

# WATER FOR CITIES AND RURAL AREAS

in contexts of climate variability: assessing paths to shared prosperity – the example of Burkina Faso

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## KEYWORDS

- SEMI-ARID LANDS IN A LOW-INCOME ECONOMY
- INCREASING CLIMATIC VARIABILITY (RAINFALL)
- URBAN-RURAL WATER ALLOCATION
- ZIGA AND BAGRÉ DAMS
- URBANISATION

The water management authorities in Burkina Faso are, at present, succeeding in responding to the 'bulk' water demand of the capital city, Ouagadougou – located in the semi-arid central region of Burkina – through a major 'supply-side' infrastructure project, the Ziga dam and Ziga-Ouagadougou pipelines. This article questions, however, the long-term viability of the current approach. Ouagadougou's status as economic and administrative capital gives it great power to plan for and mobilise investment for its own water supplies, at the expense of water for rural development.

In the context of climatic changes and forecasts of substantial continued growth of the city's population, the author argues for development of an urban-rural water strategy with a different allocation model to support a pathway to future prosperity in this semi-arid economy.

## INTRODUCTION

Political leaders tend to focus on the short term, with electoral mandates discouraging long-term thinking. When ministers or heads of state propose major infrastructure developments, it is the job of civil servants and independent experts to push for assessment of the long-term implications of those projects, including climate risks. Water and water management lie at the forefront of climate change and adaptation to climate change. The design of urban water projects and irrigation schemes, as well as hydropower dams, needs to take account of changing rainfall patterns that risk increasing vulnerability to drought, especially in arid and semi-arid lands.

The case study discussed in this paper considers efforts by the authorities in Burkina Faso to ensure water supplies for the capital city, Ouagadougou. Ouagadougou is located in the centre of the national territory, in a semi-arid zone with an average annual rainfall of just 600-900 mm a year. Burkina is experiencing climate variability, including shorter and more unpredictable rainy seasons.

From 1985 to 2000, the population of Ouagadougou doubled, putting intense pressure on water services. There were more and more frequent service interruptions, with major problems in the provision of water for the residents in the new peri-urban areas, including slums, which had grown up around the city centre. In 1998-2000, the Ziga dam was built on the Nakambé River, 50 kilometres away from

Ouagadougou to the north-east, with a water main (one metre in diameter) from there to the capital. The project was supported by the World Bank and other external donor sources, who also provided two phases of investment (2001-2007 and 2009-2015) to enable the urban water company, l'Office national de l'eau et de l'assainissement (ONEA), to extend the distribution networks and water services within the city, including partial extension into poor peri-urban areas. The Ziga dam is also in a semi-arid area. Its water is reserved for the use of Ouagadougou as well as a few other towns, not for rural communities. Their drinking/domestic water comes from boreholes and they are prohibited from using the reservoir for irrigation, for fear of contamination with polluting chemicals. Local leaders complain that they have not been sufficiently compensated for the loss of fertile land (8,500 persons in 17 villages were displaced by the reservoir) and not supported with alternative revenue-generating opportunities. Thriving rural communities need water for productive use; where their access is limited, they will tend to migrate to the cities/towns, thereby increasing urban water demand.

## 1. THE URBAN-RURAL WATER INTERFACE

The question arises as to what constitutes appropriate urban-rural water allocation in the semi-arid conditions of central Burkina with its increasingly variable rainfall and how that allocation may be assessed and negotiated at the 'urban-rural water interface' (*l'arbitrage urbain-rural* in French).

The workshop organised by the 'Pathways to Resilience in Semi-Arid Economies' project ('PRISE' project<sup>1</sup> or 'PRESA' in French) – an applied research project that aims to catalyse inclusive climate-resilient development in semi-arid lands – and held in Ouagadougou on November 12<sup>th</sup>, 2015, brought together 40 persons representing government, donors and civil society (NGOs and academia) as well as a group of 20 local actors from the area around the Ziga dam to discuss this issue. The researchers of the University of Ouagadougou II (led by Dr. Claude Wetta) and the Overseas Development Institute-ODI (Peter Newborne) invited the participants to look beyond the short and medium term to consider what policy options could be available to identify 'pathways to resilience' in this Burkinabé example of a semi-arid economy, according to the goal of PRISE. PRISE's vision of climate-resilient development is one of inclusive development that both eliminates poverty and maximises people's capacity to adapt to climate change. This requires a 'change in mechanisms of economic growth and social development, including institutional and regulatory frameworks, markets and bases of human and natural capital'.

## 2. WATER TRANSFERS

The principle that water for drinking and domestic use takes precedence over other water uses is commonly enshrined in national laws and policies. Urban areas with substantial residential populations accordingly expect to receive a priority water allocation. As cities have grown in contexts of increasing pressure on water resources, case studies have begun to emerge of water transfers and 'reallocations' from rural to urban

areas. Cities commonly include, however, a range of different types of water user – commercial and industrial as well as residential – and the issue arises as to the status of city water entitlements vis-à-vis the water rights of rural communities. In arid and semi-arid zones, this is a particularly important question.

Where these water transfers<sup>2</sup> require new or altered infrastructure, the related question arises as to what (single) purpose or (multiple) purposes the infrastructure will be built for in each case – domestic/urban water supply, energy, irrigation, livestock or other uses – and for whose benefit. Will water be conveyed long distances to urban centres by major works of civil and mechanical engineering, or will new urban areas be planned and constructed near rivers or lakes, as natural features of the environment?

The proposition considered in this paper is that, in semi-arid zones which face climate variability with the likelihood of increasing pressure on water resources, decisions on water management will increasingly require long-term strategies for allocation of water resources between urban and rural areas. Among economists, there is a tendency to argue for a systematic reallocation of water from rural to urban uses, on the basis that 'water is too often devoted to economically inefficient, "low return" (agricultural) uses and that transfers to more efficient, "high-return" (urban) uses would increase total economic welfare (Molle and Berkoff, 2009). Others challenge that view (*Ibid.*). Accordingly, there needs to be analysis and debate as to the appropriate urban-rural water balance in the national economy and society.

The Ouagadougou-Ziga case in Burkina Faso is an example of a water transfer. Ouagadougou draws 70% of its water (GoB, 2013) from the Ziga reservoir. The Nakambé, shared with neighbouring Ghana (known there as the 'White Volta'), is one of the four principal rivers of Burkina<sup>3</sup>. On the Nakambé in Burkina, the Ziga and Bagré dams comprise the major existing built infrastructure.

Both the urban population of Ouagadougou and the urban and rural populations in the area near Ziga require water for drinking and domestic, as well as productive, uses. Under Burkina law, drinking water use is highest in the hierarchy – the first listed in Article 1 of the 2001 Water Policy Management Act (GoB, 2001). The 1998 National Water Policy adds that the first objective is to 'satisfy sustainably, in quantity and quality, the water needs of a growing population and an economy in development' (GoB, 1998). As regards other uses, Article 1 of the 2001 Act continues that the goal of water management is to 'satisfy or reconcile the demands of agriculture, livestock, fishing

1 To find out more: <http://prise.odi.org/>

2 Some water transfers or 'reallocations' are temporary, during dry periods. Others are permanent, including those made following formal administrative decisions of government to appropriate and divert water sources, with or without compensation.

3 Along with the Mouhoun (or 'Black Volta', also flowing into Ghana), the Comoé and the Niger tributaries.

and aquaculture, extraction of minerals, industry, energy production, transport, tourism, leisure and all other legally-exercised human activities' as well as 'water quality' and 'protection of aquatic ecosystems' (GoB, 2001). The government, through the ministry responsible for 'integration' of water resources (Article 13) – the Ministry of Agriculture and Water Resources (MAHRH) – is responsible for overseeing how these different demands are to be satisfied as far as possible, to the extent they are complementary, or how they are to be reconciled, where competing. In Burkina, 'integrated' water resources management or 'IWRM' (*gestion intégrée des ressources en eau* or 'GIRE' in French) is the 'foundation' of national water policy (GoB, 2003).

### 3. CLIMATE

There are three climatic zones in Burkina: the arid Sahel in the North, with typically average annual rainfall of less than 600 mm; the semi-arid 'Sudano-Sahelian' zone in the centre, with average annual rainfall of 600-900 mm; and the dry sub-humid 'Sudanese' climatic zone in the South, with average annual rainfall of 900 mm (Wetta et al., 2015). Burkina has two seasons: a long dry season and a short rainy season. In the semi-arid central zone, the rainy season is about five months, typically from May/June to September/October. In the arid Sahel in the North, the rainy season is typically shorter – four months at most. In the southern zone, the rainy season lasts nearly 6 months (Wetta et al., 2015).

The past three decades have seen signs of increasing variability in rainfall distribution, temporal and spatial, manifested by shorter and more unpredictable rainy seasons (Wetta et al., 2015; FEWSNET, 2012). This has serious implications for agriculture in Burkina, which is mainly rain-fed. According to the Strategy for Accelerated Growth and Development (SCADD) 2011-2015 (GoB, 2011), Burkina was expected to move from, at the beginning of the 2000s, 'a situation of moderate water stress in a normal year and moderate/high stress in a very dry year' to a 'permanent situation of high water stress in 2010-2015' with 'water demand reaching 69.7% of utilisable volume in a normal year and 141.9% in a very dry year'. 'Pollution (domestic, agricultural, urban) exacerbates the water deficit' (*Ibid.*).

It is uncertain whether these trends are exacerbated by climate change attributed directly or indirectly to human activity or whether they are a feature of natural climate variability. According to the AGRHYMET Regional Centre, the continuing drought in the western part of the Sahel (Senegal and western Mali) contrasts with the situation in the eastern zone (Chad, eastern Niger), which is experiencing a return to wetter conditions (AGRHYMET, n.d.). As to which situation prevails in the central zone where Burkina is located, the sources are inconclusive. Some climate



projections forecast higher, and some lower, rainfall. The sources are, however, in agreement as to increasing *climate variability* affecting Burkina in shorter and more unpredictable rainy seasons.

The topography of Burkina is notable for the generally flat relief with only a few elevated areas – which means there are few available sites for deep water storage<sup>4</sup>.

### 4. POPULATION

The population of Burkina has tripled in the past five decades, from 4,317,770 inhabitants in 1960 to 14,017,262 in 2006, with growing rates of increase – from 2.8% per year in 1991 to 3.13% in 1996 and 3.42% in 2006 according to the National Demographic and Statistics Institute (INSD, 2011). At the rate of 3.1% increase per year, the country is forecast to have a population of 18,450,494 in 2015 (*Ibid.*). The urban population growth at above 5% per year is higher than overall population growth at of 3% per year (urban and rural) (figures from the 2006 census – INSD, 2008).

As for migration, whereas in 1985 only 21.7% of the population of Burkina at that time reported to the census survey that they had migrated, in 1993 this figure was up to 30.7% (Wetta et al., 2015). The principal motivation of migrants is the search for a better standard of living (*Ibid.*).

Despite the increase in the urban population, the population overall is still predominantly rural (70%) with the majority of Burkinabé – 80.9% – reported to be working in 'agriculture, hunting and forestry' (INSD, 2011). The SCADD (GoB, 2011) identifies the primary sector of 'agriculture, livestock, fishing and forestry' as a priority for development. The SCADD also identifies as a priority the promotion of economic growth in urban centres, stating there is 'under-urbanisation' in Burkina (GoB, 2011). In

<sup>4</sup> The elevated areas are, in the West, the Piton de Bérégaougou at 717 m, dominating the plane of Banfora, and Mount Ténakourou at 749 m, which is the highest in the country; and, in the South-East, the chain of the Gobnangou hills at 500 m on the frontier with Benin.



other words, the SCADD looks for stable economic growth in both the urban and rural economy without expressly favouring either.

The SCADD further observes that the agricultural sector is 'vulnerable to external shocks' including 'climatic uncertainties' (GoB, 2011). This is an important consideration for policy-makers, although vulnerability in the primary sector is mirrored by vulnerability in other parts of the economy. Burkina has, the SCADD notes, been affected by external events such as oil price fluctuations and the financial crisis post-2008.

## 5. OUAGADOUGOU

In the 1960s, following independence, Ouagadougou was the administrative capital of Burkina, with Bobo-Dioulasso considered the economic capital of the country. Subsequently, Bobo-Dioulasso's economic advantage *vis-à-vis* the capital declined as a result of government policy favouring Ouagadougou, especially during the 1980s and 1990s. Ouagadougou became the economic as well as the administrative capital<sup>5</sup>. Its geographical position in the centre of the country certainly has some advantages, as compared with Bobo-Dioulasso in the South-West (though with no ready access to water – see below).

Following on from the growth of Ouagadougou in the 1980s and 1990s, the city's population stood at 1,915,102 in 2012 (INSD website). The experience of the 10 years from 1996 to 2006 was that more than half of urban population growth occurred in Ouagadougou/the Centre region (53.1%), alongside 14.2% in Bobo-Dioulasso (GoB, 2008).

The population of Ouagadougou is still increasing at a fast rate. The UN cites population growth rates for Ouagadougou at 5.97% for the period 2015-2020, 4.95% for 2020-2025 and 4.25% for 2025-2030 (UN Population Division, 2014). At these rates, the population of Ouagadougou is forecast to be 2.83 million by 2020, 3.78 million by 2025 and

<sup>5</sup> Despite a period since 2000 of growth in Bobo-Dioulasso.



4.66 million by 2030. Assuming population growth continued thereafter – at rather lower rates to reflect a continuing downward curve in the degree of increase, at, say, 3.5% from 2030 to 2040 and 3.0% from 2040 to 2050 – the population of Ouagadougou would be 6.57 million in 2040 and 8.83 million by 2050. A 2011 study suggests the population levels of Ouagadougou (and Burkina) could be even higher (Guengant, 2011). In other words, from a 2010 baseline, the population of Ouagadougou is forecast to double by 2030 and then, potentially, to double again by 2050.

## 6. ZIGA

At the time of construction of the Ziga dam, it was noted that the sufficiency of the 'bulk' water supply to Ouagadougou in the medium term would need to be monitored. A decade later, in 2013, the city hosted nearly 2 million residents and in 2014, water shortages in Ouagadougou caused intermittent cuts to supply, pointing to the risk of a possible return to the chronic water shortages of the 1990s.

By way of response, a second phase of the Ziga project is under way (2015-2016). The intention is to lay a second mains pipe (1.2 m in diameter), parallel to the existing pipe, doubling the volume of water ONEA can convey from Ziga to Ouagadougou. That is expected to meet the capital's water needs in the medium term. The crest of the Ziga dam will not have to be raised as part of Ziga Phase 2 since the Ziga Phase 1 main requires a water storage capacity in the reservoir of just 40 million m<sup>3</sup> out of a substantially greater total volume (200 million m<sup>3</sup> when full, 184.7 million m<sup>3</sup> of useful volume/active storage).

*What, however, of the long term?* As noted above, the population of Ouagadougou continues to grow at a fast rate. This raises the question of from where the capital will draw its supply once the capacity of the Ziga reservoir has been exceeded – some time beyond 2030. Also, the issue arises of to what point the growth of Ouagadougou into an ever-and-ever larger city is sustainable. Ouagadougou is not situated beside a major river, in contrast with the second-largest city of Burkina, Bobo-Dioulasso, in the South-West, a more humid part of the country. This question is considered in 'Ouagadougou to 2025, and beyond', below.

## 7. BAGRÉ

While the designated purpose of the Ziga dam is supply of drinking water, the primary role of the Bagré dam, located near the border with Ghana, 220 km south-east of Ouagadougou (in the sub-humid climatic zone), is to supply electricity. The Bagré reservoir was first flooded in 1992. Levels of electricity access in Burkina are low, at 13.1% nationally in 2012, with a reported access rate in urban areas of 47% compared with just 1% in rural areas (SE4ALL, 2013) – a very

low rate, even by Sub-Saharan African standards. In 2013, 42% of electricity in Burkina was imported, from the Côte d'Ivoire, Ghana and Togo. The operator of the Bagré dam is the National Electricity Company (SONABEL)<sup>6</sup>. SONABEL's records as to the volume of river flows into the Bagré reservoir<sup>7</sup> (recorded monthly, in two six-monthly periods) show that the Nakambé River at/above Bagré is not perennial. In the dry season from October/November to March/April, there are no (or low) river flows into the lake. In the Bagré region, there are just six months of rain and river flows<sup>8</sup>.

Generation of electricity is not the sole purpose of Bagré. The lake is also used for irrigation, with a maximum potential of 30,000 ha. The 2010 baseline report on Bagré, nevertheless, comments that, 'When it is considered that 85% of the volume of water in the Bagré reservoir is allocated to electricity generation, the principal activity of Bagré is seen to be production of hydro-electricity. That is the reason why operation of Bagré was handed over to SONABEL' (ICI, 2010).

## 8. WATER USES: COMPETING, AND COMPLEMENTARY

A negative impact of the Ziga dam has been to reduce and limit irrigated agriculture in the area. The conclusion of an April 2013 workshop in Ziniaré near Ziga organised at the instigation of the central government authorities was that use of the Ziga reservoir for irrigation, including the small irrigation (market gardening) of the type local communities installed beside the lake (i.e. after construction of the dam), is 'totally incompatible' with the lake's drinking water purpose (GoB, 2013). The ban does not apply to *downstream* of the Ziga dam, where there are opportunities for irrigation, for example for a group of around 200 women who are benefiting from irrigation of an area of around 8 ha located some 800 m downstream, alongside two other groups. The water they are drawing comes out of the river channel below the dam, which means it is not competing (at least not directly, depending on spills/releases of water from the Ziga dam) with the water extracted from the reservoir for the treatment plant and conveyance to Ouagadougou. In the Ziga area more widely, a 2011 census recorded 4,089 irrigation plots covering a total of 341.48 ha downstream of the Ziga dam through gravity-fed irrigation mostly, with a few motor pumps in 9% of cases (Traoré, 2013). All such activities *upstream* of the dam, on both sides of the lake, are banned.

6 SONABEL (100% state-owned) is responsible for generation, transmission and distribution (i.e. the electricity sector in Burkina is not 'unbundled').

7 Including the flow into Bagré Lake of several tributaries of the Nakambé.

8 Source: key informant interview; the Mouhoun River is, in contrast, permanent, as is the Comoé.

**“A NEGATIVE IMPACT OF THE ZIGA DAM HAS BEEN TO REDUCE AND LIMIT IRRIGATED AGRICULTURE IN THE AREA. THE CONCLUSION OF AN APRIL 2013 WORKSHOP IN ZINIARÉ (...) WAS THAT USE OF THE ZIGA RESERVOIR FOR IRRIGATION IS ‘TOTALLY INCOMPATIBLE’ WITH THE LAKE’S DRINKING WATER PURPOSE.”**

There is considerable local resentment at this ban, a feeling of injustice that the villages adjoining the Ziga lake are not able to carry out productive agricultural activities because according to local leaders, the government had not honoured its commitment to support local people in alternative irrigation projects<sup>9</sup>. The small dams promised by ONEA had, according to key informants, not been built, or at least not well built; one dam had been constructed, but the earthwork has collapsed. Local people felt compensation for construction of the Ziga dam had not been adequate and the government was not engaging with local stakeholders in a spirit of 'give and take'. It is especially young people of the communities who are frustrated they cannot make a better living by producing and selling vegetables and other products of irrigation. Many young community members have already emigrated and, among those remaining, there is a grumbling discontent. A local leader commented, 'development cannot happen in a context of conflict, without social peace. As long as we do not receive support/assistance in recognition of the consequences of the dam, there is a problem that needs to be resolved.'

The people consulted in the Ziga area acknowledged the need for drinking water to be supplied to Ouagadougou. That said, among local people, there was no awareness of the reality that only *part* (albeit the majority, 85%<sup>10</sup>) of the water conveyed in the main from Ziga to Ouagadougou is destined for drinking and domestic use. The principal commercial/industrial use of water in the city is by tanneries and breweries, as well as in building/construction.

It was striking that during the key informant interviews conducted by this research study, local people consistently expressed their perception that the timing of the rainy season (onset and duration) was becoming more variable. 'There is insufficient rain for solely rain-fed agriculture,' said a local leader.

In contrast with the ban on irrigation upstream, one clear benefit of the Ziga dam has been the opportunity to fish on the Ziga Lake. The researchers met one fisher group, born and brought up in the local area. These fishermen have in the past migrated to exercise their trade, for example to the Kompienga dam (in the far South-East of Burkina) and to Bagré. Construction of the Ziga dam, however, gave them the opportunity to work as fishermen in their own locality.

The irrigation downstream and the fishing on the lake are uses that are currently compatible and complementary with the use of the Ziga reservoir for drinking water. Competition for access to the water in the reservoir is currently about water *quality* not quantity – the water in the reservoir could at present, and it seems in the medium term, serve the demands of both Ouagadougou and local water users, subject to seasonal variations in flows.

9 No figures were available to this preliminary study relating to the funds invested in the Ziga area.

10 Source: ONEA 2013 company review, as supplied by key informant.



## 9. OUAGADOUGOU TO 2025, AND BEYOND

As for future use of the Ziga reservoir, this will depend largely on the future of Ouagadougou and its water demand. The Ministry of Housing and Urban Planning published in 2008 its strategic development plan for Greater Ouagadougou to 2025 – the *Schéma Directeur d'Aménagement du Grand Ouaga, Horizon 2025* (SDAGO) (GoB, 2008). On the plan, a new designated area of future urban development constitutes between a quarter and one-third of the size of the current city, in territorial terms. In population terms, given the ministry's plan to adopt a denser model of residential housing, this expansion is likely to result in – and be designed to accommodate – a growth in Ouagadougou's population of approximately one-third; that is, an increase from 1.9 million in 2012 to 2.5 million by 2025. This is substantially lower than the forecast population figure for 2025 cited above, of 3.78 million. A question arises, therefore, as to where the extra million and more city residents forecast at that time will be accommodated, and in what conditions; and to what extent the government's efforts to manage urban growth in Ouagadougou will, or will not, be adequate to meet the actual increase in numbers.

The policy of integrated water resources management adopted in Burkina is supposed to provide for 'consensual and participatory management of water resources between a range of stakeholders at different levels with divergent interests and a variety of perspectives' (GoB, 2003). The political economy of water allocation between town and country, as revealed in the Ouagadougou-Ziga case, is, however, far from, 'consensual and participatory', at least currently. The authorities are effectively asserting Ouagadougou's water claims as right, without presenting a reasoned case. Stakeholders from the Ziga area, including members of local communities, were invited to attend the April 2013 workshop, but they were not invited to take part in decision-making. As one local representative said, 'The authorities do not consult; they tell us what they have already decided.'

It is not clear how far, in practice, climate aspects are being taken into account in water and related decision-making in Burkina. The actions set out in the National Action Plan for Climate Change read like a long 'wish' list. Many of the recommended steps are doubtless desirable, but the question arises of how far these actions are incorporated into the plans of sector ministries with government or donor funding available for their implementation (also, the current status of the National Action Plan, which was in draft form in April 2014 (GoB, 2014)).

The 2008 National Housing and Urban Development Policy notes that the 2006 Law on Urban Planning and Construction is just the 'beginning of the legal framework' (GoB, 2008). Strengthened urban planning rules and capacities are needed, it says, to tackle the 'major challenge' posed by real estate speculation, which 'is common' (*Ibid.*)<sup>11</sup>. Without 'evolution of regulation on urban land management', including 'clarification of the means by which access to land is obtained', the speculation is likely, contrary to the best efforts of the authorities, to continue and development will be uncontrolled (GoB, 2008). As noted above, the prospect is of a doubling of the size of Ouagadougou's population from 2015 to 2030 (to 4.66 million), and a further potential doubling between 2030 and 2050 (to 8.83 million). Such a fast rate of city growth suggests there will be more unplanned peri-urban areas and more slums lacking basic services, including water. While urban development plans, such as those set out by the ministry in this case, will seek to enhance the economic dynamic of the city, high inflows of migrants to the capital could give rise to the possibility of negative economic (and social) effects.

The 2008 urban development policy also notes the need for housing and land use planning to improve in other parts of Burkina, in both rural areas and in/around 'small towns', of which there are 36 (GoB, 2008) and the medium-sized towns, of which there are 11 beyond the two 'metropolitan' centres of

**“THE POLITICAL ECONOMY OF WATER ALLOCATION BETWEEN TOWN AND COUNTRY, AS REVEALED IN THE OUAGADOUGOU-ZIGA CASE, IS, HOWEVER, FAR FROM ‘CONSENSUAL AND PARTICIPATORY’, AT LEAST CURRENTLY.”**

<sup>11</sup> Typically – note the authors of the policy – customary land on the new edge of town becomes the target for purchase in the real estate market.



Ouagadougou and Bobo-Dioulasso (GoB, 2008). The authors of this national policy state: 'If this [urbanisation] process is not managed so as to achieve more of a *regional balance*, there could be very negative consequences in terms of the physical organisation of space and social equity' (emphasis added).

In Burkina's second- and fourth-largest cities, Bobo-Dioulasso and Dédougou, water demand and consumption are rising and ONEA is investing in improvements in water services. In both cities, ONEA is using a combination of its own resources and donor funds (including from the World Bank) to improve water supply. In Bobo-Dioulasso, the aim is to drill three new boreholes (into sedimentary rocks) and build three new water towers to store 4,000 m<sup>3</sup> in total. In Dédougou, similarly, there will be new boreholes to retrieve groundwater from the sedimentary geology, with new water towers. These investments should go at least some way towards a regional balance.

**What will be the water demand of an expanded Ouagadougou?** Based on the prospect of a doubling of Ouagadougou's population in the medium term, to 2030, and a further potential doubling of the city's population in the long term, to 2050, water demand would be likely to exceed the maximum capacity of the Ziga reservoir (according to the average useful volume/active storage of 184.7 million m<sup>3</sup>) at some time to be determined between the 2030 and 2050 time horizons<sup>12</sup>. The level of unaccounted-for water in Ouagadougou (i.e. water for which ONEA did not receive payment, because of either physical leaks or failures in invoicing or bill collection) was noted by the World Bank in 2009 to be at 18% of production, which, the World Bank comments, made ONEA's record one of the best performances in Sub-Saharan Africa.

Government officials referred to future growth of water demand in Ouagadougou and mentioned the possibility of a further infrastructure project to supplement the capital's supply. Post-2030 it is 'in the minds' (*dans les esprits*) of the authorities that Bagré could be the next source (or at least a further source) of water supply to Ouagadougou. As noted above, currently, the Bagré dam has two purposes: hydropower and irrigation – not water supply.

This is likely, however, to involve choices between different and sometimes competing priorities, i.e. a trade-off. The SONABEL records show a great variation in the levels of the Bagré reservoir year by year. The level of filling of the reservoir overall has been greater in the past 10 years than in the previous decade, although with, recently, considerable variation<sup>13</sup>. The fluctuations in flows/levels have become more pronounced. For example, in 2011, the reservoir was only partly filled, and 2013 was a



dry year also. In 2013, SONABEL stopped hydropower production for a period of two months<sup>14</sup>. Faced with electricity demand, SONABEL had to administer a programme of power-rationing (load-shedding), for example in Ouagadougou – by 'rotation' eight hours per day, by zone. 2006 was also a dry year. In six out of the past 10 years, in contrast, the reservoir filled to capacity and SONABEL had to spill water at Bagré.

In other words, the experience at Bagré corresponds with the national picture of increasing variability in precipitation. The indications are<sup>15</sup>, in other words, that it cannot be assumed at any given time (at least during dry periods) that Bagré will be able to serve Ouagadougou with both hydroelectric power and water supply in sufficient quantity at the same time. In dry periods, extraction from the Bagré reservoir for drinking water would reduce the amount of water stored for hydropower generation. The Burkinabé authorities will need to anticipate and analyse the potential trade-offs and set out infrastructure options by way of response.

<sup>14</sup> How far, if at all, will construction of a Bagré Aval dam change this?

<sup>15</sup> Further research could usefully examine time series data on river flows and reservoir levels.

<sup>12</sup> There was no mention during the key informant interviews of a Ziga Phase 3.

<sup>13</sup> The Bagré reservoir empties yearly – there is not an accumulation of water between years.

**“THE SCENARIO OF A VERY WATER-THIRSTY ‘MEGA-OUAGADOUGOU’ IS AVOIDABLE IF APPROPRIATE ACTION IS TAKEN BY GOVERNMENT AND OTHER ACTORS.”**

## CONCLUSION

*Decisions on water allocation and infrastructure lie at the heart of development planning in semi-arid lands. On paper, the laws and policies of Burkina Faso accord equal entitlement to drinking water for the residents of cities and the residents of small towns and villages. In practice, Ouagadougou's status as economic and administrative capital gives it much greater power to plan for and mobilise investment for its own water supplies. The Ziga project (in two phases) has been designed to secure bulk water supply for Ouagadougou until 2030. At some time after that date, as discussed in this paper, the capacity of the Ziga reservoir to supply the capital will be exceeded.*

*The existing national development strategy identifies both urban and rural areas as priorities in the promotion of economic growth, without expressly favouring either. The growing pressure on water resources in Burkina requires, however, taking account of competing water uses. Political leaders need to look ahead to the long term to see where trade-offs are likely to arise and they need to set out decision-making processes to assess options and make choices.*

*As discussed at the November 12<sup>th</sup> workshop held by the PRISE project, the scenario of a 'mega-Ouagadougou' with a population of 8 million is avoidable if appropriate action is taken by government and other actors. The participants produced some preliminary ideas of what those measures could be, for example: regional investment funds to boost development of Bobo-Dioulasso and other urban centres, including in the relatively more humid southern zone, for a better regional balance; more support to rural irrigation projects including out-of-season irrigation (la culture de contre-saison); and design of multiple use water infrastructure where possible.*

*According to the climate information available, the pressure on water resources in the Nakambé River in central and south Burkina is likely to grow with increasing rainfall variability. More access to water storage for irrigation will be essential for maintaining and increasing agricultural production. By not, currently, making water adequately available to local people in the Ziga area, the authorities are unwittingly fuelling rural-to-urban migration, including to the capital.*

## PRISE PUBLICATIONS

- English report of this Burkina Faso study: <http://prise.odi.org/research/the-urban-rural-interface-a-preliminary-study-in-burkina-faso/>
- English blog to accompany the report: <http://prise.odi.org/comment-cities-and-country-or-cities-versus-country-urban-rural-water-allocations-in-semi-arid-lands-the-case-of-burkina-faso/>
- French language report of the study: <http://prise.odi.org/research/investissements-et-repartition-des-ressources-en-eau-au-burkina-faso-etude-preliminaire-sur-larbitrage-urbain-rural/>
- French blog to accompany the report: <http://prise.odi.org/comment-villes-et-campagnes-ou-villes-v-campagnes-larbitrage-urbain-rural-dans-la-gestion-de-leau-en-terres-semi-arides-le-cas-du-burkina-faso/>
- Twitter handle: @PRISEclimate (<https://twitter.com/priseclimate>)

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