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BIBLIOGRAPHIC NOTE FROM D'A26
Territorial management of water resources

Introduction

Nowadays, with increased rainfall variability, more frequent droughts and a continuous rise in water demand, water resource management has become one of the major challenges of our century. As water has multiple uses, its management sometimes gives rise to tensions between these uses, namely agricultural, domestic, industrial, ecological and tourist uses, which often compete with each other within the same territory (Callejas Moncaleano et al., 2021 ; Wientjes & Seijger, 2024) .

In fact, when demand for water exceeds supply, especially during periods of scarcity, these uses become a source of conflict: between sectors, between actors within the same sector, between territories, and sometimes between levels of governance. In addition to these significant effects, climate change further exacerbates these tensions, making centralised or sectoral management of the resource increasingly unsuitable (Gleick, 2014) .

In this context, the adoption of integrated management appears to be a structured way of preventing and/or managing these imbalances. Based on dialogue, consultation between users, consideration of local realities and the specific characteristics of watersheds, this approach promotes the anticipation and/or management of conflicts and better, fairer governance of the resource (Molle, 2020 ; Lasserre, 2021) .

Through this bibliographic synthesis, we will first present the diversity of uses accompanied by the conflictual dynamics that it generates. Next, we will address the substance of such management and what this approach brings to water resource governance. We will illustrate this perspective through two African case studies, before returning to the conditions for success and the limitations of such an approach.

Ultimately, this work aims to justify how integrated and territorial water resource management can help to limit conflicts of use in contexts of scarcity.

1. Diversity of uses and conflict dynamics

1.1. Uses and developments

Freshwater resources are a pillar of development and are used for a wide variety of purposes: agricultural, industrial, domestic, tourism and ecological. Although these uses are complementary, they are most often managed separately, which exacerbates tensions when they compete for the same territory (Callejas Moncaleano *et al.*, 2021) .

By far the largest consumer of water is the agricultural sector, accounting for around 70% of global water withdrawals (FAO, 2000) . Water is used in this sector for crop irrigation, animal watering and facility cleaning. In sub-Saharan Africa, this share can even reach 88% of the volumes mobilised, making agriculture highly vulnerable to climate variations (Traore, 2022) .

Domestic use, meanwhile, accounts for around 11% of global water withdrawals. It includes drinking water consumption, personal and domestic hygiene, sanitation, and sometimes recreational uses. In rapidly growing urban areas, access to water is becoming unequal, which increases social tensions in times of scarcity (Wientjes & Seijger, 2024) .

According to the FAO, industry withdraws around 19% of the world's fresh water. It uses it for production, equipment cooling and chemical processes. The agri-food, chemical, textile and extractive industries use large quantities of water, and their discharges can permanently alter the quality of the environment, with a domino effect on other uses of the resource (Su, 2023) .

Although less visible in overall assessments, tourism exerts strong localised pressure on water resources, particularly in coastal areas and during the summer months. Water is used for hotels, swimming pools, golf courses and other recreational facilities (Zhu, 2023) . This occasional but intense consumption impacts the supply for local populations and exacerbates imbalances (Rahmat et *al.*, 2023) .

Finally, from an ecological perspective, water plays a key role in aquatic ecosystems, climate regulation and groundwater recharge. However, these ecological functions are often overlooked in decision-making, even though they are essential to the water resilience of territories (UNESCO, 2017) .

In addition to these sectoral pressures, there are cross-cutting dynamics: population growth, rapid urbanisation, climate change, pollution, changing diets, etc. The combination of these factors is accelerating the relative scarcity of water resources, both in terms of quantity and quality (Hatfield & Dold, 2019) .

1.2. Multifaceted conflicts

With increasing pressure on water resources, tensions between different uses are becoming more frequent and complex. While the physical scarcity of water is perceived as the immediate cause, conflicts over use more broadly reflect imbalances in the governance, allocation and prioritisation of water resources (Wientjes & Seijger, 2024 ; Gleick, 2014) .

Inter-sectoral conflicts are a well-recognised category. They pit agricultural uses against domestic uses, particularly during periods of drought. In France, the controversy surrounding mega-basins illustrates this confrontation between irrigating farmers and local authorities, in a context of growing demand and disagreement over priorities (RTL, 2025) . Furthermore, studies by Su (2023) on the effects of toxic discharges into aquatic environments have shown that industrial activities can also conflict with domestic or environmental uses, as they are both heavy water consumers and polluters.

Furthermore, tensions also arise within the same sector. This is the case in agriculture, where farmers located upstream of watersheds often have an advantage over those downstream. Similarly, in rural areas, small producers sometimes struggle to access resources in the face of larger, better-equipped farms set up by those with the means (Traore, 2022) . These intra-sectoral inequalities, although invisible in overall statistics, are nevertheless observed and noted in field surveys (Thierry, 2011) .

Territorial conflicts, particularly at the watershed level, reflect a lack of collaboration between communities that share the same water resources. When several municipalities or regions exploit the same groundwater or watercourse without a coordinated regulatory mechanism, excessive withdrawals or cross-contamination generate lasting tensions. The Jordan River basin, shared by Israel, Jordan and Palestine, is a prime example of a hydropolitical conflict, where rivalries over access are intertwined with complex geopolitical issues (Allan et al., 2010) .

At the same time, dysfunction between levels of governance can amplify these various tensions. For example, the implementation of national standards without taking local realities into account often results in policies that are disconnected from the ground (Lasserre, 2021) . This is the case in West Africa, where many water management strategies have failed because local communities were not consulted and the real needs of the territories were not taken into account (Baron & Bonnassieu, 2011) .

Far from being exceptional, these forms of conflict are symptomatic of governance that remains compartmentalised, sectoral and ill-suited to current challenges. They highlight the urgent need to establish coordination and mediation mechanisms capable of arbitrating uses within a shared territorial framework.

2. IWRM's organisational response to tensions

As the complexity of uses and the intensity of conflicts over water continue to increase, compartmentalised, hierarchical and often reactive sectoral management is showing its limitations. In response to this, integrated water resources management is presented in its principles as an organisational and territorial approach capable of reconciling equitable access, water efficiency and sustainable use (Biswas, 2004 ; GWP, 2000) . However, the literature indicates that these principles may face conceptual, institutional and political problems (limited capacities, inequalities, conflicts, lack of local ownership, etc., see §3).

2.1. Founding principles of integrated governance

From the 1990s onwards, integrated water resources management (IWRM) emerged as a response to the limitations of sectoral and technocratic approaches. It was formalised at the International Conference on Water and the Environment

held in Dublin in January 1992, which resulted in a founding declaration based on four main principles (GWP, 2000 ; Biswas, 2004 ; Lasserre, 2021) .

Principle 1: Freshwater is a limited and vulnerable resource essential to life, development and the environment.
This first principle recognises that water is not an inexhaustible resource. It is subject to increasing pressures from human activities, climate hazards and pollution. Therefore, its management must be comprehensive, integrating the interactions between water, soil, ecosystems and human uses. This requires taking into account the entire hydrological cycle and planning uses according to the actual availability of the resource (GWP, 2000) .

Principle 2: Water management and development must be based on a participatory approach involving users, planners and decision-makers at all levels
This principle emphasises that decisions relating to water can no longer be taken in a top-down and unilateral manner. They must involve the relevant stakeholders, i.e. local authorities, farmers, industrialists, NGOs and citizens, from the diagnostic phase onwards and throughout the planning process (Molle, 2020) . This participatory approach promotes transparency, the legitimacy of trade-offs and ownership of management rules (Institut 2IE, 2010) . However, this principle should be qualified insofar as there may be a discrepancy between the stated desire to promote a participatory approach and the fact that decisions are often taken outside participatory bodies (see §3, section on the limitations of IWRM).

Principle 3: The central role of women in water supply, management and conservation.
Although women are often the primary users and managers of water on a daily basis, particularly in rural areas, they are under-represented in governance bodies. This principle calls for their effective inclusion in decision-making processes, recognising their expertise and essential role in local resource management. Here too, this principle remains mostly symbolic and theoretical. Indeed, the implementation of this principle is hampered by institutional, cultural, economic and capacity constraints that relegate women to domestic roles, limit their voice in governance and prevent effective technical and participatory integration (see §3).

Principle 4: Water has economic value
The fourth principle of IWRM stipulates that water can no longer be considered a free commodity. Recognising its economic value helps to combat waste, encourage efficient use and finance infrastructure for its sustainable management[1] .

These four principles form the basis of IWRM, which aims to combine *water efficiency, social equity and environmental sustainability*. They have been incorporated into national public policies and international strategies, although with varying degrees of application depending on the context 2004 ; Lasserre, 2021) .

2.2. Contributions of IWRM to appropriate water resource governance

Beyond its conceptual foundations, IWRM is a possible response to tensions related to competing uses. It transforms the way in which decisions are made, resources are designed, planned and shared, by providing territories with organisational tools capable of anticipating conflicts, optimising uses and ensuring greater equity between stakeholders (Molle, 2020).

The first tangible contribution of IWRM is the establishment of multi-stakeholder dialogue mechanisms at both local and regional levels. The establishment of Local Water Commissions (CLE), Water Development and Management Plans (SAGE) or basin committees allows all users to participate in the joint development of rules for resource allocation (Lasserre, 2021) . This co-production of standards reduces power struggles and promotes more legitimate and transparent management.

IWRM also helps to strengthen strategic planning in a context of increasing climate uncertainty. By incorporating demographic change scenarios, drought projections and groundwater recharge data, IWRM mechanisms encourage

[1] It should be noted that this principle differs from that advocated by Elinor Ostrom, who considers water to be a common good managed by local institutions and collective rules, and not just a commodity to be exploited economically. This vision thus differs from IWRM, which emphasises economic value and market instruments. Ostrom challenges the idea that common resources are irrevocably doomed to overexploitation and shows that communities can devise rules to manage water sustainably and collectively. She formalises principles for the design of local institutions based on demarcation, participation, monitoring and graduated sanctions to avoid the presumed "tragedy" of the commons (Mazzucato and Zaqout, 2024).

preventive rather than reactive management (GWP, 2000) . This ability to anticipate is essential to avoid emergency decisions that are often poorly accepted.

Furthermore, IWRM facilitates improvements in water efficiency by promoting the adoption of appropriate technical and economic tools. For example, the use of treated wastewater for irrigation can in some cases[2] be an innovative solution to alleviate pressure on groundwater in arid areas (UNESCO, 2017) . Furthermore, the introduction of differentiated and incentive-based pricing, when properly calibrated, can encourage water conservation while ensuring the financial sustainability of water services.

Finally, this integrated approach contributes to the social acceptability of decisions by establishing mediation processes based on consultation rather than confrontation. By promoting transparency, stakeholder involvement and mutual recognition of needs, IWRM provides a stabilising organisational framework in situations of water stress or territorial rivalries (Institut 2IE, 2010 ; Molle, 2020) .

Box 1: Examples of IWRM implementation

In Cape Verde:
Cape Verde is an island nation subject to structural aridity: rainfall is less than 250 mm/year, freshwater resources are limited and fragile, and usage is heavily concentrated on the coast, where urban and tourist activities are concentrated. This context, aggravated by the salinisation of aquifers and the absence of permanent rivers, has forced the country to adopt innovative water governance. The IWRM approach has been gradually integrated through public policies aimed at combining technical modernisation and territorial involvement (Nascimento, 2017) . Its objectives were to guarantee equitable access to water despite natural constraints; optimise uses through the development of alternative water sources; and prevent allocation tensions by promoting the prudent management of available water resources. The following actions were implemented:
Adoption of a legislative framework inspired by IWRM principles, with the creation of local water management agencies;
Widespread use of desalination for drinking water and promotion of the reuse of treated wastewater in irrigated agriculture;
Differentiated pricing based on usage, water-saving measures, and education on water conservation (UNESCO, 2019) .

The results have led to improved water efficiency, particularly in semi-urban areas. The experience of the Poilao dam, studied by Nascimento (2017) , illustrates how the combination of community management, reforestation and wastewater reuse has stabilised local tensions. Cape Verde thus demonstrates that IWRM adapted to the island context not only compensates for scarcity, but also builds institutional and social resilience (Nascimento, 2017).

In Burkina Faso:
Burkina Faso, a landlocked Sahelian country, faces increasing water pressure, exacerbated by the effects of climate change. It has experienced several episodes of severe drought, particularly in the 1970s and 1980s, which have profoundly weakened its ecosystems, agricultural fabric and adaptive capacities. These prolonged droughts have also been triggers for tensions between different water users, particularly in rural areas where the resource has become a highly contested commodity in times of scarcity (Siri, 2021). However, the country has been a pioneer in West Africa in implementing ambitious institutional reform, reflected in the Action Plan for Integrated Water Resources Management (PAGIRE) launched in 2003, based on a clear legislative framework (Water Law). The objectives were to: territorialise water management at the watershed level; integrate the participation of local communities in governance bodies; improve inter-sectoral coordination; and anticipate conflicts. The actions implemented included:
Creation of multi-level structures: National Water Council, Water Agencies (AE), and Local Water Committees (CLE);
Participatory development of Integrated Water Resource Management Plans (IWRMPs) in several basins;
Implementation of field actions: rehabilitation of water points, anti-erosion dykes, distribution schemes (Wetta et *al.*, 2017 ; Siri, 2021) .

The field assessment conducted by Zerbo (2017) in the Upper Comoé sub-basin highlights concrete progress: effective local consultation, partial ownership of PGIREs, and increased skills among field actors.

[2] The reuse of treated wastewater (REUT) can be beneficial provided that it is considered a substitute resource rather than an additional resource. Indeed, this treated water, which is extremely important in contexts of scarcity, would increase water availability and thus supply. However, it must not overshadow the management of uses, and in particular the rebound effect, i.e. increased use of a resource following its new availability. REUT must therefore be integrated into a comprehensive and sustainable water resource management strategy. This involves rethinking our consumption habits and favouring more responsible and efficient uses (Ourbak and Laaouimri, 2024). It is therefore necessary to verify that this approach is appropriate for the territory concerned. In addition, it can generate significant negative externalities and encounter limitations/constraints in its implementation (see, for example, Al-Hazmi et al., 2023; Kenmogne et al., 2010; Laouimri, and Ourbak, 2024, etc.).

However, Sanogo et *al.,*(2024) point out that many CLEs struggle to operate sustainably due to lack of funding, institutional overlaps, or insufficient coordination with agricultural and climate policies. Other studies have also shown the difficulty of operationalising CLEs in Burkina Faso given the lack of ownership by local actors (Baron et al., 2022; Siri, 2021). A case study in the Ziga sub-basin in Burkina Faso also shows how institutional and organisational IWRM mechanisms encounter territories structured by endogenous pre-IWRM rules for water resource protection , which has led to unexpected effects, conflictual confrontation or, more rarely, hybridisation of rules. This discrepancy between prescribed rules and endogenous "pre-IWRM" rules is evident in conflicts between public authorities and local populations, highlighting the failure to take into account and evaluate the effectiveness of "pre-IWRM" rules in terms of resource protection (Baron et al., 2022).

Despite these limitations, Burkina Faso remains a regional benchmark. The experience of pilot basins, such as Comoé and Nakambé, is now cited as a learning ground for other Sahelian countries (Wetta et *al.*, 2017) . However, strengthening human resources, integrating hydrological data into decision-making systems, and clarifying the roles between institutions remain major challenges to be addressed in order to sustain the model.

3. Limitations of IWRM

Despite its ambitions for sustainable and equitable use of resources, IWRM has limitations when implemented in the field at the territorial level, particularly in southern countries.

The theory and mechanisms of IWRM are based on four principles that are implemented through institutional and organisational mechanisms and operational rules. These mechanisms and rules are detailed in an *IWRM toolbox*, designed on the basis of internationally recognised best practices. This presupposes the existence of (1) an adequate institutional framework; (2) legislative and regulatory mechanisms for sustainable resource management; (3) organisational structures ensuring the participation of all users; and (4) instruments (information, evaluation, etc.)" (Baron et al., 2022). However, according to Molle (2012), "IWRM has been promoted in various forms as a philosophy, a set of principles, guidelines, a framework, an approach, a method, a process or a set of prescriptions. As a result, it has often been criticised for being vague, overpromising, or unrealistic, particularly with regard to its implementation." The same author describes it as a "nirvana concept": just like Nirvana, the probability of achieving IWRM is low! There is a significant gap between theory and practice. It is a consensual and attractive notion, which is therefore difficult to question, but which in practice reveals a persistent gap between the principles set out in theory and the operational realities on the ground. Designed as a universal normative framework, IWRM is often introduced in a technocratic manner, without any real adaptation to the contexts of the territory concerned.

According to F. Molle, IWRM faces a number of problems, including often conflicting objectives, difficult compromises and power asymmetries between the various stakeholders. Indeed, participation models tend to reflect power asymmetries rather than smooth them out. This author notes the propensity of IWRM to be hijacked by interest groups seeking to legitimise their practices and the risk of it becoming a "Trojan horse" imposing standardised policies and predefined "good practices" without much attention to context. Furthermore, participation, which is a central component of IWRM practice, is not sufficient "because it is also recognised that simply creating opportunities for participation will not help disadvantaged groups if their capacity to participate is not strengthened" (Molle, 2012).

On a social level, IWRM struggles to ensure fully inclusive participation by local communities. Governance mechanisms such as Local Water Committees suffer from a lack of representativeness, which marginalises small producers, women, rural users and holders of traditional knowledge (Siri, 2021) . The emphasis on the role of women, promised by IWRM, aims to correct gender inequalities in access to and management of water. However, although women are often mentioned in IWRM frameworks, their effective inclusion remains limited, uneven and often symbolic (Johansson, 2016). *Ultimately*, equitable access to water resources remains an unfulfilled promise.

From an economic perspective, the financial resources allocated to local governance are often limited. According to Baron et *al.* (2022) , although differentiated pricing mechanisms are encouraged in theory, their implementation remains difficult in low-income rural areas, where inequalities between large operators and small users tend to widen.

At the political and institutional level, coordination between the various actors involved is proving fragile. Overlapping responsibilities, administrative delays and a lack of inter-sectoral coordination compromise the coherence of the actions taken (Lasserre, 2021) .

In short, although IWRM represents an ambitious theoretical framework for water governance, its implementation has many limitations. To be effective, it must be adapted to local socio-economic and political-institutional realities.

Conclusion

Water scarcity amplifies competition between different uses and reveals the inability of fragmented management methods to guarantee equity, sustainability and social peace. Integrating different uses and involving users in governance is therefore no longer a choice but a necessity. Integrated water resource management provides a coherent framework for responding to these challenges. By combining participation, territorial planning and the joint development of allocation rules, it makes it possible to anticipate and/or manage tensions and build compromises adapted to local contexts.

The experiences of Cape Verde and Burkina Faso show that, even in situations of low water availability, inclusion and collaboration between stakeholders can limit conflicts, strengthen the legitimacy of decisions and promote more efficient management.
In the face of climate uncertainty and growing pressures, only integrated, equitable and forward-looking governance can ensure that water remains a factor of cohesion rather than a source of division.

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