of the larger Niger River en route to the Atlantic Ocean. After the 2012 floods, it would have been expected that the country had learnt its lesson and would begin building the DHD. Unfortunately, after 13 years and another devastating flood in 2022, it was only in 2025 that the Nigerian government began to show signs of resuming construction of the dam (Infrastructure Concession Regulatory Commission, 2025).

The level of devastation of the 2012 and 2022 floods was caused by the inability of successive Nigerian governments to prepare in over forty years

for the obvious. From this point of view, the lack of political will on the part of the Nigerian government poses a greater threat to life and security than climate change or any other challenge that nature throws at the region. *Table* 4 documents the devastation of both the 2012 and 2022 floods; this chapter argues that these losses are due to the government's lack of political will; the chapter will also capture gains that have been denied due to the absence of the DHD, and again due to the government's weak and inconsistent political commitment.

Table 4. **Assessment of damage from the 2012 and 2022 floods**

Year of Flood	Rating	States Affected	Lives Lost	Number of Displaced	Value of Losses (USD)
2012	Worst flood in 50 years	30 states were affected; most severely impacting Bayelsa, Rivers, and Anambra	363	2.1 million	16.9 billion
2022	Worst flood in 60 years	33 states were affected. The worst hit were Bayelsa, Anambra, Delta, Jigawa, Kogi, and Nasarawa	612	2.4 million	9.12 billion

Sources: Federal Government of Nigeria. (2013). *NIGERIA Post-Disaster Needs Assessment 2012 Floods.* https://preventionweb.net/media/116649 (accessed 10.02.2026); National Bureau of Statistics, National Emergency Management Agency, and United Nations Development Programme. (2023). *Nigeria Impact of Flood, Recovery and Mitigation Assessment Report 2022–2023, Final Report*. Abuja, Nigeria. https://recovery. preventionweb.net/media/95408 (accessed 10.02.2026).

The report put together by the Nigerian government's risk assessment team noted that heavy rains between July and October in 2012 contributed to the flooding of towns located downstream of the Kainji, Shiroro, and Jebba dams on the Niger River. The same phenomena occurred in towns located downstream of the Lagdo Dam on the Benue River. The release of water from the Lagdo Dam was, however, the main culprit (Rasheed, 2018; Odifa, 2022). This is logical irrespective of the mention of the water overflow from the Kainji, Shiroro, and Jebba dams in the west of the country swelling the volume of the upstream section of the Niger River; states in the surrounding areas (Kwara and Niger) were not affected by the 2012 flood. Kebbi State was the exception in this case because it is prone to flooding due to its low-lying topography. The reason for its flooding was

the overflow of the dams from Bakalori and the Rima, Niger and Zamfara rivers (Muktar & Yelwa, 2020; Vanguard, 2020). Therefore, with the rains in 2012 being quite heavy, the water that spilled through these channels was also substantial.

Of the devastation of the 2012 flood, a BBC News ("African viewpoint," 2012) report stated: "The floods are of such magnitude that they stretch for several miles in width and are unstoppable in their flow, submerging whole towns and villages from the north-east near the Cameroon border through the central region down to the south-eastern coastal states."

In response to this scenario and in line with the view of this chapter, Rasheed (2018) wrote:

The flood flashes experienced in Nigeria today were expected to happen, hence in 1982, a feasibility study was conducted to build a water withholding dam at Dasin Hausa in Furore Local Government of Adamawa State. This project, unfortunately, did not proceed further, and after over three decades of dilly dallying, the plan is still on the drawing board. The dam in Nigeria would have stopped the incessant floods along the banks of the Benue River and further downstream to the sea. It will in addition, generate electricity, irrigate at least 150,000 hectares of farmlands, create jobs, and attract tourists to the site location and Adamawa State. But this is yet to happen…. While the torrents of water continue to wreak havoc in Nigeria, the people of Northern Cameroon are enjoying the resources derived from the Lagdo Lake.

This is absolute complacency; the lack of political will cannot be excused by the failure of the DHD, which could have mitigated the effect of the 2012 flood and saved lives by controlling the flood on the Benue River. It is apparent that had the DHD been constructed, the heavy rains of 2012, whether caused by climate change or not, would have resulted in fewer lives and less property lost. This indicates that the lack of political will in leadership is more dangerous than the challenges of environmental changes.

Conclusion

This chapter refers to two major water-related projects that could have been pursued by the Nigerian government over roughly the same period. The Dasin Hausa Dam would have been a national infrastructure project, whereas the Inter-Basin Water Transfer project was conceived as a joint initiative involving the riparian states of Lake Chad and, potentially, a wider circle of international partners. The repeated fundraising efforts associated with the latter may suggest that inadequate financing has been one of the

factors delaying implementation. Yet this explanation is less convincing when considered against the scale of public-resource mismanagement in Nigeria. The claim that Nigeria alone has lost more than $500 billion over approximately four decades to corruption and misappropriation suggests that the problem is not only a shortage of available resources, but also the political prioritization and institutional management of major development projects (Ogune, 2021).

The absence of implementation after decades of discussion and several donor conferences points to a deeper political will deficit. Projects such as the DHD and the IBWT have repeatedly appeared in official discourse, but their recurrence has not translated into sustained execution. This pattern suggests that large water projects can acquire political value even when they remain unrealized: they may serve as symbols of development commitment, instruments of electoral rhetoric, or opportunities for rent-seeking around planning, feasibility studies, and project negotiation. After more than four decades, the central issue is therefore not simply whether the projects are technically feasible or financially demanding, but why the institutions responsible for them have been unable, or unwilling, to move from announcement and fundraising to implementation.

The effects of climate change are among the major issues with which governments must contend. Forward-looking governments plan for these effects in order to reduce their impact on citizens, while others, as the Nigerian case suggests, have often failed to take timely action and have left affected populations to bear the consequences of recurring disasters. This remains one of the persistent weaknesses in African responses to climate-related harm. The IBWT, proposed as a response to the drying up of Lake Chad, and the construction of the DHD, intended to mitigate worsening floods, are both climate-related water governance issues that have remained unresolved in Nigeria for almost half a century.

More troubling is the absence of clear evidence that implementation is likely in the near future. The longer these projects remain unattended to, the more severe their socioeconomic consequences become: livelihoods are disrupted, poverty deepens, and preventable deaths continue to occur. This chapter therefore contends that the limited approach of many African governments, as illustrated by the Nigerian state and the Lake Chad Basin Commission, has often bordered on indifference to the plight of affected citizens and has worsened the social effects of climate change. In this respect, the lack of political will among political elites is itself a major danger in disaster management, including water-related crises.

However, political will is more than just the personal commitment or indifference of individual officials. In these cases, it takes a concrete form:

steady funding, coordination between agencies, realistic project timelines, transparent procurement, and clear accountability for delays. This perspective links back to our main argument. Environmental and technical pressures turn into chronic water insecurity primarily when institutions consistently fail to turn existing knowledge into timely action.

This implementation gap also connects the basin-focused chapters of Part II with the conflict-focused chapters that follow. Where water stress, climate exposure, and infrastructure failure are not absorbed by credible institutions, they may enter wider struggles over livelihood security, authority, and protection, as the Sahelian and Malian cases demonstrate.

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Part III

WATER, CONFLICT, AND DOMESTIC GOVERNANCE

Chapter 6

THE SAHELIAN NEXUS: CLIMATE CHANGE, WATER INSECURITY, AND THE RISE OF CONFLICT

Introduction

The Sahel is often approached through the analysis of coups, insurgency, displacement, and humanitarian emergencies, while the region's climate change and water crises tend to be sidelined as mere background. This chapter challenges this separation by treating environmental factors as core elements of the political economy of Sahelian survival. Crucially, control over wells, riverbanks, boreholes, irrigation schemes, and pastoral corridors directly dictates production, mobility, and settlement, while shaping the authority of those who settle disputes. Consequently, this research examines how water access becomes deeply entangled with land claims, mobility, protection, and coercion under conditions of climate stress and weak institutions.

The argument is narrower than the proposition that climate change causes conflict. The climate-conflict literature has yet to establish a consensus on causality. Macro-level studies identify associations between climate shocks and violence, while political ecology shows that the same environmental shock can produce different outcomes depending on land tenure, authority, markets, and local histories (Turner, 2004; Benjaminsen, 2008; Koubi, 2019). Recent work also cautions against treating farmer-herder violence as either an environmental-security problem or a counterinsurgency problem alone. Amoah et al. (2025) propose an integrated approach linking ecological pressure, human security, and power relations. That approach is useful here because it keeps causality open and prevents scarcity from becoming a substitute for analysis.

Rather than treating water insecurity as a fixed, measurable shortage, this chapter views it as a deeply relational condition – one where the political fallout of hydrological stress is shaped by local institutional arrangements. To capture this complexity across the Sahel, the study synthesizes secondary literature, conflict datasets, humanitarian assessments, and policy reports. The goal is not to calculate a single causal effect for the entire region, but to unearth the underlying mechanisms that drive these dynamics on the ground.

The western and central Sahel are analytically useful because they combine high exposure to rainfall variability, persistent gaps in drinking water and sanitation, mobile livestock systems, contested land access, and the expansion of armed groups into rural disputes. Mali, Niger, and the Lake Chad Basin are not treated as identical cases. They are used as sites that reveal different paths through which water insecurity becomes politically consequential.

Burkina Faso, Chad, Mali, Mauritania, and Niger form the empirical focus of this chapter. In these five countries in 2022, 43.5% of the population – more than 37.5 million people – lacked access to basic drinking water services, while 74.6% lacked basic sanitation services. The region was also expected to warm faster than the global average: projections from the Intergovernmental Panel on Climate Change (IPCC) indicated at least 2 degrees Celsius of warming by mid-century (World Bank, 2022, pp. 33–35).

The term Sahelian nexus is used in the chapter to describe the repeated interaction among climate variability, water insecurity, livelihood pressure, weak governance, armed violence, and declining adaptive capacity. It does not imply that every conflict in the Sahel begins with water. Cattle theft, militia retaliation, ethnic polarization, land grabbing, borderland smuggling, counterinsurgency abuse, and local political patronage can all be decisive. Water links some of these processes to everyday survival. Under weak institutions and with armed protection available, it may also feed wider escalation. The chapter explores these dynamics through five interconnected dimensions: hydrological variability, livelihood compression, institutional fragmentation, militarization, and humanitarian loss.

The Sahelian hydrological setting: scarcity, variability, and dependence

The Sahelian water problem begins with a difficult hydrological regime. Rainfall is seasonal, unevenly distributed, and highly variable from year to year. Aggregate national water statistics can therefore be misleading. A country may appear to have sufficient renewable water resources while rural communities still face acute shortages because surface water is seasonal, groundwater infrastructure is sparse, and storage capacity is limited.

Climate change increases the importance of variability. The IPCC reports that Africa has warmed faster than the global average, with observed increases in hot extremes and projected increases in heavy precipitation and pluvial flooding in parts of West Africa (IPCC, 2021, pp. 1–2). In the Sahel, this means that drought and flood risks must be analyzed together.

A year with heavy rainfall can still be a year of water insecurity if intense storms wash away soil and contaminate water points. Water insecurity is therefore less about low precipitation and more about its volatility, storage, and distribution.

Surface water is limited and often seasonal across much of the Sahel, which gives groundwater a central role in domestic supply and livestock watering. It has been noted that groundwater is a crucial resource in the region, but availability and access vary sharply across aquifers and settlement zones (World Bank, 2022, pp. 52–53).

Agriculture ties hydrology directly to livelihoods. Agricultural water withdrawals account for a large share of total withdrawals in the region, ranging from 51% in Burkina Faso to 97% in Mali (World Bank, 2022, p. 53). Yet irrigation remains very limited. Less than 1% of total cropland in the five countries is equipped for irrigation, and approximately 40% of equipped systems have fallen into disrepair (World Bank, 2022, p. 57). Thus, most agricultural production remains exposed to rainfall variability.

Lake Chad shows why emblematic water bodies should be used carefully. It is frequently invoked as proof of climate-driven collapse. The lake has indeed lost a large share of its surface area since the 1960s, but the basin has also experienced periods of partial recovery and high variability; water abstraction, population growth, governance failures, and conflict all shape the basin's trajectory (World Bank, 2022, pp. 37–38). A generic narrative of climate collapse fails to capture the institutional and livelihood mechanisms that transform water stress into actual insecurity.

Livelihoods under pressure: from complementarity to competition

Rural livelihoods in the Sahel are often described through two categories: farmers and herders. The distinction is useful for describing land use, but it can obscure overlap. Many farming households own animals; many pastoralist households cultivate fields; fishing, trade, seasonal labor, and migration provide additional income. Nevertheless, crop cultivation and mobile livestock production create different requirements for land, water, time, and mobility. Conflict emerges most sharply when those requirements are forced into the same spaces without credible rules.

Historically, crop-livestock relations were not defined only by antagonism. Seasonal exchange helped manage ecological uncertainty. Herders grazed animals on harvested fields, consumed crop residues, and fertilized soils; farmers received manure, milk, meat, transport services, and market exchange. Kratli and Toulmin argue that much farmer-herder interaction in West Africa has long been characterized by negotiation and complementa-

rity, even where disputes occurred (Kratli & Toulmin, 2020, pp. 2–4). Moritz makes a similar point: conflict and cooperation are recurring outcomes of negotiated access under changing conditions (Moritz, 2010, pp. 139–141).

Several pressures have weakened this complementarity. Population growth and agricultural expansion have increased demand for cultivated land. Experts report that cropland in the Sahel increased approximately 2.5 times between 1961 and 2009, while critical grazing areas decreased by 13% (World Bank, 2021, pp. 10–11). This expansion affects pastoralists by reducing pasture area and obstructing routes between dry-season and wet-season grazing zones. A legally recognized corridor may still be unusable if cultivated fields block the route or if local authorities cannot enforce access.

Pastoralism remains economically important under these conditions. An assessment describes pastoralism as a major economic pillar in the region and estimates that livestock production accounts for about 10 to 15% of GDP in several Sahelian countries, with wider contributions through trade, transport, employment, manure, and household assets (World Bank, 2021, pp. 9–10). Treating mobile livestock systems as backward or residual therefore understates both their economic value and their ecological function. Mobility is not an anomaly to be corrected. It is one of the principal adaptation strategies in environments where rainfall and pasture are uneven.

Markets have also changed the terms of access. Herders move because of water availability, pasture quality, livestock prices, veterinary services, insecurity, taxes, and trade routes. Brottem and McDonnell emphasize that pastoral mobility is shaped by political economy and market integration as well as by ecology (Brottem & McDonnell, 2020, pp. 11–15). Monetized access to water and grazing can reduce the flexibility of older exchange arrangements. It also creates new disputes over fees, corruption, and compensation.

The Inner Niger Delta in Mali illustrates how seasonal interdependence can come under political strain. The Inner Niger Delta is a floodplain economy in which farming, fishing, and pastoralism depend on annual flooding. Rice cultivation, bourgou pastures, fishing zones, and dry-season grazing are interdependent but competitive uses of the same seasonal landscape. Benjaminsen and Ba show that in central Mali, pastoral grievances over access fees, elite control of pasture, corrupt local administration, and the weakening of pastoral rights helped create conditions in which jihadist actors could present themselves as alternative arbiters (Benjaminsen & Ba, 2019, pp. 7–12). This case complicates a simple scarcity narrative. Conflict emerged through the politicization of access, the erosion of trusted authori-

ty, and the availability of armed actors willing to intervene in land and pasture disputes.

Land tenure insecurity reinforces the movement from complementarity to competition. A SPARC (Supporting Pastoralism and Agriculture in Recurrent and Protracted Crises) systematic scoping review of farmer-herder conflict in Africa identified 88 relevant studies and found that all reviewed case studies linked conflict directly or indirectly to land tenure insecurity, although the mechanisms varied across contexts (Nassef et al., 2023, pp. 7–9). Tenure insecurity affects farmers and herders differently. Farmers may seek to secure land through cultivation, fencing, or formal registration; pastoralists often depend on flexible access, seasonal passage, and negotiated rights that are harder to formalize. Policies that protect one form of tenure may unintentionally weaken another.

The shift from complementarity to competition is uneven. In some areas, farmer-herder exchange continues; in others, conflict is episodic; in still others, disputes have been absorbed into armed violence. A Dutch case study of five communes in Tahoua, Niger, found that conflict over natural resource use was generally low in the target sites, even though access to services remained weak and insecurity had altered mobility routes (Ayantunde et al., 2025). That finding shows that hydrological pressure becomes violent only under particular institutional and security conditions.

Governance failure and the making of the water problem

The Sahelian water problem is partly physical, but its political consequences depend on governance. Access to water depends on complex institutional and structural factors. Fragmented or predatory governance transforms water insecurity into a crisis of state legitimacy. Service deficits are substantial but are not evenly distributed. Rural areas, borderlands, and conflict-affected zones face greater difficulty accessing reliable water and sanitation. Insecurity further reduces maintenance and investment.

The Organisation for Economic Co-operation and Development (OECD) review of natural resource governance in the Sahel describes land governance as fragmented and overlapping, with customary, statutory, and decentralized institutions often operating simultaneously and with uneven authority (OECD, 2022, pp. 17–22). We could recall the concept of “twilight institutions,” whereby public authority in many African settings is exercised by actors that are neither fully state nor simply private, including chiefs, local committees, and militias (Lund, 2006, pp. 685–688). In the Sahel, such institutional overlap may allow flexibility, but it can also create corruption and disputes over who has the right to decide.

Pastoral mobility frameworks demonstrate the clear gap between recognition and implementation. In 1998, the Economic Community of West African States (ECOWAS) created a regional framework for transhumance among member states and introduced the International Transhumance Certificate to regulate cross-border livestock movement (ECOWAS, 1998, arts. 3–5). Another regulation later specified implementation procedures, including corridors, entry points, and administrative responsibilities (ECOWAS, 2003, pp. 4–7). These documents recognized mobility as a legitimate regional practice. Their weakness lies in implementation: corridors are not always demarcated, water points are insufficient or poorly maintained, local authorities may charge informal fees, and border closures or insecurity can interrupt movement.

This implementation gap has transitioned into a structural break following the formal withdrawal of the Alliance of Sahel States – Burkina Faso, Mali, and Niger – from ECOWAS. Their withdrawal from ECOWAS created legal and institutional uncertainty for regional transhumance arrangements, although some bilateral mechanisms remained relevant.

The bias toward sedentary agriculture remains a recurrent governance issue across the region. Expanding irrigation and commercial agriculture may be necessary for food security, but such projects can displace or marginalize existing users if they are designed without secure safeguards for pastoralists, fishers, and small farmers. The World Bank recognizes irrigation as a major adaptation priority, yet it also stresses that land-tenure reform and recognition of women's land rights are necessary to reduce climate and conflict risks (World Bank, 2022, pp. 55–58, 73–75).

In parts of Niger, natural resources are still governed largely through traditional rules, oral or written, and the main difficulty is enforcement rather than the complete absence of norms (Ayantunde et al., 2025). Creating official rules, certificates, or committees might look helpful. However, it can actually ruin flexible local agreements if the new laws ignore traditional leaders and seasonal changes.

Governance failure also includes corruption. Benjaminsen and Ba link pastoralist support for jihadist groups in central Mali to grievances against a corrupt and predatory state, including bribery, disputed access fees, and elite control over land and pasture (Benjaminsen & Ba, 2019, pp. 8–13). Ursu's study of central Mali similarly shows that traditional authorities became embattled when armed groups, local elites, and administrative actors competed to define and enforce access to resources (Ursu, 2018, pp. 21–28). Thus, even if the state is present, it can still cause deep resentment if its presence is abusive.

From local disputes to armed conflict

Local disputes over water, pasture, and fields do not always become armed conflicts. A small argument usually grows into bigger violence because people lose their jobs, peace talks fail, groups take sides, or weapons become available. Sometimes, armed groups get involved, leading to revenge attacks. While this happens differently in every place, it helps explain how small arguments can turn into major violence.

Conflict often starts when peace talks fail. Normally, village leaders, local groups, and courts settle fights over damaged crops and animal pathways. However, violence weakens these leaders. Some flee their villages, others are controlled by powerful people or armed groups, and some lose respect because their decisions are ignored. As a result, a small fight that used to be settled with a simple fine may now stay open long enough for armed groups to step in.

Another path of escalation is identity politicization. A dispute over water can be reframed as a conflict between ethnic or religious communities where livelihood specialization overlaps with group identity. In central Mali, pastoral Fulani communities have often been stigmatized as jihadist sympathizers, while Dogon self-defense groups have mobilized around claims of protection and territorial defense. Once this labeling occurs, compensation becomes harder because the dispute is no longer only about damage or access.

In the Liptako-Gourma borderlands between Burkina Faso, Mali, and Niger, the interaction of mobility, water access, and security is complicated by regional, cross-border movements of pastoralists, markets, and armed groups. Because traditional policies are ineffective across these shared spaces, securing corridors requires regional cooperation rather than just local district action, as water sources serve diverse groups with varying legal statuses across neighboring states.

The United Nations Office for the Coordination of Humanitarian Affairs (OCHA) 2025 Sahel Overview reports 5,833 security incidents in 2024, resulting in 16,833 deaths – a sharp increase in both incidents and fatalities compared with 2019 levels (United Nations Office for the Coordination of Humanitarian Affairs [OCHA], 2025, p. 11). While these figures show the massive scale of the crisis, they do not offer a complete picture of rural violence. Due to limited access, fear of retaliation, and inconsistent reporting, many smaller conflicts – particularly those involving land or water resources – are either missed or classified in ways that obscure their underlying causes.

Conflict then produces additional water and livelihood insecurity. Armed groups and militias loot cattle, tax markets, burn villages, and interrupt seasonal migration. Conflict therefore changes the underlying resource base and reduces the ability of communities to adapt to future shocks. This is one reason securitized responses are insufficient. They often respond after violence is visible, while ignoring earlier disputes.

Armed groups and the capture of water-related grievances

The armed actors most relevant to this discussion include Jama'at Nusrat al-Islam wal-Muslimin (JNIM), Islamic State Sahel Province, Islamic State West Africa Province in the Lake Chad Basin (ISWAP)[1], local self-defense groups, bandit networks, and community militias. Their ideologies and organizational structures differ, but many operate in rural areas where disputes over land and water are recurrent. The Global Terrorism Index 2025 reported that JNIM reached its highest level of terrorism deaths since its emergence in 2017, with 1,454 deaths attributed to the group in 2024, most of them in Burkina Faso, Mali, and Niger (Institute for Economics & Peace, 2025, pp. 42–44).

Armed groups can gain power by acting as judges. When official courts are too far away and traditional leaders are controlled by rich elites, people look for other options. If an armed commander steps in and settles a fight, local people start to trust and support them. Ursu's study of central Mali describes how armed groups and embattled traditional authorities competed over resource governance and dispute settlement (Ursu, 2018, pp. 24–31). This form of authority can be coercive and violent, but it may still appear functional to communities that have little confidence in official channels.

Protection is another important instrument. Armed groups gain support by providing protection in unsafe areas, often attracting young men who fear rival gangs, theft, or abusive authorities (Raineri, 2018, pp. 32–42). UNDP's report notes that violent extremist groups in Africa can provide services, dispute resolution, protection, or economic incentives where states are absent or distrusted, and that state abuses can be a powerful accelerant of recruitment (United Nations Development Programme, 2023, pp. 79–86).

Taxation and service provision reinforce this authority. Armed groups may tax livestock movement, markets, mining, transport, or access to territory. They may also regulate fishing, grazing, logging, and trading. When

[1] Hereinafter, this organization is referred to as an organization designated as terrorist and banned in the Russian Federation.

an armed group keeps settling arguments over wells, land, or rivers, people will naturally go to them for help next time. Fights over water are useful for these groups because water is about daily survival. By solving these regular problems, armed groups turn small fights into permanent power over the community.

Thus, people do not support armed groups just because of their ideas. Feeling wronged does not make violence right, but it shows why these groups become important to local people. Their power grows when they can turn unresolved arguments into chances to protect people, collect taxes, punish criminals, and act as judges. Fights over water and land give them these chances over and over again.

The humanitarian dimension

Humanitarian need is often treated as an outcome of climate stress and conflict. In the Sahel, it also affects the conditions under which later crises unfold. Food insecurity, displacement, disease, loss of livestock, and damaged infrastructure reduce the capacity of households and local institutions to manage the next shock.

OCHA's 2025 Sahel overview counted 28.7 million people in need and 18.4 million people targeted for humanitarian assistance under a $4.3 billion requirement. It also reported 5.9 million internally displaced persons and 2.1 million refugees and asylum seekers in the Sahel response frame as of April 2025 (OCHA, 2025, p. 6). These figures may also undercount mobile and dispersed populations: many pastoral households move without registering in camps or formal assistance systems.

OCHA projected 12.8 million people in Sahel response countries in crisis-level or worse food insecurity from June to August 2025, alongside 2.6 million children expected to suffer from severe acute malnutrition (OCHA, 2025, p. 16). Given the connection between malnutrition and water/sanitation, this forecast highlights a critical need in the region.

The 2024 floods showed how climate shocks can compound vulnerability to conflict. OCHA reported that nearly 6 million people were affected, more than 980,000 were displaced, at least 1,400 died, and 4,300 were injured; floods damaged or destroyed 200,000 homes, 1,500 schools, 400 health centers, and 90,000 water points, and made nearly 1 million hectares unsuitable for farming and livestock production (OCHA, 2025, p. 18). The floods destroyed essential agricultural resources like seeds, fodder, and stored grain, significantly impacting the entire farming year for thousands of people. The crisis highlights how multiple, compounding climate pressures increase vulnerability, rather than a direct, single cause of conflict.

Water, sanitation, and hygiene (WASH) infrastructure has become an intrinsic part of the conflict environment. OCHA reported that deliberate attacks on water infrastructure in Burkina Faso in 2023 deprived more than 980,000 people of drinking water, and that attacks continued in 2024, including sabotage of the water system serving the town of Djibo (OCHA, 2025, p. 19). The vulnerability of water infrastructure means that limited sabotage can interrupt water supply for a large settlement.

Displacement changes where water scarcity occurs. Forced migrants often settle in communities that are already facing resource pressure. This can create new conflicts if international aid is seen as unfair, or if local institutions fail to manage shared resources. Additionally, displacement ruins pastoral mobility by cutting herders off from their livestock, trade routes, and markets. Losing the ability to move destroys a crucial adaptation tool in an environment where mobility is the main way to manage risk.

Health and education services are part of the same resilience infrastructure. OCHA reported 9,907 nonfunctional schools and 922 nonfunctional health centers in the Sahel response frame (OCHA, 2025, p. 14). These closures weaken the institutional structures that help communities cope with crises. Rather than being isolated sector-specific failures, an overwhelmed health system, disrupted education, and a dysfunctional local administration are deeply interconnected. Together, they create a reinforcing cycle that multiplies local vulnerability.

Humanitarian assistance remains necessary, but it cannot by itself break the cycle. Emergency water trucking, food aid, nutrition programs, and shelter are essential in crisis conditions, but they do not resolve the governance problems that make households vulnerable. The humanitarian dimension therefore confirms the need to link water security with land governance, pastoral mobility, local justice, infrastructure protection, and civilian security.

Governance constraints and institutional responses

The Sahel has many policy instruments: national water plans, pastoral codes, regional mobility frameworks, basin organizations, and climate adaptation strategies. The recurring problem is the gap between formal instruments and the local situations. The evidence reviewed in this chapter points to implementation constraints.

One recurrent constraint is the mismatch between project geography and livelihood geography. An assessment emphasized that water security in the region depended on regional and local systems that cut across administrative borders (World Bank, 2021, pp. 46–49). In practice, water projects of-

ten follow administrative jurisdictions, while pastoral routes and aquifers follow different spatial logics. This creates gaps between planning units and the geography of access.

Water infrastructure is most stable when its local political setting is taken into account. More reliable infrastructure can reduce vulnerability, but it can also generate new disputes and claims by host and displaced populations.

Indeed, effective dispute resolution over land and water remains a critical challenge. Institutional mechanisms – such as fair crop damage compensation, accessible mediation, credible customary leaders, protected corridors, and clear water-sharing rules – determine whether local conflicts can be negotiated peacefully. However, these systems are paradoxically expected to function in areas where state authority is absent or untrusted.

Niger illustrates both the promise and the difficulty of such arrangements. A study found that natural resource management committees, local conventions, and negotiated rules can help reduce conflict when they are locally legitimate and linked to wider support systems. The same evidence also shows how fragile such mechanisms become when insecurity, elite capture, scarcity, or competing legal claims undermine enforcement (Ayantunde et al., 2025, pp. 25–31).

Financing is another problem. OCHA stressed that humanitarian aid alone cannot resolve the Sahel crisis and that underfunding leaves households to exhaust negative coping strategies. By the time emergency response arrives, livestock may have been sold, children withdrawn from school, migration forced, and local mediation weakened (OCHA, 2025, pp. 6–7, 52–54). The cost of late response is therefore institutional as well as humanitarian.

Security responses are unavoidable where armed groups tax civilians and attack infrastructure. However, the government that ignores land disputes, tolerates military abuses, or undermines local mediation only worsens the rural alienation that armed groups exploit. The chapter demonstrates that solving the security crisis is impossible without fixing resource governance, protection, and accountability.

Conclusion

This chapter has analyzed water insecurity in the Sahel as a mechanism linking environmental variability, livelihood pressure, weak governance, armed competition, and humanitarian loss. The central finding is that water becomes politically destabilizing when access to it is filtered through insecure land rights, contested mobility, damaged infrastructure, distrusted au-

thorities, and armed protection. Water scarcity alone does not explain the region's violence, but neither can water be treated as mere background.

The evidence challenges a simplistic climate-war thesis, highlighting instead that Sahelian environmental variability is historically managed through changing institutional contexts rather than solely by climate, as relations between farmers and herders shift amidst encroaching cultivation, market monetization, and the decline of traditional authority. Consequently, a governance vacuum has emerged – marked by predatory or absent state actors – which armed groups exploit by intervening in local disputes to establish roles as judges, protectors, or tax collectors.

While the "farmer-herder" label captures a vital livelihood dynamic, it oversimplifies rural reality. This view often masks the complex overlap of survival strategies, market dependencies, militia politics, and counterinsurgency efforts that shape local histories of power. Violence is produced through escalation: failed mediation, identity politicization, militarization, retaliation, and the capture of resource disputes by armed actors.

Humanitarian statistics are both records of damage and blueprints of institutional collapse. Food insecurity, displacement, health system disruption, school closure, and damaged water infrastructure reduce adaptive capacity and make later disputes harder to manage. Ultimately, the conflict ceases to be an event but becomes a structural reality.

For the wider monograph, the Sahelian case shows that water in contemporary Africa is linked to livelihoods, vulnerability, and institutional contestation. Water infrastructure exposes inequalities in authority and access. Hence, the politics of water in the Sahel cannot be understood apart from the governance of land, mobility, civilian protection, and local dispute settlement.

The following chapter narrows this argument to Mali, where the general Sahelian mechanisms of mobility, land access, weak mediation, and armed authority appear in a concrete national and local setting.

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Chapter 7

AGRO-PASTORAL CLASHES IN MALI: LAND, WATER, AND THE POLITICS OF RURAL CONFLICT

Introduction

The Republic of Mali is a low-income, semi-desert, landlocked country located in the Sahel region of West Africa (Food and Agriculture Organization of the United Nations, 2017, p. 1). The country has one of the world's highest population growth rates, while approximately 10% of its citizens are nomadic. The country is heavily dependent on agriculture and agro-pastoralism for its social and economic development (International Center for Tropical Agriculture et al., 2020, pp. 2–3). Livestock rearing makes up to 10.8% of the country's GDP (Jones-Casey & Knox, 2011). In general, the agricultural sector employs approximately 63% to 65% of Mali's total workforce and contributes roughly 33% to the country's GDP (World Bank, 2026a; World Bank, 2026b). Approximately 95% of the country's farms are smallholder family farms that produce most of its agricultural outputs, with millet, rice, sorghum, and maize taking priority as subsistence crops, while groundnuts, cotton, and canes are grown for export purposes (Koné, 2012, p. 2). Since the 1960s, the country's annual temperatures have been increasing and are expected to climb by 1.2°C to 3.6°C by 2060. Like other countries in the region, Mali has experienced severe droughts over the past few years, and its future precipitation is expected to be more erratic. These climatic pressures leave groups reliant on natural resources in a vulnerable position and less able to invest in climate resilience (Tarif & Grand, 2021).

Over the years, the country has also undergone significant changes in its agricultural and pastoral environment. Factors such as population growth, the pressure on arable land, climate change, and economic transformation are notably cited. These changes have intensified the longstanding conflictual relationship between the farmers and the herders, which dates to the 15th century when the Fulani first brought the animals into the Inner Niger Delta. Importantly, the challenges between the two groups extend well beyond their traditional rivalry and now include cultural, ethno-religious, and political factors. The decentralization reforms have further complicated the traditional resource management rules, rendering traditional mechanisms

insufficient to resolve conflicts between the two groups. The professional specialization between the farmers and herders also extends the wedge between the groups and complicates the cohabitation of the two systems as the livelihoods of the groups have often been linked to their ethnic identities (Ba, 2023, pp. 7–9). Many Dogon communities engage in farming and hunting, while many Fulani communities have traditionally practiced pastoralism (International Work Group for Indigenous Affairs, 2019). With that in mind, this chapter seeks to contextualize the politics of agro-pastoral clashes in Mali.

The climate-security nexus

The climate-security nexus examines the link between climate conditions, peace, and security. The nexus is both complex and multifaceted as it incorporates environmental, social, cultural, and political factors. It has become a key concern for many countries given the unpredictable nature, frequency, and severity of climate-related events and their ability to increase the risks to human insecurity. This is important because climate change is a non-traditional threat that exacerbates existing environmental stressors and security risks. Extreme environmental conditions like desertification, water scarcity, and rising temperatures could result in greater migration and displacement, social unrest, security instability, and climate-induced resource scarcity. The latter can be instrumentalized by armed groups and organized crime networks (European Commission, 2023, p. 1; Nevitt, 2023; Pacillo et al., 2024, pp. 1–2).

Violent armed groups are often found in areas suffering from exposure to climate risks. Key examples include the Sahel, the Levant, and the Horn of Africa, among others. In these areas, the impact of climate change can aggravate the root causes for these armed groups, allowing them to increase their recruitment. Poor governance and weak rule of law, rising levels of inequality, a lack of public participation and inclusive development can serve as root causes and drivers for these armed groups (United Nations Development Programme [UNDP], 2020, p. 4).

Climate change can increase resource scarcity and competition for essential resources, fueling tensions between different communities (UNDP, 2020, p. 4). While this climate-induced resource scarcity, in the context of Mali, does not foster direct farmer-herder conflict, it can contribute to its escalation when a degree of ethnic polarization, political marginalization, and a lack of dispute-resolution mechanisms are in place. While it is uncertain exactly how bad the conditions need to be for this, it can be argued that droughts and desertification can fuel conflicts and migration (Sweijs et al., 2022, p. 11).

Historical political rule in Mali

From 1400, the Ardobé in the Inner Niger Delta constituted the military and political leadership, providing floodplain land to their subordinates for farming. They introduced local chiefs, which were called the *jowros*. These jowros were the noble Fulani who were pastoralists and the owners of grass in their territorial units. The Ardobé ruled until 1818, when Islamic clergymen mobilized a jihad which resulted in the establishment of the Dina Empire based south of Mopti (Benjaminsen & Ba, 2009, p. 73). The new state maintained the Ardobé's territorial model and codified and formalized the resource management principles and rights introduced by the former rulers. This meant that the Fulani would continue managing the pastures, while livestock routes were established for the farmers. All those who utilized the pastures had to pay a fee to the Fulani and clear ranks were established for herds. In 1862, the Dina Empire was conquered by the Toucouleur Empire, who were subsequently defeated by the French in 1893. In 1895, the French established their colony. The French maintained the spatial organization and resource management of the Dina Empire, and some of the Fulani became chefs de canton (local chiefs or administrative leaders), while others continued managing the pastures. With time, the French allowed the Fulani to collect rent from the users of the pastures. To date, the Dina code and its associated rights are considered customary law in Mali (Benjaminsen & Ba, 2009, p. 74).

After independence, the country's first post-colonial president embarked on developmentalist agricultural modernization, which continued to favor farmers over herders. His administration perceived pastoralism as an obstacle to development. Consequently, it wanted to convert the pastoralists into farmers. The government also regarded the Fulani local chiefs as feudal landlords and sought to undermine their authority (Hansen, 2024). The local chiefs' positions were rehabilitated after the military coup that took place in 1968. This military government ruled until 1991 when they were overthrown via another coup. The introduction of democracy in 1991 was accompanied by a commitment to decentralization, which was accepted by referendum in 1992, 1993, and 1995. The land tenure conflicts remained a challenge for the decentralization reforms (Benjaminsen & Ba, 2009, p. 75).

Fulani–Dogon relations

Historically, Malians' livelihoods were linked to their ethnic identities, with the Fulani practicing herding, and the Dogon being farmers. The Fulani owned their herds and passed them down through their lineage in Mali and

Burkina Faso. They maintained their customary power for years and dominated the Ogossagou village. They separated it into two communities naming it the Ogossagou Peul and the Ogossagou Dogon. The former was dominated by the Fulani and the latter served as a space for the Dogon who did not wish to be integrated into the Fulani society (Gaye, 2018, pp. 14–15).

The Dogon were believed to have originated from southern Mali in the area south of Bamako and moved to the Bandiagara Escarpment during the 13th and 14th centuries to escape external conflict within their own lineage. During the 15th and 16th centuries, they moved down from the rocky escarpment to the plains to farm in the Madougou area, which is often referred to as the Ourokorohi, meaning old villages. They, however, had to return to the Escarpment in the 18th and 19th centuries after they refused to become part of the enslaved Rimaybe. They paid a bundle of millet to the local Fulani sub-chiefs in recognition of their ownership of the plains during the 20th century. This ensured that the Fulani did not find their new settlement problematic. The Dogon started changing their use of land as their population started growing. Thus, the dynamics between the groups were changing (Benjaminsen & Ba, 2021, pp. 8–9). During colonization, the land decree of 1906 asserted that all vacant land in Mali came under the ownership of the state. This included land used on a seasonal basis. The land used for agricultural practices remained under customary regulations. This resulted in pastoralists having fewer land rights (Hansen, 2024). Post-independence, their power and wealth also declined (Benjaminsen & Ba, 2009, p. 71). Despite these shifts in the power dynamics between the groups, the Fulani have maintained their superiority over the Dogon (Benjaminsen & Ba, 2021, pp. 8–9).

Land use

Natural resource legislation remains a challenge across rural African communities because most resource users gain access to the resources through their local tenure systems. While this access is gained through tradition and customs, these have changed over the years due to their reinterpretation. Additional factors like cultural interactions, population pressures, and socioeconomic changes add to this complexity. This has resulted in different tenure systems for different villages. This situation means that natural resource policies are shaped by local concepts and practices (Cotula & Cissé, 2006, p. 1).

In Mali, the institutions that regulate pastoralist access and the use of land often tend to consist of uncodified rules and regulations. Instead, they are based on ecological factors. In the Senno-Manngo in Central Mali, the

concept of rangeland rights is captured in the notion of territoriality where ecology determines the scope of resources used instead of society (Hansen, 2024). This practice is also followed in Macina (the Inner Niger Delta), where rice farming, fishing, and livestock rearing take place. This vast floodplain has served as a rich resource for rice farming, fishing, and pastoralism for years. The pastoral system requires that livestock grazing takes place during the dry season (December to June). Thereafter, the herders move northeast or northwest. During their departure, the delta (Macina) would be used to plant rice paddy alongside the burgu. However, this has changed over time as the paddy fields expanded, partially contributing to a decrease in flooding along the Niger River – especially following the construction of the downstream hydropower dam (Benjaminsen & Ba, 2019, p. 7).

It is worth noting that many pastures have been lost since the expansion of the rice fields. The expansion of rice fields also reduced access to land cover and grazing resources for livestock (Hansen, 2024). This places severe pressure on pastoral production as the general policies and laws favor agriculture. This, along with the decentralization reforms and rent-seeking behavior by corrupt bureaucrats, has aggravated land disputes in the country (Benjaminsen & Ba, 2009, p. 78). It could be argued that the existence and use of both customary and formal state laws further contribute towards the conflict between farmers and herders because the former covers most rural lands while the latter is perceived not to protect local rights. It has been found that uncertainty and scarcity arise when statutory laws do not recognize customary laws which are more flexible and informal in nature (Hansen, 2024, p. 1059).

Causes of agro-pastoral conflict in Mali

Farmer-herder conflicts ordinarily revolved around access to and the use of water and land for grazing and cultivation. Conflicts would occur when resources became scarce or in instances where there was an encroachment or overlap in the use of land, resulting in each party seeking to protect their own livelihoods. This conflict would often arise due to the damaging of crops or farmers encroaching on areas meant for grazing, resulting in increased tensions between farmers and herders that would last for weeks (Brottem, 2021, pp. 2–3; Hansen, 2024). These tensions would ultimately be resolved using traditional dispute resolution methods overseen by chiefs and community leaders. In some instances, these tensions would remain in place for years. Competition over scarce resources, climate change, environmental degradation, and weak state institutional response are important

contributing factors (Amoah et al., 2025). The changes in the customary land governance, and conflict resolution mechanisms are also notable additions (Hansen, 2024).

Literature suggests that these conflicts can also be sparked by ethnicity. In the case of Mali, the Fulani have been recruited to join jihadist organizations given their perceived sense of political marginalization and disempowerment (Hansen, 2024). This literature disregards the socioeconomic and political contexts that create opposition between farmers and herders. When studying northwestern Mali, it becomes evident that these conflicts sometimes arise between sedentary Fulani herders and the incoming Fulani herders over water, as well as possible animal disease carried by incoming livestock (Hansen, 2024).

Rent seeking behavior from corrupt bureaucrats also contributes to persistent agro-pastoral conflict in Mali. Farmers who use fields owned by the Office Riz Mopti[2], for example, pay fees to management committees for maintenance but often complain about clogged canals. Complaints about payments are often met with threats to reallocate fields to other individuals. Those seeking to open new livestock corridors also must pay state technicians and administrators for this to happen (Benjaminsen & Ba, 2009, p. 78).

There is also unequal representation of groups in both governance and development. Additionally, there are misconceptions regarding pastoral system, their economies, and grievances in many of the country's policy documents (Cottyn & Meester, 2021, pp. 1–2). Government policies also promote farming over livestock production. The government has set out to prioritize foreign investment for farming while its national laws remain ambiguous, allowing confusion, conflict, and poor land governance to prevail (Djiré et al., 2012, p. 2).

Jihadist presence in Mali

Residents in rural communities have often complained about the predatory behavior of state and traditional elites. Their rent-seeking behavior has often been cited for intensifying conflict between the farmers and herders as it often leaves them feeling disempowered and marginalized. Many of these armed groups have benefitted from these feelings resulting in pastoralists falling victim to jihadist rhetoric and ultimately joining jihadist groups. These groups tend to form alliances which often collapse and result

[2] Office Riz Mopti is a state-run irrigation authority that expanded commercial rice cultivation at the expense of traditional pastoral grazing lands (Editor's note).

in their acronyms changing. In the 2010s, the main groups in Mali were Al-Qaeda[3] in the Islamic Maghreb (AQIM) and Ansar Dine. The Movement for Oneness and Jihad in West Africa (MOJWA), which was one of the primary groups, disintegrated in 2013 and left for Niger (Benjaminsen & Ba, 2021, p. 15). Since 2017, the principal Al-Qaeda-aligned coalition operating in Mali has been Jama'at Nusrat al-Islam wal-Muslimin (JNIM), which was formed through the merger of Ansar Dine, Al-Mourabitoun, Katiba Macina, and the Sahara branch of AQIM.

The presence of jihadists in Mali stems from the spillover that occurred after the Algerian civil war started in 1991. This spillover resulted in the emergence of Islamist guerrillas and their ultimate expansion into the northern part of the country. Since their installation in Mali, AQIM has strengthened its financial position through the kidnapping of foreign nationals and involvement in cigarette and drug smuggling. By 2011, AQIM had a unit of 500 fighters in northern Mali. After the 2011 NATO-led military intervention in Libya and the death of Muammar Gaddafi, between 1,000 and 4,000 heavily armed Tuareg soldiers moved into Mali. They occupied the northern towns of Kidal, Gao, and Timbuktu (Benjaminsen & Ba, 2019, p. 6).

In 2012, Tuareg fighters led by the National Movement for the Liberation of Azawad (MNLA) launched an attack on northern Mali. The group, alongside Ansar Dine and its affiliates, took control of the northern part of the country by 2012. Once they established control, MNLA was displaced by Ansar Dine, which became the most prominent terrorist group in the country (Dal Santo & Van der Heide, 2018, p. 276). In January 2013, Ansar Dine, AQIM, and MOJWA started moving towards the southern part of the country, which resulted in the Malian President requesting French assistance, which ultimately resulted in the rebel groups retreating to the Mopti region. Over 30 community leaders were killed between 2015–2017 for cooperating with the army and state (Benjaminsen & Ba, 2019, pp. 7, 9). Jointly, these groups launched attacks on café La Terrasse and the Radisson Blu hotel in Bamako in 2015. By 2016, some of the villages in the Delta had jihadist presence. Armed men arrived at irregular intervals to give orders to villagers before disappearing again. By 2017, they attacked the Le Campement resort and formed JNIM (Dal Santo & Van der Heide, 2018, p. 277; Benjaminsen & Ba, 2019, p. 9). Between January and August 2018, 500 people were killed, while an additional five villages were burned and 15,000 people were displaced (Cline, 2023, p. 182).

[3] Hereinafter, this organization is referred to as an organization designated as terrorist and banned in the Russian Federation.

By March 2019, 175 Fulani villagers in the Ogossagou village were attacked and killed by Dogon hunters. This militia attacked the village again on 14 February 2020, killing 31 Fulani villagers. By mid-May 2020, 212 Fulani and 90 Dogon villages were destroyed (Benjaminsen & Ba, 2021, p. 4). In September 2019, 25 Malian soldiers were killed, while 6 went missing (Cline, 2023, p. 175). The internal security of Mali has further eroded over the years. According to the 2024 Global Terrorism Index, Mali was the country fifth most affected by terrorism globally (Bartos & Chin, 2025).

Conclusion

Agro-pastoral conflict in Mali has several causes, with climate change, inter-group politics, and the country's agricultural policies being at the forefront. One should also acknowledge the role of the government's unwillingness to develop the northern part of the country, which contributed to the separatist action that resulted in the establishment of MNLA. The popular support that the movement initially received is indicative of the inequalities experienced by residents of the north. The state's withdrawal from the area, ethnic divisions, lawlessness, and the presence of armed groups in the area strengthened the MNLA, resulting in the consolidation of control over the north (Madonsela, 2023, p. 56). These developments ultimately paved the way for further conflict.

The situation in Mali fits directly into the core argument of this book. Climate change and stress on land or water create the initial risk, but violence only breaks out because of deeper structural issues. The real triggers are unequal development, struggles over pastoral routes, collapsing local courts, political marginalization, and the presence of armed groups. Scarcity alone does not cause the conflict. Instead, everyday disputes over livelihoods slowly turn into political and security crises when state institutions lose their power or ability to manage resource access fairly.

To re-establish state authority in the country, the Malian government would need to reintegrate itself into the ungoverned parts of the country as political vacuums often create space for parallel governance structures, which the armed groups benefit from. Continued state and security presence in these areas would deter armed groups from freely operating in the northern part of the country. Additionally, it would need to restore local governance, particularly in the north. Such reform would require impartial administration and the inclusion of representation from the north. This inclusion would weaken the shared rhetoric between armed groups and residents. This, along with poverty alleviation efforts and measures to reduce

inequality, might encourage greater trust in government and governmental institutions.

It is of the utmost importance that the state works towards addressing the country's unequal development. This would require that state resources be dispersed towards the north to ensure that infrastructure and economic development take place. Youth initiatives need to be introduced to equip young people with new skills, consequently reducing their vulnerability to joining armed groups. Rehabilitation programs are also needed for those seeking to leave armed groups. This would ensure that their reintegration into their respective communities becomes possible.

While it is important for the state to support agriculture, it also needs to find mechanisms to support pastoralism. This could assist in reducing the tensions between the groups and foster possible future collaboration. Furthermore, there needs to be formal demarcation of land and routes that would support both farmers and transhumance corridors as the current systems lack coherence and promote confusion. Communal dialogue needs to be encouraged and improved to ensure consensual land tenure policies. Local mediation needs to be promoted as a means of restoring communication and peaceful interactions between the farmers and herders.

The state urgently needs to improve its infrastructure, which would entail drilling new boreholes, rehabilitating existing wells, and establishing fodder reserves. Additional climate adaptation technology is needed to assist climate-vulnerable communities in adapting to climate shocks. This may ultimately lead to innovation in farming. Climate-smart farming may also be required. To fund all of this, the country would need to work with external actors and funders. State actors are already playing a significant role in addressing the armed violence in the country, but additional mediation could also assist the state in reaching common ground with groups like MNLA. While the existing context of Mali appears volatile, achieving peace, security, and stability is possible. This would require decisive action and political will from those in power.

This case study of Mali gives local detail to the mechanisms discussed in Chapter 6 on the Sahel and also prepares the ground for Chapter 8 on the Niger Delta, where water-related conflict is shaped less by dryland mobility than by pollution, extraction, and unequal control over remediation.

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Chapter 8

POWER DYNAMICS AND WATER CONFLICTS IN THE NIGER DELTA: HYDRO-HEGEMONY IN AN EXTRACTIVE REGION

Introduction

Water is an essential resource for human survival, economic activity, and environmental sustainability. The Niger Delta region of Nigeria, which is home to over 40 million people, is endowed with abundant water resources when compared to other regions in the country. Out of the nine states that make up the region, six are coastal states – Akwa Ibom, Bayelsa, Cross River, Delta, Ondo, and Rivers – while the remaining three – Abia, Edo, and Imo – are situated further inland. The area is also characterized by wetlands, swamps, and mangrove forests, distinguishing it from other regions in the country, which also explains why the Niger Delta people traditionally work as fishermen and farmers. This region is also central to Nigeria's economy, playing host to abundant oil resources that account for about 65% of government revenue and over 85% of total exports (Extractive Industries Transparency Initiative, 2024), thereby making the region an indispensable part of Nigeria. However, despite this abundance, the local communities in this region face persistent challenges related to water access, quality, and governance.

These challenges are rooted in decades of oil pollution, environmental degradation, infrastructure neglect, and governance failures. In parts of the Niger Delta, oil spills, gas flaring, and industrial waste have contaminated rivers and farmlands, displacing communities and undermining livelihoods. In the Ogoniland region of Rivers State, for example, prolonged oil spills rendered water sources unsafe and farmlands infertile, compelling many residents to abandon their homes in search of safer living conditions. Moreover, hundreds of thousands of Ogoni people reportedly face serious health risks from unsafe water (Amnesty International, 2020). Similarly, Associated Press (2023) reported that major spills at a Shell facility in Ogoniland disrupted fishing and farming activities, thereby leaving communities in competition over dwindling water resources essential for daily survival.

Although scholars like Hussein (2018) identify climate change, population growth, geological factors, and unfair resource distribution as ma-

jor contributors to water scarcity, research increasingly shows that water scarcity is not merely a physical or natural phenomenon; it is deeply intertwined with social and economic power relations (Mehta, 2003; Sultana, 2011). It is the power dynamics along with the social and environmental implications that have given rise to localized hydro-hegemony, where powerful actors like international oil companies (IOCs), government agencies, elites, and sometimes armed groups influence water access and control.

Hydro-hegemony in the Niger Delta can be examined through the lens of power dynamics in water control, access, and resource management. Hydro-hegemony refers to the dominance exerted by powerful entities over water resources, often leading to inequitable access and control. While the concept of hydro-hegemony typically applies to transboundary water conflicts (as seen in the Nile Basin or Euphrates–Tigris systems), localized forms of hydro-hegemony can also exist within national contexts, including the Niger Delta. The struggle for hydro-hegemony over Niger Delta waters comes from several quarters:

– IOCs like Shell, Chevron, and ExxonMobil indirectly control water access by polluting water bodies and then offering compensatory infrastructure like boreholes, reinforcing dependence.

– Local power struggles, including those involving militant groups and political elites, influence access to waterways and riverine transport routes; groups such as the Niger Delta Avengers have disrupted oil and water transport, determining who gains access in certain areas (Babatunde, 2016; Fund for Peace, 2016).

– Government agencies like the Niger Delta Development Commission (NDDC) and state water boards exercise significant control over water projects, often resulting in uneven access and neglect of certain communities. Together, these dynamics create a complex system of dominance and exclusion in water governance.

Given the foregoing, this chapter intends to critically examine hydro-hegemony in the Niger Delta, focusing on how power asymmetries influence water conflicts and water access. By applying the hydro-hegemony framework, typically used to analyze international river basin conflicts, to a subnational context, the chapter aims to understand how political and structural forces influence inequalities in water access and related conflicts in an extractive region. More specifically, the analysis identifies the principal actors and power structures shaping control over water resources, examines the strategies through which dominant actors maintain that control, and considers how these asymmetries contribute to water conflicts and unequal access. It also assesses their implications for sustainable water governance

and discusses measures that could reduce water-related tensions in the Niger Delta.

Research on water conflicts has grown substantially in recent years, driven by global concerns about scarcity, climate change, and sustainability. Much of this work has focused on transboundary water disputes between countries (Zeitoun & Warner, 2006; Cascão & Zeitoun, 2010). However, scholars have begun to apply similar concepts to subnational contexts, recognizing that internal power struggles over water are equally significant.

In Nigeria, studies have documented the environmental degradation of the Niger Delta caused by oil extraction (Okonta & Douglas, 2003; Watts, 2008). These works highlight the role of multinational oil corporations and the Nigerian state in causing ecological damage and social unrest. While some literature focuses on the direct impacts of oil spills and gas flaring, other studies (Obi, 2010; Nriagu et al., 2016) explore the broader consequences of environmental mismanagement, including water pollution and access inequalities. However, fewer studies explicitly examine water governance through the lens of power and hydro-hegemony within the region.

This chapter makes several contributions. First, it extends the hydro-hegemony framework to a subnational context, bridging the gap between international water studies and intra-state resource governance. The research also offers a political interpretation of water governance in the Niger Delta, challenging the notion that water scarcity and pollution are purely technical or environmental problems. By highlighting institutional and political drivers of water inequality, the chapter provides actionable insights for policy reform, environmental justice, and conflict-sensitive water management. In addition, the research highlights the importance of water, and not just oil, in understanding conflict, development, and resource politics in the Niger Delta.

Theoretically, the chapter engages the hydro-hegemony theory by Zeitoun and Warner (2006), the resource curse theory (Auty, 1993), and the structural violence theory (Galtung, 1969). Hydro-hegemony helps explain how power is used to dominate water access; resource curse theory illuminates how oil wealth contributes to water-related conflicts and governance failures in the Niger Delta; and the structural violence theory exposes how systemic inequalities and institutionalized power structures deprive groups of basic needs, including access to clean water. Together, these theories offer distinctive insights into understanding the power structures, institutional failures, and social injustices embedded in water governance.

Methodologically, the chapter adopts a qualitative research design, including document review and thematic analysis to capture the complexity of water conflicts in the Niger Delta. This exploratory approach enables a

deeper understanding of the political and social dimensions of water conflict rather than simply documenting technical deficiencies. The research focuses on communities in Rivers State that are heavily affected by environmental degradation and resource-related conflicts. These locations have a mix of urban and rural settings, histories of resistance, and varied experiences with water governance, making them suitable for examining hydro-hegemony at the local level.

Contextual background of water governance in the Niger Delta

The preceding sections established the conceptual and methodological frame for this chapter, especially the adaptation of hydro-hegemony to a subnational, extractive-region setting, and situated the analysis within debates about power, resource control, and environmental justice. This section situates those debates in the concrete institutional, historical, and socio-environmental realities of the Niger Delta. It explains how formal water sector arrangements, extractive industry practices, and layered governance weaknesses interact to shape who accesses, controls, and suffers from water resources in the region.

Historical overview and environmental foundations. The Niger Delta is one of the world's most complex and sensitive wetland ecosystems, consisting of creeks, rivers, estuaries, and mangrove swamps. Historically, these water systems supported local livelihoods such as artisanal fishing, small-scale agriculture, and transport (Sam et al., 2018). Over decades, however, large-scale oil exploration and production have profoundly altered this ecological foundation.

Since the discovery of oil in the region in the 1950s, frequent oil spills, gas flaring, and pipeline leaks have degraded water quality and disrupted aquatic ecosystems (United Nations Environment Programme [UNEP], 2011). In Ogoniland, for example, UNEP conducted an environmental assessment involving more than 4,000 samples from over 200 sites, finding that hydrocarbons penetrated deep into the soil (to depths greater than 5 m) and contaminated groundwater. In one community (Nisisioken Ogale), UNEP found that locals draw water from wells, and such water contained benzene at levels more than 900 times the World Health Organization (WHO) guideline, posing severe health risks (UNEP, 2011).

Mangrove forests, a critical ecological buffer and nursery for fish, have also suffered. UNEP documented mangrove degradation and persistent tar-like coatings on roots, which impair both biodiversity and the ecosystem services these wetlands provide (UNEP, 2011). This environmental legacy lays the foundation for understanding how water in the Niger Delta became

not only a resource but a contested space marked by pollution, health risk, and inequity.

Institutional architecture and policy frameworks. Water governance in the Niger Delta is embedded within a layered institutional framework. At the federal level, Nigeria's Ministry of Water Resources formulates national water policy and regulates major water infrastructure. At the subnational level, state water agencies and river basin development authorities manage implementation, allocation, and water quality monitoring. One such body is the Niger Delta River Basin Development Authority, established under the River Basins Development Authorities Decree of 1976 to develop both surface and groundwater resources, provide irrigation infrastructure, and monitor water quality.

Despite the formal architecture, governance is weak in practice. Regulatory institutions often suffer from underfunding, overlapping mandates, and poor enforcement of environmental standards (e.g., wastewater discharge, oil-pollution remediation). These institutional weaknesses create a governance vacuum, which allows both extractive actors and informal local actors to exert considerable influence over water access and quality.

Further complicating the institutional terrain is the Niger Delta Development Commission (NDDC), a federal agency created in 2000. Among its functions are designing and implementing infrastructure projects, including water supply, in oil-producing communities (Ibaba, 2010). However, critics argue that the NDDC has not fully fulfilled its mandate, citing environmental degradation and poor service delivery (Foundation for Partnership Initiatives in the Niger Delta, 2021).

Pollution dynamics and the role of extractive industries. International oil companies and domestic operators are central to the water governance challenges in the Niger Delta. Their operational practices like oil spills, pipeline leaks, and inadequate maintenance have been identified as major sources of chronic water contamination. An Amnesty International investigation found that rivers, creeks, and wetlands are routinely polluted by oil discharges, dumped drilling waste, and untreated wastewater, severely compromising water quality (Amnesty International, 2018).

Studies also highlight how wastewater from oil operations, along with gas flaring and industrial effluents, exacerbates the degradation of both surface and groundwater systems (Nriagu et al., 2016). In some communities, the very groundwater that residents rely on for drinking is polluted with petroleum hydrocarbons, heavy metals, and other toxic substances, turning the "safe" water sources into a public health hazard.

In response, some oil companies have implemented remediation and compensation measures. For example, they may provide boreholes or water

trucks to affected communities. But according to scholars, these are often temporary stopgaps that fail to address root-cause pollution or long-term water treatment (UNEP, 2011; Sam et al., 2018; Amnesty International, 2020).

Public health and socioeconomic implications. The contamination of water in the Niger Delta has profound public health and socioeconomic impacts. In Ogoniland, UNEP's assessment linked high levels of hydrocarbons in drinking water to elevated risk of cancers, respiratory problems, and other chronic illnesses. The report also reviewed over 5,000 medical records and conducted community surveys, revealing widespread exposure pathways (UNEP, 2011).

Recent socioeconomic research corroborates these findings: many residents report that contaminated water sources force them to rely on more expensive alternatives, such as water sold in tankers, which imposes significant financial burdens (Zabbey et al., 2024). In the same communities, more than three-quarters of respondents in focus group discussions admitted that they do not treat water before use, often because they cannot afford treatment or because they mistrust local "clean" sources (Sam & Zabbey, 2024).

The economic consequences also compound: falling fish yields, loss of agricultural productivity, and health-related loss of labor contribute to deepening poverty in already marginalized communities. The combination of environmental degradation and limited institutional response reinforces cycles of vulnerability and exclusion.

Governance gaps and the basis for hydro-hegemonic control. The interplay of powerful extractive actors, weak enforcement, and fragmented governance creates conditions for what can be described as hydro-hegemonic control at the subnational level. Dominant actors, particularly oil companies, leverage their material, political, and economic power to influence water access and governance. For instance, by controlling the sources of "clean" water (e.g., boreholes) and selectively providing mitigation measures, these actors exert de facto control over local water security.

At the same time, state actors (through weak regulatory institutions) often lack the capacity or will to hold polluters fully accountable. Meanwhile, local elites, informal power brokers, and traditional authorities sometimes mediate access to water in ways that reproduce inequities, particularly when formal governance fails to deliver (Zeitoun & Warner, 2006). These dynamics generate exclusionary outcomes: while formal legal entitlements to water may exist, everyday lived realities frequently diverge from these norms, especially for the most marginalized.

Key actors in hydro-hegemony in the Niger Delta

International oil companies and domestic operators remain central to the water governance dynamics of the Niger Delta. Multinational corporations (e.g., Shell) operate legacy and active infrastructure in Ogoniland and other parts of the Delta. Their activities directly affect water quality through spills, leaks, and discharges, but they also influence remediation via clean-up contracts, infrastructure provision, and employment. Hydrocarbon Pollution Remediation Project (HYPREP), a key federal initiative tasked with clean-up, is funded, in part, by the joint-venture partners of the Shell Petroleum Development Company of Nigeria Limited (Stakeholder Democracy Network [SDN], 2021). These joint-venture partners not only control polluting infrastructure, but also manage mitigation efforts, including the provision of potable water, shoreline cleaning, and livelihood restoration. HYPREP reports suggest that "50 Simple Risk Sites have been remediated and certified by … NOSDRA," and that shoreline cleanup and mangrove restoration are underway (Nwaoku, 2025). Such control over remediation channels gives oil companies a form of de facto governance influence in water that extends beyond production to environmental recovery.

State institutions, regulatory agencies, and remediation bodies. A complex institutional architecture governs water and pollution in the Delta. Key among these are:

– National Oil Spill Detection and Response Agency (NOSDRA), which was established to monitor spills, enforce environmental standards in the petroleum sector, and certify remediation sites (Federal Republic of Nigeria, 2006).

– HYPREP, which was formed under the Ministry of Environment to implement the recommendations of the UNEP Ogoniland assessment. Its mandate includes environmental cleanup, water provision, community health, and sustainable livelihoods (Hydrocarbon Pollution Remediation Project, 2026).

– Federal Ministry of Environment, which supervises HYPREP, sets regulatory policy, and is responsible for long-term environmental governance.

However, gaps still persist. Civil society groups like the Stakeholder Democracy Network (SDN) have raised concerns about weak transparency, slow remediation, and insufficient ecological restoration. In particular, SDN reported that many "corrective actions and extended monitoring periods" were needed for remediation lots where contaminant levels remained high (SDN, 2021). Moreover, in December 2023, UNEP closed its formal

technical assistance to HYPREP after five years, signaling a transition to wholly national leadership for the cleanup (UNEP, 2023).

Local communities, traditional authorities, and civil society. Local communities in the Niger Delta are not passive victims; they are active participants in the water governance arena, although often with limited power. Civil society organizations, such as SDN, have played a vital role in monitoring remediation, holding HYPREP and NOSDRA accountable, and building capacity in community-based water governance (Stakeholder Democracy Network [SDN], n.d.).

Traditional authorities and grassroots groups mediate how water and its restoration are experienced on the ground. For example, community leaders have publicly lamented the slow pace of clean-up and the limited reach of potable water delivery. In *Al Jazeera*'s reporting by Saint (2022), a former ruler of the Bomu community noted, "the contaminated streams are our source of water supply … we go there to fetch water to drink."

Youth and militant groups also shape the political economy of resource control. The Ijaw Youth Council remains an influential sociopolitical actor in the Niger Delta, historically advocating for greater resource control, environmental justice, and political inclusion (Obi, 2010). In some areas, local vigilante or militant groups (e.g., the Niger Delta People's Volunteer Force) exert de facto control over both oil infrastructure and local political bargaining, although their role in water governance is more indirect (via resource politics rather than formal water service delivery) (Akinwale, 2020).

Power dynamics in water control

Forms of power: material, structural, and ideational. In the Niger Delta, power over water and environmental remediation is exercised in multiple, interlocking forms, reflecting the complex political economy of resource control:

– Material power: oil companies hold substantial material power through direct control over oil infrastructure (pipelines, flow stations, and wells). This control has a direct bearing on water quality, as oil spills and gas flaring contaminate rivers, creeks, and groundwater relied upon by communities. Material power is not limited to destructive capacity; corporations also wield positive material influence by funding remediation projects, drilling boreholes, installing water treatment facilities, or subcontracting local actors to manage water access. For example, HYPREP's remediation efforts are largely contingent upon funds from corporate partners, highlighting how material resources translate into influence over both environmental and social outcomes.

– Structural power emerges through formal institutions that set the rules, standards, and enforcement mechanisms governing water and environmental management. In the Niger Delta, state agencies such as the HYPREP, and NOSDRA occupy central roles in shaping clean-up operations and water provision initiatives. However, structural power is contested and unevenly exercised. Reports from civil society organizations, including the SDN (2021), indicate bureaucratic delays, weak enforcement, and insufficient funding, which constrain the effectiveness of official remediation efforts. Local communities often perceive this structural power as distant or unresponsive, creating gaps that are sometimes filled by youth groups or local actors with informal authority.

– Ideational power operates through discourse, narratives, and framing, influencing how stakeholders perceive responsibilities, priorities, and acceptable solutions. HYPREP, for instance, emphasizes a dual mandate of environmental remediation and livelihood support in its public communications (Nwaoku, 2025), framing clean-up not only as a technical task but also a community development agenda. International actors reinforce this narrative; UNEP's 2011 Environmental Assessment recommended the establishment of a dedicated Environmental Restoration Authority and a $1 billion fund to ensure sustained remediation. Such framing underscores long-term environmental justice and positions remediation as a collective societal responsibility rather than a purely corporate or governmental obligation (UNEP, 2011). Ideational power also shapes public expectations, media coverage, and NGO advocacy campaigns, which can pressure state and corporate actors to adopt more accountable practices.

These forms of power do not operate in isolation. Material resources enable corporations to influence policy design (structural) and public narratives (ideational), for example, by funding research, commissioning reports, or shaping HYPREP's messaging around "sustainable clean-up." Conversely, ideational power, such as framing remediation as a moral and developmental obligation, can legitimize structural interventions and mobilize additional material resources from government or international donors. Structural power, in turn, can constrain or enable material and ideational actors; formal institutional endorsement of clean-up projects can expand corporate influence and reinforce community trust in remediation efforts. The dynamic interplay among material, structural, and ideational power thus creates a complex ecosystem of influence, shaping both the governance of water resources and the lived realities of affected communities in the Niger Delta.

Mechanisms of control and influence. Actors in the Niger Delta use a variety of mechanisms to maintain, exercise, or challenge control over wa-

ter resources and remediation processes. These mechanisms cut across material, structural, and ideational dimensions, shaping community access, accountability, and local governance dynamics:

– Selective remediation and mitigation*:* one key mechanism is the strategic prioritization of contaminated sites for remediation. Oil companies, in collaboration with HYPREP, decide which locations receive immediate attention based on risk assessment, cost considerations, and public visibility. High-profile sites or those categorized as medium- and high-risk tend to be prioritized, while other areas may experience delays or limited remediation efforts. NOSDRA plays a certification role, declaring certain sites safe or remediated, thereby controlling the narrative around "clean" and "unsafe" environments. The selective approach not only determines which communities benefit from remediation but also influences local perceptions of institutional responsiveness. Such decisions demonstrate how technical control is intertwined with political influence, with remediation status shaping local negotiation power and dependency on dominant actors.

– Provision of potable water as a governance instrument*:* water supply itself functions as a means of influence. HYPREP's commitment to providing potable water to Ogoni communities exemplifies how access to essential services can be politicized. By 2025, over 30 communities reportedly had access to clean drinking water, according to Nwaoku (2026). This provision is often tied to the broader clean-up agenda: communities that demonstrate cooperation with remediation initiatives or engagement with corporate/government programs are more likely to benefit from water infrastructure. In this way, water becomes both a resource and a governance tool, shaping local dependencies, reinforcing power hierarchies, and influencing how communities engage with state and corporate actors.

– Institutional gatekeeping*:* HYPREP's governance structure exemplifies institutional gatekeeping. The organization's board integrates government officials, community representatives, and corporate actors, theoretically enabling multi-stakeholder oversight. In practice, critics argue that civil society participation remains limited, and decision-making processes often favor the interests of the most powerful actors, typically multinational corporations or government agencies with funding and regulatory authority. Through its mandate and board composition, HYPREP can control the flow of information, set priorities, and determine resource allocation, thereby shaping both the procedural and substantive outcomes of water governance and remediation.

– Civil society monitoring and advocacy*:* civil society organizations (CSOs) such as the SDN play a critical counterbalancing role. Through water sampling, soil monitoring, and community engagement, they expose

gaps in clean-up efforts, document environmental hazards, and demand accountability from HYPREP and NOSDRA (SDN, 2021). Civil society monitoring serves multiple functions: it provides evidence-based assessments for advocacy, pressures institutional actors to meet performance benchmarks, and empowers local communities to negotiate access to clean water and remediation support. In doing so, CSOs transform water governance from a top-down process into a more contested and participatory arena, challenging dominant actors while reinforcing norms of environmental responsibility and justice.

These mechanisms of control, selective remediation, water provision, institutional gatekeeping, and civil society monitoring do not operate independently. They interact and reinforce each other. For example, selective remediation and potable water provision reinforce dependency on HYPREP and corporate partners, while civil society monitoring contests those dependencies and advocates for transparency. Institutional gatekeeping structures both enable and constrain the exercise of material and ideational power, while community perceptions of legitimacy and fairness influence the effectiveness of governance interventions. Together, these mechanisms illustrate a complex, multi-layered system of water control in the Niger Delta, where power, resources, and accountability are constantly negotiated among state, corporate, and local actors.

Manifestations of hydro-hegemony in the Niger Delta

Contaminated water access as a form of control. In the Niger Delta, the very presence of contamination functions as a mechanism of power and control. In many Ogoni communities, access to safe and clean water remains limited because local rivers, creeks, and wells are heavily polluted by decades of oil exploration and spills. UNEP's 2011 Environmental Assessment highlighted the severity of this contamination, noting that "floating layers of oil" coat numerous creeks and that groundwater in some wells contains hydrocarbons and other pollutants at levels harmful to human health (UNEP, 2011).

This environmental degradation is not merely an ecological problem: it also structures social and political relations. Control over remediation infrastructure, such as boreholes and potable water systems, effectively enables dominant actors like corporate entities, government agencies, and HYPREP to define who gains access to safe water and under what conditions. Access to water thus becomes a tool of negotiation and influence, reinforcing dependencies and shaping community interactions with both state and corporate stakeholders. In this sense, hydro-hegemony manifests materially: con-

trol over contaminated versus clean water reflects a tangible form of authority and leverage in local governance.

Uneven remediation and certification. Hydro-hegemony is further reinforced through selective and uneven remediation. Certification by NOSDRA signals formal recognition that a contaminated site has been remediated according to regulatory standards. However, progress in remediation is highly asymmetrical, reflecting both technical challenges and strategic prioritization.

As of August 2025, HYPREP reported that 50 "simple risk" sites have been certified as remediated, while more complex, medium-risk sites remain only partly addressed (Nwaoku, 2026). Independent monitoring by the SDN (SDN, 2021) corroborates this unevenness, revealing discrepancies in contaminant levels and prompting demands for extended monitoring or corrective action. This patchwork remediation produces differential access to safe water, with communities near fully remediated sites benefiting, while others remain exposed to hazardous conditions. Unequal remediation thus functions as a structural mechanism of hydro-hegemony, where institutions' capacity and choices determine the spatial and social distribution of environmental benefits and risks.

Governance narratives and legitimacy. Hydro-hegemony is also broadly constructed through governance narratives. HYPREP routinely frames its operations in line with UNEP's recommendations, emphasizing a dual mandate: environmental remediation and socioeconomic restoration. Public statements highlight achievements such as "tremendous successes in soil and groundwater remediation, provision of potable water, public health interventions, and sustainable livelihoods" (Nwaoku, 2026). These narratives are intended to legitimize institutional authority, foster trust, and demonstrate accountability to both the government and affected communities.

However, legitimacy remains contested at the community level. *Al Jazeera*'s reporting by Saint (2022) indicates that some residents question whether HYPREP acts primarily as a regulatory body with strong oversight or as a cleanup contractor, where accountability is limited, and technical expertise, particularly in medical or public health oversight, is insufficient. Discrepancies between institutional claims and community perceptions illustrate a tension in the ideational dimension of hydro-hegemony: narratives of success and compliance coexist with local skepticism and demands for transparency, reflecting broader struggles over environmental authority, trust, and justice.

Integrated dynamics of hydro-hegemony. Together, contaminated water access, selective remediation, and governance narratives reveal the mul-

ti-dimensional nature of hydro-hegemony in the Niger Delta. Material power (control over infrastructure and resources), structural power (institutional rules, certifications, and enforcement), and ideational power (narratives of remediation and legitimacy) operate in tandem. Communities' access to safe water is not solely determined by environmental conditions but by who controls remediation, how certification is granted, and how legitimacy is constructed and contested. The uneven distribution of benefits and risks underscores the political and economic stakes of water governance, highlighting how hydro-hegemony shapes both ecological outcomes and social relations in oil-impacted regions.

Water conflicts and local experiences

Health impacts and personal testimonies. The human consequences of polluted water in the Niger Delta are profound, with community testimonies offering stark evidence of lived vulnerability. In Bomu community, for example, a former traditional ruler told *Al Jazeera* that residents continue to rely on contaminated streams for drinking and domestic use, stating plainly that "the contaminated streams are our source of water supply … we go there to fetch water to drink." These accounts show that contamination is not an abstract environmental issue but a daily reality that shapes health, dignity, and survival (Saint, 2022).

Medical experts interviewed by *Al Jazeera* further warn that prolonged exposure to hydrocarbons and heavy metals, common in polluted Ogoni water systems, can contribute to chronic and life-threatening illnesses, including cancer, respiratory disorders, reproductive health complications, and developmental challenges for children. These risks intensify when households have no alternative water source, creating a cycle of exposure that affects multiple generations (Saint, 2022).

While HYPREP has initiated potable water interventions based on its baseline studies, the gap between policy commitments and local experience remains substantial. According to Nwaoku (2026), more than 30 Ogoni communities reportedly had access to potable water by the end of 2025, but access does not always equate to sufficiency, reliability, or sustainability. Some systems face challenges related to maintenance, inconsistent supply, lack of reticulation networks, or community-level capacity to manage the infrastructure. As a result, many households continue to rely on unsafe streams and shallow wells, demonstrating that remediation without holistic water governance leaves crucial needs unmet.

Livelihood disruption and environmental justice. Oil pollution has fundamentally reshaped the economic landscape of the Niger Delta, partic-

ularly in communities whose livelihoods are anchored in fishing, farming, and artisanal activities. UNEP's (2011) assessment clearly states that "fish tend to leave polluted areas … the fisheries sector is suffering due to the destruction of fish habitat," confirming what local fisherfolk have long reported: dead creeks mean dead livelihoods. The disappearance of once-abundant species, coupled with the destruction of mangroves and spawning grounds, has pushed many fishing households into poverty.

Farmers similarly report declining soil fertility, reduced crop yields, and a loss of arable land due to repeated spills and long-term contamination. These environmental changes compound economic vulnerability, forcing many, especially youths, to migrate, seek unstable informal jobs, or depend on compensation claims that are often delayed or contested.

Civil society organizations like SDN add another layer to the narrative by highlighting the disconnect between cleanup activities and actual livelihood recovery. Although HYPREP runs livelihood training, job programs, and skill-acquisition schemes, many communities argue that these initiatives are either insufficient, short-term, or fail to compensate for decades of ecological loss. Some beneficiaries receive temporary employment in remediation projects, but long-term economic security remains elusive. This gap reflects broader concerns about environmental justice, where remediation addresses symptoms but not necessarily the structural inequities that reproduce economic hardship.

Conflict dimensions: power, participation, and exclusion. Water-related conflict in the Niger Delta manifests in both visible and subtle forms, rooted in struggles over access, resource control, legitimacy, and local participation. Ongoing negotiations between communities, HYPREP, oil companies, and government agencies often revolve around who benefits from potable water systems, whose lands are prioritized for remediation, and who is included in decision-making processes.

Local leadership structures such as traditional rulers, youth groups, and community development committees, play influential but sometimes contested roles. In some cases, local leaders facilitate equitable distribution of water or compensation resources. In others, accusations of favoritism, exclusion, or political interference emerge, generating intra-community tensions.

Beyond local structures, broader political actors also influence water governance. Groups like the Ijaw Youth Council continue to pressure state and corporate actors on issues of environmental justice, resource control, and autonomy. Although not directly involved in everyday water distribution, their advocacy signals enduring regional grievances about environmental neglect and the unequal distribution of oil wealth.

These dynamics reflect that water conflict in the Niger Delta is not simply a matter of scarcity or contamination; it is deeply embedded in power relations, including such questions as:

– Who speaks for the community?
– Who negotiates with external actors?
– Whose claims are recognized or marginalized?
– Who ultimately controls the benefits of remediation and water provision?

In this sense, water conflict intertwines with ethnic politics, youth mobilization, environmental activism, and broader contestations around governance and state legitimacy. Hydro-hegemony becomes localized, reproduced through everyday decisions about whose water gets cleaned, whose land gets certified, and whose voices shape remediation policy.

Strategies used by dominant actors to maintain control

Strategic remediation prioritization. Remediation in Ogoniland is not only a technical process but also a political and strategic one. Dominant actors, particularly oil companies and HYPREP, often sequence clean-up activities in ways that reflect both risk classification and political incentives. While official statements indicate that "simple-risk" sites have been certified more quickly, medium and high-risk complex sites remain in various stages of partial remediation (Nwaoku, 2025).

This uneven prioritization shapes patterns of power and resource access. Communities near certified sites can claim safer water and often receive more immediate benefits such as water infrastructure or livelihood programs. Meanwhile, communities around complex, heavily polluted sites wait much longer, sometimes with no temporary water alternatives. Such selective sequencing reinforces unequal geographies of environmental safety, giving dominant actors the ability to influence:

– Where clean-up visibility is highest.
– Which communities receive early political appeasement.
– Where grievances remain contained or deferred.

In effect, remediation becomes a spatial tool of control, allowing corporate and state actors to manage risk, maintain legitimacy, and strategically allocate benefits.

Water provision as a governance tool. The installation of potable water systems such as treatment plants, boreholes, and distribution networks, goes beyond public service delivery; it is also a governance instrument. By early 2025, HYPREP reported that at least 30 Ogoni communities now have access to drinking water systems (Nwaoku, 2025). Although these

systems address an urgent humanitarian need, they also serve political functions. Water infrastructure is symbolic capital: a visible sign that clean-up is "working," even when complex sites remain contaminated. This allows remediation actors to claim progress, reduce scrutiny, and negotiate legitimacy with skeptical communities.

At the community level, water provision helps manage discontent and reduce the likelihood of protest or disruption. When a basic need is met, communities may become more cooperative or less confrontational toward remediation timelines. Thus, water becomes a tool for stabilizing political relationships, shifting local narratives from "neglect" to "intervention," and reinforcing the role of HYPREP and its partners as indispensable providers rather than contributors to the original pollution.

In this sense, the provision of water, which is anything but neutral, enables dominant actors to manage political risks, reinforce their authority, and influence how communities perceive the clean-up process.

Institutional gatekeeping and co-governance. While HYPREP's board and governance frameworks formally incorporate government representatives, oil companies, stakeholders, and technical experts, the distribution of power among them is far from equal. Critics argue that civil society organizations and grassroots community voices, though present, have limited impact on core decisions such as selecting which sites to remediate first, allocating contracts, or setting performance benchmarks (SDN, 2021).

This inequality reflects a form of institutional gatekeeping, where participation exists in form but not always in substance. By controlling agenda-setting spaces, documentation flows, and technical decision-making, dominant actors retain the ability to steer the clean-up's direction even under a banner of "collaborative governance."

Through this structure, HYPREP functions not only as an implementer but also as a political mediator, balancing state interests, corporate priorities, and community expectations, yet often with a tilt toward those who hold financial and regulatory power. Gatekeeping ensures continuity of influence: even as remediation progresses, the fundamental power hierarchy embedded in the institution remains intact.

Civil Society Oversight and Resistance

Despite these structural imbalances, civil society actors, especially the SDN, play an important counter-hegemonic role. SDN's monitoring program trains community-based monitors to collect water and soil samples, track remediation activities, evaluate contractor performance, and report inconsistencies. Their findings have frequently highlighted:

– Sites where contamination remains above regulatory thresholds.
– Failures in contractor compliance.
– Delays in remediation.
– Discrepancies between official claims and on-the-ground realities.

This independent documentation challenges dominant narratives of progress and forces institutional actors like HYPREP and NOSDRA to address oversight gaps, reopen sites, or revise remediation plans. Civil society thus acts as an accountability engine, exposing weaknesses in implementation and demanding greater transparency, community consultation, and scientific rigor.

In a broader sense, SDN and other NGOs disrupt hydro-hegemonic dynamics by empowering communities with information, transforming them from passive recipients of remediation to informed actors capable of questioning and reshaping its trajectory.

Implications for water governance and environmental justice

Persistent governance gaps and institutional weakness. Although the clean-up process has been formalized through HYPREP and regulatory oversight is mandated through NOSDRA, significant governance gaps remain. Remediation continues to be uneven, and many contaminated sites do not receive equal attention or timely intervention. Limited financial and technical resources further weaken the capacity of institutions responsible for ensuring accountability and environmental quality. These constraints contribute to persistent public skepticism, as civil society organizations and local communities frequently question the accuracy of remediation timelines and the effectiveness of the clean-up measures.

These governance weaknesses open space for hydro-hegemonic control. In such settings, actors with political or economic influence are able to shape the direction, pace, and priorities of the clean-up process. Instead of responding directly to community needs, the remediation agenda can become aligned with the interests of more powerful stakeholders, thereby sustaining patterns of exclusion and marginalization.

Equity and access risks. The selective and uneven distribution of clean water systems and remediation projects carries serious equity implications. Communities that are better mobilized, more visible to state institutions, or positioned in politically strategic locations often receive faster access to potable water or benefit from more comprehensive remediation. Meanwhile, other settlements with equal or greater environmental needs remain overlooked and continue to face the consequences of long-term pollution.

This situation is particularly troubling in a region already defined by deep social and economic disparities. If water provision and remediation continue to follow unequal political and administrative patterns, the clean-up process risks reproducing the very inequalities it is meant to address. As a result, environmental justice becomes compromised, and vulnerable communities remain locked in cycles of deprivation and insecurity.

Human security and long-term sustainability. Water governance in the Niger Delta has direct implications for human security. Exposure to contaminated water increases the burden of disease, disrupts livelihoods such as fishing and farming, and intensifies social tensions within and between communities. When remediation is inconsistent and clean water delivery is unreliable, the broader security environment deteriorates, undermining the resilience of already fragile populations.

Sustainability becomes even more precarious when water provision is not linked to comprehensive environmental restoration. Clean water delivered today will not remain safe or accessible tomorrow if pollution continues or if the ecological systems that support the region remain degraded. Long-term sustainability therefore requires a coherent approach that combines public health protection, ecological rehabilitation, and transparent governance.

The need for transformative governance models. The complex hydrohegemonic dynamics in Ogoniland stress the need for governance models that not only manage pollution but also transform the power relations that determine water access and environmental decision-making. Achieving this transformation requires several critical elements.

First, civil society participation must be strengthened. Community monitors, advocacy groups, and local leaders should have a clear role in decision-making, including active representation on key committees within HYPREP and related institutions. Second, independent environmental oversight should be institutionalized to ensure that monitoring and evaluation processes remain free from political or corporate influence. Third, remediation standards must be guided primarily by public health objectives rather than minimal compliance thresholds or cost saving considerations. Finally, water provision infrastructure should be designed and implemented in direct connection with long-term ecosystem restoration plans, ensuring that potable water access is supported by healthier and more resilient natural systems.

Together, these measures point toward a more equitable, transparent, and sustainable approach to water governance and environmental justice in the Niger Delta.

Towards a conflict-sensitive water governance framework

Principles for reform. Developing a conflict-sensitive framework for water governance in the Niger Delta requires embedding several core principles that address both environmental and socio-political dimensions:

– Equity*:* governance frameworks must ensure that access to potable water and benefits from remediation are distributed fairly across communities, regardless of political influence or geographic location. Equity also entails prioritizing historically marginalized communities and monitoring outcomes to prevent unintended disparities.

– Participation*:* genuine inclusion of local communities, civil society organizations, youth groups, and traditional authorities in decision-making processes strengthens legitimacy and trust. Participation must go beyond consultation to grant meaningful input in planning, prioritization, and oversight of remediation projects.

– Transparency*:* open and accessible data on remediation progress, water quality, and site certification is essential. Transparency allows communities to verify claims, monitor compliance, and engage constructively with both state and corporate actors.

– Sustainability*:* governance must focus on long-term ecological restoration rather than temporary or stop-gap solutions. Sustainable approaches integrate clean water provision with habitat restoration, pollution prevention, and resilient infrastructure capable of withstanding future environmental stressors.

– Accountability*:* mechanisms should be in place to sanction negligence, repair failures, and enforce regulatory standards. Accountability ensures that actors responsible for clean-up, including corporations and government agencies, cannot disregard obligations without consequences, thereby reducing opportunities for hydro-hegemonic control.

Institutional recommendations. To operationalize these principles, the following institutional reforms are proposed:

– Implement HYPREP governance reform*:* reconstitute the governance structure to increase representation from affected communities, civil society organizations, and independent environmental experts. Decision-making should be participatory and responsive to local priorities.

– Strengthen NOSDRA*:* enhance the technical, financial, and legal independence of the National Oil Spill Detection and Response Agency to ensure it can enforce environmental standards without undue influence from government or corporate actors.

– Establish an environmental restoration authority*:* following UNEP's recommendations (UNEP, 2011), a dedicated body should oversee all re-

mediation activities, with stable funding, monitoring authority, and enforcement powers to ensure effective implementation.

– Form a civil society-led monitoring body*:* create a legally mandated body to oversee sampling, reporting, and evaluation of remediation progress. This would institutionalize community engagement and increase transparency, enabling public scrutiny and informed advocacy.

– Upgrade policy and regulation*:* review and revise remediation thresholds, for example, total petroleum hydrocarbons in soil, to align with the applicable Nigerian regulatory standards or documented UNEP benchmarks, ensuring that public health is the guiding criterion.

Community-level strategies. Community engagement and empowerment are critical to sustainable water governance:

– Local monitors*:* expand and formalize the role of community-based monitors, including civil society organizations, youth groups, and traditional leaders, in routine water and soil testing. Training and resources should be provided to ensure accuracy and consistency.

– Public health integration*:* tie water governance to public health initiatives such as mobile clinics, waterborne disease surveillance, and health education campaigns. Linking environmental management to health outcomes reinforces the social relevance of remediation.

– Livelihood restoration*:* strengthen programs that restore traditional livelihoods such as fishing, farming, and small business development, through co-designed projects with sustained funding. Programs should combine skills training, employment opportunities, and ecosystem rehabilitation to promote long-term economic and social resilience.

– Sustainable water infrastructure*:* scale up potable water provision in a manner directly tied to clean-up operations, incorporating long-term maintenance plans and ensuring community ownership of the infrastructure.

Conclusion

This chapter has demonstrated that water governance in the Niger Delta is deeply intertwined with power, resource extraction, and environmental injustice. Through the application of a hydro-hegemony framework at the subnational level, it becomes evident that control over water extends beyond questions of contamination and clean-up. Instead, it is a multi-layered process that involves determining who governs, who benefits, and who remains marginalized or excluded from decision-making and resource access.

The analysis reveals a complex interplay among key actors, including multinational oil companies, state agencies such as HYPREP and

NOSDRA, civil society organizations, and local communities. Oil companies exert material and structural influence through control of infrastructure and financial resources, which allows them to shape both remediation priorities and narratives around progress. State agencies, while formally tasked with oversight and remediation, often operate within constraints of limited capacity, competing interests, and institutional gatekeeping, which can reinforce inequities in water access. Civil society actors, particularly trained community monitors, function as crucial counterweights by documenting contamination, monitoring clean-up, and demanding transparency and accountability. Local communities, meanwhile, navigate these dynamics through both formal engagement and informal strategies, highlighting how water governance is inseparable from broader social, political, and economic contestations.

A key insight from this chapter is the uneven and selective nature of remediation and water provision. The prioritization of "simple-risk" sites, delayed remediation of complex or high-risk areas, and selective provision of potable water systems reveal how hydro-hegemonic dynamics operate in practice. These patterns exacerbate existing social inequalities, as communities with greater political leverage or visibility gain earlier and more comprehensive access to clean water and remediation benefits, while more marginalized groups remain exposed to contamination and associated health and livelihood risks.

The chapter further underscores the importance of integrating water governance with human security and environmental sustainability. Long-term health outcomes, livelihood restoration, and ecosystem rehabilitation are deeply intertwined with equitable access to water and effective remediation. Clean-up efforts that focus solely on technical compliance, without addressing institutional accountability, community participation, and ecological restoration, risk producing only temporary improvements, leaving communities vulnerable to future environmental and social stressors.

Achieving conflict-sensitive and just water governance in the Niger Delta therefore requires comprehensive reform. This entails institutional transformation, such as strengthening the independence and capacity of oversight agencies, rebalancing representation within HYPREP governance structures, and embedding civil society in meaningful monitoring and decision-making roles. It also necessitates sustainable, long-term water and ecosystem management strategies, linking potable water provision to broader ecological restoration and livelihood initiatives.

Ultimately, this chapter highlights that water governance is both a technical and deeply political endeavor. The Niger Delta's experience illustrates how environmental remediation and resource control are inseparable

from questions of power, equity, and justice. Addressing hydro-hegemonic control through reform, transparency, and community empowerment is not only critical for restoring safe water and healthy ecosystems, but also essential for fostering social stability, environmental justice, and sustainable development in one of Nigeria's most polluted and vulnerable regions.

This subnational application of hydro-hegemony also prepares the transition to the South African chapters. In all three cases, water governance is not only a question of supply or infrastructure, but also of authority, accountability, and the unequal capacity of communities to influence decisions that affect access to safe water.

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Chapter 9

MUNICIPAL WATER GOVERNANCE AND LOCAL INSTABILITY IN SOUTH AFRICA

Introduction

The governance of municipal water services in South Africa presents a complex, multifaceted challenge, deeply intertwined with the country's legacies and contemporary socio-political dynamics. Despite possessing significant water infrastructure, South Africa is a water-scarce and predominantly semi-arid country in which effective management and equitable distribution remain elusive, particularly at the municipal level, where service delivery failures have become a persistent source of public discontent and social unrest. In 2022, about 82.4% of households in South Africa had access to piped water inside their dwelling or yard, 8.9% had piped water outside their yard, and 8.7% had no access to piped water. Access to piped water varies by province. For instance, 85.5% of households in the Western Cape have piped water inside their dwellings, compared to 49.5% in the Eastern Cape, while in Limpopo, the figure is only 31.4% (Statistics South Africa, 2022).

This chapter situates itself within a growing body of scholarship that highlights the critical role of water governance as both a technical and political process shaped by institutional capacity, community participation, and broader policy frameworks (Pahl-Wostl, 2009; Chiwarawara, 2022; Dugard, 2023; Adom & Simatele, 2024).

South Africa's water governance challenges cannot be disentangled from its apartheid history, which entrenched spatial and racial inequalities in access to basic services, including water (McDonald, 2009). The post-apartheid era has seen several policy reforms aimed at redressing these inequities, notably through the 1998 National Water Act ("National Water Act," 1998) and the establishment of catchment management agencies. However, these reforms have often been undermined by institutional fragmentation, limited municipal capacity, and inadequate coordination among stakeholders (Molobela & Sinha, 2011; Adom & Simatele, 2024). The failure to effectively integrate water governance with local socioeconomic realities has exacerbated tensions, particularly in rapidly urbanizing areas where infrastructure is strained and vulnerable communities face inconsistent service delivery (Matsiliza, 2024; Ishola et al., 2025).

Community engagement emerges as a pivotal dimension in understanding the failures of water governance. Exclusionary decision-making processes not only perpetuate historical marginalization but also erode public trust in local authorities, thereby fostering a climate of mistrust and resistance (Booysen, 2011; Kaziboni, 2024). This erosion of trust is consequential, as it diminishes the prospects for collaborative governance and often fosters protests and conflict over water access (Alexander, 2010; Matebesi, 2017). The chapter's empirical focus on case studies from diverse municipal contexts provides granular insights into how these dynamics unfold on the ground, revealing the interplay between governance structures, service delivery, and community responses.

The chapter underscores the imperative of policy coherence in water governance. It argues that aligning water management strategies with broader socioeconomic and environmental objectives is essential to foster sustainable and equitable outcomes. In this regard, it entails not only technical and institutional reforms but also a reimagining of governance paradigms that prioritize inclusivity, transparency, and adaptive capacity in the face of climate change and local government challenges. By critically engaging with these dimensions, the chapter contributes to an understanding of how municipal water challenges in South Africa are both a symptom and a driver of local instability, with implications for governance and social cohesion.

Water management and protests: theoretical insights

Theoretical perspectives on water management provide a critical foundation for understanding the persistent issues of poor municipal service delivery and community protests in South Africa. These challenges are not isolated technical failures, but are deeply rooted in the socio-political and institutional dynamics highlighted by the theoretical overview that follows.

Political ecology and power dynamics. Political ecology explains that failures in water service delivery often reflect entrenched power imbalances and socioeconomic inequalities (Oskam et al., 2021). In South Africa, as in many developing countries, municipalities, serving as frontline water service providers, frequently struggle with limited resources and political interference, which can marginalize vulnerable communities. When communities perceive exclusion from decision-making or unfair distribution of water services, protests emerge as expressions of resistance against systemic inequities (Nleya, 2011; Swatuk, 2019; Ntwana & Naidoo, 2024). These protests underscore the ongoing struggle over water as a political and social resource, rather than merely a commodity.

Political ecology frames water management as inherently political, focusing on how power relations, historical legacies, and socioeconomic inequalities shape access to and control over water resources (Oskam et al., 2021; Daher, 2022). Water service delivery remains uneven and contested in South Africa due to historical legacies and spatial inequalities. For instance, the apartheid regime institutionalized racial segregation and unequal resource allocation, including water infrastructure. White communities received substantial investment, while black communities were systematically neglected (Sutherland et al., 2014; Rodina & Harris, 2016; Mokoena, 2022). These spatial inequalities persist today. Political ecology highlights how these historical injustices are perpetuated through contemporary governance structures, where municipal budgets and priorities often favor wealthier areas (Mkhwanazi & Jili, 2024), reinforcing exclusion and fostering protests.

As water governance involves multi-scalar power dynamics – from national policies to local municipalities and informal community arrangements – the political ecology framework examines how power operates across these scales, revealing conflicts between centralized state control and local community needs. As a strategic resource tied to economic and political power, municipalities, local elites, and political actors may control water distribution to consolidate their influence, which can sometimes lead to corruption, patronage, or clientelism (Matebesi, 2023). Communities excluded from these power networks experience service delivery failures as a form of marginalization. In this regard, protests against municipalities can be understood as a critical mechanism for marginalized groups to challenge these power asymmetries, assert their rights and demand redress (Masiangoako et al., 2022; Rodina et al., 2024).

Integrated Water Resources Management (IWRM) is a globally endorsed approach aimed at promoting the coordinated development and management of water, land, and related resources to maximize economic and social welfare equitably without compromising the sustainability of vital ecosystems (Global Water Partnership, 2000; Biswas, 2004). It emphasizes participatory governance, integrating multiple stakeholders across sectors and scales to address the complex interdependencies of water use and to balance competing demands among agriculture, industry, domestic consumption, and environmental needs (Savenije & van der Zaag, 2002, 2008; Mitchell, 2005). By fostering holistic and adaptive management frameworks, IWRM seeks to improve water security, reduce conflicts, and enhance resilience to climate variability and socioeconomic changes worldwide (Pahl-Wostl, 2007).

In South Africa, translating IWRM principles into effective municipal service delivery faces significant obstacles. First, while IWRM promotes

integrated and participatory water governance, its practical implementation at the municipal level faces substantial hurdles. Many municipalities lack the technical capacity, financial resources, and institutional coordination required to deliver reliable water services (Van Koppen et al., 2007, p. 14; Mathetsa et al., 2019; Dirwai et al., 2021; Nagata et al., 2022).

IWRM emphasizes inclusive decision-making that involves all water users, including marginalized communities. However, municipalities often struggle to facilitate meaningful participation due to limited resources, bureaucratic inertia, or political resistance (Galvin, 2023; Mbana & Sinthumule, 2024). This exclusion fuels community frustration, as people feel their voices are being ignored in planning and resource allocation, leading to protests that demand greater transparency and involvement (Masiangoako et al., 2022; Galvin, 2023). Generally, this gap between the ideal of stakeholder participation and the reality of top-down decision-making fuels community dissatisfaction. Poor service delivery thus reflects institutional weaknesses in translating IWRM principles into effective local governance, triggering protests that demand accountability and improved services (Nagata et al., 2022; Mabadahanye et al., 2024; Seema et al., 2025).

Additionally, IWRM aims to balance the social, economic, and environmental needs for water. In this regard, municipalities must allocate scarce water between domestic use, agriculture, industry, and ecological preservation. Such competing demands, especially in water-scarce regions, create difficult trade-offs (Lukat et al., 2022; Malima et al., 2022). The need for adequate investment in infrastructure and maintenance further exacerbates this issue as municipalities face budget shortfalls and rely on aging infrastructure (Galvin, 2023). This leads to frequent breakdowns and an unreliable supply of potable water. As a result, the inability to maintain and expand service undermines the goals of IWRM and erodes public trust (Biswas, 2008; Meran et al., 2021).

Human rights-based approach and service delivery failures. The constitutional right to water establishes a legal and moral obligation – within the framework of reasonable measures and available resources – for municipalities to provide basic water services. When municipalities fail to meet this obligation due to poor planning, corruption, and resource constraints, affected communities invoke their rights through protests and demands for redress (Republic of South Africa, 1996; Chiwarawara, 2022; Dugard, 2023). The human rights framework thus frames service delivery failures not just as technical problems but as violations of citizens' fundamental rights, thereby intensifying social mobilization (South African Human Rights Commission, 2014; Mubangizi & Mubangizi, 2025). A human-rights-based approach (HRBA) to water services delivery fundamentally

reframes water access as an inalienable entitlement, rather than a commodity or mere service (UN General Assembly, 2010). By embedding human rights principles into water governance, HRBA challenges traditional technocratic or market-driven models that often prioritize efficiency or economic returns over social justice (McDonald & Ruiters, 2012). This approach asserts that states have immediate obligations to respect, protect, and fulfill the "right to water", compelling governments to establish legal frameworks and institutional mechanisms that ensure universal, affordable, and safe access to water (Robina Ramírez & Sañudo-Fontaneda, 2018).

The HRBA to water service delivery is critical in the context of South African community protests, where inadequate access to safe and affordable water has been a central grievance.

Despite constitutional guarantees of the right to water, many townships and informal settlements continue to experience intermittent supply, poor infrastructure, and exclusion from formal service networks, fueling social unrest and protests (Muller, 2007). These protests highlight the failure of water service delivery systems to fully realize their human rights obligations, underscoring the need for governance reforms that prioritize equity and meaningful community participation (Masiangoako et al., 2022; Dugard, 2023; Rodina et al., 2024).

South African water protests often expose the tension between neoliberal water management policies and human rights imperatives (Robina Ramírez & Sañudo-Fontaneda, 2018). Efforts to implement cost recovery and privatization measures have sometimes led to water cut-offs or unaffordable tariffs for low-income households, triggering widespread resistance (Magdahl, 2022; Borgert & Ghisi, 2024). Protesters demand not only improved infrastructure but also accountability, transparency, and inclusion in decision-making processes, reflecting the core principles of the human rights-based approach (Jegede & Shikwambane, 2021; Thusi et al., 2022). These movements, often starting as sporadic protests and evolving into formalized structures when issues persist, have catalyzed public debates about the role of the state in ensuring water as a public good rather than a commodity, thereby challenging market-driven reforms that undermine universal access (Muller, 2007; Sorinel, 2011; Galvin, 2023).

The HRBA advocates for accessible grievance procedures, independent oversight, and transparent monitoring to address these governance deficits and uphold the right to water (Matsiliza, 2024; Higgs et al., 2025; Pearson et al., 2025). Strengthening these mechanisms can help transform protest energy into constructive dialogue and policy change, advancing equitable water service delivery that aligns with constitutional and international human rights standards.

Civil society struggles for water delivery in South Africa

Civil society in South Africa has played a pivotal role in the struggle for equitable water delivery, often acting as a watchdog, mobilizer, and advocate for communities.

Water boards: An institutional misnomer? One of the main struggles of civil society organizations in South Africa has been against water boards. These boards were conceptualized to address the fragmented and inequitable systems of the past and facilitate more effective management and service delivery in the post-apartheid landscape (Ngobeni & Breitenbach, 2021). Water boards serve as suppliers of water services to local authorities in most major urban regions in South Africa. These water boards oversee a substantial component of the water supply network and impact both upstream and downstream operations in this chain (Lubourt, 2010). South Africa's seven water boards are Amatola Water, Lepelle Northern Water, Magalies Water, Overberg Water, Rand Water, uMngeni-uThukela Water, and Vaal Central Water (Parliamentary Monitoring Group, 2026).

However, the effectiveness of water boards has been challenged by governance issues. Scholars such as Gutas (2025) have noted that, while water boards are responsible for large-scale water management, they often operate with limited accountability and transparency. This lack of oversight can lead to inefficiencies in resource allocation and service delivery, exacerbating the grievances of communities that depend on these services.

Corruption within water boards has emerged as a significant challenge, negatively impacting the governance and technical management of water resources. Cases of theft of funds, nepotism in contract awarding, and a lack of responsibility have been documented (Adom & Simatele, 2025). For instance, the Auditor-General has regularly commented on irregular expenditures and the failure of water boards to meet financial requirements. These results indicate structural issues with the governance structure that ultimately erode community satisfaction and public trust in water services (Auditor-General South Africa [AGSA], 2022). The impact of corruption has been particularly severe in marginalized communities such as Alexandra in Gauteng and Gugulethu in Cape Town (Chiwarawara, 2024). Many residents have reported intermittent access to clean water, leading to protests. As highlighted by Von Holdt and Naidoo (2019), community protests often stem from residents' frustration with the direct consequences of corruption and inefficiency, and with feeling neglected by the very institutions designed to serve their needs.

The manifestation of these issues is evident in protests across South Africa, where community members demand accountability, improved ser-

vices, and an end to corruption within water boards (AGSA, 2022). In response to dissatisfaction with water provision facilitated by water boards, CSOs have emerged to advocate for community rights and accountability. For instance, after a lengthy delay, the Minister of Water and Sanitation has succumbed to pressure to initiate independent investigations into allegations of corruption within water boards (Mokone, 2025).

As noted, theories of political ecology foreground power dynamics and local contexts in shaping water governance, while the IWRM complements this by promoting a holistic approach that considers water as a finite resource linking social, economic, and environmental goals (Pahl-Wostl, 2007; Biswas, 2008; Meran et al., 2021; Jalisa, 2023). However, despite their name, water boards in South Africa may be considered an institutional misnomer, as they often do not function as traditional "boards" in the decision-making sense. Instead, they primarily act as service providers rather than serving as regulatory agencies. The term "board" suggests a governance structure capable of oversight and policy-making, which may not accurately reflect the operational realities of these entities.

Similarly, while the principles of IWRM emphasize participatory governance and stakeholder engagement, water boards, given their operational focus and hierarchical structures, may not always effectively incorporate community perspectives. This raises questions about their capacity to embrace the integrative and participatory aspects of IWRM (Nagata et al., 2022; Islam et al., 2023; Swatuk & Al-Qader, 2023). This highlights the urgent need for reforms in the governance of water boards to curb corruption and restore public trust in water management systems (Scheba, 2022).

Strategic litigation and volunteerism by ratepayers' associations. In the evolving landscape of local governance, South African municipalities face persistent challenges that undermine their ability to achieve their set plans and objectives. Consequently, there has been a notable intensification of strategic litigation by ratepayers' associations, which use the withholding of municipal rates and taxes as a form of protest (May, 2010). Strategic litigation is regarded as "legal action through a judicial mechanism in order to secure an outcome, either by an affected party or on behalf of an affected party" (Van der Pas, 2021, p. 127). This process is undertaken by ratepayers' associations, which are highly formalized grassroots structures in predominantly white communities. These local associations are affiliated with a national umbrella body called the National Taxpayers Union (NTU) (May, 2010; Matebesi, 2017). Some of these associations initially form due to security concerns, gradually assuming responsibilities such as pothole repair, park maintenance, and public lighting, thereby providing services that municipalities should deliver (Rates Watch, 2025). Interestingly, NTU

does not get involved in the affairs of local associations. As a result, there are different modalities of withholding rates by these local associations.

Ratepayers' associations withhold municipal rates and taxes, deposit the funds into a trust account, and deliver services on behalf of municipalities, with a detrimental effect on the municipal revenue base (Mubangizi, 2022; Patji & Selepe, 2022; Netswera, 2024; Ramolobe & Ramaru, 2024). In particular, the literature highlights five common steps ratepayers' associations take before initiating legal action against a municipality. First, a service delivery failure is identified. In this regard, several communities in the Free State (for example, Bethlehem, Frankfort, Hennenman, and Kroonstad) and the Northern Cape (for example, Barkly West, Delportshoop, Warrenton, and Windsorton) have been withholding property rates due to the municipality's failure to provide clean drinking water (Ayele & May, 2010). Second, ratepayers' associations engage the municipality. In several case studies (Grabouw, Heilbron, and Sannieshof), ratepayers' associations demonstrated sustained engagement with municipalities to resolve service delivery failures (May, 2010; Matebesi, 2017). Third, once the municipality fails to resolve the grievance, ratepayers' associations declare a dispute in terms of section 102(2) of the Municipal Systems Act. In this regard, ratepayers' associations use declaratory orders to challenge municipal conduct, such as failures to provide basic services. Applicants must have a genuine interest in the matter, as these orders are granted at the court's discretion. For instance, in Cape Town, the South African Property Owners Association and AfriForum – a South African civil-rights organization that advocates for minority rights – challenged the City's fixed water tariffs and their decision to link certain fixed charges to property values (Tembo, 2025). Fourth, there is the withholding of payments to the municipality. During this phase, residents deposit their property rate payments into a designated trust account managed by the ratepayers' associations. The associations then provide municipalities with detailed monthly financial statements (Ayele & May, 2010). Fifth, in dire situations, ratepayers' associations utilize some of the funds collected to deliver services on behalf of the municipality (Matebesi, 2017; Mubangizi, 2022; Netswera, 2024). In sum, as Masiangoako et al. (2022, p. 98) state, "litigation is a valuable component of rights-claiming" employed by ratepayers' associations to gain access to water services.

The water wars of community activist groups. Community protests in South Africa exhibit a broad spectrum of tactics. Several case studies conducted by the author between 2005 and 2024 in the country have shown that in predominantly black communities, sporadic and fragmented actions by loosely connected groups are leading community protests. For example,

in Kuruman, a relatively large town in the Northern Cape province of South Africa with 22 surrounding villages, protests in 2014 began over the poor state of the roads. Several other demands, including the provision of potable water, were also raised by the protesters. This protest affected more than 16,000 learners, as parents in the area prevented them from attending school for more than eight months (Matebesi, 2017).

Regarding the community protests in post-apartheid South Africa, the Ficksburg protest ranks among the most notable. The roots of the Ficksburg water crisis can be traced back to early 2011, when the community experienced severe water shortages. The residents of Meqheleng, a black neighborhood near Ficksburg, had to walk long distances with buckets and wheelbarrows to collect drinking water. While the Setsoto Local Municipality claimed the water crisis was caused by the drought, which hit the region at the time, many residents interviewed stated that it is indicative of a municipality lacking long-term planning for critical infrastructure and services.

On 13 April 2011, Meqheleng residents marched to the Setsoto Local Municipal offices. Andries Tatane, a teacher and community activist, was brutally killed by the police – an event broadcast live on television during the prime-time evening news ("Who was Andries," 2011). The protest followed after several failed attempts to engage peacefully with the Setsoto Local Municipality over the erratic water supply to Meqheleng and other grievances (Matebesi, 2017). This was a tragic and highly publicized event in South Africa that drew widespread condemnation both nationally and internationally. This event exposed deep issues related to police brutality, protest policing, and the broader social unrest stemming from service delivery failures.

Conclusion

Despite being endowed with significant water resources, South Africa faces water governance challenges that lie at the heart of social instability in many communities, resulting from deep-rooted power imbalances and structural inequalities in access to this vital resource. While the IWRM offers a framework for more inclusive and sustainable governance, its principles often remain aspirational in practice, hindered by bureaucratic inefficiencies and limited accountability of municipalities and water boards.

As shown above, these institutions frequently operate in ways that reinforce existing inequalities, marginalizing vulnerable populations and failing to address their urgent needs. As a result, protests have become one of the few means for communities to voice grievances and demand access to wa-

ter. The live televised shooting of Andries Tatane remains a powerful and painful reminder of the consequences of systemic failures in governance and law enforcement.

The political ecology perspective reveals that poor municipal water services delivery and community protests are deeply rooted in historical imbalances and ongoing struggles over resource control and social justice. Meanwhile, the challenges of implementing IWRM at the municipal level in South Africa expose institutional weaknesses, capacity deficits, and participation gaps that undermine equitable and sustainable water governance. Addressing these intertwined issues requires not only technical and financial solutions but transformative governance reforms that redistribute power, enhance institutional effectiveness, and empower communities.

The next chapter examines a different response to related concerns about state capacity and trust. Whereas this chapter focuses on protest and instability under municipal failure, the Orania case explores localized self-management and infrastructural autonomy as another possible, though politically specific, reaction to unreliable water governance.

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Chapter 10

HYDROPOLITICS AND MINORITY AUTONOMY: ORANIA AND AFRIKANER CIVIL SOCIETY ORGANIZATIONS

Introduction

Water scarcity constitutes one of the fundamental structural constraints on South Africa's economic and social development. With average annual precipitation of approximately 450–500 mm – nearly half the global mean – the country is inherently dependent on engineered water systems such as dams, inter-basin transfers, and large-scale irrigation schemes (Nnadozie, 2011; Tempelhoff, 2017). In such environments, water security is primarily a function of infrastructure, institutional capacity, and long-term planning, rather than redistribution alone. Contemporary debates on water inequality and minority autonomy must be situated within this structural reality of limited per capita water availability. At the same time, South Africa's political history has profoundly influenced who has access to reliable water services. This chapter explores how historical legacies and current governance challenges have driven some minority Afrikaner communities to seek local autonomy in water provision. The analysis first reviews the apartheid-era water development model and its inequities, then examines post-1994 reforms and their outcomes, and finally discusses Afrikaner initiatives – exemplified by the town of Orania and civil society groups like Solidariteit (Solidarity) and AfriForum – to secure water and infrastructure in the face of state shortcomings. Throughout, the emphasis is on a neutral, evidence-driven assessment of how water scarcity, race-based redistribution policies, and declining state capacity intersect with Afrikaner self-reliance efforts in post-apartheid South Africa.

Historical context: water and racial inequality under apartheid

During the apartheid period (1948–1994), water governance in South Africa was explicitly centralized and infrastructure-driven. The 1956 Water Act enabled state-led hydraulic planning synchronized with industrial and commercial agricultural development (Tempelhoff, 2017). Between the 1950s and 1980s, the state invested heavily in dams, reservoirs, and inter-

basin transfer schemes. A flagship effort was the Orange River Project, approved in 1962, which entailed the construction of the country's two largest dams: the Gariep Dam (completed 1971, maximum storage capacity ~5,340 million m³) and the Vanderkloof Dam (completed 1977, capacity ~3,200 million m³) on the Orange River. These and other projects significantly expanded the country's regulated water capacity, following global hydraulic paradigms similar to those implemented in the United States, Western Europe, and the Soviet Union.

By the mid-1990s, South Africa had constructed an extensive network of water infrastructure. For example, out of 282 large dams (defined by the International Commission on Large Dams as dams with a height of 15 m or more from the foundation, or between 5 and 15 m with a reservoir capacity exceeding 3 million m^3) in the country, 253 were built before 1994, compared to only 29 built in the post-apartheid era (Greyling, 2025). Total reservoir storage increased dramatically under the apartheid government: between 1964 and 1994, the government added roughly 22,000 million m^3 of dam capacity to national supply, a figure far exceeding the mere ~1.7 billion m³ added in the three decades after 1994 (Daily Investor, 2023).

This infrastructure-centric approach ensured that by the end of the apartheid era South Africa's water storage per capita was among the highest in SSA, albeit serving populations in a highly uneven manner. Access to these modern water services was distributed extremely unequally along racial lines. White-owned commercial farms, urban centers, and industrial zones received reliable water deliveries and benefitted from massive irrigation schemes. For instance, large-scale projects like the Vaalharts irrigation scheme (one of the world's oldest and largest, located in a white farming area) and the Orange River Project provided dependable water to white farmers cultivating high-value crops.

In contrast, African rural communities, particularly those relegated to "homelands" under apartheid, saw minimal state investment in water infrastructure. Many homeland areas lacked large dams or bulk water schemes; they continued to rely on rain-fed agriculture and rudimentary sources. This outcome reflected political priorities rather than an absolute technological incapacity. Notably, one of the few sizable dams in a homeland, the Mthatha Dam in the Transkei (completed 1977, ~254 million m³ capacity), was built primarily to supply the homeland's capital city, while vast rural hinterlands remained without treated water. By 1994, an estimated one-third of South Africa's population – virtually all of them black, mostly in rural areas – still had no access to safe drinking water on site (Nnadozie, 2011). The majority of rural black households depended on rivers, springs, or commu-

nal boreholes, in stark contrast to the piped water systems serving white suburbs and farms.

Indeed, apartheid's separate development policies created what some scholars have termed a form of "water apartheid," wherein water scarcity for black communities was not merely a function of aridity but was institutionally imposed through exclusion (Kaziboni, 2024). In many homeland areas, colonial and apartheid policies restricted capital investment and state-supported irrigation development, leaving rural communities dependent on rain-fed agriculture and small-scale water sources. Later this made state-led hydraulic expansion decisive in determining regional water security. In sum, apartheid South Africa achieved impressive feats of water engineering, but the benefits were deliberately concentrated: modern water infrastructure became another lever of racial privilege, with more reliable access for white urban and commercial agricultural users, and systematically inferior access for many black rural communities. This legacy of inequitable water distribution set the stage for the post-1994 government's agenda of redress, but also left a foundation of infrastructure that the new nation would continue to depend upon for decades.

Post-apartheid water reforms and structural constraints

After 1994, the democratic government undertook comprehensive legal reforms aimed at redressing historical inequalities in water access. The Constitution of the Republic of South Africa (Act 108 of 1996) enshrined the right "to have access to sufficient water" as a justiciable socioeconomic right (Republic of South Africa, 1996, sec. 27). In alignment with this mandate, the National Water Act of 1998 abolished the race- and land-ownership-based water rights of the past, declaring water a public resource to be allocated in the national interest. The companion Water Services Act of 1997 established a framework for delivering basic water and sanitation services to all communities, including a policy (from 2001 onward) of providing a free basic water allowance (6,000 liters per household per month) to indigent households (Department of Water Affairs and Forestry, 2004).

These progressive policies were backed by significant public investment in extending water infrastructure to underserved areas in the late 1990s and early 2000s. As a result, basic access improved markedly. The proportion of households with at least an improved water source (within a reasonable distance) rose from roughly 70% in 1994 to over 90% by 2010 (Nnadozie, 2011). According to national census data, the share of households with piped water either inside the dwelling or on the residential plot increased

from about 60% in 1996 to 82% by 2022 (Statistics South Africa, 2023). This represents tens of millions of people gaining access to safer water in the post-apartheid period – a major social achievement often credited to the new rights-based policy regime and infrastructure programs. At the same time, the racial gap in household water access narrowed substantially; while black rural households disproportionately lacked safe water in 1994, the vast majority had secured basic supply by the 2010s.

These achievements are often attributed to the new rights-based policy regime and its associated infrastructure programs, which are presented as evidence of a more inclusive, rights-based approach to service provision. However, such reforms would have been structurally impossible without the existing bulk-water, energy, and distribution infrastructure inherited from earlier periods. Redistribution, by definition, is constrained by the available and deliverable resource base. In this sense, contemporary social gains reflect not only policy reorientation, but also the enduring legacy of earlier large-scale infrastructural investment.

Despite these important gains in access, post-apartheid water policy coincided with limited expansion of physical water supply capacity. While the population and overall water demand increased substantially, few major dams or inter-basin transfer schemes comparable to the pre-1994 projects were constructed after the end of apartheid. The focus of water policy shifted toward equity and reallocation of existing resources, rather than building new storage infrastructure. This shift came at a time when South Africa's population grew from about 40 million in 1994 to 62 million by 2022 (Statistics South Africa, 2023), and when urbanization and economic development were increasing water consumption. However, the pace of infrastructure development fell behind.

As has been noted, in the three decades since 1994, the government added on the order of only 1.7 billion m³ of dam reservoir capacity, a comparatively small increase compared to the roughly 22 billion m^3 added in the 30 years prior to 1994 (Daily Investor, 2023). Notably, according to industry analyses, only two dams with storage capacity above 200 million m³ have been completed in South Africa since democracy – one of which is the De Hoop Dam (347 million m³, Limpopo province, completed in 2014) – whereas 14 such large dams were constructed between 1964 and 1994 (Daily Investor, 2023). No dam exceeding 1 billion m³ in storage capacity has been built since the Vanderkloof project of the 1970s. This stagnation in supply expansion means that per capita water storage has actually declined, as growing demand presses against a relatively fixed resource base (Greyling, 2025). By 2025, experts warned that South Africa's dam capacity had not kept pace with needs, and that without new investments

the country risked chronic water shortages (Greyling, 2025). In effect, the democratic era largely inherited and utilized the infrastructure built under the previous regime, but struggled to augment it for a new era of greater population and climatically uncertain water supply. The comparative neglect of supply-side augmentation in the post-1994 period is now widely seen as a strategic misstep, even as the moral imperatives of redistribution remain acknowledged.

Compounding the lack of new infrastructure has been the severe decay of existing water infrastructure and management capacity in many areas. South Africa's impressive dams and pipelines cannot deliver reliable water if the networks that connect them to consumers are poorly maintained. Unfortunately, the post-apartheid decades have been characterized by declining performance of water institutions at multiple levels. Many municipalities – now in charge of local water supply and wastewater treatment – have experienced skills deficits, financial mismanagement, and corruption, leading to breakdowns in service delivery. Non-revenue water (NRW), which includes losses from leaks and theft, has risen to very high levels.

Studies by the Water Research Commission found that by 2012, approximately 36% of municipal water was NRW (McKenzie et al., 2012). Subsequent estimates indicate the situation has not improved: national NRW reached 47% in 2023 (Greyling, 2025). Aging and poorly maintained distribution pipes are a major contributor to these losses, with bursts and leaks common in many towns. The result is that even where bulk water exists in dams, it often fails to reach the end users efficiently. Likewise, wastewater infrastructure has deteriorated dramatically. Municipal sewage treatment plants have widely fallen out of compliance, polluting rivers and dam reservoirs that are sources for downstream users.

A 2021 audit by the Department of Water and Sanitation (DWS) found more than half of wastewater treatment works in South Africa to be in a "critical state" (DWS, 2021). By 2023, an alarming 99% of wastewater treatment works monitored failed to meet at least one effluent quality standard, meaning virtually all were releasing inadequately treated sewage into the environment (Auditor-General, as cited in AfriForum, 2025a). Independent testing by civil society corroborates this decline: AfriForum's 2025 Water Quality Report, which sampled 109 sewage plants, found 86% were releasing polluted effluent into rivers (AfriForum, 2025a). Such failures have cascading effects: polluted source water is harder to treat for consumption, ecosystems are damaged, and communities downstream face health risks. In several well-documented cases, water infrastructure collapse has led to acute local crises. For example, in the town of QwaQwa (Free State), years of mismanagement and drought combined to leave about

90 villages with dry taps for extended periods since 2018, forcing residents to rely on water tankers and pay exorbitant prices to private water vendors (Mopeli, 2021). In early 2020, the situation in QwaQwa became so desperate that residents protested violently and the government had to allocate emergency funds (R220 million, or approximately $15.2 million) to restore basic water supply (Mopeli, 2021). Similarly, in the Gauteng province, aging infrastructure and poor maintenance have led to so-called "water-shedding" – a term likening water supply interruptions to electricity load-shedding. This has forced Johannesburg, the province's primary economic hub, and other major metros to impose pressure reductions or rotational supply cuts to manage demand (Daily Investor, 2023). These examples illustrate how state capacity deficits have translated into real and worsening water insecurity on the ground, even in areas theoretically well-served by infrastructure.

Crucially, the structural constraints of limited supply expansion and infrastructure decay have meant that redistribution has often occurred within a fixed or even shrinking resource envelope. To address this, the democratic state has been tasked with reallocating water to previously excluded groups through mechanisms like water use licenses and Broad-Based Black Economic Empowerment (B-BBEE) targets in irrigation. Consequently, this zero-sum dynamic has led to intense contestation in water policy. Specifically, the government has pursued transformation of water ownership and use, for instance, by attempting to attach race-based conditions to water licenses in order to favor black farmers and companies (Jegede & Shikwambane, 2021).

In 2020–2021, DWS drafted amendments to the National Water Act and related regulations that would explicitly make racial demographics a factor in water-allocation decisions and set targets for water use by black-controlled entities (AfriForum, 2025b). These efforts are seen by proponents as necessary to dismantle the remaining vestiges of "water apartheid" – the claim that a majority of commercially usable water remains controlled by white-owned or white-run farms and industries decades after apartheid (Jegede & Shikwambane, 2021). On the other hand, such race-conscious policies have generated backlash and legal challenges, especially from minority agricultural and civil rights organizations. They argue that elevating race as the determining factor in water allocation disregards merit and efficiency, potentially harming the economy and even black workers employed on established farms (AfriForum, 2025b). For example, in 2025 the civil rights group AfriForum appealed a DWS decision that prevented a black farmer from transferring water rights to a white farmer – the Department explicitly justified the refusal on "transformation objectives," despite

other statutory factors like resource efficiency and public interest (AfriForum, 2025b).

Table 5. **Comparison of Water Infrastructure Development, 1948–1994 vs. 1994–2024**

Indicators	1948–1994 (apartheid era)	1994–2024 (post-apartheid era)
Dams above 200 million m^3 storage capacity built	14 dams total, including Gariep Dam (1971, 5.3 billion m^3) and Vanderkloof Dam (1977, 3.2 billion m^3)	2 dams total, including De Hoop Dam (2014, 347 million m^3)
Total new dam capacity added	~22 billion m^3	~1.7 billion m^3 added to national storage
Total population	~40 million (in 1994) – lower overall demand	~60 million (in 2024) – higher demand pressure
Households with piped water on site	~60% (in 1994) had piped water in dwelling or yard; many others had only distant or no access.	82.4% (in 2022) have piped water in dwelling or yard; significant expansion in access, but still not universal.
Non-revenue water (leakage, etc.)	Estimated <30% lost (c. early 1990s); infrastructure relatively new, serving privileged areas primarily.	Estimated 47% lost (2020s); much higher in some municipalities
Wastewater treatment compliance	Very high in urban white areas; minimal infrastructure in "homelands" (apartheid government maintained key systems for privileged cities).	Critically low: 50%+ of plants in dysfunction; 86% releasing polluted effluent; water resources face pollution burden.

N.B.: Data for non-revenue water in late apartheid are scarce; significant leakage did occur but was less documented, and major systems were still in good repair up to the early 1990s.

Sources: Department of Water and Sanitation (2018; 2021); McKenzie et al. (2012); Statistics South Africa (2023); Daily Investor (2023); AfriForum (2025b).

AfriForum argued that the 1998 National Water Act does not authorize permanent race-based exclusion and that courts have ruled against such rigid racial criteria in water allocation (AfriForum, 2025b). This dispute encapsulates the central tension: while the state is attempting to use race-

conscious redress measures in water allocation, doing so amid institutional fragility and without augmenting supply spurs resistance and fears of inefficiency. Thus, post-apartheid hydropolitics has increasingly been marked by conflict between equity-driven policy and the practical realities of scarcity and governance capacity. As the next section will explore, this context has motivated some Afrikaner communities and organizations to pursue self-reliant strategies, essentially opting to secure their own water and infrastructure rather than depending on an overstretched state or risking disadvantage in water-allocation disputes.

As *Table* 5 highlights, the pre-1994 period saw a far more rapid build-out of storage infrastructure than the post-1994 period, resulting in a stark contrast in total water supply capacity added. Meanwhile, improvements in household access to water since 1994 are evident (rising to over 80% of households with on-site piped water), but this was achieved largely via extending distribution networks and not by increasing bulk water availability proportionately. The table also underscores the relative decline in infrastructure performance indicators (such as NRW and wastewater treatment compliance) after apartheid, illustrating the governance and maintenance challenges discussed above.

In short, South Africa's water sector after apartheid faces the dual problem of insufficient new resources and degradation of existing assets, set against the imperative of equitable service delivery. These conditions help explain why certain communities that feel vulnerable to water insecurity and are skeptical of the state's capacity have moved to secure greater autonomy over water provision.

Afrikaner self-determination and water: the case of Orania

In this context of scarcity and institutional uncertainty, some Afrikaner communities have pursued localized self-management strategies to secure essential services, including water. Orania, founded in 1991 on private land along the Orange River in the Northern Cape, represents the most developed example of such an initiative. Orania was established by Afrikaner ideologues as a cultural-political self-determination project – a town intended to preserve Afrikaner culture and autonomy. Over the past three decades, Orania's approximately 2,800 residents (as of 2023) have built and maintained their own municipal infrastructure, effectively operating as a self-reliant enclave within the South African state (de Beer, 2006; Orania Representative Council [ORC], 2023).

Crucially, this includes Orania's water extraction, treatment, and wastewater systems, which are run independently of the surrounding

Thembelihle Municipality. Orania's water strategy emphasizes direct community control over the full water cycle, from abstraction to waste treatment, within the regulatory framework of national water legislation. The town holds the necessary water use licenses from DWS to pump water from the Orange River, and it pays fees for this abstraction like any other lawful user (ORC, 2023). However, all infrastructure and day-to-day operations are managed internally by Orania's own institutions. This model allows Orania to largely insulate itself from the dysfunction affecting many other towns.

Concrete examples illustrate Orania's hydraulic autonomy. The community financed and constructed a pumping station on the Orange River, which feeds raw water via a 9 km pipeline into Orania for both irrigation and domestic use (ORC, 2023). This capital project – completed without any funding from the national government – ensures a reliable supply for the town's needs. Orania's farmers have consequently been able to expand irrigated agriculture significantly: since the town's founding in 1991, the community has acquired an additional 7,000 hectares of land, developing over 330 hectares into highly efficient irrigated fields for high-value export crops like pecan nuts (ORC, 2023).

This expansion was possible only through assured water availability from the community-run pump and canal system. The term "irrigation autonomy" can be applied here: unlike neighboring farming areas that rely on government-run water schemes, Orania's farmers get their water through infrastructure they built, own, and operate themselves. If maintenance is needed or upgrades are required, the community addresses it directly, funded by local irrigation tariffs and community investment. Such autonomy has proved advantageous amid the wider decline of state irrigation schemes and delays in government maintenance; for instance, while many state-run canals silt up or collapse due to neglect, Orania's system is diligently kept in working order by its stakeholders.

On the domestic water front, Orania similarly runs its own water treatment works to supply potable water to households. Groundwater is also used: the town has drilled and equipped several boreholes to diversify its supply (ORC, 2023). Water is disinfected and tested by Orania's technical services to ensure safety, paralleling what a municipal water department would normally do. The distribution network in town is maintained by Orania's utility department. Because Orania's residents fund these services through local taxes and water fees (the town has a share-block company governance model functioning like a municipality), they have a direct interest in keeping the system efficient. Losses are minimized through proactive leak detection and prompt repairs. Orania even employs a dual water reticu-

lation system in parts of the town: potable water is delivered separately from untreated canal water, which can be used for garden irrigation and other non-potable purposes (ORC, 2023). This conserves treated water and reduces the load on treatment facilities, reflecting a practice widely recommended in water-scarce regions. Additionally, Orania has invested in modern wastewater treatment facilities.

In 2022, the town completed a new sewage treatment works designed to handle waste from up to 10,000 future residents (ORC, 2023). This plant employs mechanical and biological treatment processes to ensure that effluent meets environmental standards before being discharged or reused (treated effluent is partly reused for irrigation of public spaces). By building this capacity ahead of demand, Orania avoided the overload and collapse seen in many municipal sewage systems. The town's waste management and environmental practices (such as required solar water heaters for new homes and extensive recycling programs) further contribute to a sustainable local water cycle (ORC, 2023).

Orania's experience demonstrates that localized "hydro-autarky" is feasible on a small scale. The community has effectively recreated the functions of a municipality, but with a strong ethic of maintenance and financial discipline. Orania's administration – accountable directly to its ratepayers and shareholders – has kept service delivery on track. In fact, Orania has consistently received clean financial audits for over 30 years, indicating that funds for services like water are properly managed (ORC, 2023). Water infrastructure is upgraded as needed using local reserves or community fundraising; there is no dependence on the often slow and unreliable disbursement of national municipal infrastructure grants.

Importantly, Orania's water autonomy is not an absolute independence from the national water infrastructure: the town still operates under South African law, its water use is part of the broader Orange River system, and it must coordinate with upstream and downstream users through the relevant catchment management agency. In times of extreme drought, Orania would be subject to the same restrictions on river abstraction as other users. Thus, its autonomy constitutes an operational and institutional but not hydrological separation from the basin. Town leaders describe this model as "practical self-management rather than secession" as Orania remains embedded in national hydrology but has minimized its reliance on failing state institutions (de Beer, 2006). The benefits of this approach became evident during regional water crises: while nearby towns sometimes suffered outages due to municipal failures, Orania's taps kept running, because the town could respond quickly to problems and had redundancies (such as backup pumps and local water storage) in place. For example, when pumping equipment at

the river intake failed in 2018, Orania was able to mobilize funds and repair it within days, avoiding a prolonged disruption (ORC, 2023). In a comparable incident in a state-run system, repairs might take weeks due to bureaucracy and a lack of maintenance funding.

It is important to note that Orania's unique situation cannot be easily replicated everywhere. The town is small, cohesive, and relatively affluent; it benefits from a reliable water source (the Orange River) at its doorstep, and it does not carry the burden of servicing large impoverished settlements. The residents share both a cultural vision and a practical incentive to maintain local services, which helps create a high level of civic participation in infrastructure upkeep. These factors underpin Orania's success but are not present in many other communities. Nonetheless, Orania offers a telling case study of how a minority community has navigated South Africa's structural water challenges: rather than accept deteriorating state provision or fight political battles for better service, Orania opted to pursue self-provision in a controlled, legal manner. This reflects an ethos of self-reliance deeply ingrained in some Afrikaner circles, dating back to frontier histories and later prompted by a sense of alienation from post-1994 governance. One can view Orania's project as a test of how far local autonomy can mitigate national infrastructure deficits. In many respects, the case suggests that with competent management and sufficient initial capital, even a tiny community can achieve water security in a water-scarce country – a lesson that might be of interest to other towns and cooperative schemes.

Afrikaner civil society responses to water governance failures: the Solidarity Movement and AfriForum

Beyond Orania, Afrikaner-led civil society organizations have also increasingly taken the initiative to address water and infrastructure issues in the vacuum left by state failures. Two prominent examples are the Solidarity Movement (*Solidariteit Beweging*, hereinafter "Solidarity") and AfriForum, which, while not tied to a specific geographic community like Orania, seek to empower Afrikaners and broader communities through parallel institutional structures.

Solidarity is a historic Afrikaner trade union that has evolved into a broader movement with affiliated entities focused on education, culture, and self-help. One of Solidarity's strategies has been to invest in independent infrastructure to reduce dependence on government services. A striking illustration is Solidarity's investment in education and training facilities. For instance, the movement built a new vocational college campus (Sol-Tech) in Centurion (Gauteng province) at a cost of R300 million (approximately

$20.7 million), entirely funded by community donations and investments (BusinessTech, 2019). This Sol-Tech campus, opened in 2021, is part of a larger R4.5 billion (approximately $310 million) Solidarity Network initiative to develop a private Afrikaans-language university (*Akademia*) and a network of schools and institutions (BusinessTech, 2019). While these projects are in the realm of education rather than water, they reflect a broader pattern of reducing dependence on state-provided services. The philosophy, as articulated by Solidarity leaders, is that relying on the government has become a risk; instead, communities should proactively "build the future ourselves" (Hermann, as cited in BusinessTech, 2019).

Translating this to the water sector, Solidarity has supported its sister organization AfriForum in various water-related interventions. Notably, in 2021 Solidarity challenged the government's importation of Cuban engineers to assist with South Africa's water infrastructure maintenance. The Ministry of Water and Sanitation had brought in Cuban technical teams to help fix dysfunctional water schemes, a move that Solidarity saw as both a waste of resources and an affront to local engineering capacity. Solidarity took the matter to court, revealing that the Cuban engineers were being paid significantly more (with perks) than South African engineers would charge, and arguing that many qualified South African (including Afrikaner) engineers were available to do the job (Tshikalange, 2021). The union's legal pressure led the government to disclose details of the contracts and temporarily suspend further deployments. Solidarity's CEO D. Hermann framed it as pushing back against an irrational decision that ignored domestic capacity (Tshikalange, 2021).

Although this instance was about human resources, it had direct implications for water infrastructure repair and underscored Solidarity's commitment to ensuring that local know-how is utilized. In addition, Solidarity has established training programs to develop technical skills (such as those of plumbers, artisans, water technicians) through its institutions, thereby contributing to a talent pool that could, in theory, support community-based service delivery (Solidarity Movement, 2022). These efforts by Solidarity signal that a segment of the Afrikaner population is actively investing in parallel systems – schools, colleges, plans for private healthcare, and even security – that run alongside public ones. One can call it a form of infrastructural secessionism, motivated not by a desire to abandon South Africa, but by a pragmatic assessment that the state is failing to deliver and that self-reliance is the best path to stability (van Staden, 2023). This sentiment captures how history has informed the Afrikaner community's current behavior: having once had privileged access via the state (during apartheid) and then experiencing a loss of political power, many Afrikaners see con-

trolling their own institutions as a safer guarantee of their community's well-being than any government policy.

AfriForum, a civil rights organization established in 2006 as an offshoot of Solidarity, has become particularly prominent in water and infrastructure activism. AfriForum explicitly positions itself as a non-governmental actor stepping in where the government is "unable or unwilling" to fulfill its duties. With over 300,000 predominantly Afrikaner members, AfriForum has both financial and human capital to deploy (van Staden, 2023). In the water sector, AfriForum's interventions have been multifaceted: monitoring, direct service provision, and legal advocacy.

One major initiative is its Water Quality Watch program. Each year, AfriForum volunteers and experts sample water from hundreds of towns – testing both drinking water (Blue Drop) and treated sewage effluent (Green Drop) in communities across all provinces (AfriForum, 2025b). They do this in part because the government's official Blue/Green Drop monitoring system lapsed for years (between 2014 and 2022 no comprehensive reports were released). In 2025, AfriForum's own testing reported, as noted earlier, generally acceptable drinking water quality in about 88% of tested towns (thanks to local efforts to chlorinate water), but an extremely poor record on wastewater, with only 14% of sewage works producing clean effluent (AfriForum, 2025b). By publicly releasing these findings, AfriForum puts pressure on municipalities and draws attention to pollution issues that might otherwise be underreported. In some cases, the organization has launched cleanup operations – for example, mobilizing community members to physically remove sludge and refuse from blocked sewage plants or repair broken pipes in small towns. AfriForum's local branches have drilled boreholes and installed public taps in communities where the municipal water supply collapsed, as a stopgap measure (AfriForum, 2022). They have also provided water tankers during emergencies.

A section on AfriForum's website highlights "hands-on efforts to support communities where government fails, including emergency water points and water distribution" (AfriForum, 2022). In 2019, when the town of Makhanda (Grahamstown) in Eastern Cape faced a severe water outage due to drought and a failed municipal response, AfriForum trucked in thousands of liters of water and assisted with borehole projects for schools and hospitals – actions that garnered significant media coverage and relief for residents. Such direct interventions, though localized, demonstrate the capacity of civil society to alleviate suffering and increase pressure on authorities to act.

AfriForum's advocacy has extended to the courts and regulatory sphere as well. The organization has consistently used legal channels to hold the

government accountable for water service delivery. For instance, AfriForum has laid criminal charges against officials of municipalities that continually spill sewage into rivers, arguing that this violates environmental and health laws (AfriForum, 2018). In one notable case, AfriForum was admitted as *amicus curiae* (friend of the court) in a 2022 lawsuit concerning the constitutional mandate of the South African Human Rights Commission to enforce service delivery; AfriForum participated as *amicus curiae* in a case that affirmed that communities have the right to seek direct relief when their water is contaminated by state negligence (Shomolekae, 2025). AfriForum has also opposed what it sees as racial discrimination in water rights.

In 2022, AfriForum lodged formal comments and later an appeal against proposed regulations to introduce racial quotas in water use licenses, arguing they were *ultra vires*, or beyond legal authority, and impractical. The pressure contributed to DWS's withdrawal of those particular regulations at the last moment (AfriForum, 2025b). When the government introduced a draft National Water Amendment Bill in 2023 that would make B-BBEE scoring a mandatory consideration for water allocations, AfriForum publicly campaigned against it, asserting that it had "no rational connection" to actual water management and was likely unconstitutional (AfriForum, 2024). Although these stances have led some to criticize AfriForum for wanting to preserve white privilege, the organization frames its position as defending non-racial principles and preventing further inefficiencies. It often highlights that failing infrastructure and mismanagement harm all South Africans, not just minorities – pointing to examples where black communities suffer from the same dysfunction (AfriForum, 2022). Indeed, while AfriForum's primary mandate remains the protection of Afrikaner and minority interests, it frequently cooperates with black-led community groups in protests or legal actions regarding service delivery. Still, its focus on issues such as water-rights transfers reveals an underlying concern that Afrikaner farmers and communities could be adversely affected by aggressive redistributive policies, hence the preemptive legal defense.

The combined efforts of Orania, Solidarity, and AfriForum illustrate how Afrikaners have, in various forms, become agents in navigating and partially circumventing South Africa's structural water challenges. Rather than viewing themselves simply as victims of a failing state or of affirmative action policies, these actors have, to a significant degree, taken the initiative: building parallel infrastructure, maintaining their own systems, and using legal channels to assert their interests. This proactive stance is often encapsulated by the Afrikaans term "*selfdoen*" (do it yourself) – a philosophy that Solidarity explicitly celebrates (van Staden, 2023).

Far from retreating into powerlessness, many Afrikaners are leveraging resources – financial, technical, and organizational – to create pockets of functionality that benefit not only themselves but, in some cases, neighboring communities. For example, while Orania is exclusive in terms of residency, it contributes surplus agricultural produce to the national market. AfriForum's water projects, though driven by an Afrikaner-dominated group, often aid mixed-community areas (water tankers, boreholes, etc. are provided to whoever needs them on the ground). This nuance is important: the Afrikaner initiatives are rooted in preserving their community's rights and living standards, but they are not necessarily zero-sum or inherently antagonistic to other groups' welfare. In many instances, they fill gaps that the government has left, arguably reducing burdens on the state. Indeed, there are criticisms: some argue that private or ethnic-based solutions undermine the push for a more equitable, integrated public service system, and that they could entrench separateness or privilege (Jegede & Shikwambane, 2021). Afrikaner organizations respond that their actions are open to all who share their values of good governance, and that competent parallel systems can inspire improvement in the public sector via competition or example (van Staden, 2023). This debate ties into broader questions of social cohesion and the role of non-state actors in essential services. Nonetheless, the evidence indicates that these Afrikaner-led efforts have provided real relief and created functional models at a time when South Africa's water security is under severe strain countrywide.

Conclusion

South Africa's water crisis cannot be resolved through redistribution or legal litigation alone – it is fundamentally a crisis of quantity, quality, and governance capacity. Although apartheid-era water governance produced profound racial inequalities, it also built the hydraulic foundation that still underpins the country's supply. Post-1994 reforms successfully expanded basic access to millions who were previously excluded, representing a remarkable social transformation. However, these gains have come without commensurate investments in new supply capacity or maintenance of aging infrastructure. As a result, South Africa in the 2020s finds itself with a growing population, a warming climate, and deteriorating water systems that leak and pollute at alarming rates. In this context, minority Afrikaner communities and organizations have turned toward self-reliance and local autonomy as a pragmatic response. Their experiences – Orania's microcosm of a self-run water grid, Solidarity's community-funded infrastruc-

ture, AfriForum's grassroots interventions – highlight both the potential and limitations of localized solutions.

On the one hand, these Afrikaner initiatives demonstrate that agency at the community level can partially compensate for state failures. Orania's ability to ensure reliable water services and even drive economic irrigation projects, all through local management, is a testament to what can be achieved with cohesive governance and investment. These actions contribute to holding the line against a complete breakdown of services in some areas. They also exemplify innovation – for example, dual water systems and community monitoring – that could be emulated elsewhere. The Afrikaner case thus offers valuable lessons in community resilience and the importance of institutional culture (maintenance-minded, transparent, accountable) in managing water resources. It underscores that when citizens feel a sense of ownership – literally, in Orania's case – they are more likely to ensure the infrastructure is cared for. In a broader sense, the Afrikaner experience is a microcosm of what is possible in decentralization: empowered local entities tackling problems directly, which aligns with the principle of subsidiarity in resource management.

On the other hand, localized autonomy is not a panacea for a national water crisis. The scale of South Africa's water challenges – affecting tens of millions of people, vast interconnected river basins, and large metropolitan economies – means that piecemeal solutions will inevitably fall short. Orania's successful self-management benefits its residents, but it is a small town on a major river; its model could be much harder to implement for a dense city of half a million people without abundant nearby water. Not every community has the social capital or homogeneity that Orania has to make such a system work. Moreover, while Afrikaner organizations can treat symptoms (like fixing a pump or drilling a borehole here and there), they cannot by themselves build the large-scale dams, inter-basin transfers, or desalination plants that the country may need to truly secure supply for the future. Those require state-led coordination, huge funding, and political will.

Indeed, the Afrikaner autonomy approach carries the risk of fragmentation: if each capable community withdraws into its own infrastructural island, the country could see widening disparities and lost economies of scale. It might also weaken the pressure on the government to fulfill its responsibilities, as parallel systems reduce the urgency of demands from certain segments (this is a familiar argument in debates about private vs. public services). From a justice perspective, there is the danger that only communities with resources can self-provision, while poorer communities cannot and thus continue to suffer unless the state steps up. The challenge,

therefore, is finding a balance where community initiatives complement and spur national efforts, rather than entrenching a two-tier system.

The intersection of water scarcity, equity-oriented water-allocation reforms, and state capacity in South Africa is complex and often politically charged. The selected Afrikaner-led actors examined here have not simply cast themselves as "victims" of post-apartheid change. Rather, they have acted as proactive agents, attempting to navigate and mitigate structural challenges. One can argue that these actions can be interpreted as a rational adaptation to a reality where water is increasingly a contested and unreliable resource. Simultaneously, the fact that such parallel efforts are deemed necessary is itself symptomatic of governance shortcomings that affect all South Africans.

Ultimately, the solution to South Africa's water crisis will require a reinvigorated state effort – one that moves beyond a narrow focus on allocation alone while still acknowledging historical redress and focuses relentlessly on expanding and renewing water infrastructure, enforcing sound management, and incorporating community participation in decision-making. Recent developments indicate some recognition of this: in 2023–2024, the national government announced plans for new dam construction projects across several provinces and sought partnerships to fast-track infrastructure development (Greyling, 2025). Ambitious targets were set, including building several large dams and upgrading existing ones, to increase storage and adapt to climate variability. However, as history has shown, plans on paper are not enough – execution is where South Africa has faltered in the past 30 years (Greyling, 2025). It will take sustained political commitment, insulated from corruption, and possibly leveraging the kind of private and community expertise that groups like Solidarity and AfriForum have demonstrated, to implement these plans.

In conclusion, South Africa stands at a crossroads where it must confront the hard reality of severe water stress coupled with institutional fragility. Racial redress in water allocation, while morally and legally justified, will be inherently limited by that reality: one cannot redistribute what does not exist or what cannot be delivered. The experiences of Afrikaner self-reliance in water provision serve as both a warning and an inspiration. They warn that if the central state does not improve, more groups may seek to exit from its services, leading to a patchwork of haves and have-nots. Yet they inspire by showing that better outcomes are possible with determined management and community will.

The fate of South Africa's hydropolitics will likely depend on integrating these lessons – fostering local empowerment and accountability across all communities, while rebuilding the state's capacity to provide for the

larger common good. Only by expanding available water supply and improving efficiency can the country avoid a future of intensifying distributive conflicts. In that sense, ensuring water security is a precondition for social harmony. The Afrikaner case has illuminated one pathway to coping in difficult times; the hope is that South Africa as a whole can take on the challenge so that such extreme measures of autonomy are not the only recourse for reliable water. The pressing need is for South Africans across racial and political lines to collectively demand and contribute to a renewal of the national water system. Without such systemic reform, everyone remains ultimately at risk, irrespective of how self-sufficient a select few might temporarily become.

Together with the preceding chapter, this case brings the volume back to one of its central claims: water insecurity is not only a problem of shared basins, rural conflict, or extractive pollution. It is also a domestic governance problem, shaped by the capacity of states and municipalities to maintain infrastructure, secure trust, and incorporate local agency without deepening social fragmentation.

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CONCLUSION

Taken together, these chapters bring us back to our core question: why do similar environmental pressures produce different social and political outcomes? The findings prove that water insecurity in contemporary sub-Saharan Africa cannot be treated as a single-sector issue. Instead, it crosses multiple boundaries – acting simultaneously as a health crisis, a test of diplomacy, an infrastructure failure, and a driver of local clashes. This deep complexity is exactly why studying water in Africa requires an interdisciplinary approach. Our comparative findings confirm that scarcity, floods, pollution, and climate shifts create major pressures, but they do not dictate the final result. Their impact depends almost entirely on infrastructure, institutional capacity, political power, and public trust.

The first major finding concerns human vulnerability. The chapter on water-, sanitation-, and hygiene-related diseases shows, in a continental comparative perspective, that unsafe water and inadequate sanitation remain among the most direct ways in which water insecurity damages societies in SSA. Disease transmission is shaped by biological and climatic conditions, yet the decisive factors are often WASH provision and governance capacity. This finding gives the volume a necessary baseline. Before water becomes a matter of diplomacy or conflict, it is a condition of daily survival.

The Great Lakes chapter extends this finding to the regional level. It shows that large freshwater systems cannot be understood only as natural endowments. They are economic, ecological, and political spaces in which fisheries, agriculture, energy production, biodiversity, urban growth, and regional organizations intersect. The available evidence suggests that cooperation in the African Great Lakes region has institutional foundations, but that the effectiveness of these arrangements is limited by uneven capacity, underfinancing, pollution, armed insecurity, and the difficulty of maintaining long-term investment. The chapter therefore links human vulnerability to regional development without assuming that shared water automatically creates either conflict or cooperation.

The second major finding concerns transboundary hydropolitics. The Zambezi chapter shows that water insecurity may arise even in basins with substantial aggregate resources. The problem is not only how much water exists, but where it is located, when it is available, who can store and use it, and whether basin institutions can influence national development choices. The Zambezi case demonstrates that formal cooperation has advanced, yet the implementation gap remains substantial. Data-sharing, financing, bene-

fit-sharing, and the relationship between regional commitments and national infrastructure planning remain decisive constraints.

The Orange–Senqu chapter reaches a similar conclusion through a different basin. It shows that scarcity becomes politically sensitive where it overlaps with asymmetry among riparian states, economic dependence, and unequal control over infrastructure. ORASECOM and related agreements provide an important cooperative architecture, but institutional form alone does not resolve underlying inequalities. The chapter's value lies in showing that transboundary cooperation is not a fixed achievement. It has to be maintained through trust, investment, credible allocation rules and recognition of the different positions occupied by upstream, downstream, and economically dominant states.

The chapter on Lake Chad and the Dasin Hausa Dam adds a sharper emphasis on implementation. It examines cases in which the main problems have long been recognized, and where proposed solutions have circulated for decades. The persistence of vulnerability in these cases cannot be explained only by climate change or technical uncertainty. It reflects delay, underinvestment, weak political will, and the inability to convert planning into infrastructure. This finding is important because it shifts attention from the production of strategies to the political and administrative conditions under which strategies are acted upon.

The third major finding concerns conflict. The Sahelian chapter provides the book's clearest rejection of simple climate-conflict causality. Water insecurity contributes to instability when it intersects with insecure land tenure, blocked mobility, damaged infrastructure, weak dispute settlement, predatory authorities, and armed protection markets. In this setting, a dry season, a damaged pump, or a blocked pastoral corridor may remain a local problem, or it may enter a wider chain of retaliation and armed mobilization. The difference lies in social and political mediation.

The Mali chapter gives this argument empirical detail. Agro-pastoral clashes in Mali are linked to climate pressures and land degradation, but these pressures operate through changing agricultural practices, altered mobility routes, local power struggles, ethnic polarization, and the weakening of mechanisms that historically regulated access between farmers and herders. The chapter's main contribution is to show that rural conflict is produced through a combination of ecological stress and political disorder. Water and land matter, yet they matter through institutions and relationships that can either contain or intensify disputes.

The Niger Delta chapter introduces another form of water insecurity: contamination in an extractive region. Here the problem is not the absence of water, but the degradation of water through oil production and the une-

qual power relations that shape remediation. The application of hydro-hegemony to a subnational setting helps explain how multinational companies, state agencies, and local communities occupy very different positions in deciding what counts as damage, who is responsible, and how access to safe water is restored. The chapter shows that environmental justice is not external to water governance. It is one of the conditions under which water governance becomes credible.

The South African chapters, meanwhile, demonstrate that domestic water governance remains politically fragile even where legal frameworks are relatively developed. The municipal governance chapter demonstrates how fragmented institutions, weak administrative capacity, corruption, poor communication, and exclusion from decision-making contribute to protest and local instability. Water service failures become politically charged because they are read as evidence of wider neglect and broken accountability. The chapter on Orania and Afrikaner civil-society organizations examines a different response to state weakness: localized self-management and infrastructural autonomy. Its findings do not make local autonomy a general model, but they show why some communities seek to insulate themselves from failing systems when they possess the resources and organization to do so.

The cases in this volume demonstrate how misleading it can be to treat water availability as a direct measure of water security. The Great Lakes region has abundant freshwater, yet access remains uneven and water systems are vulnerable to weak infrastructure and political instability. In the Niger Delta, the problem is hardly a lack of water. Pollution and the unequal distribution of the costs of oil production have made proximity to water a poor guarantee of safe access. The Zambezi presents another configuration: a major river supports hydropower and regional development while the benefits and risks associated with its use remain unevenly distributed. What matters in each case is what happens to water after its physical availability is taken for granted.

This shifts attention to infrastructure. Dams and pipelines are usually discussed as technical assets, although the cases examined here show that they also shape distribution. Their location and operation affect who receives a reliable supply and who remains exposed when the system fails. Large projects may serve national development goals while producing much less visible effects in particular localities. In the Orange–Senqu River Basin, regional integration through water infrastructure has developed within a relationship marked by South Africa's much greater economic and technical weight. The Zambezi raises similar questions about how the gains from shared resources are distributed across countries and communities.

Failure to build infrastructure can be equally consequential. Lake Chad and the long history of the Dasin Hausa Dam illustrate this from another angle. Delayed projects are easily described as administrative failures, especially after they have been postponed for years. The consequences, however, are borne outside the institutions responsible for those delays. Communities continue to face risks that the proposed infrastructure was meant to reduce. A project that exists for decades in plans and political statements may have little meaning for people living without proper water supply.

The same point applies to infrastructure that has already been built. Much of the policy discussion surrounding African water problems still favors new construction. Maintenance attracts less attention. Yet an urban network can expand on paper while the quality of supply deteriorates because old pipes leak and repairs are delayed. A treatment plant that cannot operate reliably solves little. In this respect, the condition of existing infrastructure may tell us more about governance than the number of projects announced or completed. Keeping systems functional requires more continuity in public administration.

This brings us to one of the clearest findings of the comparison. Most of the cases in this volume are not taking place in an institutional vacuum. There are ministries, development plans, basin organizations, and formal rules. The recurring problem lies in the gap between these arrangements and what they are able to deliver. That gap can persist for years. New strategies are often introduced without resolving the weakness that prevented implementation in the first place.

The sources of this weakness differ across cases, so reducing them to a standard list of governance failures would confuse more than it explains. A basin organization may depend on decisions taken by national governments and have little influence once those governments have fixed their priorities. A municipal utility may carry formal responsibility for service provision without controlling the resources required to renew its network. Elsewhere, the problem lies in the way public funds are used or in the political preference for visible projects over routine maintenance. Indeed, institutions are judged by tasks they are formally responsible for, while their actual room for action is often much smaller.

Seen in this light, “political will” becomes a more useful concept when it is tied to observable decisions. Leaders may publicly support a project for years while financing remains uncertain and administrative responsibility is passed between agencies. Governments may endorse regional cooperation while withholding data or giving national projects priority over agreed basin objectives. In such cases, political will is visible in implementation by whether money is allocated, decisions are followed

through, and institutions can be held responsible when commitments are repeatedly missed.

The regional cases also limit a common assumption that cooperation gradually reduces inequality between participants. It may reduce uncertainty and make disputes easier to manage. It can also support investment that would be difficult for one country to undertake alone. None of this necessarily changes the underlying distribution of power. South Africa enters cooperation in the Orange–Senqu River Basin with capacities that smaller basin states cannot match. Similar asymmetries appear elsewhere, sometimes through finance, sometimes through technical expertise or access to information. They influence whose preferences are easier to turn into policy.

For this reason, hydro-hegemony is too narrow if it is understood only as the advantage of an upstream or downstream state over river flows. Control may also rest on ownership of infrastructure and on the ability to finance new projects. The actor that produces the data used in negotiations can acquire influence before a formal bargaining process even begins. In some cases, power lies in deciding which risks deserve immediate attention and which can be postponed. Looking at water politics in these terms helps explain why cooperative institutions can remain stable while their benefits continue to be distributed unevenly.

The Niger Delta shows that similar relationships exist below the interstate level. Oil companies, state institutions, and local communities do not approach water governance with comparable resources. Communities living close to extraction sites may face environmental costs while having limited influence over the decisions that produce them. This resembles the river-basin cases in an important respect. Formal participation alone does not remove a large imbalance in the capacity to define problems and obtain remedies. The political economy of water cannot be separated from the broader distribution of power within which water decisions are made.

The chapters on the Sahel and Mali point to a different danger of oversimplification. Water stress can become part of violent conflict, although the route from one to the other is rarely direct. A dry season or declining access to a water point enters a setting where land rights may already be disputed and pastoral mobility constrained. Security conditions matter as well. In such circumstances, additional pressure on water can sharpen an existing dispute or make an earlier arrangement harder to sustain. Describing the resulting violence simply as a conflict over scarce water leaves much of the causal story unexplained.

This distinction has practical importance. Increasing the supply of water does not by itself settle a dispute over who is entitled to use a particular source. A new borehole can alter local patterns of access and create new

winners and losers. Measures that look technically straightforward may change relations between communities once they are introduced into an existing system of land use and authority. The Sahelian cases make this especially clear, demonstrating that water management and conflict prevention cannot be designed independently of the rules through which people gain access to land and move across it.

South Africa brings another dimension into view. Here the failure of public water systems can lead to protest, but wealthier households and communities have another option, allowing them to reduce their dependence on public provision. Private boreholes, storage capacity, and other forms of self-supply make such households more resilient to interruption. They also change the politics of service provision. Those with sufficient resources can partly insulate themselves from a failing system, while poorer users remain dependent on it. A practical response to unreliable water may thus deepen the very inequality that made the original failure so damaging.

This is where public trust becomes more than an abstract measure of institutional legitimacy. People form judgments about water governance through repeated experience. Once confidence has been lost, even technically sound measures may face resistance. Trust is especially difficult to rebuild where people have learned to rely on private arrangements because public provision has repeatedly failed them.

These cases also draw attention to an awkward feature of adaptation. Households and communities often find ways to live with unreliable systems. They store water, buy it privately, or change how they use land during periods of stress. Such adjustments are frequently described as resilience. At household level they can also represent a transfer of costs from public systems to private users. A family that spends more money on water, or more time obtaining it, may have successfully avoided complete deprivation while becoming less secure in other respects. The capacity to adapt should thus be assessed together with the price of adaptation and with the question of who pays it.

The comparison across chapters ultimately brings us back to the analytical framework of this volume. Environmental and hydrological pressures enter political systems through specific institutions and material arrangements. Their effects depend on the condition of infrastructure, on how authority is exercised and on existing inequalities. Public trust influences what happens after failures occur and whether collective responses remain possible. The outcome may be a health crisis, protest, greater reliance on private provision or, under particular conditions, violent conflict. In other settings the same pressure can encourage cooperation or prompt institutional adjustment.

The sequence is important because these outcomes do not end the process. They reshape the conditions under which the next shock is handled. Repeated service failure may weaken trust and encourage those who can afford it to leave the public system. A regional institution that manages one difficult episode successfully may gain credibility and make later cooperation easier. Infrastructure that is maintained can absorb pressure that would otherwise become a political crisis.

The cases in this volume are too different to support a single model of water insecurity for SSA, and that was never the purpose of the comparison. Their value lies in showing why similar pressures lead to different outcomes and why similar outcomes may have very different causes. Physical scarcity explains some cases well and others poorly. Institutional weakness matters widely, although it takes different forms. Infrastructure can reduce vulnerability, create new dependencies, or simply cease to work as intended. What emerges across the chapters is a set of relationships that becomes visible only when environmental conditions are followed through the political and social systems in which they are experienced.

This also sets reasonable limits on policy transfer. Frequent water interruptions in two cities do not mean that both need more production capacity. One may face an actual supply deficit; another may lose large volumes through a deteriorating network. Two areas experiencing conflict around water points may require different responses if mobility has been restricted in one and local rules for access have broken down in the other. A successful intervention begins with identifying where the chain is failing in that particular case.

The broader lesson is straightforward. Water becomes secure when available resources can be converted into access that remains reliable under pressure and is distributed in a way that societies can sustain politically. This depends partly on engineering. It also depends on what happens after a project is opened and after a crisis has passed from public attention. Across the cases studied here, some of the most important failures occurred precisely in that less visible space between formal commitments and routine practice. The same is true of many of the successes.

From a practical standpoint, our findings highlight four key priorities:

– Basic WASH provision must remain the foundation of any water policy.

– Governments should prioritize repairing and maintaining existing networks over building high-profile new projects.

– Basin institutions require sufficient operational capacity and effective information-sharing mechanisms.

– Water treaties must be evaluated by their actual impact on local communities, ensuring benefits and risks are shared fairly.

Our findings also suggest specific, actionable steps for three distinct settings:

– In drylands and conflict zones, governments must align water planning with pastoral routes and other livelihood geographies. This requires actively protecting mobility corridors and critical water infrastructure, while strengthening dispute-resolution systems. These mechanisms must rely on credible customary leaders, transparent water-sharing rules, and fair compensation for crop damage.

– In extractive regions, authorities need to ensure the independence and capacity of environmental oversight agencies. Success depends on expanding the representation of affected communities and civil-society groups in remediation bodies, while institutionalizing local participation in monitoring. Furthermore, states must directly link potable water provision to long-term clean-up, ecosystem restoration, and livelihood recovery.

– In urban areas, municipalities need to strengthen their technical and administrative capacity and improve coordination with water boards and other service providers. Local governments must also introduce transparent service monitoring, accessible grievance procedures, and meaningful community participation in water governance decisions.

The findings also point to a practical field for Russia–Africa cooperation. Chapter 1 identifies water treatment and sanitation as one area in which Russian technologies may respond to African needs. The wider comparison in this volume suggests that such cooperation will be most useful when technology transfer is accompanied by maintenance, training, and support for the institutions that operate water systems after installation. The same principle applies to monitoring equipment and larger infrastructure projects, since their value depends on whether they continue to provide reliable services once the initial investment phase has ended. Water security could therefore become a concrete field of long-term Russian–African cooperation, linking scientific work with practical infrastructure and professional training.

Moving forward, future studies should apply this framework to new settings, including groundwater aquifers, fast-growing cities, and unstable borderlands. It is also vital to track how institutions perform over longer periods, and how social factors – like gender, class, and climate displacement – affect who suffers most from water scarcity. Furthermore, emerging issues deserve closer attention, specifically climate finance and digital monitoring tools. Finally, scholars must analyze success, not just failure, by studying regions where institutions manage variability and keep public trust alive.

Today, formal commitments like SDG 6, basin treaties, and constitutional water rights coexist with failing pipes, delayed infrastructure, and contaminated water. Africa's "blue gold" is therefore shaped less by nature's supply than by state capacity to turn climate uncertainty into fair, lasting, and accountable provision. Where local infrastructure and public trust are weak, environmental pressure translates directly into preventable disease, structural inequality, and conflict; where they are strong, similar pressures remain governable.

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This collective monograph explores water insecurity in contemporary sub-Saharan Africa as a core challenge for development, governance, conflict prevention, and regional cooperation. The volume combines concrete case studies on public health risks from unsafe water and poor sanitation, transboundary water management in the African Great Lakes and the Zambezi and Orange–Senqu river basins, and governance failures around Lake Chad and the Dasin Hausa Dam. It also analyzes the climate–water–conflict nexus in the Sahel, agro-pastoral clashes in Mali, hydro-hegemony dynamics in the Niger Delta, and municipal or community water governance failures in South Africa. Together, the authors demonstrate that water insecurity across the continent cannot be simplified to physical scarcity alone. Instead, its daily impacts are produced by the complex interaction of weak institutional capacity, broken infrastructure, environmental degradation, political inequality, and a lack of public trust, which shapes how states, local communities, and regional bodies actually manage water resources under severe uncertainty.

The book is intended for researchers, policy analysts, and postgraduate students working in African studies, development politics, environmental sociology, and conflict resolution.