



The Global Water Initiative

A Partnership Funded by the Howard G. Buffett Foundation

Sharing the water, sharing the benefits



Lessons from six large dams in West Africa



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Edited by
Frédéric Bazin (IRAM),
Jamie Skinner (IIED) and
Jérôme Koundouno (IUCN)

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About the Global Water Initiative

The Global Water Initiative (GWI), supported by the Howard G. Buffett Foundation, addresses the challenge of providing long term access to clean water and sanitation, as well as protecting and managing ecosystem services and watersheds, for the poorest and most vulnerable people dependent on those services. Water provision under GWI takes place in the context of securing the resource base and developing new or improved approaches to water management, and forms part of a larger framework for addressing poverty, power and inequalities that particularly affect the poorest populations. This means combining a practical focus on water and sanitation delivery with investments targeted at strengthening institutions, raising awareness and developing effective policies.

The Regional GWI consortium for West Africa includes the following partners:

- International Union for the Conservation of Nature (IUCN)
- Catholic Relief Services (CRS)
- CARE International
- SOS Sahel (UK)
- International Institute for Environment and Development (IIED).

GWI West Africa covers five countries: Burkina Faso, Ghana, Mali, Niger and Senegal. Some activities also take place around the proposed Fomi dam in Guinea.

For more information on the GWI, please visit: www.globalwaterinitiative.com

Executive summary

West African countries are planning to construct new large dams in order to meet their energy and water needs and to promote food security against an uncertain backdrop of climate change. If these new dams are to offer development opportunities for all and avoid social conflict over land and water management then lessons need to be learned from past projects.

This document examines the experiences of six dams built in West Africa between the late 1970s and late 1990s: the Niandouba and Confluent in Senegal, the Sélingué in Mali, and the Bagré, Kompienga and Moussodougou dams in Burkina Faso. Retrospective studies were conducted for each of these dams and their conclusions discussed in multi-stakeholder national workshops in each country. These enabled those involved to gain a better understanding of how the dams affected local people's ways of life and the ensuing development opportunities. The lessons learned from these studies now need to contribute to ensuring improved benefit sharing in the future, particularly for those affected by the dams, while also promoting inclusive local development.

Dams represent a significant investment for developing countries with limited resources. They are often proposed in response to national development needs, for example to provide the necessary electricity for the country's economic development, reducing its dependence on imported energy, improving food security and so on.

More rarely, they may also have a regional development objective: modernising local production systems, opening up the region, and developing new activities such as fishing or tourism. This local or regional development objective is always subordinate to the overriding goal of national development, however, which justifies the state's significant intervention.

Hydro-electric dams are often considered fairly successful in terms of achieving their national-level objectives: they provide the expected electricity, sometimes even more than expected if the climatic conditions are right. Irrigation dams often have more mixed results because irrigated agriculture involves a highly complex set of technical, economic, organisational and cultural factors that governments find more difficult to master than electricity production and distribution.

Whatever their initial objectives, these dams have transformed the areas in which they were built. They have changed the landscape and ecosystems but also, and more importantly, they have changed the local socio-economic context. Increased activities and economic opportunities have led to sizeable influxes of migrants, completely transforming local traditional societies.

Paradoxically, the local people are often unhappy about the effects the dams have had on their lives. Although this can be explained partly by traditional society's resistance to the rapid changes caused by these dams, this does not go far enough to explain all of the discontent and frustration that local people express when they are consulted. There are many reasons for their dissatisfaction:

- The compensation for losses suffered due to the construction, filling and operating of the dam was often badly planned and insufficient to maintain their previous standard of living and well-being. The feasibility studies conducted to determine the dams' effects on people, infrastructure and economic activities were often inadequate, mainly because the land in the countries in question legally belongs to the state and is not subject to compensation.
- The local people affected by the dam find it difficult to take advantage of the benefits it creates. To do so requires great adaptability and organisation in the face of insufficient or even non-existent support mechanisms. Some of the benefits were not even envisaged when the dam was built and so there were no programmes to enable the local population to capitalise on them.
- There are often no resource management structures or rules and, when there are, these are often multiple and contradictory, being based on both national and customary law. Each player using a resource will often have his or her own idea of the rules to be applied. This lack of clear rules, and/or their inadequate enforcement, is the source of often violent social conflicts.

Ensuring that local people benefit from the dams does not have to be incompatible with broader national development objectives, nor does it require large sums of money. It does, however, require the political will to implement the following:

- Ensure that the local people affected by the dam are involved in the benefits it creates and thus in all of the decisions that are taken with regard to its construction, relocations, compensation, investments, support programmes and so on.
- Replace compensation policies aimed at reproducing previous living conditions with local development policies that support local players to adapt to the changes the dam will bring to the region, and to benefit from them.
- Promote the development of local production systems by ensuring access to land and natural resources through agreements and regulations that are compatible with both positive and customary law.
- Establish local regulations negotiated with and validated by all local stakeholders, thus enabling a fair and sustainable use of the natural resources.
- Encourage fair access to the dam's benefits for local people by establishing preferential access terms (for example to the irrigated plots or electricity), promoting apprenticeships and organisational dynamics that will help local people to adapt, and establishing a local development fund financed by the dam's economic activity.

Acronyms and abbreviations

AAS	Sélingué Dam Construction Authority (<i>Autorité pour l'Aménagement de Sélingué</i>), Mali
ADB	African Development Bank
AFD	French Development Agency (<i>Agence Française de Développement</i>)
AVV	Volta Valleys Development Agency (<i>Autorité pour l'Aménagement des Vallées des Voltas</i>), Burkina Faso
BADEA	Arab Bank for Economic Development in Africa (<i>Banque Arabe pour le Développement Économique en Afrique</i>)
CGP	<i>Caisse Générale de Péréquation</i> , Burkina Faso
CLE	Local water committee (<i>Comité Local de l'Eau</i>)
CRS	Catholic Relief Services
CVD	Village development committee (<i>Commission villageoise de développement</i>), Burkina Faso
EDF	European Development Fund
EDM	Mali's state-run energy company (<i>Énergie du Mali</i>)
EIB	European Investment Bank
EIG	Economic interest group
FAC	Fund for Aid and Cooperation (France)
FCFA	<i>Franc de la Communauté Financière Africaine</i>
FEPROBA	Federation of Anambé Basin Producers (<i>Fédération des Producteurs du Bassin de l'Anambé</i>), Senegal
GPSO	Fisheries Management in the South-West (<i>Gestion de la pêche dans le sud-ouest</i>), Burkina Faso
GWh	Gigawatt hour
GWI	Global Water Initiative
HWP	High water point
ICI	<i>Initiatives Conseil International</i> (consulting group), Burkina Faso
IIED	International Institute for Environment and Development
Iram	Institut de Recherches et d'Applications des Méthodes de développement (France)
IUCN	International Union for the Conservation of Nature
KFAED	Kuwait Fund for Arab Economic Development
MOB	<i>Maîtrise d'Ouvrage de Bagré</i> , Burkina Faso
MOK	<i>Maîtrise d'Ouvrage de la Kompienga</i> , Burkina Faso
MW	Megawatt
NGO	Non-governmental organisation
ODRS	Sélingué Rural Development Service (<i>Office de Développement Rural de Sélingué</i>), Mali
OERHN	Upper Niger Water Resource Management Service (<i>Office pour l'Exploitation des Ressources Hydrauliques du Haut Niger</i>)
OMVG	Gambia River Development Organisation (<i>Organisation pour la Mise en Valeur du fleuve Gambie</i>)
ONAT	National Office for Land Management (<i>Office National pour l'Aménagement des Terroirs</i>), Burkina Faso

ONEA	National water and sanitation company (<i>Office National de l'Eau et de l'Assainissement</i>), Burkina Faso
OPEC	Organization of the Petroleum Exporting Countries
PADERBA	Anambé Basin Rural Development Support Project (<i>Projet d'Appui au Développement Rural dans le Bassin de l'Anambé</i>), Senegal
PAIE	Aquacultural Economic Interest Area (<i>Périmètre Aquacole d'Intérêt Économique</i>), Burkina Faso
PEP	Fish Farming Project (<i>Projet d'Élevage Piscicole</i>), Burkina Faso
PHBA	Anambé basin hydro-agricultural project (<i>Projet Hydroagricole du Bassin de l'Anambé</i>), Senegal
PO	Producer organisation
POAS	Land Occupation and Allocation Plan (<i>Plan d'Occupation et d'Affectation des Sols</i>), Senegal
SEIA	Socio-environmental impact assessment
SFD	Saudi Fund for Development
SN-SOSUCO	National Sugar Company of the Comoé (<i>Société Nationale – Société Sucrière de la Comoé</i>), Burkina Faso
SODAGRI	Agricultural and Industrial Development Company (<i>Société de Développement Agricole et Industriel</i>), Senegal
SOENA	Agricultural Support Agency (<i>Société d'Encadrement Agricole</i>), Senegal
SONABEL	National electricity company of Burkina Faso (<i>Société Nationale d'Électricité du Burkina</i>)
UCEPAK	Union of Farming Cooperatives of the Karfiguéla Irrigated Area (<i>Union des Coopératives des Exploitants du Périmètre Aménagé de Karfiguéla</i>), Burkina Faso
UGPRB	Federation of Rice Producers at Bagré (<i>Union des Groupements des Producteurs de Riz de Bagré</i>), Burkina Faso
WB	World Bank

Note about the currency used in the text:

Rate of the CFA franc at the time of going to press:

EUR 1 = FCFA 655.957 (the CFA franc has a fixed exchange rate to the Euro)

USD 1 = FCFA 480.264

Preamble

1. Global Water Initiative on large dams

A regional review published by IIED in 2009¹ demonstrated that outcomes from dams for affected people are often below expectations. It further demonstrated that there has been little or no learning around resettlement programmes and benefit sharing in West Africa despite experience of construction of some 150 dams directly affecting over 250,000 people in the region.

The GWI programme on dams works to establish the evidence base, learning what works, and what does not work from individual dams, according to the experience of communities and government, that can then inform improved approaches and policies. These are shared with local people affected by new dams in the planning phase (such as at Kandadji in Niger, Taoussa in Mali and Fomi in Guinea) and discussed with the project developers, policy makers and donors.

In addition, local processes for improved sharing of benefits and fairer management of water resources, are developed around three of the dam sites presented here² involving local people to encourage better year to year outcomes and trade-offs with the dam reservoir and irrigation system and between the various users. This focuses especially on multiple use of reservoirs through effective management. IIED and IUCN work with partners across the region, governments, local authorities, civil society groups, river basin organisations and other regional institutions to implement this programme.

2. Methodology

During 2010 and 2011, GWI initiated a series of studies on the experience of local people around six existing dams in three West African countries (Burkina Faso, Mali, Senegal), where the Confluent and Niandouba in Senegal form a single complex. Chosen for their range of situations (large hydropower, small private sector irrigation, multipurpose) and the range of impacts on affected people, the dams selected are presented in Table 1 and their location in Figure 1. They were not selected to be representative as all dams have their own local specificities.

In each country a multidisciplinary team addressed the following broad questions:

- What did the developers originally envisage in terms of benefits and services from the dam and how were these shared with local people?
- What was the basis for secure livelihoods before the dam and how did this change after the dam?
- How do local people assess the changes that have taken place in their lives (positive and negative)?

1. Skinner, J., Niassé, M. and Haas, L. (eds.) 2009. Sharing the benefits of large dams in West Africa. Natural Resource Issues No. 19. International Institute for Environment and Development, London, UK.

2. KOMPIENGA, Burkina Faso; SÉLINGUÉ, Mali; NIANDOUBA and CONFLUENT, Senegal.

- How have relationships between communities changed with respect to access to resources (particularly displaced communities with respect to their host communities)?
- What lessons can be learned from these case studies that are applicable to local, national or regional policies to improve equitable outcomes from dam projects?

Each team read the available documentation both pre and post dam where these were available and used interviews, focus groups and local workshops to consult local actors. The draft report was fed back to local people and its analysis and conclusions then examined during a national workshop that brought together all the different actors (local mayors, decentralised government, water managers, civil society, private sector, electricity generators, agribusiness, central government departments, etc.) at national level before being finalised. Field work was undertaken from March 2010 to October 2010.

This publication seeks to summarise the analysis and results of this process in an accessible form, and readers interested in reading more about the detailed results of this work, or the details of the analysis undertaken, can read the original documents (only in French) at www.iucn.org/gwidams. The team members who undertook the work in each country are listed in the Acknowledgements.

3. Structure of the publication

Part 1 of the report presents an analysis across the five case studies and summarises for a range of themes, the experience of local people affected by these dams. It draws out the main issues that are common across the region and suggests a range of lessons deriving from these local examples.

Part 2 includes a summary of each of the studies undertaken on the five case study dams. These chapters are drawn entirely from the information given in each of the final national reports as finalised following the national workshops. They seek to present the information and experience that is relevant to the analysis and the lessons in Part 1.

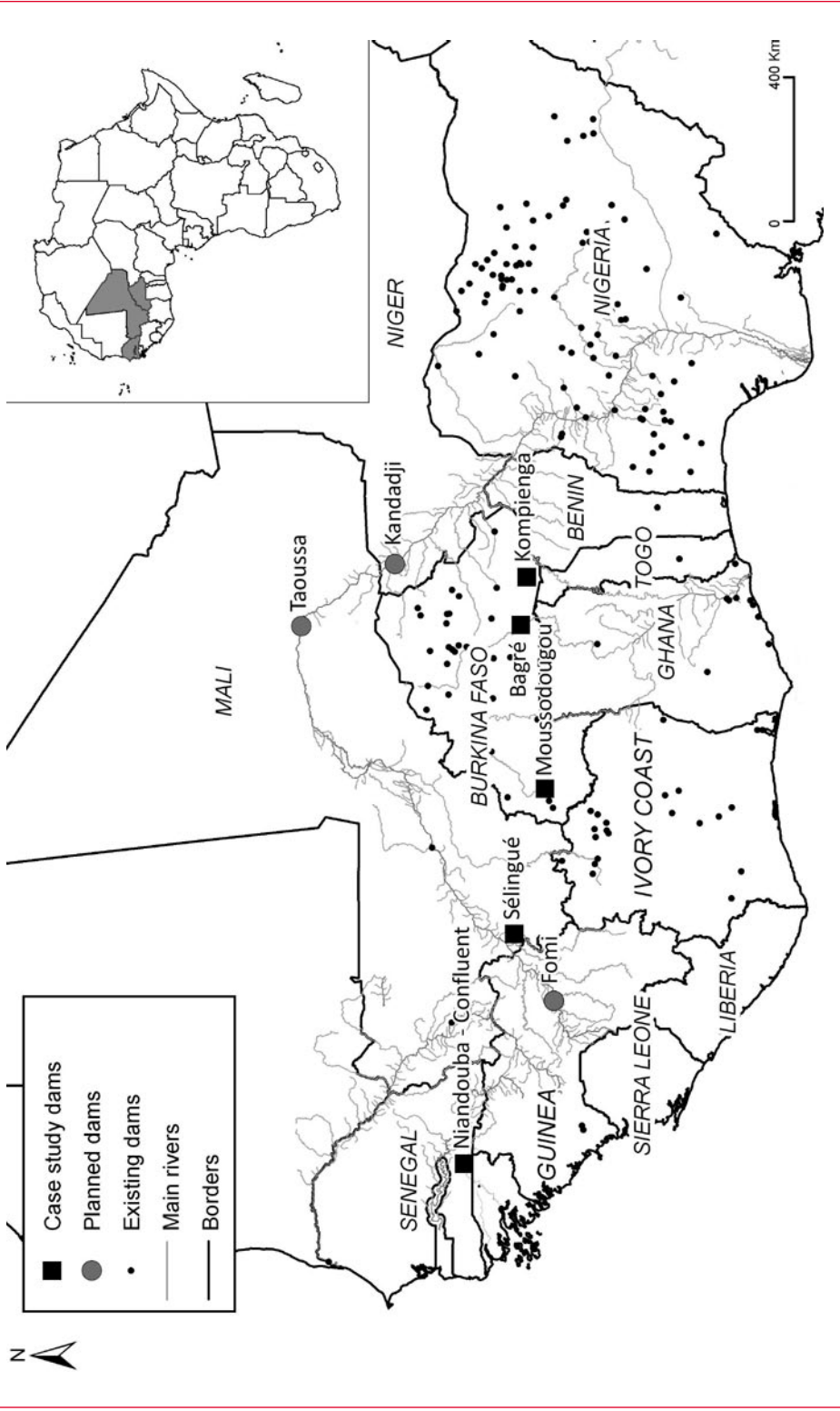
Part 3 lists the bibliographies from the original studies to inform readers of the sources the original authors drew on, the origin of the data presented, and to facilitate further reading.

Table 1. Technical information on each of the six dams studied

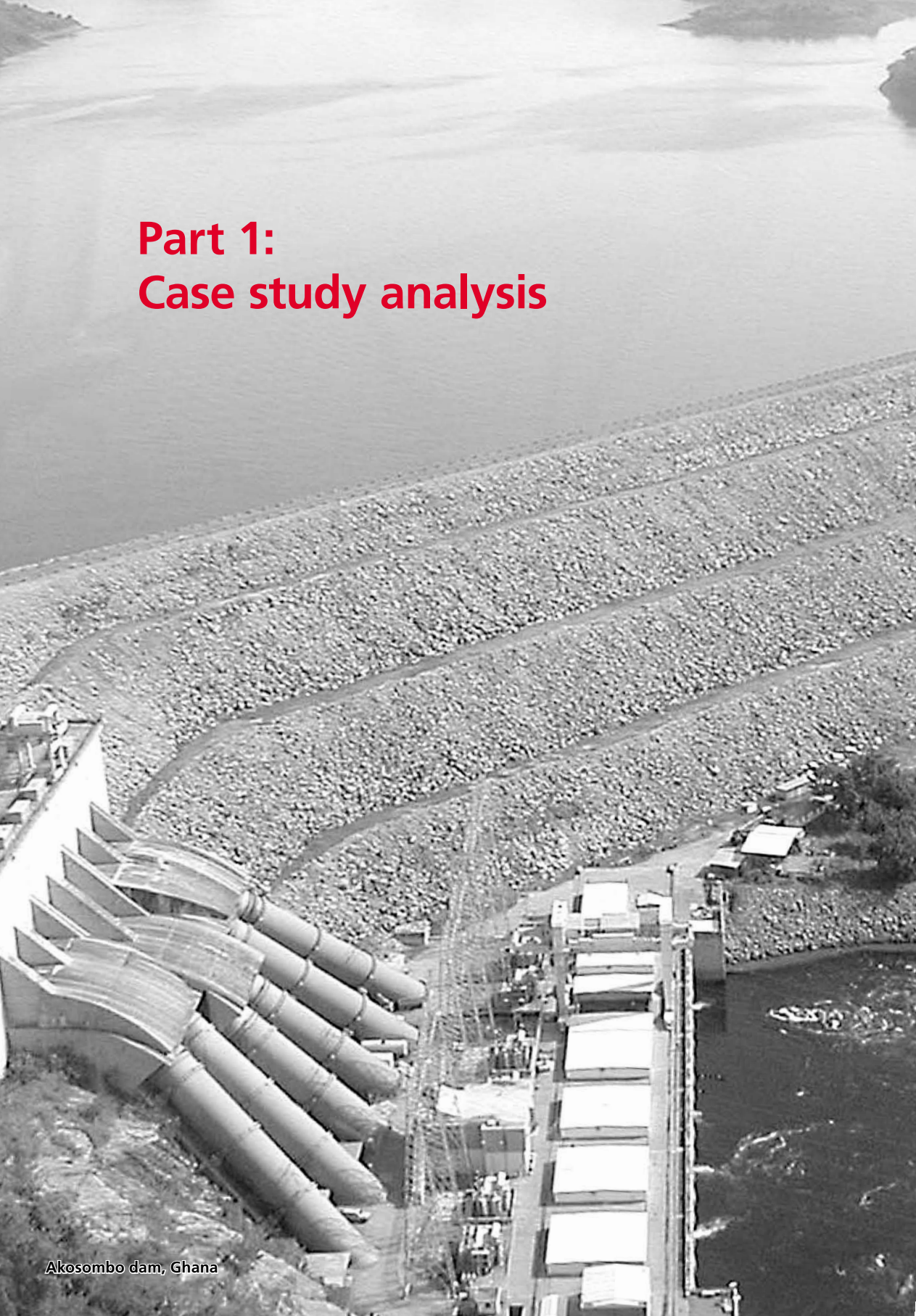
	Sélingué (Mali)	Confluent (Senegal)	Niandouba (Senegal)	Moussodougou (Burkina Faso)	Bagré (Burkina Faso)	Kompienga (Burkina Faso)
Date of filling	1981	1984	1997	1991	1994	1988
Cost of project (FCFA)	35 billion	7.6 billion	19.5 billion	N/A*	32.5 billion	36 billion
Donors	WB, EIB, EDF, BADEA, SFD, Mali Govt	SFD, Senegal Govt	SFD, Senegal Govt	FAC, Burkina Govt	ADB, BADEA, AFD, FAC, KFAED, SFD, OPEC Fund, Burkina Govt	ADB, Burkina Govt, AFD and KFW
Reservoir area	40,900ha	1684ha	2870ha	600ha	25,500ha	21,000ha
Reservoir capacity	2.17 billion m ³	34 million m ³	85 million m ³	35.5 million m ³	1.7 billion m ³	2 billion m ³
Main functions						
Irrigation schemes	5000ha	5000ha		4350ha	3380ha	700ha
Electricity generation	Yes	No	No	No	Yes	Yes
Installed capacity	44MW	-	-	-	16MW	14MW
Navigation	Yes	No	No	No	No	No
Tourism	Yes	Marginal		No	Yes	Yes
Fishing, pisciculture	Yes	Yes	Yes	Yes	Yes	Yes
Planned displacement						
Villages	15	0	5	N/A	1	7
Population (families)	607	0	N/A	74	N/A	226
Population (individuals)	12,490	0	749	N/A	618	1562
Actual displacement						
Villages (total or partial)	15	0	18	N/A	1	6
Population (families)	607	0	N/A	N/A	N/A	196
Population (individuals)	12,490	0	4305	1000	618	1372

* N/A = Not Available

Figure 1. Location of the case study dams



Part 1: Case study analysis



Introduction

Dams are a core component of any national strategy for water management, especially in countries facing uncertainties in supply such as the Sahelian countries of West Africa. Governments throughout Africa have historically not optimised dam design and management in a systematic way that minimises planned and unforeseen impacts on local people, while maximising local development opportunities. Large dams have usually been seen as serving primarily national, not local objectives. This is now beginning to change.

During the 1990s and early 21st century the pace of dam construction slowed considerably largely due to concerns over financing, environmental, social and downstream impacts and the changes in lending practices of the major donors. Four factors have recently combined to give dam construction a new lease of life in the region, and in Africa more broadly:

1. The Millennium Development Goals have provided a major focus for water management activities.
2. Predictions of climate change have demonstrated the variability and uncertainty of future water resource availability which has generally led to a belief that more storage is required.³
3. Peak oil prices in 2007/2008 have seen hydropower emerge as an increasingly competitive option in meeting energy needs of rapidly growing urban communities, and additionally as a measure that also (usually) reduces greenhouse gas emissions in energy generation.
4. The increase in global food prices, particularly for rice and wheat, has prompted governments to provide for self-sufficiency in the face of growing populations and to promote food security for the rural poor.

The new wave of dams being implemented or planned will be delivered in a very different political and institutional context to those from the 1980s and 1990s. Democracies have progressively replaced dictatorships, increasing decentralisation and local elections have changed the dynamic of accountability and governance between the centre and the rural areas, and participatory processes are more normal in development planning. While top down planning is still prevalent, greater voice is being given to local concerns.

So why focus on benefit sharing? How does viewing a dam project through this lens help to understand the dynamics involved? The World Commission on Dams that reported in 2000 analysed the social and environmental consequences of dams worldwide.⁴ It concluded that one reason why local people felt so aggrieved at the large dams that displaced them is that they suffered many negative consequences of the displacement but benefitted from few of the development opportunities that the dam offered.

3. There is currently no consensus among climate models concerning the direction or scale of possible changes in rainfall in West Africa, beyond a general assessment of "more variability".

4. World Commission on Dams (2000). *Dams and Development: A New Framework for Decision Making*. Earthscan Publications, London, UK.

Involving and engaging local people and giving them a stake in a dam is clearly something that is desirable and which can benefit all parties involved (see Box 1). As the five case studies analysed below demonstrate, frustration due to a sense of exclusion can often lead to social tensions and conflicts. This analysis therefore asks what experience there has been on benefit sharing, and how dam projects could be designed better with this objective in mind. It recognises that in many cases grievances do not disappear over time; if anything, they become intergenerational and increasingly difficult to deal with, causing significant transaction costs for local elected officials and government faced with dealing with the disaffected people. Including strong development options for local people from the outset, combined with effective compensation for lost assets and natural resources, will lay the groundwork for more equitable, and less controversial, development outcomes in future.

Box 1. Why bother with benefit sharing with affected people?

"(...) benefit sharing [with affected people] has received growing attention in connection with dams.

(...) closer examination always shows that the introduction of benefit sharing mechanisms is positive from all stakeholder perspectives. It allows *project-affected people* and *traditional river users* as well as basin residents involved in catchment management to become partners in projects. And it provides them with a stronger voice in decisions that affect them, and an opportunity to be first among project beneficiaries, not last.

From the *government* perspective, benefit sharing is a practical policy tool to achieve greater social inclusiveness and balance social, economic and environmental factors in planning, design, implementation and operation of dam projects.

From the *dam operator* perspective, benefit sharing increases capacity to work effectively with local communities. Good community relations are important for many reasons, ranging from the reduced risk of project delays to improved prospects for local cooperation in catchment management and implementing environment mitigation measures as prescribed by law, and reputational risk.

From the perspective of potential *investors*, the presence of an explicit policy framework with realistic provisions for local benefit sharing is an indicator that locally affected communities and the public are likely to support a dam project – all things considered. As a consequence, the investor risk exposure is reduced and investors are more inclined to become financing partners. (...)

Benefit sharing helps to address many past shortcomings in dam planning and management that are well documented. Among these include failures to honour social commitments made to project affected communities and failures to finance environmental mitigation measures. All too often these commitments have been based on assumptions that money was available from already overstretched government budgets, or temporary donor budgets. The predictable result is that many commitments are not kept. It addresses the need to ensure there is a stream of financing/resources [for local development] over the longer term."

Source: Skinner, J., Niasse, M. and Haas, L. (eds.) 2009. Sharing the benefits of large dams in West Africa. Natural Resource Issues No. 19. International Institute for Environment and Development, London, UK.

Understanding local consequences in order to minimise negative impacts and avoid conflicts

2.1 Compensating for lost means of production

Those affected by dams are generally compensated for the loss of both individual and community infrastructure, such as homes, wells and schools. Compensation may be in the form of money or the replacement, and sometimes even improvement, of the assets that are lost.

Rural populations do not just lose infrastructure, however; they also very often lose all or part of their livelihood. They generally rely on the land and its natural resources for food, income and other needs such as firewood, medicinal plants and construction materials. When the dam is built and the reservoir filled, orchards, farmland, pasture and forest may all – to varying degrees – be submerged.

None of the projects in these case studies provided financial compensation for the loss of land. In Senegal, Mali and Burkina Faso, the land is legally owned by the state; the small-scale farmers who farm it and depend on it for their existence therefore technically only have rights of use over it. While the state is required to compensate for lost productive assets, such as fruit trees, it does not therefore feel obliged to compensate for the land itself.

The impact of such loss of land on local livelihoods will depend not only on the natural resources that disappear with the dam but, above all, on the pre-existing situation. In most West African countries, rural people's livelihoods and their relationships with the land are in practice governed by traditional land tenure systems. The land belongs to clans or families who establish rules for its allocation and use. The impact of the dam therefore needs to be specifically assessed for each clan, rather than for the area as a whole.

When a clan loses some of its land, it may simply relocate to another part of its traditional territory, where population density and land quality permit. In this case, the immediate impact of the dam on livelihoods will be limited. In the longer term, an influx of migrants and the increasing scarcity of available land may create difficulties that force the clan to adapt its production systems to the increasingly restrictive context.

Box 2. Population movements at Sélingué (Mali)

The resettlement sites were chosen by the displaced groups themselves and the host populations gave their agreement, as testified by the head of a host village: 'There was no conflict because we had given our agreement. It was we who said *anw beku* (there is space for all).' Yet later, the relocation was to create unavoidable disagreements as there was not 'space for all' after all, at least not for both homes and farmland. Although all the families had somewhere to live, not all of them had access to fields.

The land pressures caused by a dam are rarely taken into account when compensation is made, and the local people are rarely helped to intensify their agricultural production to make up for it. Their dissatisfaction with their loss may only appear several years later when growing pressure on the land makes the loss of the plots that were submerged more keenly felt. At Kompienga in Burkina Faso, for example, the area's low population density meant that those affected by the dam were able to relocate to another part of their village territory. As migrants began to arrive, however, the population density increased and it is only now, 15 years after the dam was completed, that land tensions are emerging between migrants and local people.

Clans that lose all or nearly all of their lands have a different experience. They are generally offered two solutions: to relocate onto lands owned by other social groups or to be provided with irrigated plots on which to farm.

- Resettlement on lands belonging to other clans or ethnic groups theoretically enables the displaced group to reproduce its production systems on these new lands. But, while the host populations may allow the people to live there and to farm plots of land, they do not grant them ownership of that land. Relationships between the different social groups are still governed by customary law, which means that the resettled groups owe their hosts an obligation, and have no security over the land they occupy. When land is plentiful this does not generally cause any problems but, once pressure on the land begins to be felt, conflicts emerge between local and displaced populations.
- Where people who have lost their lands are compensated by access to irrigated plots, the plots offered may be smaller but have a higher production potential. In this case, too, the displaced groups are not considered the owners but simply the beneficiaries of the plots, which means the government (or the government body responsible for managing the irrigated area) can take them away if the families do not meet the allocation criteria. Without significant technical and/or financial support, local people find it hard to make the necessary investments and to learn the techniques needed to farm these plots successfully. Many families either abandon their plots or have them revoked by the authorities.

Box 3. Local people lose irrigated land at Sélingué (Mali)

The people who lost their lands because of the Sélingué dam were all given irrigated plots but they were provided with little support and found it difficult to master the new agricultural techniques. Faced with disastrous first harvests, many villagers abandoned their plots or had them taken away by Sélingué Rural Development Office (ODRS) staff for failing to farm them properly or because they were unable to pay the service charge.

The major challenge when building a dam is therefore not housing or even social infrastructure; it is compensating for the impact that a loss of land has on local people's livelihoods. The case studies show that local people believe that if compensation is to be fair and effective, it must take into account:

- all the people whose traditional land resources are directly affected by the dam, whether they have to relocate or not;
- people who are indirectly affected by the dam, whether due to the relocation of families onto their land, the development of new irrigated plots (as at Sélingué) or new rules governing natural resource use (for instance the reserved areas at Komienga, and the pastoral areas and protected reservoir banks at Bagré);
- the impact on each clan of increased land pressure not only at the time the reservoir is filled, but in the longer term, considering probable demographic changes in the area.

Note that, even if national legislation permitted it, it is difficult to provide proper financial compensation for loss of land because there is no market for land; a family that has lost its land cannot buy land somewhere else and reproduce its living conditions. Compensation therefore has to involve providing access to new land, by means of transparent procedures, accepted both by the displaced and the host populations and validated by the relevant authorities. This means establishing methods for giving access to land that are compatible with the law and with social norms, and are thus recognised by both the government and the customary authorities.

2.2 Revising the resource management rules

The five studies show that dams significantly change the natural resources on which the livelihoods of local people depend. Some resources decline or disappear; others, in contrast, increase or are even created by the dam.

Boxes 4 and 5 give an idea of the impacts these dams have had on the ecosystems and resources of the sites in question.

Box 4. Ecosystem changes caused by dams

The Sélingué dam in Mali caused significant destruction of woodland: as well as submerging gallery forests along the river, land was cleared to build roads and tracks, to relocate the displaced villages and to make way for the migrant population and their fields (18,000ha of natural vegetation were lost), to establish irrigated areas immediately downstream of the dam and at Maninkoro, and to set up fishing settlements, which required significant amounts of timber for smoking fish and constructing landing stages. Moreover, the demand for wood, which was previously only for local needs, also increased. Since the construction of the asphalt road between Sélingué and Bamako, the area is now Bamako's main source of wood. Some resources used by the local people are dying out, such as African mahogany (*Khaya senegalensis*), used to make dugouts. Large traditionally hunted game has disappeared.

In contrast, at Niandouba in Senegal, the dam's construction led to the wetland areas increasing from 2600ha in 1987 to nearly 17,000ha in 2010. This expansion of aquatic and semi-aquatic ecosystems has led to a revitalisation of the Kayanga forest reserve and the development of permanent green pasture, benefiting animals (hippopotamus, Nile crocodile) and birds (duck, crane, heron, fish eagle, pelican, cormorant and so on).

Box 5. Changes in the availability of, and access to, pasture

At Sélingué, in Mali, the dam led to a decline in both the amount and the quality of pastureland that was available. The lowlands, plains and valleys, in which coveted species such as *Vetiveria nigritiana* and *Andropogon gayanus* used to thrive, disappeared when the dam was filled. The situation on the plateaux is the same, where infertile and fallow lands used as pasture prior to the dam's construction are gradually being turned over to farming by people in search of agricultural land. In Senegal, around the Confluent dam, the development of irrigated plots has also led to a decline in rangeland and pastureland in the Anambé basin. The remaining pasture is coming under strong pressure from herds, leading to poor natural regeneration and impoverishing the forests and the areas around the cattle routes.

In contrast, in Burkina Faso, the Komienga dam has improved access to water and fodder: there are between 5000 and 45,000ha of pastureland available, depending on seasonal variations in the water level. In fact, the reservoir has facilitated the watering of cattle, as these can now be easily led to the water's edge along clearly marked access corridors. Fodder is also more accessible on the banks of the reservoir, where the pastoralists go to graze their cattle during the rainy season. They also take the opportunity to cut the grass, which they dry for later use during the dry season.

Like the land, use of natural resources is governed both by legislation and particularly by customary law. Local agreements establish rights of access and use over the territory's different resources: water, pasture, forest products, farmland and so on.

As the availability of these resources changes, the rules governing their use may become outdated and tensions may emerge between different social groups. This can happen when farmers, with less and less farmland available to them, gradually settle on cattle routes, or even on the pastureland itself (as in Sélingué in Mali), or when pastoralists have to cross farmland to reach the watering points created by the dam (as in Niandouba-Confluent). The animals may then damage crops, creating conflicts between farmers and pastoralists. In such cases, traditional rules are often still used to resolve conflicts, with the modern court system used only as a last resort when traditional mechanisms have proved ineffective or insufficient.

It is only when the effects of migration, the opening up of the region and the new economic dynamics are added to these changes in the availability of resources that the significance of the transformations brought about by the dam becomes clear. The rules governing natural resource management and conflict resolution may quickly prove ineffective if they are not adapted to the new context. The traditional chiefs responsible for setting and enforcing these rules may also find their legitimacy challenged if they fail to take account of the new social groups, particularly the displaced and the migrants.

It is thus essential to encourage the adaptation of natural resource management rules to the changing context if the sustainable development of the area is to be promoted and the risk of conflict reduced. Yet the state institutions responsible for managing the dam and related infrastructure and regional development often focus unduly on national rather than customary law. National laws are often not effective because they are neither known nor accepted locally and because the state rarely has the capacity to enforce them.

In some cases, where resources such as reservoir fish are new and there are no management rules in place (see Box 6), it is a question of encouraging a joint process to create rules that will enable structured natural resource management and avoid conflict.

Box 6. Changes in fishery resources

In all the cases studied, fishery resources were virtually if not completely non-existent prior to the dam's construction. Fish were a new resource created by the reservoir, attracting many occasional or professional fishers. In Senegal, the Confluent and Niandouba dams had 593 fishers in 2010, grouped into 31 associations. A large number were professional fishers from outside the area. In Mali, the Sélingué dam had almost 2700 fishers in 2009, 95 per cent of whom were migrants.

New resources often have no restrictions placed on their access nor any traditional management rules. In some cases, the state establishes management rules of its own: this is the case in Burkina Faso for large bodies of water known as Aquacultural Economic Interest Areas (PAIE). These rules are not always accepted by all fishers, however, and the state does not have the resources to ensure they are enforced.

In the absence of widely accepted management rules, fish yields in the reservoirs have been low and productivity is declining due to over-exploitation of the resource. In areas where one particular group monopolises all the benefits, as with the Moussodougou dam in Burkina Faso, this can lead to considerable tension between them and the people who are excluded.

2.3 Compensating for the dam's impacts on livelihoods

All of the dam's impacts on local people's livelihoods must be taken into account if appropriate compensation is to be provided and harmonious socio-economic development encouraged. Not all local stakeholders are affected equally and so it is important to conduct a detailed evaluation of the losses suffered. The case studies highlight various weaknesses in the mechanisms for evaluating and compensating for negative impacts.

- Some preliminary impact studies incorrectly assessed the size of the area that would be directly or indirectly affected by the dam water and thus which villages would need to be moved, as in the case of the Niandouba dam in Senegal and the Kompienga dam in Burkina Faso. At the time the compensation was agreed, it therefore failed to include some villages, creating frustration and discontent.
- The studies did not take all the dams' impacts into account, particularly the impact on production systems, an aspect that was considered little if at all. It was very often not deemed necessary to compensate local people whose production systems were affected but who did not have to relocate.
- The anticipated compensation was sometimes insufficient and often never fully implemented either due to a lack of financial resources, technical skill or political will. For the Kompienga dam in Burkina Faso, for example, the planned agricultural improvements, tomato processing factory, and fish stocking of the reservoir never materialised.

2.3.1 Compensating for the impact on production systems

Dams can affect production systems in different ways. Farmland may be submerged, and reservoir banks protected or set aside for other uses (wildlife reserves, pastoral areas, irrigated zones and so on). Although not directly flooded, some plots may become unsuitable for certain crops such as fruit trees or tubers due to the higher water table. Livestock rearing systems may be affected by the decline in fodder and increases in epizootic diseases due to the presence of water. It is nonetheless first and foremost the encroachment of farmland onto pastoral areas and the difficulties in accessing water that create most problems for pastoralists and thus create most conflicts. The decline in forest area and biodiversity is often accompanied by difficulties in finding firewood, non-timber forest products (used as medicine, construction materials, food and so on) and game, which forms a source of protein.

The case studies show that little if any compensation is provided for lost production systems. The low population density in the area around the Bagré dam, for example, gave the impression that the land was not being used and thus that no compensation would be needed. At Sélingué, fruit tree owners received 750 FCFA per tree but new areas for plantations were never established.

Although governments may not have given the farmers or pastoralists affected by the projects any compensation, they did sometimes try to give them priority when allocating plots in the irrigated perimeters. This was the case at both Bagré and Sélingué where the authorities envisaged transforming the population affected by the dam from rainfed millet farmers into irrigated rice growers. In other places, the state tried to promote more intensive production systems by promoting access to agricultural equipment (Kompienga) or by providing pastoral areas (Niandouba and Confluent) although these initiatives did not yield the anticipated results.

2.3.2 Encouraging access to social infrastructure

Lost infrastructure (houses, wells, health centres and schools) is generally properly compensated for and the new facilities are often an improvement on the old.

In some cases the local people were given financial compensation and then rebuilt their homes themselves; in others, the dam construction company was responsible for rebuilding houses identical to the ones lost. Whatever route is taken, it is important that the groups affected are consulted in such a way that they are in full possession of the facts when choosing the kind of housing they want and its location. This should include information about the economic, social and demographic changes that the dam is likely to cause, something that local people are rarely aware of in advance.

Traditional drinking water supply structures were sometimes replaced with modern water points but the local population were not made aware of the cost of pumping and maintenance; many of these water points fell into disrepair soon after they were provided and the people had to dig new open wells themselves. For example, at Sélingué the dam authorities built modern water points in all reception and host villages. When this study was undertaken in May 2010, only one modern water point – in Kondjiguilla village – was still operating. Elsewhere the people were drawing water from open wells they had dug themselves on their plots.

Compensation for social infrastructure generally consists of rebuilding the same number of structures as before the dam, failing to take into account new needs arising from the dam. Health infrastructure, for example, should allow for not only the increase in population due to migration, but also the health risks associated with influxes of migrants and the presence of a permanent body of water.

2.3.3 Implementing a real resettlement policy

The compensation provided to the people affected by the dams was often insufficient: at Niandouba in Senegal, the prior studies incorrectly assessed which groups would have to be moved and, because of this, some people received no compensation; at Komienga in Burkina Faso, no compensation was anticipated for groups whose production systems were affected; at Sélingué in Mali, and at Bagré in Burkina Faso, people were given access to irrigated plots but found it difficult to make them profitable for lack of sufficient technical and financial support.

Instead of such insufficient and badly designed measures, governments should implement real settlement policies aimed at ensuring everyone affected by the project is able to enjoy at least the same standard of living they had prior to the dam's construction.

Better still, rather than simply replicating the previous systems (educational, production and so on), the government could implement a true local development policy, anticipating future changes due to the presence of the dam: migration, changes in production systems and natural resources, new economic opportunities, public health needs and so on.

2.4 Taking inward migration into account

Four of the dams studied have attracted significant numbers of migrants. Migrants flow in from the local region, from other parts of the country and even from neighbouring countries. Some came at the time of the dam's construction and stayed on once the work had finished; others, as at Sélingué in Mali, were relocated by the government because of repeated droughts in their areas of origin; yet others come spontaneously, attracted by the economic opportunities offered by the dam. The following table gives an overview of the kinds of migration noted in the case studies and their significance.

The effects of migration should be anticipated in local development plans, particularly in terms of the educational and health needs resulting from the increased population. Local people do not necessarily see the migrants only as competitors (for land or natural resources) but also as the potential facilitators of technical and economic progress. With properly planned settlement and spaces for negotiation between migrants and locals, the risk of conflict could be reduced and local development dynamics would be encouraged.

Table 2. Significance of migration for each of the study sites

Dam/country	Migrations and changes in the population
Sélingué – Mali	<p>The dam's construction entailed very significant movements of people. The populations of the six villages included in the study sample increased from 6178 inhabitants in 1976, prior to the dam's construction, to 22,789 in 1998, 15 years after it was filled (an average 12 per cent growth per year). The following categories can be noted:</p> <ul style="list-style-type: none"> ■ so-called 'economically displaced' groups: these are people who were the victims of the drought in the early 1980s in other regions of the country (mainly the Dogon), and for whom the Malian government reserved plots on the dam's new irrigated area; ■ individual migrants, who came in successive waves: dam workers who remained after the works had been completed, then farmers, fishers and pastoralists who came to take advantage of the opportunities offered by the creation of the reservoir and the regulation of the water level.
Confluent/ Niandouba – Sénégal	<p>Between 1998 and 2002, the population of the rural communities of the Anambé and Kayanga basins increased by more than 50 per cent, well above the country's average growth rate; this was due essentially to the arrival of migrants. International migration was primarily for economic reasons: Peul Fouta from Guinea, and Malian fishers. To this was added internal migration from the regions of the Arachidier Basin, in search of farmland. They settled around the irrigated plots in the Anambé, or in Diaobé village because of its market.</p>
Moussodougou – Burkina Faso	<p>There has been no notable inward migration at Moussodougou. Its population has fluctuated from 8477 inhabitants in 1985 to 6865 inhabitants in 1996 and 10,444 inhabitants in 2006 (an average of 1 per cent per year).</p>
Kompienga – Burkina Faso	<p>The Kompienga dam led to a significant influx of migrants from neighbouring provinces, particularly from the Central Plateau region, initially attracted by the jobs created by the dam's construction and then by the economic opportunities offered by agriculture, livestock rearing and fishing. These significant movements of internal migrants were facilitated by the opening of rural roads and the asphalted of the national highway linking Fada N'Gourma to Pama and the border with Togo and Benin.</p> <p>The population of Kompienga department rose from 24,000 inhabitants in 1985, prior to the dam's construction, to 41,000 in 1996 and 67,000 in 2006, an average of 6 per cent per year.</p>
Bagré – Burkina Faso	<p>The population of the direct area of influence virtually doubled between 2000 and 2010, from 22,237 to 40,649 (averaging 8 per cent per year). This was primarily due to inward migration of people from the surrounding area. This means that, despite its size, the area's ethnic structure has remained predominantly the same.</p>

Box 7. The positive impact of migration on the local people

At the Niandouba/Confluent complex in Senegal, professional Malian fishers have trained a large number of farmers/pastoralists, who had previously only engaged in artisanal fishing, in how to fish on large bodies of water. The Malians have been accepted by the villagers and they have no difficulty in accessing the fishery resources.

At Sélingué in Mali, rice growers have learned a great deal from the largely Dogon immigrant population. They now use the solidarity of their social group to retain control of their plots even if they do not have the physical or material resources to farm them. A group of farmers will help a defaulting member to pay his or her charges and to work the plot, and the resulting produce will be sold to finance activities of general interest. The plot thus remains in the hands of its 'owner'. This strategy is being increasingly used by local people, and revives the previous family solidarity that came under pressure during the difficulties of the first years following resettlement and farming of the irrigated perimeter. The rice growers have also learned to form associations and co-operatives and to be more confident about accepting credit.

Encouraging local benefits from dams

The local population rarely sees the full benefit of a dam, at least not those that it was originally designed for: the electricity generated by a hydro-electric dam, for example, often benefits distant towns but leaves the local people without electricity supply.

There are, however, other secondary outcomes of a dam which may benefit the local population, such as increased fishing activity in a hydro-electric dam's reservoir.

There are three kinds of benefit that the local population can enjoy:

- improved socio-economic infrastructure and access to basic services;
- opening up of the area and development of economic activities;
- monetary benefits.

The case studies show that a lack of proper planning from the very early project stages has meant that the local populations have seen few benefits. When a dam is constructed with national development objectives such as electricity production in mind, as at Kompienga and Sélingué, it is quite common for its local, even regional, development potential to be overlooked and – with the exception of the resettlement policies – the measures taken prevent local people from capitalising on the positive socio-economic impacts.

3.1 Improving access to water and electricity

Services such as water and electricity are largely inaccessible to local people, even around hydro-electric dams such as Sélingué in Mali. Where it is available, access to electricity is fundamental to local development: at Sélingué it has encouraged the development of cottage industries and small ice production units aimed at conserving and marketing fish.

The electricity suppliers have a series of requirements that must be met before they will connect an area to the grid (private land title, land divided into lots, payment procedures and so on) and these need to be taken into account during the resettlement phase in order to remove the technical and administrative barriers to obtaining electricity. Another important factor preventing local people from obtaining electricity is the high cost of connecting to the network, plus the cost of the electricity itself, which is considered too high.

In the absence of a fair access policy, some villages are prioritised over others and this leads to local migration and demographic imbalances that damage the peaceful development of the area. If properly planned right from the very early stages of the project, those who have suffered losses could be granted preferential tariffs both for connection to the network and the cost of the electricity, and this would enable more harmonious and equitable socio-economic development to take place.

3.2 Promoting local access to agricultural schemes

Irrigation from the stored reservoir water is often developed with a number of objectives in mind: to offer an alternative income and greater food security to producers whose production systems have been affected by the dam, to encourage local economic development, to promote national food security and so on.

The projects proved disappointing in terms of achieving their overall objectives. Production often failed to meet government expectations and the local people benefit little from the schemes. In some cases such schemes lead to tensions and conflict between local people and outsiders, or between the beneficiaries and the administration.

The irrigated perimeters are often smaller than originally planned; this limits production and the schemes are unable to meet the significant and often growing demand due to the arrival of migrants. Conflicts between migrants and local communities are exacerbated by a lack of available plots.

Tensions can also arise, even when the affected groups are given priority in the allocation of irrigated plots, if in order to obtain or hold onto them they have to meet a number of criteria. Often, the allocation of a plot is linked to the beneficiary's capacity to farm it. This puts the local population, who have few material or financial resources and lack the technical knowledge needed to farm irrigated plots, at a disadvantage.

In the early years of farming the irrigated plots, many producers achieved only low yields and, at best, mediocre incomes due to lack of experience of irrigated systems, or inefficient management of the irrigation system by the area managers. Many small-scale farmers abandoned their plots or had them taken away because they had not paid the service charge or because they could not meet the necessary productivity criteria to be a plot beneficiary.

To enable local farmers to master irrigated crop growing and obtain good yields, the case studies show that two conditions are essential:

- The plot allocation criteria must be clear, negotiated between the different parties and unchanging over time. Local farmers need secure access to these plots if they are going to be willing to make the necessary investments in them.
- Farmers must receive technical, financial and institutional support enabling them to adapt to the needs of irrigated farming and establish systems that are both productive and profitable.

These conditions are not always met. In Mali, for example, the authorities promised those families affected by the Sélingué dam that they would be provided with irrigated plots and good technical support. In 1989, however, eight years after the reservoir was filled, the allocation criteria changed (see Box 8) and because they had not been given sufficient technical support, the local population had not been able to master the new farming methods. It has been extremely difficult for local people to cover the additional overheads involved in irrigated rice growing (service charge, labour, fertiliser, herbicides), particularly given their initial poor yields and

the fact that they have no access to credit. In Senegal, the state-owned Senegalese Agricultural and Industrial Development Company (SODAGRI) withdrew from a number of support activities both upstream and downstream of production (credit, marketing, service and input provision), weakening the Niandouba/ Confluent irrigation scheme's rice growing operations. So far the private sector has proved insufficiently competitive and the farmers' organisations have not had the training to take over. In many countries, national policies explicitly favour private investors, who have the means to develop the plots, over subsistence farmers. This contributes to increased tensions, particularly when there isn't enough irrigated land to meet demand, as in Bagré in Burkina Faso.

Box 8. Restrictions on local people's effective use of irrigation schemes

At Sélingué in Mali :

From 1989 onwards the number of applications for plots began to increase as Dogon communities supported by the Malian government began to arrive and government workers and former dam workers began to settle permanently in the area. Doubt was cast over the initial allocation criteria and displaced groups and their hosts began to lose their priority status. From that point on, plots were allocated to anyone who requested them and who could meet the operating criteria, namely: regular plot maintenance, payment of a service charge, and the use of fertilisers and pesticides provided via credit. According to the local people, they were unable to meet these conditions and so they tended to be excluded in favour of 'people from Bamako and staff from the dam'.

At Niandouba in Sénégal :

Rice production on the irrigated plots has been limited due to (i) a lack of knowhow about managing water needs, both for farmers themselves and for water managers (for example leading to pumping station breakdowns); (ii) a lack of tractors and harvesters/threshers on the plots, leading to delays at crucial points in the farming calendar which made it hard for farmers to dovetail with the timetable of their rain-fed crops.

This led to serious consequences for production, particularly from 2000 onwards. Bad harvests meant that debts could not be repaid, and so many farmers gradually abandoned their irrigated plots and cropping intensity had declined to 81.6 per cent by 2009.

In order to facilitate local people's access to hydro-agricultural schemes, it is important to promote their involvement and capacity building right from the start. This enables common criteria to be agreed for the allocation and removal of plots and more effective production strategies to be implemented. These strategies need to take the existing rain-fed production systems into account, along with their role in the producers' risk reduction strategies, and must encourage a transition between the rain-fed systems and the irrigated systems, whilst also considering all the possible irrigation options. In practice, large irrigation schemes are often prioritised even though they have excluded people who live in remote or badly connected villages (for example, in the case of Niandouba); smaller irrigation perimeters nearer to the villages would be more inclusive and more easily managed. Moreover, these large schemes are generally intended for rice production, and the profitability of rice is highly dependent on the international market and on government policies. In contrast, many small-scale farmers spontaneously embark on market gardening along the banks of the reservoir in response to local and national demand. They do so with only rudimentary techniques and without any technical or financial

support from the state. Supporting market gardening, which is primarily a female activity, would improve the financial situation of women, who are often overlooked in compensation schemes and economic development policies. More diversified agricultural models, including different irrigated and rain-fed crops, would enable a number of different demands to be met while also limiting the risks, would encourage synergies and would promote a more integrated regional development.

3.3 Securing livestock production

The impact of dams on pastoralism is paradoxical: while fairly large chunks of the pastoral reserves are submerged or converted to irrigated farmland, the year-round presence of water, and hence of pasture, attracts numerous nomadic and sedentary pastoralists into the area. In many cases, local pastoralists subsequently reduce their transhumance or remain in the same place virtually all year.

The dams thus cause a significant restructuring of pastoral systems and, often, a seasonal influx of herds attracted by the presence of dry-season surface water. Under such conditions, difficulty in accessing the water resources and the encroachment of arable farmers onto pasturelands or cattle routes can become a source of significant conflict. The traditional rules governing relations between the different stakeholders (local pastoralists, nomadic pastoralists, arable farmers) therefore need to be reconsidered and adapted to this new context with a view to avoiding further conflict. They could, for example, include establishing and marking out new cattle routes along with penalties if pastoralists or farmers fail to respect them. Some planning tools, such as the land occupation and allocation plans (POAS) in Senegal could be used to facilitate negotiations between players and form a point of reference in case of conflict. The implementation of such measures as marking out of cattle routes is dependent, however, on the political will and financial capacity of the local authorities.

Changes in pastoral systems often involve gradual intensification, and this can also be encouraged through investment and technical assistance. At Bagré in Burkina Faso, pastoral areas have been designated upstream of the dam and infrastructure and natural resource management committees have been established. At Niandouba in Senegal, the provision of livestock wells and pools facilitates pastoralists' access to resources. At Sélingué in Mali, livestock development programmes have led to improvements in animal health and an intensification of animal feeding practices, with the introduction of the use of crop waste and concentrated feed.

3.4 Promoting sustainable fishing and sharing its benefits

Prior to the building of the case study dams, fishing in the areas studied was a marginal or seasonal activity practised in water courses and ponds by locals and, more rarely, by professional fishers visiting at low water.

Once the reservoirs had been filled, the fishery resources increased considerably although the fishing practices of the local people (dugouts, driftnets and so on), and processing and marketing methods, changed little. However these large bodies of water attracted professional fishers from other regions or neighbouring countries. At Kompienga in Burkina Faso, there were almost 800 fishers in 2009, two-thirds of whom were foreign. At Sélingué in Mali, a survey conducted in 2009 found 2700 fishers, 95 per cent of whom were migrants from other regions of the country.

In many countries, the legal and institutional framework governing fisheries imposes restrictions, particularly on the use of certain techniques. This legal framework, however, is not widely understood locally, and the state often lacks the resources to enforce it.

Traditionally, the rivers and their resources are considered to be freely accessible to all. The same applies to the reservoirs if they are neither subject to traditional management rules nor monopolised by particular social groups.

Box 9. Traditional fisheries management among the Bozo in Mali

Traditionally, the Bozo are considered to be the masters of the water. The river and its tributaries are shared between the Bozo clans and each clan knows the boundaries of its river territory. Conflicts between Bozo are few and far between. This is not the case for the reservoir waters, however, which belong to no-one. Fishing in the reservoirs is not governed by tradition and the dam has therefore created an unprecedented situation. The fishers can establish themselves wherever they want and can fish far from their home base without any constraints.

In the absence of any monopolisation or resource management rules, everyone – local or outsider alike – can fish in the reservoir waters as they please. In order to start fishing, however, professional fishers from outside the area may have to obtain the agreement of the local village chiefs in the fishing areas. In return, there is often a tacit agreement that the fishers will supply the local village with fish.

Three broad types of fishers can be found: professional fishers, generally from outside the area (Bozo from Mali and Thioubalo from the Senegal River valley); local semi-professional fishers who fish commercially or for their own consumption while continuing to farm the land or rear livestock; and occasional or subsistence fishers who fish for recreation or to meet their family's needs.

Without any collectively agreed rules, and in the absence of a legitimately recognised authority to negotiate and enforce such rules, fish stocks are often over-exploited and the catch begins to decline after a few years.

To ensure both the productivity of the reservoir and the sustainability of its fisheries, the studies indicate that two complementary measures are essential:

- jointly established resource management rules, from the moment the reservoir is filled, acceptable to all fishing groups and which include monitoring and enforcement mechanisms;
- promotion of the fishing industry through investments in infrastructure and equipment, and training in sustainable techniques.

In Burkina Faso, large reservoirs known as Aquacultural Economic Interest Areas (PAIE) are governed by a special resource use system aimed at encouraging a joint and participatory management approach and ensuring sustainable resource use and social harmony in the area. This structure, along with the PAIE's management tools (management and development plan for fishing and aquaculture activities, development fund) seems likely to lead to better resource management and a fairer sharing of the benefits.

At Sélingué in Mali, programmes to promote fishing have enabled fishers to obtain effective and authorised equipment. The Kangaré co-operative has established and fitted out an ice manufacturing unit which enables them to sell fresh fish in Bamako at a higher price than on the local market. It was not until 2006, however, that an agreement for the sustainable management of the lake's resources was drawn up between the authorities responsible for managing the reservoir and the fishers. Unfortunately, this agreement has not been observed by all fishers and the use of prohibited fishing equipment continues, with a concomitant decline in fishery resources.

Fishing can generate substantial incomes. At Moussodougou in Burkina Faso, the 20,000 kilograms of fish produced each year are estimated to provide an annual total revenue of 30 million FCFA. As the state has granted fishing rights to a group of some 30 fishers, each of them must therefore be earning an average of 1 million FCFA per year. The frustration that is created when a small group of individuals is able to monopolise the benefits of a collective resource becomes only too clear.

More often, the benefits of fishing are monopolised by professional fishers from outside, whose families also play an important role downstream in the industry (processing and marketing). This creates growing tensions with the local population, particularly when the revenues generated from fishing are not reinvested either into the fishery (for fish conservation particularly) or into the local economy. In addition to measures to promote the local population's use of fishery resources (such as training or credit to buy equipment), the payment of taxes or charges to the local authorities' budget or into a local development fund could lead to a fairer distribution of the benefits.

3.5 Reaping local benefits from hunting and tourism

The dams often show great potential for developing activities such as:

- recreational tourism using the banks of the reservoir for relaxation and recuperation;
- sports tourism based on line fishing, water sports, observation of hippopotamus and birds;
- hunting, linked to the presence of plentiful wildlife in the wetlands.

These resources are largely underexploited, through lack of appropriate facilities but also a lack of organisation. In the Niandouba dam in Senegal, private individuals have leased seven hunting licences to organise hunting parties on behalf of tourist agencies. The hunting fees are paid to the state, thus benefiting neither the local population nor the local authorities.

3.6 Encouraging trade and cottage industries

The dams have a significant indirect impact on the development of trade, through increased local demand for produce (fish, fruit and vegetables, rice, milk and meat), bringing roads that open up the region, and the weekly markets, which take on more significance.

Access to energy promotes the development of cottage industries, as at Sélingué in Mali, where welding, forging, carpentry and metallurgy workshops have sprung up along both sides of the asphalt road to Kangaré and Dalabala.

All these activities promote youth employment and help the local population to access important services.

3.7 Generating funding for local development

The case studies show that although dams create significant economic development opportunities, the financial benefits they generate for the local people and local authorities are often insignificant.

Many activities could provide significant financial benefits if a contribution or access fee were paid, whether for activities that use the reservoirs' water (electricity and drinking water production, irrigated agriculture) or for hunting, fishing and tourism (hunting or fishing fees, tourist taxes). Yet there are few dams where these contributions are levied and, when they are, the money generated goes into the state coffers and is rarely reinvested in resource management or local development.

If financial benefits are to be generated, this needs to be planned from the very beginning of the project. The payment and use of these financial contributions must be negotiated with all stakeholders, and the money handled in a fair and transparent manner.

Box 10. Payments to local authorities by electricity companies in Mali and Burkina Faso

Since the decentralisation of government powers in Mali, 80 per cent of the taxes levied on *Energie du Mali's* sale of water and electricity has been returned to the regional authorities. According to the General Secretary of Baya Municipality, 96 million FCFA, or 60 per cent, goes to Baya municipality where the Sélingué dam is located, with the remaining 40 per cent shared between the Yanfolila *cercle* council and the Sikasso regional assembly.

In Burkina Faso, the Burkinabé National Electricity Company (SONABEL), which manages the Bagré dam, paid 45 million FCFA to Bagré council in 2009. This is causing tensions with other local councils such as Boussouma, which receives no financial support from SONABEL, despite 40 per cent of its territory being covered by the reservoir.

Apart from the fact that these financial transfers are dependent upon the ups and downs of financial relations between the state and the regional authorities, one could ask whether it is fair that only the commune hosting the dam receives a payment. Nor is it at all clear that the local people are aware that the electricity company is making a contribution to local finances. Greater transparency in both the distribution and use of the money generated by the dam would enable this money to become a good tool for local development.

Improving local stakeholder involvement

4.1 Involvement in decision-making

The lack of adequate compensation and financial benefits is largely the result of the failure of dam management companies to consult with local stakeholders. It is generally the government that decides to build a dam on the basis of national strategic objectives such as economic development or food security. There are few if any local development objectives; the local population are therefore not considered as partners who might have their own vision for the region or who could be involved in its development, but rather as obstacles to be overcome in order to achieve a national development objective.

In the case studies in question, the local people generally accepted all the government's proposals regarding their resettlement and compensation, although this was clearly without sufficient understanding of the long-term implications. They could not foresee the changes that were likely to occur to their environment and their livelihoods following the dam's construction, and so they placed their trust in the state, convinced that it had their best interests at heart.

Box 11. Promises made to the local people of Sélingué

In the initial stages of the dam project, the dam authorities played on the local people's patriotism to obtain their consent. They emphasised that construction of the dam was vital for the country, and that the country would always be grateful that they had contributed so decisively to its development. The people who would be coming to live alongside them were their brothers and sisters, and they would never forget their hospitality: 'We were told that Mali needed us to do this and we said *Ouhoun* (expressing agreement),' said one village chief. The people were prepared to accept the demands being made of them.

At the same time, the authorities promised them full compensation for all inconvenience caused ('They promised to replace everything we would lose in the move, down to the last needle') along with improved production systems through the allocation of rice-growing plots in the irrigated perimeter: 'We were told there would be so much rice that we would be making *tô* (flour and water-based dish) with it, instead of the millet we traditionally use. We were told there'd be so much that we'd be able to eat it and sell it to buy millet if we ever needed any', said the head of Kangaré village.

Local people should be involved in three kinds of decisions:

- the dam's construction and the alternatives;
- resettlement and compensation for damages;
- benefit sharing.

In none of the case studies was there any local involvement in the decisions about the dam's construction. The local people were informed of the government's decision, and their agreement was often obtained by playing on nationalist sentiment or by making promises that were rarely kept (see Box 11 for the case of Sélingué). At most, they were consulted about their resettlement and compensation payments. The state did not view such issues as important and so the people's

wishes, for example over the choice of relocation sites, were not always respected. The authorities generally decided on the methods of compensation without seeking the people's opinion and without giving them the chance to challenge the decisions in court. As the authors of the report on the Sélingué dam put it, 'It was as if the local people were disaster victims that had to be happy with whatever was given to them.'

Finally, the question of benefit sharing with the local population was never raised at the start of the project since the overriding development objectives were national. These issues were only addressed as conflicts began to emerge, either between the local communities and the government's representatives or between the different population groups. Only then were a number of consultation structures created to respond to these challenges (see Boxes 13, 14 and 15 below). This lack of local involvement in decision-making processes is reminiscent of a vertical, authoritarian and paternalistic relationship more characteristic of a governor with his subjects than of a state with its citizens.

In fact, when it came to taking decisions, the state 'ignored' all local players, including the social organisations and regional authorities. In some cases, the state representatives were even taking decisions that legally fell to other institutions (see Box 12). The decentralisation laws gave the local authorities in many countries responsibilities ranging from land management to local socio-economic development, including town and country planning and natural resource management.

Box 12. The role of the SODAGRI in land allocations near the Confluent and Niandouba dams, Senegal

In accordance with the law on national domain, the Rural Community Councils have the power to allocate and revoke irrigated plots on village farmland. The state agency, SODAGRI, however, originally felt that the rural councils lacked the necessary experience to do this and so took these powers upon itself. The plot allocation procedure has now been regularised to bring it into line with the law on national domain and the decentralisation legislation, although SODAGRI still retains significant influence over the rural communities' decisions. These councils are, in fact, more or less dependent upon SODAGRI for technical advice, surveys and plot positioning. The main criterion when allocating a plot is the applicants' capacity to farm it. This puts SODAGRI in a strong position to determine the allocation decisions as its staff are best placed to know the social status and technical and financial capacities of the various farmers.

The studies show that local players, and particularly vulnerable groups (women, the elderly, young people and disabled people), have to be involved in all decisions that affect them if the aim is to ensure their active participation – a gauge of the success of the initiative – and to avoid subsequent conflict. It is therefore essential to establish spaces for consultation in which all players can exchange information and participate in decision-making. Such consultations must be transparently run to be effective and capacity building must be built into the project.

4.2 Resource management mechanisms and structures

As well as being included in a number of important decisions at the time the facilities are established, such as the compensation criteria and the irrigation options available, the local population should also be involved in managing the land and the infrastructure once it is complete.

The current, albeit limited, trend is to involve local people in different resource management mechanisms. Although this is partly a way for the state to reduce its costs by disengaging from various activities, it is also an opportunity for the local people to protect their interests.

4.2.1 Managing the reservoir's water

Managing the reservoir's water is key to a number of activities. In the case of hydro-electric dams, the water produces electricity but it can also be used for irrigation, flood plain crops and for watering animals. A decline in water resources will also have an impact on fish. This means there are many stakeholders dependent upon the way in which the reservoir's water is managed and their needs sometimes conflict: for example, water that is used during the rainy season to produce electricity will no longer be available for irrigation in the dry season.

The organisation responsible for managing the reservoir's water often also needs to use the water for its own activities (see Box 13) and it then tends to prioritise its own needs over those of other players, creating tension and even conflict with other resource users.

Box 13. Some examples of delegated dam management in Burkina Faso

The management of the Bagré dam has been returned to SONABEL, which is responsible for hydro-electric power production. The dam management agreement signed between the Burkinabé government and SONABEL gives this latter 'complete freedom to turbine' (Art. 12).

In the case of the Moussodougou dam, the private sugar company, SN-SOSUCO (*Nouvelle Société Sucrière de la Comoé*), the main user of the dam's water, is also responsible for its management. It goes without saying that the water from the dam is primarily devoted to satisfying SN-SOSUCO's needs, which are met before any other potential uses can be made of it.

Conflicts over SN-SOSUCO's water management began to arise when it refused to release water during the dry season because of the low level of water in the dam. This led to depleted harvests for the farmers on the Karfiguéla irrigated area downstream. During the following rainy season, heavy rainfall forced SN-SOSUCO to open the sluice gates, thus flooding the plains. The farmers organised a march in protest at SN-SOSUCO's water management and threatened to attack its facilities.

When ad hoc structures involving all stakeholders are created, it is possible to reconcile the interests of all the different users as far as possible and thus limit the risk of conflict.

Box 14. Some examples of joint reservoir management structures

At Sélingué in Mali, the reservoir's water is managed by *Energie du Mali* via an electricity production concession. In 2001, the rice growing plots downstream were flooded without warning following releases of water. Following this incident, a 'Water Management' committee for the Sélingué dam was created in December 2002 with the aim of jointly managing the dam. The periods when water is released are discussed between the different players and the whole population is informed. It is, however, a shame that this committee only includes representatives of the state services and not the local people.

At Moussodougou in Burkina Faso, the conflict between SN-SOSUCO and the Karfiguéla farmers over use of the Comoé's water led the government to establish a consultation, co-ordination and promotion structure: the Local Water Committee for the Upper Comoé (CLE). This committee facilitates the participation of all players whose activities have a quantitative or qualitative impact, whether positive or negative, on the water resources. It includes local authorities, users, regional governments, customary and religious authorities and civil society organisations. In August 2009, after the farmers on the plains said that they had water shortages due to delays in the rains, CLE worked to ensure that SN-SOSUCO released water, thus contributing to a better harvest.

4.2.2 Management structures for the irrigation schemes

As noted above, the way in which the irrigation schemes are managed is a significant source of dissatisfaction for the local people, who blame the state for allocating plots according to criteria that are lacking in transparency, favouring migrant farmers or government employees. They often perceive the organisations responsible for managing the irrigated perimeters as being quicker to penalise farmers than to help them farm their plots successfully.

The state sometimes tries to encourage the producers to become more involved in managing these areas themselves although this is more an attempt to get them to take responsibility for the costs of irrigation than out of any real desire to share power. The farmers have to pay a water charge but take little part in decisions about the way the area is managed. The example of Senegal (see Box 15) shows that the division of responsibility between the farmers and management structures still needs to be more clearly defined. Consultation bodies involving management structures, regional authorities and farmers' representatives could reduce conflict and ensure a more effective management of the irrigation schemes.

4.2.3 Natural resource management structures

A number of other structures could be established to manage the natural resources, such as catchment-level water resources (basin committees or local water committees) or the dam's fishery resources (dam management committees or Aquacultural Economic Interest Group management committees). As already noted, these structures become more important as the dam changes the natural resources, and as management rules have to be adapted or even established.

Box 15. Management structures for the Niandouba and Confluent irrigation scheme

SODAGRI manages the irrigation scheme at Niandouba and Confluent in Senegal, but it wants to hand over some areas of management to the producers. The producers are grouped into Water Unions and these take the main decisions over water management and day-to-day maintenance such as:

- collecting and managing the funds necessary to cover the costs of running the pumping stations
- providing day-to-day maintenance of secondary and tertiary networks
- providing additional releases of irrigation water during the rainy season, at the request of farmers and provided SODAGRI ensures that water is available
- deciding on dry season crop programmes with SODAGRI's technical support and according to the volumes of water in the dams
- providing water management in sectors that depend on the pumping station through the provision of staff paid for by the Union.

The Water Unions seem to be more SODAGRI's sub-contractor than its partner. There is no clearly negotiated contract establishing their formal relationship and so the parties blame each other for any failure to improve the facilities.

4.3 Conflicts and conflict resolution mechanisms

The dams have had a strong impact on access to the land and natural resources and have significantly changed the social and productive structures. Not all social groups have been affected equally, however: some have seen their production potential improve with the filling of the reservoir while others have in contrast been deprived of their basic means of production. Competition over access to natural resources and their use has thus been exacerbated and many conflicts have arisen, as can be seen from the case studies, including: conflicts between different water users; land conflicts between farmers and pastoralists; conflicts between social groups over fishery resources.

A number of measures can be taken to prevent and resolve conflicts:

■ Define clear and stable rules

Many conflicts arise because of a failure to discuss and agree rules beforehand amongst all stakeholders. The existence of some rules dictated by tradition and others by the national legal framework leads to different understandings and different responses and hence conflict. Such is the case when tradition holds a resource to be a common public good that is freely accessible, whereas the law states that only a certain group of people (those holding fishing or hunting licences, for example) can use it.

The local authority, relocated families and host families may each have a different understanding of the rights that the relocated groups have to land: for the authority, the state owns the land and allocates plots; for the host population, the land belongs to them and they are only giving rights of use to the relocating families; for the relocating families themselves, the land belongs to them because it was given in compensation for the land they lost.

- **Encourage transparency and consultation in decision-making**

The rules governing access to the resources and benefits of a dam must be clear, known to all and, as far as possible, negotiated with all stakeholders. When this is not the case, these rules risk harming a number of players, inadvertently or otherwise, whose interests are as legitimate as those who are benefiting from the resource. A lack of transparency when defining a rule (for example, plot allocation or withdrawal criteria) reinforces the suspicion that this rule is neither legitimate nor fair. The existence of written documents prevents different interpretations of the rules and agreements from arising between stakeholders.

Once established, these rules should only be changed with the consent of all stakeholders.

- **Put effective conflict resolution mechanisms in place**

To be effective, the rules must then be accompanied by monitoring and enforcement mechanisms. Often, it is the failure to enforce a particular rule that leads to conflict. Once a conflict has arisen, mediation mechanisms are needed to find a solution between the different parties.

Sharing the benefits and reducing conflicts

The lessons learned from these studies can enable future dam projects to be more successful. What is a 'successful' dam project? It is one that offers development opportunities for all and does not create social conflict or tension because of the way in which the area or water is managed. Experience shows that social transformation happens very quickly and, once it has taken place, it is very difficult and costly to correct. The villagers will already have been relocated, the lands allocated and the territory changed. Social and economic situations will have crystallised and conflicts arisen. Good initial planning is crucial and must be followed up with a substantial period of support aimed at helping people to adapt to the social and economic changes. During this period, the broad regional dynamics can still be influenced as they gradually become established. This process requires significant financial and political investment in the early stages but will bear fruit for the rest of the project's lifetime.

5.1 National development vs. local development

The dams featured in these case studies were built between the late 1970s and the late 1990s. In the 1970s, when the Sélingué dam was built, the local people felt they had to 'sacrifice themselves for national development' and they were considered disaster victims that 'should be content with whatever support the state gave them'.

With the decentralisation and growing democratisation of West African countries, political and economic contexts have now changed: dams have a wider range of objectives, environmental and social impact assessments are a legal obligation and local consultation mechanisms have been established.

Despite these changes, however, the local people are still only marginally involved in decision-making, even when such decisions directly affect their lives and livelihoods. This means that their interests are rarely taken into account and, when they are, it is often in an inappropriate manner. This leads to social and often intergenerational frustration which is very difficult to resolve at a later date. For a project to succeed, the local people need to gain more than they lose and they need to feel they are receiving a fair share of the benefits in relation to external migrants. If not, the transaction costs will grow year on year and will be felt decades after project 'completion'.

One of the main reasons for this lack of local involvement is that the state generally has strategic national objectives in mind, such as economic development or food security, when it decides on a dam project. Because there is no local development objective, the local people are not considered as partners in the development, but rather as obstacles to be overcome.

Yet ensuring that local people benefit from the dams need not be incompatible with broader national development objectives, in fact quite the opposite.

It requires, above all, the political will to include the local people affected by the dam in the benefits it creates and thus in all of the decisions that are taken with regard to its construction, relocations, compensation, investments, support programmes and so on. This dialogue between stakeholders, particularly local people, should be established from the very moment of project conception.

5.2 From compensation to local development

The upheavals caused by dams represent both threats and opportunities for the local people. Threats because their values and their way of life are affected; opportunities because new economic activities, new knowledge and better socio-economic infrastructure may enable them to improve their standard of living.

For local people to be able to benefit from these opportunities, it is essential that they are properly compensated for lost means of production and infrastructure. This is unfortunately not always the case: environmental and social impact assessments – if they are conducted at all – have struggled to identify all the villages that will be affected and have not taken full account of the dam's impact on families' livelihoods. Initial promises, limited though they were, have not always been kept. This is not necessarily due to any lack of will on the part of the developers but due to poorly designed plans that fail to take all factors into account. Moreover, project implementation is often long and difficult. Projects change over time, and the financial resources allocated may prove insufficient. It is therefore important to build in some room for manoeuvre.

Properly compensating the affected population is not enough on its own. The case studies show that they also need to be given the capacity to make the most of the opportunities that arise by preparing them for the changes that will take place: the flow of migrants attracted by the dam's construction and the economic activities this offers, the opening up of the region, the diversification of activities and so on. For local people to be able to benefit from the irrigation schemes, for example, they require training in irrigated agriculture as they have no experience of this.

In terms of planning, the challenge is not simply to reproduce the local infrastructure that existed prior to the dam but to anticipate and manage all the transformations that are going to affect the area in the medium term (migration, growing pressure on the land, changes to production systems and natural resources, new economic opportunities, new public health needs and so on). Rather than simply providing compensation, the state needs to establish a true local development policy.

5.3 Compensating for and developing livelihoods by securing access to land

Dams often lead to a decline in, or even the disappearance of, some natural resources that are essential for the local people's production systems. There is a risk of growing poverty if the loss of these resources is not counteracted. For any given family or social group, the extent of this poverty will depend on its size and what available land resources it has. Difficulties do not always become apparent

until the dam has been in operation for a number of years, when growing pressure on the land drives home the lost production potential of the lands flooded by the reservoir. Compensation should enable people to restructure their livelihoods so that they can establish a sustainable quality of life that is at least equivalent to the life they enjoyed prior to the dam's construction.

Access to land and natural resources is at the root of family food security and income and yet financial compensation for loss of lands is useless in a society that has no market for land. The relocation of displaced families onto lands that do not belong to them is a source of conflict. The host communities give the displaced groups the right to live and farm on their land but not actual ownership of it. Relations between the different social groups are always governed by customary law, which means that the displaced population have no security over the land they are occupying and on which they rely for their subsistence. Compensation must thus involve allocating secure rights to land or other resources. These rights must be recognised by other social groups in customary law as well as by the relevant authorities (national law). Host families agreeing to hand these rights over to displaced families must also be compensated.

The local people should be given compensation for land that is developed by the state, for example as irrigation schemes, if they lose their control over it. Given the great production potential these irrigated areas represent, and the necessary investment they require, specific criteria for allocating them need to be better defined.

The studies also show that these allocation criteria need to give priority to those people whose livelihoods have been affected by the dams, particularly when it has not been possible to compensate them by other means. In the case studies in question, such initiatives did not always have the intended results. The state, seeking to maximise production, defines allocation criteria on the basis of yield factors, particularly investment capacity. The farmers aim to feed their families while keeping risk to the minimum and often have neither the financial resources nor the technical knowledge necessary to farm a plot to its full potential. The irrigated plots granted to local people may therefore be revoked by the state (or the body responsible for managing the irrigation scheme). People who have lost their land should have guaranteed access to such plots and also the support they need to farm them properly.

Technical and financial support is essential to enable a successful transition from pre-dam production systems to the more intensive systems that become necessary due to the loss of land. Whether it relates to irrigation systems, rain-fed systems or more intensive pastoral systems, this support must be planned from the very start of the project and the producers supported throughout the whole transition phase. Only clear allocation and withdrawal criteria – negotiated, transparent and stable – will avoid the unfair exclusion of local populations or the creation of conflict.

5.4 Establishing rules for sustainable natural resource management

Rules governing the access and use of natural resources are essential if conflicts are to be avoided between the different users and resource sustainability ensured. The public institutions responsible for managing hydraulic structures or for regional development often only take national legislation into account, even though the state may have little means of enforcing this. Local communities, in contrast, look to customary law when establishing rights of access to or use of resources such as water, pasture, forest products and farmland. This rather uncomfortable co-existence is open to different interpretations and responses, and thus conflict. Such is the situation with the irrigation schemes, where the state (on the basis of legislation), the local people (on the basis of customary law) and the displaced groups (on the basis of compensation for lands lost) all consider they have rights over the plots.

As access to resources changes, tensions may also arise between different social groups over their use. Such is the case of the arable farmers and pastoralists when, as the land available for farming decreases, the farmers gradually settle on pastureland. The existing rules therefore need to be adapted in line with the changing context in order to encourage the region's sustainable development and to limit the risk of conflict. The new rules, which must be discussed and accepted by all resource users, will often need to be accompanied by investment, for example in cattle routes; such investments may also be needed for irrigation projects.

In some cases, the resources are new and so there are no pre-existing customary management rules; these then need to be created jointly to ensure a rational management of the natural resources and to avoid conflict. If the authorities also participate in producing these locally negotiated rules, this will ensure that they are compatible with national legislation. By writing down these rules, differences in interpretation can be minimised and this will help resolve any conflicts that may arise.

The reservoir's water is a case in point. The many stakeholders who depend on this water often have conflicting needs: for example, the water used in the rainy season to produce electricity will no longer be available for irrigation in the dry season. Where they do exist, the management structures and rules governing water resources are often not widely known. Each stakeholder may thus have his or her own idea of what the rules are. In many cases, the dam management company manages the reservoir's water in a way that prioritises its own needs to the detriment of other resource users. By establishing *ad hoc* structures that involve all stakeholders with an interest in managing the reservoir's water, it is possible to reconcile the interests of different users as best as possible and thus limit the risk of conflict.

This is also the case for the dam's fishery resources. In many countries, the legal and institutional framework governing fisheries limits people's right to fish by imposing restrictions, particularly on the use of certain techniques. This legal

framework, however, is often not widely understood and the state often does not have the resources to enforce it. On the other hand, fish are traditionally considered to be a freely accessible resource. Unless there are rules that have been jointly agreed by all fishing groups, or an authority with the legitimacy to negotiate and enforce these rules, everyone can use the fishery resources as they please. They are consequently often over-exploited and fish catches tend to decline after a few years.

A management system that guarantees the sustainable use of fishery resources and a fairer sharing of its benefits would involve the following:

- Fishing rights should be allocated to individuals as members of groups with membership criteria that are transparent and locally accepted.
- The rights and duties of these fishing groups should be negotiated with all stakeholders (local population, other reservoir water users, local and national authorities and so on). These rules, defined locally but in line with national legislation, should form the object of written documents validated by the local authorities.
- Rules should be established that guarantee a satisfactory production level whilst also ensuring that the resource is sustainably used and that the various users have fair access to it. These rules must clearly establish the conditions for accessing the resource, the fishing techniques and kinds of tackle that are authorised, closed seasons, protected areas and so on, along with mechanisms for ensuring that local regulations are observed and enforced.
- The fishing group should pay taxes or fees to the local authorities or into a local development fund.

5.5 Encouraging fair access to the benefits created by the dam

The social and economic changes caused by dams offer huge potential for regional development. Changing natural resources, more intensive production systems, the arrival of migrants and improved road and social infrastructure all encourage the development of a range of activities and can lead to improved nutrition and overall quality of life for the local people. To ensure that this is the case for all social groups affected by or living near the dam, a number of simple initiatives need to be taken:

- It is essential to encourage apprenticeships and to organise local players so that they can benefit from the opportunities offered by the dams. Fishing is a case in point: sustainable resource management requires technical and financial support in order to encourage appropriate equipment and non-predatory fishing techniques on top of clear and rigorously monitored reservoir management rules, accepted by all.

- Services such as water and electricity are largely inaccessible to the affected population, even in the case of hydro-electric dams. The main barriers are the cost of connecting to the network, as well as the cost of the electricity itself, which is too high. These services can't be made free, but ways need to be found to make them affordable to local people.
- Large irrigation schemes have often failed to achieve all of their objectives in relation to the investment made. In some cases, the schemes cause tension and conflict between locals and outsiders, or between beneficiaries and the administration. Smaller areas, close to villages, enabling diversified agricultural activity, and particularly market gardening for women, could prove both more inclusive and easier to manage.

Many of the dams generate substantial revenues but benefit the local economy and the affected populations little: this is the case of electricity production, fishing (which seems to benefit migrants disproportionately), tourism and hunting. As well as encouraging greater local access to these benefits through training, investment support and so on, the negotiations over fees paid into local development funds by electricity companies, hunting licence holders, fishing groups and so on should start as soon as the dam is constructed. In order to maximise their impact, these different contributions, and the way in which they are allocated and managed, must be subject to transparent rules and local involvement.

Part 2: Case studies



Cattle at the Kompienga dam site, Burkina Faso

1. Geographical and historical context to the dam's construction

1.1 Dam location

The filling of the Sélingué dam in 1981 created a reservoir of 409 square kilometers with a maximum level of 348.50 metres and a capacity of 2 billion m³.

The dam's area of influence is located wholly within the current *cercle* (sub-region) of Yanfolila, in Sikasso region, the 3rd administrative region of Mali. This *cercle* covers an area of 4770km². At the time of the dam's construction, Yanfolila comprised eight districts, four of which – Kangaré, Siékorolé, Guélenikoro and Yanfolila Central – were directly affected by the dam (Figure 2).

1.2 Natural resource use by different social groups prior to the dam's construction

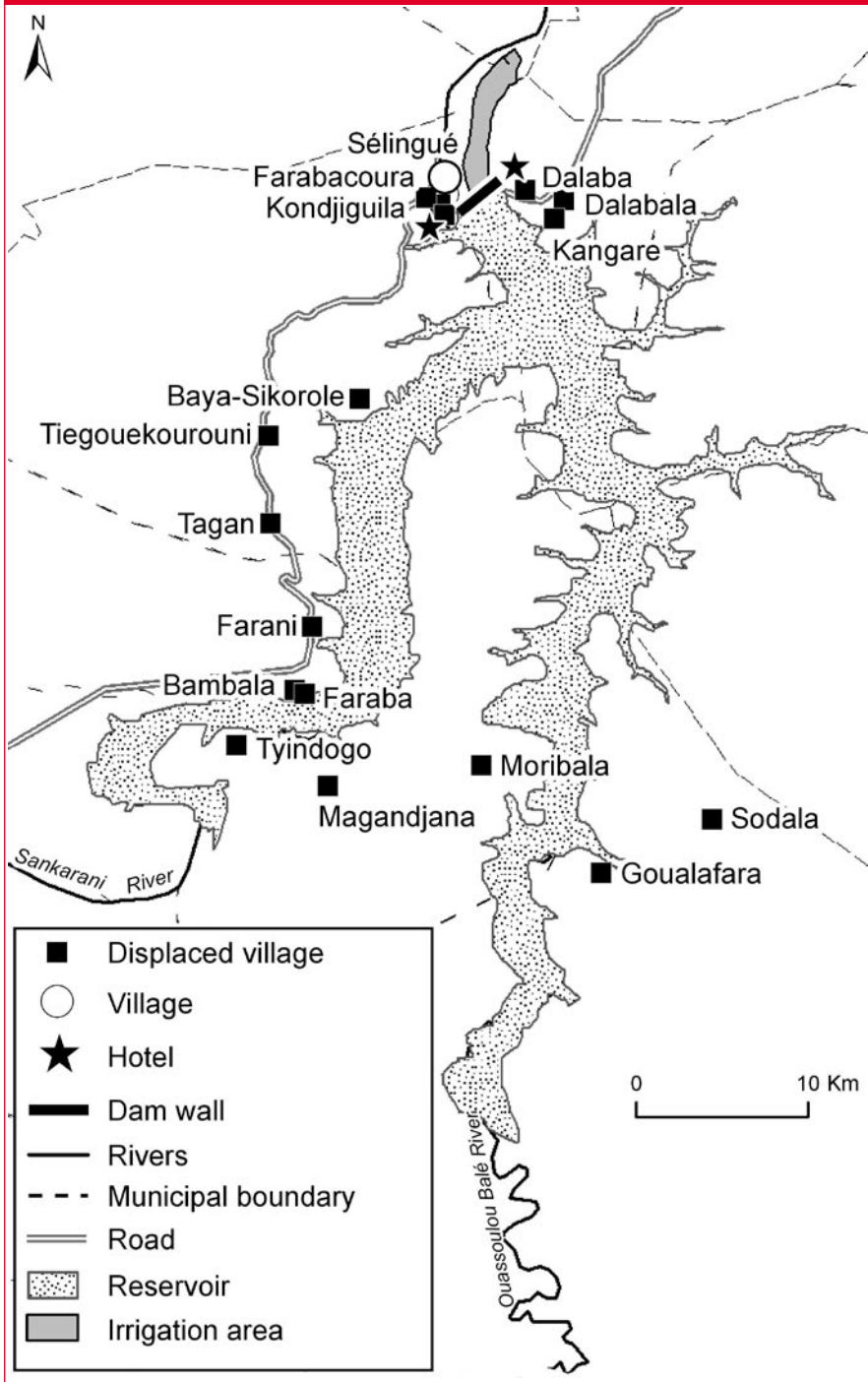
The local population consists of two main ethnic groups, the Malinké and the Peul. The Malinké originally lived almost entirely in the former district of Kangaré. Social relations are relatively stable throughout the whole area, due primarily to the custom of exogamy (marriage outside the social group), which governs marriage alliances. A tradition of mutual mockery (*parenté à plaisanterie*) reinforces this peaceful co-existence between the Malinké and the Peul.

The area used to be covered with sparse forest and bush on the plateaux and hills, and gallery forest along the Sankarani and Ouassoulou Balé rivers. The main activity was agriculture, dominated by rain-fed crops, particularly millet and sorghum (60 per cent of the area) as these formed the staple foods of the region. The main cash crops were groundnut (20 per cent of the area) and rice (17 per cent of the area), grown in the flat valleys (*bas-fonds*). With no pressure on land, extensive agriculture was practised on the basis of fairly long 5-10 year rotation periods, thus ensuring the partial restoration of fertility and eliminating the need for many commercial inputs.

1.3 The dam's aims

The main aim of the Sélingué dam was to produce electricity in a country that was, at the time, completely dependent on thermal energy and unable to generate enough to meet demand. Further objectives included making a rice growing area of more than 5000 hectares available to the population and enabling double-cropping of rice on the large irrigated areas set aside for this purpose by the Office du Niger in the Inner Niger Delta. Two further benefits were also anticipated: improved navigation between Koulikoro and Markala and support for the minimum annual flows of the Niger River, and the promotion of fishing and tourism in the dam area.

Figure 2. The Sélingué dam area



Source: Google Earth image, 2007, SIEREM

1.4 Legal and institutional framework

By law, the state owns all the land in Mali, although customary land ownership is also recognised alongside this. Legally, people have the right to use and enjoy the land but not to sell it. The government can exercise its exclusive right to obtain land whenever it requires space within the national territory. The government thus has the right to expropriate lands without compensation if the owners do not hold property titles.

The people, however, believe that the land belongs to its first inhabitants, the ones who tamed the spirits and the beasts that roamed the area prior to their arrival. Land is considered to be the property of the founding clans and the eldest patriarch of the clan or line is thus responsible for managing it, and for deciding whether to grant rights of use to newcomers.

Up until 1989, the law with regard to resettling groups of people was aimed more at protecting the interests of the state than those of the people being relocated. It was not until 2003 that Mali passed a law intended to mitigate the negative impacts of dams. The Sélingué dam project was therefore not subjected to any formal impact assessment prior to its construction. Sector studies enabled some mitigation measures to be implemented in relation to the population resettlements and reservoir deforestation.

1.5 Background to its construction and development

The Sélingué dam took four years to build, from 1976 to 1980, and more than 12,000 local people had to be relocated and resettled in an often complex and difficult process of displacement.

The Sélingué Dam Construction Authority (*Autorité pour l'Aménagement de Sélingué/AAS*) was created in January 1977 to supervise the dam's construction. Its objective was to establish the dam, build access roads and recreate the necessary administrative structures within the relocated villages. This work was completed in 1982 and the AAS was replaced by a new body called the Upper Niger Water Resource Management Service (*Office pour l'Exploitation des Ressources Hydrauliques du Haut Niger/OERHN*), the aim of which was to ensure electricity production and develop the 5000ha of irrigated perimeters.

The OERHN was dissolved in 1996. Responsibility for electricity production passed to the EDM (*Electricité du Mali*, Mali's state-run energy company) while environmental protection and rural development services were handed over to the Sélingué Rural Development Service (*Office de Développement Rural de Sélingué/ODRS*). Although the EDM has since been privatised, the ODRS remains a public body.

The Sélingué dam has an installed capacity of 44 megawatts. In 1983 it accounted for more than 75 per cent of the country's total electricity production, enabling it to considerably reduce its imports of oil.

2. Economic and social transformations caused by the dam

2.1 Significant demographic changes

The region experienced significant movements of people following the dam's construction. The six villages included in the current study for example, saw their population increase from 6178 in 1976, prior to the dam's construction, to 22,789 in 1998, 15 years after it was filled. Those affected fall in to the following categories of people:

- Local people from the 30 or so villages and hamlets within the dam area which had to be moved (Table 3). Some villages were completely relocated away from their lands (Kangaré, Dalaba, Binko, Baya, Siékorolé and Kondjiguila); others only moved sideways by a small distance and remained on their village lands.
- So-called 'economically displaced' groups. These were people who had suffered during the drought of the early 1980s in other regions of the country (mainly the Dogon). As a consequence, the Malian government reserved plots for them within the dam's new irrigated perimeters.
- Individual migrants. These arrived in successive waves: dam workers who remained after the construction work had ended, followed by farmers, fishers and pastoralists attracted by the opportunities created by the lake and the controlled flow of water.

Table 3. Breakdown of the villages affected by the dam

Municipality	Villages affected by the dam
Baya	Dalabala, Kangaré, Sélinkéni, Sirakoroni, Dalaba
Tagandougou	Kondjiguila, Baya Sikorolé, Tagan, Binko, Faraba Coura, Tiégouékourouni
Sankarani	Bambala, Faraba, Farani
Serémoussa Ni Samou	Magandjana, Moribala, Bada, Sanyimalé, Tyindogo
Yanfolila Centrale	Sodola, Goualafara

2.2 Transformation of livelihoods

2.2.1 Emergence of land conflicts

Displaced groups were resettled with the agreement of the host population but disagreements arose between the different communities over two issues:

- The local population, which was relatively small in comparison to other areas of the Sikasso region, grew rapidly. Given the extensive nature of local production systems, this resulted in greater demands on agricultural and pastoral lands. As groups began to settle on new lands, conflicts often arose between farmers, and between farmers and pastoralists.

- The laws governing land concessions were not clearly stated, and this gave rise to different interpretations amongst the stakeholders. Did the land belong to the state, as stipulated by law? Or to those that worked it, as maintained by the government? Or to the customary owners, also recognised by law?

Conflicts emerged between population groups and the state over the allocation of rights to the irrigated plots. There was also conflict over the areas not developed by the state, particularly between the local population and the ‘immigrants’, whether migrants or displaced persons.

Groups who had previously rented plots started commandeering them for themselves, afraid that they would lose their land, and thus their means of existence. Likewise, fruit growers who had lost their orchards and had no more free land began to clear land belonging to other clans. The customary owners’ requests to get the authorities to evict them fell on deaf ears. Meanwhile the local people themselves engaged in unprecedented land speculation: land was sold to developers and unused ‘reserved areas’ were designated.

Faced with these constraints on land, some displaced families returned to their original villages, settling on the outskirts that had not been flooded. Others returned to their farming settlements, where living conditions were quite harsh. Such moves have prevented outright confrontation but are far from ideal.

Urban areas have also seen deteriorating relations between locals and migrants. Displaced groups are claiming ownership of the areas that were initially made available to them by their hosts and are now treating these as if they were their own. The host villagers believe the only rights these newcomers have are to the housing plots that were allocated to them and they cannot distribute additional plots for residential use on their host’s land. These conflicts have given rise to court cases, some of which have yet to receive a final ruling.

2.2.2 Degradation of natural resources

With the dam’s construction, the vegetation in the Sélingué area has been greatly degraded. In addition to the reservoir submerging 40 per cent of the gallery forests along the river, 830ha were cleared to build roads and tracks, and 18,000ha to relocate the displaced villages and to make way for the migrant population and their fields. Land was also cleared to establish irrigated areas immediately downstream of the dam and at Maninkoro, and to set up fishing settlements, which required significant timber for smoking fish and for constructing landing stages.

The opening up of the region has meant that firewood, previously only used to satisfy local needs, is now in great demand to supply other areas such as the capital, Bamako.

The gathering of non-timber forest products (nééré, shea, tamarind, etc.) has declined significantly, affecting women’s incomes. Hunting, which used to form an important source of protein for households, has also suffered a similar decline.

2.2.3 Changes in production systems

a. Agriculture

Pressure on the land has forced local farmers to adapt their production systems. Millet, previously grown over large areas, has now been replaced by maize, which produces good yields in small areas. The dam has also led to a decline in groundnut production, a crop that used to form the women's main source of income.

Agroforestry has also been badly affected by the dam. Some 32,000 fruit trees were submerged by the water and, because of land constraints, a lack of suitable areas for planting and the inadequate compensation paid to growers, this activity has not been resumed in other areas.

b. Pastoralism

Pastoralism was initially badly affected when the reservoir was filled, first through the loss of animals during the resettlement programme and then through the gradual decline in grazing land. Infertile and fallow lands used as pasture prior to the dam's construction were gradually turned over to crops by people under pressure to find farmland. Moreover, the marshes, plains and valleys that used to provide high quality grazing disappeared when the dam was filled.

Since then, however, cattle farming has seen remarkable growth. Livestock numbers have recovered in Baya and Tangadougou municipalities, thanks in part to the animal health programmes started in 1986. The pastoralists have had to adapt to the new conditions by changing the way they feed their animals, introducing crop residues and concentrated feeds (such as cattle cake made of groundnut or cottonseed) into their diet.

There has also been a renewed interest in cattle due to the increased use of draft animals, particularly in the irrigated area. Moreover, the cattle market in Kangaré and the general opening up of the region have created outlets for livestock produce (meat and milk). One of the consequences of this growth was the founding of a highly active pastoralists' co-operative in Kangaré in 2007, which operates a milk collection centre.

2.3 Erosion of social cohesion

The area's strong social harmony disappeared with the arrival of the dam, as it gave rise to conflicts over access to farmland and natural resources. The deteriorating situation can be seen in the way in which marriage alliances are now made, and in the declining influence the head of the household has over his family members. Alliances between Malinké clans have given way to alliances with Peul and Bambara as neighbourly relations and the tradition of 'mutual mockery' with these groups were not affected by the dam. The Bambara are showing no desire to assert rights to the land, and the Peul have also remained on their own land.

This deteriorating situation can also be seen in the creation of new municipalities. When government decentralisation was introduced in 1997, the districts were broken up to form municipalities, grouping together villages with a strong affinity to each other or, more importantly, with shared resentments. In Kangaré district, the villages of Binko, Kondjiguila and Baya Siékoroli were all home to displaced people unhappy with the attitude of their host communities and they formed – along with Tagan village – the municipality of Tagandougou. Baya municipality, comprising just five villages (Kangaré, Dalabala, Dalaba, Soninkoura and Sélinkéni), is made up of communities which claimed a common ancestor and believed the lands they occupied were their own. Such ‘mini-municipalities’, whose long-term viability is doubtful, have emerged throughout the whole of the dam’s area.

Alongside this, increasing numbers of migrants have built large hamlets which they intend to establish as autonomous villages. The local population do not agree with this approach, considering these hamlets to be part of their own villages and they have taken measures to restrict their expansion. This has led to open tension and the authorities have not yet been able to find any common ground between them.

3. Measures to compensate for the negative impacts of the dam

3.1 Insufficient compensation for the displaced population

The support measures were decided by the authorities, with the local people simply agreeing to their proposals. Table 4 shows the different measures planned and any difficulties that emerged. The ones relating to infrastructure (such as reconstruction of houses and basic social infrastructure in the villages, and improved road infrastructure) seem to have been undertaken to the local people's satisfaction. In contrast, measures aimed at compensating for the loss of local people's livelihoods (financial compensation for lost productive investments, the allocation of plots within the irrigated perimeter, food support) were handled badly or have proved insufficient. The financial and land losses suffered by the displaced populations have constrained their efforts to adapt their production systems to the new situation, which is now compounded by the growing population. This has created feelings of rancour.

3.2 Lack of compensation for the host villages

The host villages are those that received the displaced population onto their land: Dalabala and Sanankoroni on the left bank and Sélinkéni on the right. As these host populations lost some of their lands, they were also given priority allocation of plots in the irrigated area and have suffered the same difficulties as the displaced population.

Table 4. Measures planned to compensate for the negative impacts of the dam: constraints and difficulties

Anticipated compensation	Measures taken	Constraints or difficulties
Infrastructure		
Reconstruction of villages, homes and road infrastructure	<p>Living space provided; local construction materials supplied: adobe, straw (but not concrete or brick blocks)</p> <p>Construction of road access to the dam</p> <p>Provision of a number of rural tracks: Sélingué-Faraba, Sélingué-Manincoura</p>	<p>Lack of minor roads linking villages to the main road</p> <p>The track linking Faraba to the dam is not passable all year round</p>
Reconstruction of basic social infrastructure	<p>Reconstruction of schools and health centres, with an increased number of classrooms</p> <p>Construction of teachers' accommodation</p> <p>Construction of modern wells</p> <p>Construction of a research health centre and, later, a referral health centre</p>	<p>Management problems with modern wells, which quickly fall into disrepair</p>
Livelihoods		
Food support for three years	Distribution of food products (wheat flour, corn flour, oil, tinned foods, etc.)	Distribution to extended families and not by household, only for one year
Compensation for lost productive investments	Payment of 750 FCFA per tree for fruit trees	<p>No new areas provided in which to re-establish the plantations</p> <p>No space allocated for rain-fed crops</p>
Allocation of plots in the rice growing area	All listed households received plots according to their size and available agricultural equipment, inventoried prior to their displacement	<p>Lack of technical support to help the farmers master cultivation of a new crop</p> <p>The poor results led to plots being abandoned or taken away from the farmers for failure to pay the service charge</p> <p>The allocation criteria soon changed: displaced populations no longer have priority, the plots allocated are smaller, the service charges higher and so on</p>

4. Recognition of rights and benefit sharing

4.1 What rights of the local population were recognised?

The dam's main objective was to contribute to Mali's economic development through the production of electricity. The displaced and host villages were to be compensated for the losses caused by the construction and filling of the dam but they were never considered as potential beneficiaries. Their involvement in decision-making was therefore virtually non-existent (they were consulted over the choice of resettlement or reception sites but not over the nature or amount of the compensation) and they simply acquiesced to the authorities' proposals, often unaware of the short- and medium-term implications of those decisions.

Moreover, the management regulations that were to prevail once the infrastructure had been completed and the population resettled were never clarified. The allocation of irrigated plots to those affected proved to be temporary as, after the first season, the authorities established criteria that these people could not meet. It was only then that they realised, contrary to what they had believed, that they only had a right of use and not ownership of the irrigated plots, despite the losses they had suffered following their displacement. No specific rights of the displaced were recognised and the state retains a monopoly over the allocation and withdrawal of irrigated plots to or from families, according to its own criteria. Tensions have also arisen between local and displaced groups over plots intended for housing; meanwhile the state is demanding that inhabitants pay to obtain a property title for plots they have occupied since relocation, which is simply exacerbating feelings of land insecurity.

In 2001, the rice-growing plots were flooded following an unscheduled release of water. The ODRS staff advised the farmers to go to court, where they lodged a complaint and obtained a ruling in their favour against *Electricité du Mali* (EDM), the company responsible for managing the dam's water. Following this incident, in December 2002 a water management committee was created aimed at ensuring the dam's joint management. Unfortunately this committee is primarily made up of state players; users and local authorities are not represented.

The EDM management team is responsible for designing and implementing the electricity management policy within the guidelines laid down by the Malian government. This policy must be observed by all local bodies, which explains why the local Sélingué institutions have been powerless to propose specific tariffs for the local people. There is no local Sélingué representation on the EDM committee responsible for setting consumer tariffs and the local authority is therefore unable to influence policies that might enable the local people to gain access to the electricity supply.

4.2 What benefits does the dam offer the local community?

4.2.1 Direct and indirect economic benefits

a. Fishing

The main bodies of water in the area prior to the dam's construction were the Sankarani and Ouassoulou Balé rivers. Although fishing was practised by local and migrant fishers, it was seasonal and small scale, aimed entirely at the local market.

The large reservoir created by the dam attracted professional fishers from other regions of Mali. A 2009 survey put the number of fishers at 2666, living in 76 fishing settlements; 95 per cent of these people were migrants originally from the regions of Ségou (55 per cent), Mopti (33 per cent), Sikasso (5 per cent), Timbuktu (5 per cent) and Koulikoro (2 per cent). They belonged to the Bozo (63 per cent), Somono (16 per cent), Bambara (2 per cent) and other ethnic groups.

Apart from the fishers themselves, the industry supports a large number of other players: wholesalers, ice vendors, fish hauliers, ODRS staff, Water and Forest Department staff (responsible for monitoring fishing equipment), vendors of equipment such as dugouts and nets, and so on.

The fishers sell most of their fish fresh to wholesalers; the rest is smoked and dried or kept for their own consumption. The processed products are destined mainly for Bamako, Konobougou and Ségou.

b. Irrigated perimeters

Once the dam was constructed, an irrigated perimeter of 1300ha was established in 1983. It was followed in 2004 by another of 1080ha downstream. The aim was to promote irrigated rice growing, intended both to replace millet and sorghum as the local people's staple food and to provide them with revenues through the marketing of surpluses.

People who lost their lands because of the dam were all given plots; however, as they were offered little supervision or advice, they initially proved unable to master the new agricultural technique. Faced with disastrous first harvests, many villagers abandoned their plots or had them taken away by ODRS staff for failing to farm them properly or because they were unable to pay the service charge.

As Dogon communities supported by the Malian government began to arrive and government workers and former dam workers began to settle permanently in the area, the number of applications for plots began to increase. The allocation criteria changed and plots were given to those people able to meet a series of economic and technical conditions that were generally out of the reach of the local people.

Given the lack of land available for rain-fed crops, irrigated rice growing is now essential to the local farmers' production systems as it allows two harvests per year. Having learnt the new rice growing techniques from the migrants or from OERHN and ODRS technicians, the local people are now attempting to claim back the plots they lost or, failing this, are demanding priority in the reallocation process. Given the lack of available farmland, applications are now being submitted by households, or even by individuals, rather than by the heads of large extended families.

c. Commercial activities

Previously small-scale activities have expanded due to the increased population around the dam and the demand for products and services. Welding, forging, carpentry and metallurgy workshops, for example, have sprung up along both sides of the asphalt road to Kangaré and Dalabala. These activities promote youth employment and the whole population benefits from services that were previously only available in Ouélessébougou or Bamako.

Trade has greatly increased because of the new roads, which have opened up the region to the outside. There is a flourishing trade in fresh and smoked fish for the Bamako market. Fruit and vegetables are gradually being commercially traded and rice wholesalers are also moving large quantities to the capital. There is a local trade in and flow of products to the weekly markets in Dalabala, Dialakoro and Siékorolé.

The dam has also led to a number of new activities. For example, the availability of electricity in some villages around the dam has enabled people to undertake arts and crafts and establish small ice-production units aimed at preserving fresh fish.

4.2.2 Improvements in infrastructure and services

a. Poor access to water and electricity

All the villages around the area of the dam were provided with a drinking water supply. The cost of using these facilities was often very high and so many families continued to draw water for most of their needs – sometimes even drinking water – from traditional wells or the dam. No appropriate mechanisms for managing these new facilities were established and most of them fell into disrepair after only a few years through lack of maintenance. It would seem that the state was more concerned with providing compensation for lost infrastructure than with actually ensuring the provision of a service.

In terms of access to electricity, EDM treats the local population around the dam like any other national customer and offers them no preferential tariff either for connection or supply. The minimum 150,000 FCFA charge for connection to the electricity grid is quite clearly out of the reach of most families.

Only Kangaré and Binko are connected to mains electricity and drinking water networks and even this water is not accessible to all households as the connection cost is a minimum of 100,000 FCFA. Despite such access difficulties, these villages attract people from the other villages because of their better services.

b. Improved access to health and education

The dam project only planned to build schools for those villages that had schools before they were displaced. This promise was kept and although the AAS took no further steps to improve the area's school infrastructure, the provision of education has improved through the emergence of community and private schools.

During the displacement process, the AAS did not rebuild the clinics in Binko and Dialakoro because they were community initiatives. In contrast, the Kangaré health

centre, a state-run structure, was rebuilt at the village's resettlement site. The provision of state-run health services in the area was therefore no better at the conclusion of the dam works than it was at the beginning.

Kangaré will also benefit from a new centre in the context of the onchocerciasis programme being implemented by the National Institute for Public Health Research. This will subsequently become a referral centre, and will mean that Baya municipality is one of the few in Mali to have an analytical laboratory, an operating theatre and a radiology unit.

The presence of the dam, the increased population and the inflow of migrants have increased the prevalence of some diseases. Malaria, for example, was previously a seasonal disease, appearing only in the rainy season, but is now present almost all year round. Its prevalence rate has increased to 60 per cent from 36 per cent before the dam was built. Outbreaks of other diseases, such as bilharzia, have also occurred. In just three years, the prevalence of this disease has increased from 3.2 per cent to more than 30 per cent in the displaced villages, and from 3.2 per cent to 11 per cent among the rest.

c. Improvements to communication routes

The construction of roads and rural tracks has contributed to opening up the region and to reviving the local economy, both in terms of local products flowing out of the area (to weekly markets such as at Dalabala, Dialakoro, Siékorolé) and in terms of the provision of staple foods. In addition, regular releases of water from the dam have supported minimum annual flows downstream while the reservoir enables water to be held upstream. Together, these have contributed to improved river navigation both above and below the dam.

4.2.3 Financial benefits for local authorities

Since decentralisation, 80 per cent of the taxes levied on EDM's sale of water and electricity has been returned to the regional authorities. According to the General Secretary of Baya municipality, 60 per cent of this, 96 million FCFA, goes to Baya municipality, where the dam is located, with the remaining 40 per cent shared between the Yanfolila *cercle* council and the Sikasso regional assembly. According to the Mayor of Baya, however, payment of this tax is irregular and never as much as it should be.

4.2.4 Factors limiting the dam's benefits

a. High cost of irrigated rice growing

The main problem currently facing farmers is the cost of production: the annual service charge is 70,000 FCFA per hectare per year, to which must be added the cost of purchasing fertiliser (100,000 FCFA/ha), labour, weed killer, the cost of hiring threshers, transporting the rice and so on.

The birth of micro-finance at the end of the 1990s encouraged rice growing to develop. Local farmers organised into co-operatives and can now access mutual guarantee loans. The rate of interest is quite high and so access to this credit remains limited.

b. Lack of regulations governing fishery resources

All those involved in the fishing industry confirm that catches are declining, and put this down to bad fishing practices. Unlike other natural resources, the reservoir did not exist before the dam was built and thus has no customary rules governing its use. This lack of regulation continued until 2006 when the ODRS, aware of the danger this situation was creating for fish stocks, initiated an agreement between the fishers aimed at the sustainable management of the reservoir's resources. The agreement banned the use of some fishing tackle and fishing techniques although some individuals refuse to observe the terms of the agreement, with the full knowledge of the authorities. Cases raised by the fishing associations go unpunished and the use of prohibited tackle continues, with the consequent continuing deterioration of the lake's ecosystem.

c. Lack of contribution from fishing to local development

After electricity and water, fishing generates the most income in the region. Sélingué is now Mali's second largest fishing port, after Mopti. Little of this wealth ends up in the hands of the local people, however. It is largely concentrated in the hands of a few Bozo clans, many of whom only turn up when the waters are low and favourable to large catches. Apart from the duties and taxes these people pay the authorities, this activity provides few other benefits to the area or its inhabitants.

5. Synthesis of local people's perception of the effects of the dam

The local people who lost their land believed that the irrigated perimeter that replaced rice growing and rain-fed fields would be theirs by right, in perpetuity, and that the concessions they obtained in their new settlements would be at no cost to themselves.

The disastrous results of the first harvest led to the plots being withdrawn from all the local farmers who were in default. These farmers then realised, to their horror, that this facility had not been provided for their benefit, and that they were left with little to survive on. This was a bitter disappointment for them, as they found themselves virtual outsiders on their own lands. The new land allocation criteria, which focused on financial capacity, merely reinforced this trend.

All the benefits of the dam (drinking water, electricity, rice growing plots) have been provided for Mali's urban population. The local people are bitter that their region, which is where the electricity is produced, has one of the worst electricity supplies in the country and that, even when it is available, it is at an exorbitant price, similar to that paid by civil servants or Bamako residents with higher incomes. Moreover, the local people note that available plots in the irrigated perimeter are often allocated to the staff of the ODRS or to people who do not live in the villages. This only reinforces their feelings of exclusion, and their belief that the perimeter is not for the local people but for civil servants and Bamako residents.

Nonetheless, the local people also realise that the dam has provided opportunities in terms of revenues and food security. In just a few years, particularly through contact with migrants, they have been able to adapt to irrigated rice farming and make money from it; they have also learned to rely on group solidarity to avoid plots being taken away from them. Most families that initially lost or abandoned their plots have now submitted an application for their return.

The women and youth have also been able to use the opportunities offered by the dam to develop income-generating activities. The women are undertaking market gardening or are active in the marketing of rice and fruit and vegetables such as tomatoes and onions, while the young people are running small businesses and offering services demanded by public and private administrative structures and the middle classes such as selling petrol, and running dispensaries and grocer's shops. Young people are no longer leaving the area: they have enough work to make a satisfactory living.

1. Geographical and historical context to the dams' construction

1.1 Location of the dams

The Confluent and Niandouba dams were built in 1984 and 1997 respectively, in the Kayanga and Anambé basins upstream of the Kayanga River, Kolda region, in southern Senegal (Figure 3). This resulted in the formation of three reservoirs: the Niandouba reservoir upstream (85 million cubic metres), then the Confluent reservoir (34 million m³) and, finally, the Waïma Lake reservoir, at the level of the Kounkané Bridge (25 million m³). This storage has enabled 5000 hectares of irrigated plots to be established in the wet season and 3000ha in the dry season, out of an estimated total potential irrigated area of 16,000ha.

1.2 Natural resource use by different social groups prior to the dams' construction

Prior to the construction of these dams, the local people's main sources of income were the rain-fed crops that were grown on the plateaux, rice growing in the flat valleys and livestock rearing, both sedentary and pastoral with seasonal movements of animals around an area of pasture adjacent to the village.

1.3 The dams' aims

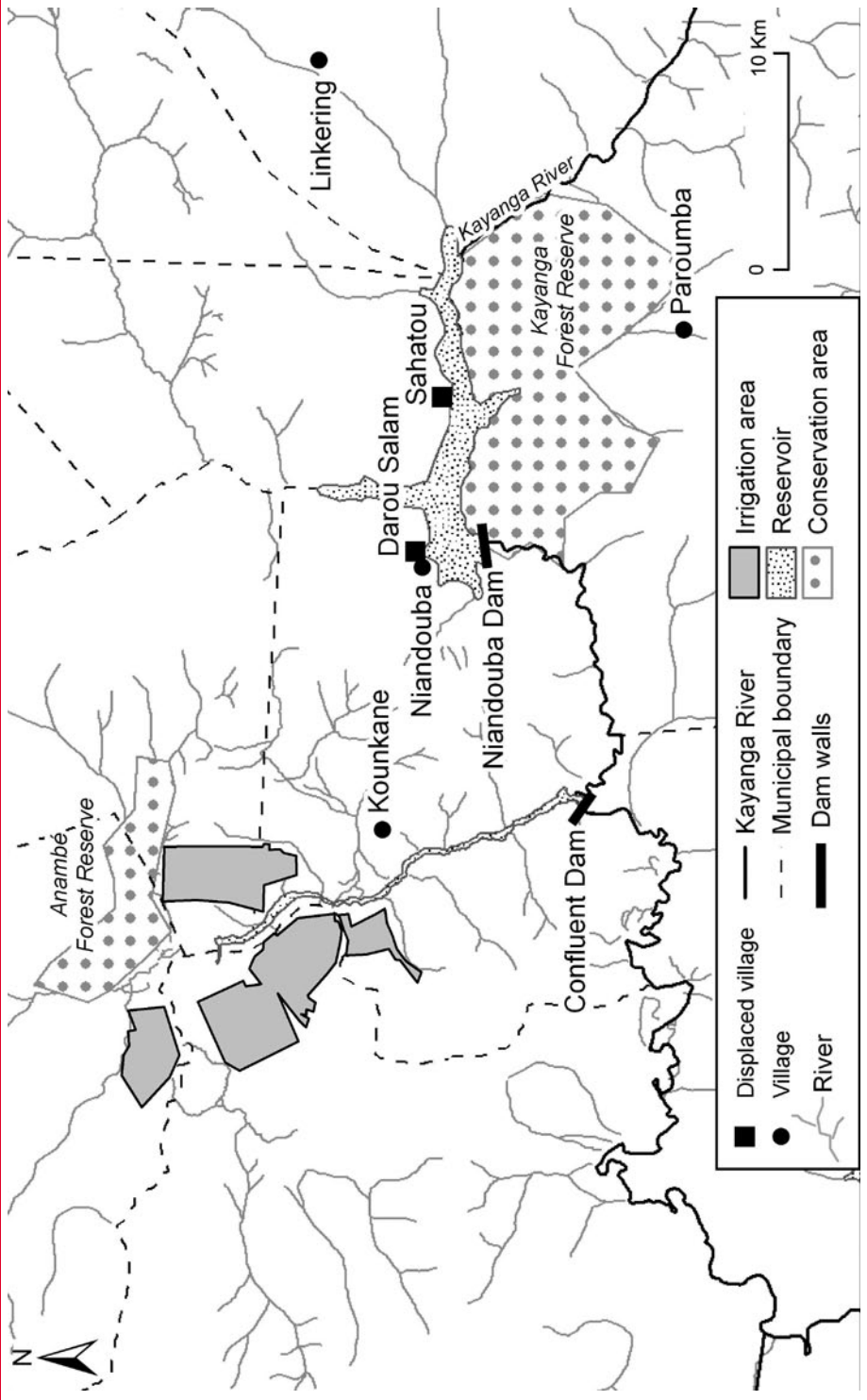
The Niandouba and Confluent dams were built to help the local and national economy better withstand the risk of drought by ensuring improved water availability for agricultural production. The dams store and deliver water to the irrigated plots, which are intended to contribute to national food security by producing 40,000 tonnes of paddy rice, 25,000 tonnes of maize and 15,000 tonnes of sorghum each year.

1.4 Legal and institutional framework

The Kayanga/Géba river basin straddles Guinea, Senegal and Guinea Bissau and is managed by the Gambia River Development Organisation (*Organisation pour la Mise en Valeur du fleuve Gambie/OMVG*). Because the Kayanga/Anambé river basin development project was implemented before the agreement granting the Kayanga/Gébe River international status came into force, however, its prior approval by the OMVG was not necessary.

The 1976 Public Land Law establishes that hydro-agricultural complexes fall within the public domain. Although the state manages the natural resources (bodies of water and water courses) that are in the public domain, the artificial facilities (dams and hydro-agricultural facilities) in the Anambé basin are managed by the Agricultural and Industrial Development Company (*Société de Développement Agricole et Industriel/SODAGRI*). The reservoir areas were withdrawn from the public domain and registered to the state following a Declaration of Public Utility.

Figure 3. The Niandouba and Confluent dam areas



Such a declaration is equivalent to an expropriation and requires the payment of fair and timely compensation to the evicted occupants, calculated on the basis of the value of their buildings, facilities, plantations and crops.

In 1996, the state devolved responsibility for land and public property matters, urban planning and habitat, environment and natural resource management to the local authorities. In particular, the Rural Community authorities are responsible for allocating and removing the land under their authority, including the irrigated plots managed by SODAGRI. Regulations governing the national domain exist alongside traditional land management rules, however, and the Rural Communities exert little authority over the non-irrigated fields in the plateaux and in the valleys, where traditional landholding systems prevail.

1.5 Background to the dams' construction and development

SODAGRI was established in 1974 as a limited company with a majority public shareholding under the technical supervision of the Minister for Agriculture. It has been responsible for supervising the three phases of the Anambé Basin Hydro-Agricultural Project (PHBA), including the construction of the dams and the development of the irrigated perimeters, followed by the Anambé Basin Rural Development Support Project (PADERBA).

2. Economic and social transformations caused by the dams

2.1 Displacement of the local population and migrations

Studies for the Confluent dam anticipated that no villages would be affected by the dam's construction or filling. Its design and implementation were therefore not accompanied by a resettlement policy.

Numerous studies attempted to estimate the number of villages that would be affected by the creation of the Niandouba reservoir. The first, conducted in 1980, based the resettlement needs on the number of villages located within an area likely to be affected by a 1 in 100-year flood event (38 metres high). At that time, the study concluded that 22 villages would be affected, requiring the resettlement of a population of some 3000 people. Thirty-five villages would lose some of their farmland, totalling around 2000 hectares in all. In the end, changes to the initial project design meant the number of villages considered at risk fell to nine, then seven, and finally five after a new study, conducted in March 1998, identified a maximum water level of 32.41m.

These five villages comprised 373 dwellings, 749 inhabitants and 486ha of farmland. They were divided into two different categories:

- Highly threatened villages requiring complete relocation. Only one village fell into this category, Médina Dianguette, which was moved 1.5km as the crow flies from its original location.
- Moderately or less threatened villages, requiring a move of a few hundred metres. The other four villages fell into this category, threatened with varying degrees of flooding: Darou Salam (56 per cent), Sahatou (49 per cent), Mayel Lafou (28 per cent) and Pouréga (25 per cent).

However, after the dam's construction it was estimated that 4305 inhabitants had been affected by relocations. This number includes people from villages affected by either total or partial displacement.

Between 1998 and 2002, the population of the rural communities of the Anambé and Kayanga basins grew by more than 50 per cent, a rate above the national average, essentially due to an influx of migrants. Some of the migration was from abroad, primarily for economic reasons: Peul (Fouta) from Guinea and Malian fishers. To this were added internal migrants from the regions of the Arachidier Basin, in search of farmland. They settled around the Anambé irrigated plots, or around Diaobé village because of its market. Despite this, the population density remained fairly low (35 inhabitants per square kilometre) in comparison with the national average (51 inhabitants/km²).

2.2 Transformation of livelihoods

2.2.1 Land conflicts

Pastoral lands (pasture, cattle routes, watering points) in particular have declined in the Anambé basin due to the hydro-agricultural developments. Despite the fact that land occupation and allocation plans (POAS) were produced for seven rural communities of the Anambé basin, cattle routes have not been marked out, and agricultural activities are encroaching upon pastureland, making access to watering points more difficult. There have consequently been increasing numbers of cases of cattle straying, giving rise to conflicts between farmers and pastoralists.

2.2.2 Degradation of natural resources

The construction of the Confluent and Niandouba dams and their related infrastructure involved clearing a total area of around 9500ha, 6500ha of which was in the Anambé basin. This land clearing led to changes in the natural ecosystems, a fall in the number of large mammals, difficulties in satisfying the need for firewood and forest products, and reduced pastureland. The negative impact was compounded by the expansion of cash crops (cotton and groundnut) and the development of arboriculture.

2.2.3 Mixed impacts on production systems

The flooding of the flat valleys and the high level of the flood waters meant that areas traditionally devoted to rice growing along the tributaries of the Kayanga River disappeared. The fields on the plateaux were also submerged, and fruit trees lost.

The dams had a number of different effects on the livestock systems:

- The abundance of water in the dams and in the Kayanga River led to a rise in the level of the water table supplying the village wells and growth of vegetation, enabling an increase in livestock numbers and milk production.
- The development of 5000ha of irrigated plots in the Anambé basin brought about a decline in pastureland. The remaining pasture came under increasing pressure from grazing. At the same time, forests and the areas around the cattle routes have been reduced to savannas.
- There have been difficulties in accessing watering points for cattle because the irrigated plots form a continuous belt of cultivated land between the Anambé and the rest of the basin. This lack of access routes has been the source of extraordinarily bitter conflicts, particularly in the dry season when water is only available in the area of the Waïma Reservoir.

2.3 Increase in the number of conflicts over access to natural resources

No conflicts have emerged as a direct result of the resettlements, as all the villages in question were resettled on a different part of their own traditional land. Instead, conflicts are being caused by competition over access to resources between players with differing but often closely entwined interests.

2.3.1 Conflicts over straying cattle

This is the most common source of conflict in the Confluent dam's area of influence, where the development of hydro-agricultural facilities failed to take the needs of pastoralism into account. These conflicts are most often resolved amicably between the two parties in question.

2.3.2 Conflicts caused by an increased pressure on land

Conflicts over land have been increasing since 2005 when the Anambé basin's irrigated plots were opened up to farmers of Touba origin. This has led to demand for land completely outstripping the available supply. Land conflicts have also been caused by a lack of understanding of the somewhat inconsistent regulations governing access to the irrigated plots, the temporary nature of plot allocations and competition over access to those plots considered to be of better quality.

2.3.3 Conflicts linked to the unclear framework governing the relations between producers and resource management structures

These conflicts have arisen primarily between SODAGRI and the Federation of Anambé Basin Producers (*Fédération des Producteurs du Bassin de l'Anambé*/ FEPROBA). There are many reasons for them but they are generally caused by the lack of any formal framework governing the relationship between SODAGRI and the different producer organisations (POs). The conflict between FEPROBA and SODAGRI now seems to be being resolved, as SODAGRI's Managing Director issued a circular in June 2010 lifting an ongoing suspension of relations, following mediation by the administrative authorities.

2.3.4 Conflicts between producers and service providers

In line with its policy of disengagement, SODAGRI has handed over responsibility for the provision of mechanised services for tilling and harvesting to a private company, SOENA. There is not enough agricultural equipment to meet the demand, however, and the local farmers accuse SOENA of favouring large, often immigrant, farmers to the detriment of the poorest producers.

3. Measures to compensate for the negative impacts of the dams

3.1 One out of five displaced villages received compensation

Of the five villages that had to be moved, only Médina Dianguette agreed to the relocation in 1998, before the reservoir was filled, and thus received support from SODAGRI. The new site was jointly agreed between the village chief and the dam's developers, who carried out the necessary work to ensure the site's viability. Compensation was provided for all lost assets on the basis of an inventory drawn up at the original village site. In terms of community infrastructure, the new village was provided with a primary school and a health centre but just one well whereas the old village had seven.

The other villages only moved after suffering from repeated flooding, and therefore received no compensation or infrastructure except a modern well. They had to rebuild their houses themselves, sink wells and clear new fields.

3.2 Lack of compensation for the villages that were affected but not relocated

Apart from the five villages whose relocations were planned, other villages have also been affected by recurrent flooding.⁵ These floods are due to the cumulative effects of the two dams, and started happening after the filling of the Niandouba reservoir in 1999. In addition to their impact on housing and social infrastructure, these floods have caused the loss of gallery forests, affected family crops and food security, and in some places have caused the villages to become effectively cut off from the outside world. Some villages have been forced to move to higher ground and clear new land for houses and crops.

3.3 Impacts of the dams on livelihoods were not taken into account

Numerous villages were affected by the loss of farmland, fruit trees, forest areas and pasture. Apart from in Médina Dianguette, the impact on livelihoods was neither assessed nor compensated for.

SODAGRI did implement some measures to mitigate the negative impacts of the hydro-agricultural facilities on pastoral systems in the Anambé basin, through the PADERBA. This involved sinking pastoral wells and establishing watering points for livestock in the affected villages.

5. Eight villages comprising 1700 inhabitants have been affected in the Anambé basin; 10 villages of 2028 inhabitants were affected in the area of the Niandouba reservoir and, upstream of the Niandouba dam, 8 villages of 2277 inhabitants were affected.

4. Recognition of rights and benefit sharing

4.1 What rights of local population were recognised?

4.1.1 Limited involvement of the local population in decision-making

There appears to have been very limited consultation of the local people in the Anambé Basin during the design of the project's various phases, which explains the problems in benefit sharing now being experienced.

4.1.2 A conflict resolution mechanism: the POAS

Conflict prevention and resolution is taking place with the involvement of the usual players (traditional authorities, state representatives, local authorities). Since 2004, the rules for allocating and managing land have been set out in the POAS (Land Occupation and Allocation Plan) in order to ensure a better use of the area and the peaceful coexistence of agricultural and livestock rearing activities. The POAS is an important tool for conflict prevention but, as it is not well understood by either the rural councillors or the local people, it is rarely used in practice.

4.1.3 Steps towards bringing local people into the management of the dams and their benefits

a. Land management

For many years, SODAGRI distributed the irrigated plots as it chose. Then in 2010 the rural community councils reclaimed the power to allocate or withhold the irrigated plots. The main criterion when allocating a plot is the applicant's capacity to develop it. As SODAGRI's staff are best placed to know the social status and technical and financial capacities of the various farmers, the rural community councils therefore pass the requests on to SODAGRI for its technical opinion.

In reality, the local authorities have few resources available with which to exercise their powers and are under strong pressure from the local population, SODAGRI, the large producers and even the administrative authorities. They rarely decide to withdraw plots, although there is a clear tendency to grant ever more land to migrants and private companies that are likely to offer jobs to the local people.

Although the rural community councils have legal powers permitting them to delimit and demarcate the livestock routes, and although these are anticipated in the POAS, pastoralists still find it hard to enforce their rights to access pasture and watering points.

b. Water resource management

From 1998 onwards, SODAGRI began to withdraw from some activities in an attempt to encourage the producers to take on more responsibility for managing irrigation infrastructure.

Management of the reservoirs' water resources, the main canals and irrigated perimeters is thus shared between SODAGRI and the Water Unions, which are made up of the economic interest groups (EIGs) that use the water. SODAGRI

is realigning itself around the maintenance of the infrastructure facilities (dams, supply channels, pumping stations and canals). The Water Unions are directly involved in managing the water through the day-to-day maintenance of the secondary and tertiary networks, ensuring releases of additional irrigation water, taking decisions about off-season crop programmes, collecting and managing funds for pumping station operations, and so on.

There is, however, no legal instrument establishing the formal relationship between SODAGRI and the unions. This creates further conflict since the parties blame each other for the failure to improve the facilities.

4.2 What benefits do the dams offer the local community?

4.2.1 Direct and indirect economic benefits

a. Irrigated plots

The hydro-agricultural facilities enable 5000 hectares to be irrigated in the wet season and 3000ha in the dry season. The size of the plots varies according to the capacity of those farming them.

Rice growing takes place primarily in two seasons: the rainy season and the dry season. Dry season rice was only grown in the periods from 1985 to 1991, and from 2003 to 2007, because of breakdowns in the pumping stations and disruption from the SODAGRI hydro-agricultural development programme phase II works. The wet season rice fields increased from 500ha in 1985 to 2500ha in 2009, albeit with substantial variations over the period.

From 1997 onwards, a diversified range of cereal crops (maize, millet and sorghum) appeared, with cash crops beginning to emerge in 2000 (cotton and groundnut) and then market gardening in 2006.

The beneficiaries of the irrigated plots are individual farmers (69 per cent), EIGs (15 per cent) and agricultural companies. People from many different locations in the region can be found working the plots alongside migrants from Ziguinchor, Dakar and Touba-Mbacké. There are far fewer women beneficiaries than men (only 8 per cent of individual beneficiaries are women). Just 8 per cent of the villages account for 72 per cent of the plots allocated in 2010. Migrants and companies are being allocated a growing share of the plots.

b. Market gardening

With water available, market gardening has expanded in around 20 of the region's villages: the area being farmed, and the lengths of time for which it is farmed and the number of people involved, have all increased substantially. Women are the primary beneficiaries of this expansion in market gardening: generally organised into village groups, they have experienced increasing revenues ever since they began this activity. In fact this is the activity that has most benefited the communities affected by the dams.

c. Fruit trees

Over the study area as a whole, fruit tree cultivation is being developed along the banks of the water courses, generally in combination with market gardening. The species planted include mango, banana, citrus fruit and cashew. Planting fruit trees requires a great deal of capital and is therefore only within the reach of salaried employees or migrants who have come to invest in the land. There are increasing numbers of investors in the area, not necessarily local, although any land allocations made to them by the rural community councils are always controversial, particularly if they involve large areas.

d. Fishing

The reservoirs have attracted a growing number of people involved in fishing. In 2010, the Union of Fishers of the Anambé Basin (*Union des pêcheurs du bassin de l'Anambé*), which is affiliated to the National Federation of Fishing EIGs (*Fédération Nationale des GIE de pêche*), had 593 members organised into 31 different groups. The fishers can be classified into the following groups:

- professional fishers from outside the area: the Bozo from Mali and the Thioubalo from the Senegal River valley
- local semi-professional fishers who fish commercially while continuing to farm the land or rear livestock
- occasional or subsistence fishers.

Fishers acknowledge that their incomes have grown despite a lack of adequate equipment, a lack of fish preserving units and the remoteness of some landing sites. The migrants are considered to have benefited from this activity more than the local people as they are experienced professionals.

Access to fishery resources remains unregulated despite the existence of a legal framework (the Continental Fisheries Code), which is still virtually unknown.

e. Tourism and hunting

The construction of the Niandouba dam, the Confluent dam and the Waïma reservoir, formed water bodies that average some 8500 hectares in size, in addition to the irrigated perimeters, the ponds and the areas of water upstream of the Niandouba dam. Since 1987, wetlands have thus increased from 2600ha to almost 17,000ha. This expansion of aquatic and semi-aquatic ecosystems has encouraged a diverse range of habitats, in particular attracting wetland birds, fish, mammals and reptiles.⁶

Hunting tourism is benefiting to some extent from the opportunities offered by these wetlands. A hunting camp has been established near to the Confluent dam. Others are being built at Linkéring and Paroumba, in the Kayanga basin. The eco-tourism potential of the Kayanga-Anambé complex remains significantly underexploited, however.

6. More than 60 hippopotamus can be found here, for example, along with numerous Nile crocodiles, listed in Annex 1 to the Washington Convention on Endangered Species. These may have swum down the Kayanga from the Niokolo Koba National Park.

In terms of hunting, seven leases have been issued in the Kayanga-Anambé complex, covering an area of 242,766ha. These are areas in which hunting rights are leased to private individuals who then organise hunting parties on behalf of travel agencies. Terms and conditions drawn up between the state and the leaseholder specify the leaseholder's obligations to provide hunting facilities and socio-economic investment in the local area in question but these commitments are rarely kept. The benefits from hunting thus accrue primarily to the state, which receives the hunting fees.

4.2.2 Improvements in infrastructure and services

a. Improvements in water supply

The dams have had a positive impact on the level of the water table, to the extent that it is now extremely rare for wells to dry up around dams and water courses. Consequently, the distances travelled and the time devoted to collecting water have now declined.

b. Opening up of the area and increased trade

The construction of 500km of access routes and tracks linking to the national road network has contributed to making over a hundred villages around the irrigated perimeters more accessible to the outside world. The transport of goods, people and emergency health cases has thus been improved.

Trade has benefited from this increased access. Significant flows of people and goods from Senegal and neighbouring countries are channelled through the Diaobé sub-regional market and this market plays an important role in the area's trade in agricultural produce.

In the dry season, a large part of the active population is involved in trading goods and this forms an important secondary source of income. Women play a significant role in marketing gathered produce, processed agricultural products, vegetables, milk, fruit and livestock.

4.2.3 Factors limiting the dams' benefits

a. Constraints to cereal growing in the irrigated plots

The benefits the local population can obtain from the hydro-agricultural facilities are limited by a number of constraints.

- Not all the local people affected by the dams have benefited from the hydro-agricultural facilities. It is difficult for producers who live some distance from the irrigation facilities to farm the rice growing plots properly as they require a great deal of work. Moreover, in order to make a return on its investment, the state tends to prioritise migrant producers with significant resources over small local producers.
- The benefits from the irrigated plots are limited due to problems in accessing credit and inputs, marketing difficulties, poor management of the way in which water is distributed to the plots, together with a lack of equipment with which to work the land and undertake harvest and post-harvest activities.

This can be seen particularly in the poor results obtained from rice growing in the dry season. Annual rice production in the large irrigated perimeter has never exceeded 20,000 tonnes, and has only averaged 5000, although the original target was 40,000 tonnes of paddy rice per year.

Because of these technical and institutional problems, the agronomic and financial risks of rice growing are high and producers often find it difficult to repay the loans received from SODAGRI or the financing institutions. To minimise these risks, the local beneficiaries, agricultural and livestock farmers, continue to farm both the irrigated plots and traditional crops on the plateaux. This strategy runs counter to that of SODAGRI, which is intent on improving the cropping intensity and yield of the irrigated plots. Local producers often end up having their plots taken away once and for all if they fail to farm them intensively enough; these then pass to farmers with greater available resources.

b. Constraints to the development of market gardening

Market gardening has arisen spontaneously, without any technical or financial support from SODAGRI. Although some projects and non-governmental organisations (NGOs) have been involved in this activity, further development has been limited due to technical problems, insufficient extension services, the remoteness of the production areas and a lack of investment capacity.

c. Constraints to the development of fishing

The main constraints to the development of fishing are:

- Marketing: catches are largely destined for local consumption because of the distances to markets and the fact that there is no means of preserving the fish.
- The rules for managing fishery resources: fishing is not organised on the basis of fishing councils and local fishing regulations, as stipulated by law. The resource is freely and openly accessible to all, even though Malian fishers did have the agreement of the local village chiefs before settling in the area. Regulations governing the use of fishing gear are not observed, and some fishers use destructive techniques such as conical pots and monofilament nets, water beating and the capture of juveniles. In the context of national policy, the Kolda regional government has all the legal authority it needs to implement measures for a rational management of the water, fishery and fish farming resources but does not exercise it.

4.3 Benefit sharing procedures

The benefits from natural resources are unevenly distributed between localities and among population groups.

- Pastoral resources, for example, have generally improved for people living in the Kayanga basin but have deteriorated for those in the Anambé basin. Recent projects aimed at sinking wells and establishing cattle routes are not enough to compensate for the disturbance to the pastoral systems caused by the development of the irrigated perimeters.

- Access to the irrigated plots has also been uneven. The villages closest to these facilities have been allocated most of the plots. Consultations with the different villages affected by the dams would probably have enabled smaller, more accessible plots to be provided that could have been more easily integrated into existing production systems.

The local people also feel that they have benefited little from the benefits created by the dams.

- Fishing, which is of significant income-generating potential, primarily benefits professional migrant fishers, although these people have now trained many of the local farmers in how to fish the lakes.
- The irrigated plots have not provided the benefits expected by the local people, despite the time and money invested in them. They are reluctant to take further risks and so invest little in irrigation, resulting in poor harvests from the plots.
- In order to get the best return on their investment in the Anambé basin, the government and SODAGRI tend to prioritise producers with significant resources – in other words investors from the outside – to the detriment of small local producers.
- The activity that local people have benefited from most is market gardening; however, this has developed independently and it has not received enough support from projects or NGOs to remove many of the barriers to further growth in this area.

5. Synthesis of local people's perception of the effects of the dams

The dams have enabled the local people to diversify both their sources of food (such as fish and vegetables) and of revenue (through market gardening, fishing, trade and so on). Because the development model adopted did not involve consulting the local population, it has given rise to a number of frustrations.

- The compensation process underestimated the number of villages that would be affected and only provided support for the reconstruction of infrastructure in one village; all the other villages had to rebuild their houses and their socio-economic infrastructure without SODAGRI's support. In addition to this, no compensation was provided for loss of lands and productive assets, so people lost income.
- The irrigated perimeter was established without taking existing livestock systems into account and so access to pasture and watering points was severely restricted, creating not only a negative economic impact for the pastoralists but also bringing them into significant conflict with the farmers.
- The irrigated plots did not improve either the families' food security or their incomes. On the contrary, they often lost money, partly because they had insufficient knowledge of the technical and economic requirements for growing irrigated rice but also because of problems caused by SODAGRI's management of the irrigation system. Even when the problems were caused by SODAGRI, however, the losses were borne by the farmers alone.
- Poorly compensated for the negative impacts of the dams, local people do not view SODAGRI's current policy of encouraging companies and external producers to settle in the area positively. Moreover, the organisation's strategy of progressively disengaging from a number of agricultural activities has led to serious conflicts between SODAGRI and the producer organisations.

1. Geographical and historical context to the dam's construction

1.1 Dam location

Moussodougou is a rural municipality comprising four villages (Diamon, Kolokolo, Mondon and Moussodougou) in Comoé Province, Cascades Region and covering an area of 296 square kilometres (Figure 4). Average annual precipitation for the period 1980-2009 was 1028mm, although there is significant variability between years.

The Burkinabé Government built the Moussodougou dam, also known as the Comoé dam, on the Comoé River in 1991 with funding from the French Fund for Aid and Cooperation (FAC). With a capacity of 35,500,000 cubic metres, the resulting reservoir has an area of 600 hectares that forms part of the larger Comoé watershed covering more than 3300km².

1.2 Natural resource use by different social groups prior to the dam's construction

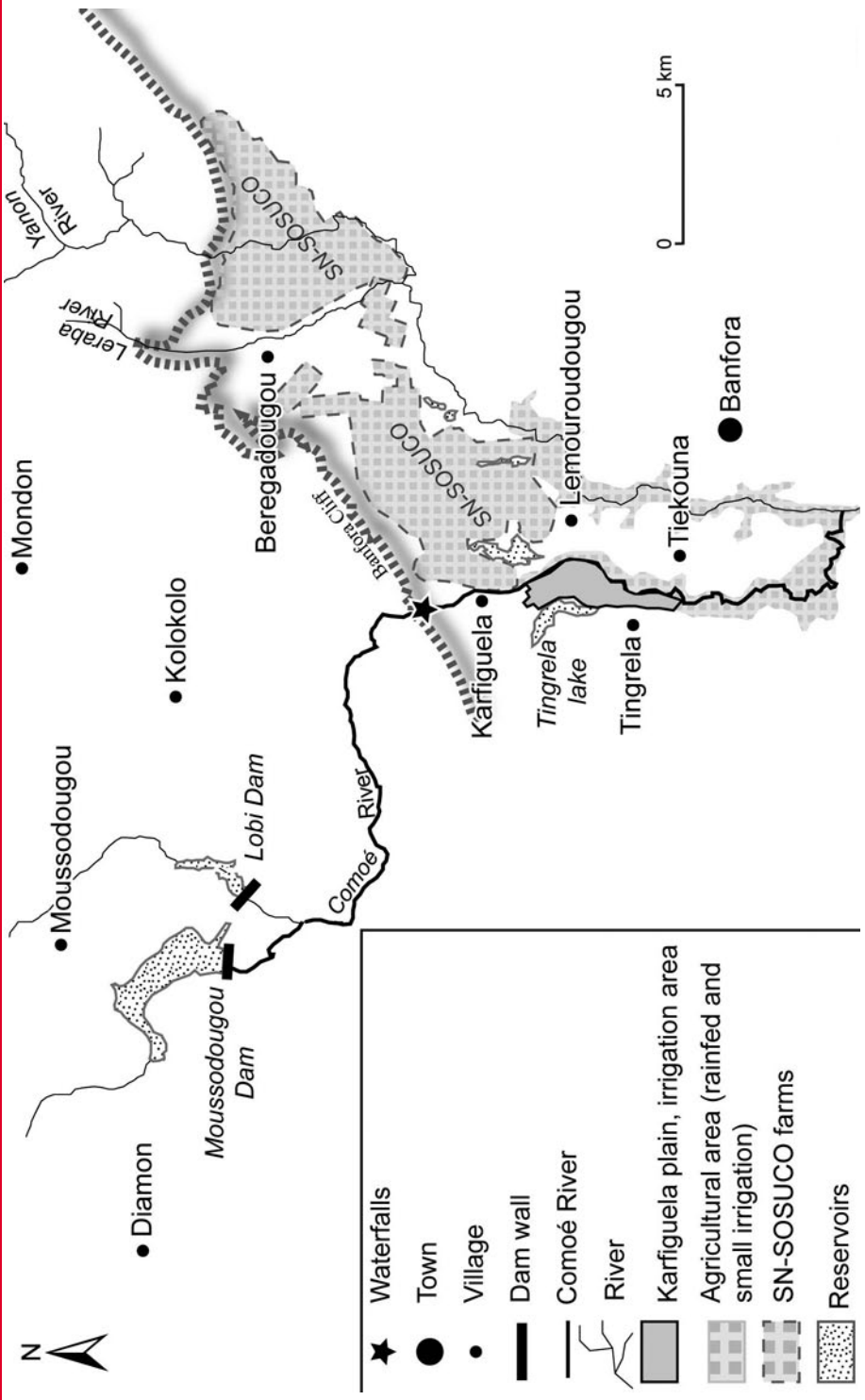
Before the dam was built in 1991, the Comoé River was used by SN-SOSUCO (*Société Nationale – Société Sucrière de la Comoé*), the rice growers of the Karfiguéla Plains irrigated area, and market gardeners and fruit tree owners based along the Comoé upstream of the plains.

- SN-SOSUCO was founded in 1968 as a state enterprise to farm the plains for sugar production, and was privatised in 1998. It occupies 10,000 hectares of the plains, an area that was expropriated for public use without any compensation, being declared an area of common public interest in the 1970s. Irrigated sugar cane is grown on 4000ha and SN-SOSUCO supplies 46 per cent of the sugar consumed in Burkina Faso.
- The infrastructure for the Karfiguéla Plains irrigated area was built between 1973 and 1978, first by the Taiwanese development agency and then by the People's Republic of China, to allow flooded rice to be grown during the wet season. The area has a gravitational irrigation system, with water drawn from an offtake on the Comoé River.

The aim of the Karfiguéla irrigation area is two-fold: to provide food for local families and to obtain revenue. It is farmed by 730 farmers coming from the town of Banfora and eight villages, including Karfiguéla, Tengréla, Nafona, Lémouroudougou, Kiribina, Tiékouna and Sibiéna. Many of these farmers lost their farmland when SN-SOSUCO was established in the early 1970s.

Initially intended to cover 750ha, only 350ha of land was actually irrigated; this was due to the absence of a master plan, a lack of knowledge about both the Comoé hydrological system and the SN-SOSUCO's requirements for water consumption, as it was also using the Comoé's water to irrigate its sugar cane.

Figure 4. The Moussodougou dam area



Source: rapport WAIPRO, 2010, J.Cour

The area is managed by five co-operatives grouped together in a union, the Union of Farming Cooperatives of the Karfiguéla Irrigated Area (*Union des Coopératives des Exploitants du Périmètre Aménagé de Karfiguéla/UCEPAK*).

- Market gardeners farming outside the plains come mainly from the villages of Karfiguéla, Tingrela and Kiribina but also, to a lesser extent, from Lémouroudougou and Nafona. They are primarily farmers from the irrigated plains who farm family lands in the undeveloped zone during the dry season, siphoning irrigation water directly from the Comoé River downstream of the Karfiguéla Plains, with the aid of small motor pumps. They mostly grow fruit and vegetables for market, sold directly to traders at the point of production.

1.3 The dam's aims

The dam was constructed largely for SN-SOSUCO's benefit, in a climate of fierce competition for the Comoé River's waters. Its aim was to enable regulation of the Comoé's flow so that enough water would be available during the dry season to irrigate the sugar cane. As the Comoé's flow drops in the dry season, the dams previously being used by SN-SOSUCO to irrigate the sugar cane (Toussiana dam, storing 3.6 million m³ and Lobi dam holding 1 million m³) were woefully inadequate.

1.4 Legal and institutional framework

The state handed the dam over to SN-SOSUCO via a concession (Concession Agreement dated 30 January 1992 between the State and SN-SOSUCO). Under the terms of this concession, SN-SOSUCO is the principal beneficiary of the dam, and is also responsible for ensuring its maintenance and supervision.

The water from the dam is primarily intended to satisfy SN-SOSUCO's needs, which have to be met before any other potential use can be made of it. Annual surveying, maintenance and monitoring work is undertaken by SN-SOSUCO. The costs of these are, however, deducted from the annual water royalties the company pays, which means that, in actual fact, these costs are borne by the state.

Legislation at the time meant that the state owned the lands as state lands (*Domaine foncier national*) meaning that compensation could only be paid for loss of capital investments.

2. Economic and social transformations caused by the dam

2.1 Minor demographic changes

Given the low-density occupation of the area, the dam did not cause significant displacements of people with those who had to move remaining within the boundary of their village lands (*terroir villageois*); nor were there any notable migratory flows.

The population of Moussodougou has experienced uneven growth, from 8477 inhabitants in 1985, to 6865 inhabitants in 1996 and 10,444 inhabitants in 2006. Population densities for the same period fell from 28.6 inhabitants per square kilometre in 1985 to 23.2 inhabitants/km² in 1996, rising again to 35.3 inhabitants/km² in 2006. In comparison, the national average was 38.1 inhabitants/km² in 1996 and 51.8 inhabitants/km² in 2006. Despite this growth, the available land and its fertility has so far not been a problem in the municipality, although some pressure is beginning to be felt.

2.2 Intensification of existing economic activities

Livestock rearing was already being practised in the region but the creation of the reservoir became an important factor in the transhumant routes chosen for herds and a larger number of pastoralists were thus attracted to the area. Access to water is, however, now subject to certain restrictions (there are areas where livestock watering is banned, or where there is an obligation to follow water access corridors).

Market gardening has always been practised downstream of the Karfiguéla Plains but has now increased because of the year-round availability of river water due to the regulation of the Comoé by the dam.

Construction of the dam enabled the introduction of irrigated farming in the Karfiguéla Plains in the dry season in 1992. The main crops grown in this area are rice, maize and groundnut. A strip of land is also devoted to market gardening (tomato, cabbage, etc.). At the end of every growing season, each farmer has to pay a water fee of 6000 FCFA per hectare to UCEPAK (Union of Farming Cooperatives of the Karfiguéla Irrigated Area) as a contribution towards the maintenance of the infrastructure in the irrigated area.

Dry-season irrigation of this area should theoretically enable the production capacity of the plains to be doubled. It has never been possible, however, to irrigate the whole of the area in the dry season due to a lack of water, and this has thus limited the dam's contribution to agricultural production.

SN-SOSUCO remains the largest consumer of water from the Moussodougou dam, which it draws from the Comoé, upstream of UCEPAK's take-off point. Thanks to the water from the dam, it has been able to increase its area of irrigated sugar cane. Four thousand hectares are therefore now under cultivation, yielding harvests

of between 250,000 and 300,000 tonnes per year, or an equivalent annual production of approximately 35,000 tonnes of golden or refined white cane sugar. SN-SOSUCO employs 1075 permanent staff and recruits between 4500 and 5000 seasonal workers during the peak season (from November to April).

2.3 Increased number of conflicts

Conflicts between arable and livestock farmers have increased with the construction of the dam and use of the reservoir to water animals. Many of these conflicts can be explained by the size of the livestock population and the lack of access routes for herds to the reservoir. Stakeholders generally tend to resolve these conflicts first and foremost through local mechanisms.

Given the absence of any significant migratory flows or land constraints, land conflicts are virtually non-existent between locals and migrants.

The main conflicts caused by construction of the dam are related to the sharing of water between SN-SOSUCO and other users, particularly the farmers in the Karfiguéla irrigated area. Relations between SN-SOSUCO and the plain farmers deteriorated following the 2006 growing season when SN-SOSUCO refused to release water during the dry season due to the low level of water in the dam, leading to loss of harvests among the farmers. In addition, during the following winter growing season, heavy rainfall forced SN-SOSUCO to open the sluice gates, flooding the plains. In 2008, the farmers organised a protest march against SN-SOSUCO's water management and threatened to attack their facilities.

3. Measures to compensate for the negative impacts of the dam

3.1 Compensation for the displaced population

Prior to the dam's construction, those Moussodougou residents who were living very close to the site were informed by SN-SOSUCO that they would need to move to another part of the village. A resettlement plan was drawn up which would have provided the following infrastructure in the part of Moussodougou that was to receive the displaced population:

- a housing development comprising 74 plots (including construction of a main house on each plot), corresponding to the number of families to be relocated
- the sinking of boreholes
- a three-classroom school
- rural tracks
- a clinic
- a maternity ward
- a football pitch
- a public square.

At the last moment, however, the people in question declined this offer and opted instead to take cash compensation paid by SN-SOSUCO. They subsequently dispersed throughout Moussodougou village.

3.2 Insufficient compensation for the dam's impacts on livelihoods

Only the fruit trees were compensated and not the cultivated fields, and even then this was only for the displaced population. The groups affected by a loss of their land but who were not displaced received no compensation at all. For example Kossougou, an area upstream of the dam, lost fields due to the flooding but because the inhabitants were not in the displacement zone they received no compensation.

4. Recognition of rights and benefit sharing

4.1 What rights of the local population were recognised?

Local people were not involved in the decision-making about either the construction or the management of the dam because the dam's objective – guaranteeing the necessary water supply for SN-SOSUCO's sugar production – justified handing the facility over to the company via a concession agreement.

The other groups using the Comoé's water were not at first considered stakeholders in dam management, and so initially, no management or conflict resolution mechanisms were established.

4.2 What benefits does the dam offer the local community?

After the dam was constructed, existing activities intensified and new activities emerged, these latter representing new sources of income for the local people.

4.2.1 The creation of new economic activities

a. Rice growing on the banks of the reservoir

This is a new activity resulting from the construction of the dam although it is illegal, as it does not comply with the rules for reservoir protection.

Many rice growers justify their use of the reservoir's banks by the fact that they lost their farmlands following the dam's construction. Others explain it by the low fertility of their rain-fed fields through continuous farming.

b. Fishing

The dam's construction in 1992 offered enormous potential for fishing as a way of diversifying incomes in a rural environment. This activity was promoted through the 'Fisheries Management in the South-West' project (GPSO), with German Development Cooperation (*Deutsche Gesellschaft für Technische Zusammenarbeit/ GTZ*) funding from 1988 to 2002. The Moussodougou dam production capacity has been assessed as 144 tonnes of fish per year provided the dam is supplied with 4950 kilograms of juvenile fish a year.

To achieve this objective, an economic interest group (EIG), the Fishers' Group of Moussodougou, was created in 1992. It obtained a fishing concession from the state which gave it a monopoly over fishing rights. It has 28 members and a committee of six people. Membership conditions are simultaneously both simple and complex. Simple because admission, following a unanimous vote of the members, costs 1000 FCFA to join plus an annual fee of 10,000 FCFA. Complex because, in fact, no new members have ever been admitted, which explains the small size of the group.

The fishers sell their product to two kinds of traders: wholesalers from Bobo-Dioulasso and fish processors and other purchasers in the village. The wholesalers are interested in large *Tilapia* ('carpes') and Nile perch ('capitaine') worth an estimated 1550 FCFA/kg, while the processors and local purchasers buy the smaller sizes and weights, generally for around 500 FCFA/kg. According to the statistics

available, 20,000 kg of fish are sold each year at an average price of 1500 FCFA/kg, and fishing provides the group with an overall annual income of 30 million FCFA, or around 1 million FCFA per group member.

The Moussodougou dam has thus created a new means of existence for the local population, fishing in the reservoir, and this provides a significant annual income for a limited number of group members and actors downstream in the industry.

4.2.2 Access to services

The construction of the Moussodougou dam was not accompanied by the provision of socio-economic infrastructure that could have contributed to improved living standards among the local community.

The dam does contribute to providing the town of Banfora with drinking water. It should nonetheless be noted that the residents of Moussodougou still do not have a piped drinking water supply system

4.2.3 Factors limiting the dam's benefits to local economic development

a. Lack of water in the Karfiguéla Plains

The main problem for the area is a lack of irrigation water during the dry season, which has direct consequences on yields, particularly of rice. This lack of water in the dry season is due to the rationing imposed by SN-SOSUCO, aimed at ensuring there is sufficient water for its sugar fields.

This problem is aggravated by a lack of maintenance to the irrigation and drainage network, poor water resource management and a failure to respect irrigation scheduling, all of which are closely related to the low recovery rate of the water fee paid by the plain irrigators.

b. Precarious situation of the rice growers on the banks of the reservoir

The rice growers on the banks of the reservoir farm plots located in the reservoir protection zone, an area that is not clearly demarcated or physically marked out by the technical services. These rice growers are thus in a vulnerable situation and risk no longer being able to farm as their activity encroaches upon the public domain and leads to the silting up of the dam.

c. Conflicts on the access and management of fishery resources

Fishing is of undeniable economic potential but is currently monopolised by a small group of people who benefit from an advantageous situation by refusing to expand their membership base (indeed their number has actually fallen from 35 members at the start to 28 today).

This group is made up of local people who remain primarily farmers, with each member purchasing his fishing gear according to his own financial capacity. This means that not only are the fishing techniques inefficient but that there is also no co-operation between group members to collectively manage the resource, such as regularly restocking it with fish.

The EIG's lack of openness to accepting new members hardly encourages the local people – denied any fishing rights – to play by the rules, whether national fisheries and fish resource legislation or the group's own internal rules. Some people fish at night with small mesh nets, others fish with spears or do not observe spawning grounds, and so on.

Consequently, not only has the initial objective of 144 tonnes of fish per year never been achieved but the catch is actually declining.

The fishers also blame the farmers who grow rice or vegetables around the dam for causing it to silt up and for allowing agricultural chemicals to leach into the dam waters. Attempts by the fishers and technical services to curb these practices have been fruitless and are contributing to a deterioration of relationships between the fishers and the whole village.

4.3 Benefit sharing procedures

The main benefit-generating resources created by the dam are its water and its fish. There are no traditional rules in place that could be used to manage these resources equitably and resolve conflicts. In such cases, there is a need to establish rules and put specific management mechanisms in place.

4.3.1 The sharing of benefits linked to water

The beneficiaries of the Karfiguéla Plains irrigated area blame SN-SOSUCO for the lack of irrigation water, which it manages according to its own needs to the detriment of other users.

It is against this backdrop of conflict over water resource sharing between SN-SOSUCO and the Karfiguéla Plains farmers that the Local Water Committee for the Upper Comoé (*Comité Local de l'Eau de la Haute Comoé/CLE*) was born. Established in March 2008, the CLE is a structure for consultation, co-ordination and promotion bringing together all players affected by the reservoir at local level to contribute to the joint management of the Comoé's water resources.

The CLE ensures the participation of all players whose activities have a quantitative or qualitative impact, whether positive or negative, on the water resources. It encompasses local authorities, users, regional governments, customary and religious authorities and civil society organisations.

Since its creation, the Upper Comoé CLE has played an important role in distributing water between the different users, replacing the management committee which was established by the Concession Agreement but which never functioned. The CLE's approach to distributing water is as follows: first, the CLE estimates the users' water requirements (SN-SOSUCO, ONEA, Karfiguéla Plains, market gardeners, water reserved for the environment and to feed the waterfalls for tourism), along with the amount of water stored at the end of the rainy season (October or November). It then proposes the volumes of water that should go to each user in relation to their needs. These proposals are subsequently adopted by the CLE's General Assembly, following arbitration.

The CLE thus plays a major role in the joint management of water resources and contributes to relieving tensions between SN-SOSUCO and the producers on the Karfiguéla irrigated plain.

It should also be noted that although SN-SOSUCO makes annual payments to Bérégadougou municipality, the territory on which a part of the sugar cane plantation is located, it does not contribute any financial support to Moussodougou municipality, despite the fact that the dam water is stored on its lands.

4.3.2 The sharing of benefits linked to fishery resources

The fishing group members have seen their incomes increase and their standards of living improve; most of the villagers, however, have not shared in this benefit. The group's refusal to accept new members creates a feeling of frustration and contributes to giving the structure a bad image, as it is perceived as a group that defends its own individual interests and perpetuates a monopoly. The Moussodougou local population cannot understand how the fishing concession has been granted to the group, given that the local people consider such bodies of water to be public assets, common resources that should be governed by village rules of access and use. This explains why some people who do not benefit from the fishing concession use different strategies to circumvent the rules (fishing at night, illegal equipment, etc.).

The Moussodougou Dam Management Committee could play an important role in conflicts between the fishing group and the rest of the population and village chief. This structure, which was supposed to handle all issues relating to the dam's management, was chaired by the village chief and has ceased functioning because of serious disagreements between the chief and the fishers over governance problems, particularly over the fines paid for infractions. If this committee were to be re-convened, it would need to be more democratic and accountable than it was in order to ensure the involvement of all stakeholders and respect for its decisions.

The fishing group is reluctant to contribute to the municipality budget or to a local development fund that would benefit the community. Nor does it contribute to local development through payment of taxes to the municipality, or by contributing to a fisheries development fund that could implement sustainable development activities for the benefit of the municipality and province.

5. Synthesis of local people's perception of the effects of the dam

The Moussodougou dam has enabled pre-existing production activities to be intensified, for example rice growing on the Karfiguéla Plains, market gardening along the Comoé and on the banks of the dam, and pastoralism around the water points. Nonetheless, the main beneficiary of the dam is undoubtedly SN-SOSUCO, for whom the body of water has enabled the irrigation of its sugar cane fields.

The fact that the state granted SN-SOSUCO the concession to the dam means that it can manage the water according to its own needs, even if this has been to the detriment of other users. The injustice felt by the latter is all the greater because the creation of SN-SOSUCO in the 1970s and then the subsequent construction of the dam meant many families lost their fields and ancestral lands with no compensation.

The establishment of the Local Water Committee for the Upper Comoé, in 2008, seems likely to promote a more equitable management of the dam's waters and to limit conflicts between users.

The Moussodougou dam has also created a new source of income linked to the dam's fishery resources, and this is offering a new means of support to fishers, as well as to traders and fish processors. Nonetheless, very few people actually benefit from these new opportunities, primarily due to the fact that the fishing rights were granted to an organisation that manages the fishery resources exclusively for its own benefit. This situation leads to people who do not benefit from fishing rights circumventing the rules, and adopting strategies that are harmful both to the management of the resource and to social harmony. There is currently no management mechanism that would enable this conflict to be resolved.

1. Geographical and historical context to the dam's construction

1.1 Dam location

Situated around 230 kilometres from Ouagadougou, on the Nakambé River in Bissa country, the area around the Bagré dam has an annual rainfall of between 800 and 900 millimetres (Figure 5).

The Bagré dam's area of influence covers over 493,000 hectares: 406,000ha in Boulgou Province (or 82.4 per cent of the dam's total area of influence), 75,700ha in Zoundwéogo Province (15.4 per cent), 10,100ha in Kouritenga Province (2 per cent) and 1200ha in Ganzourgou Province (0.2 per cent). This includes a direct area of influence of 60,000ha in which intensive development activities are planned (including an irrigated perimeter) and an indirect area of influence measuring 433,000ha in which development is focused around a number of hubs, including the valleys and depressions (*bas-fonds*), watering points and areas of intensive livestock farming.

1.2 Natural resource use by different social groups prior to the dam's construction

Up until the mid-1970s, onchocerciasis (or river blindness) was rife along all of Burkina Faso's rivers, including the Nakambé, and this explains why a vast area straddling this watercourse had been so little developed in the past.

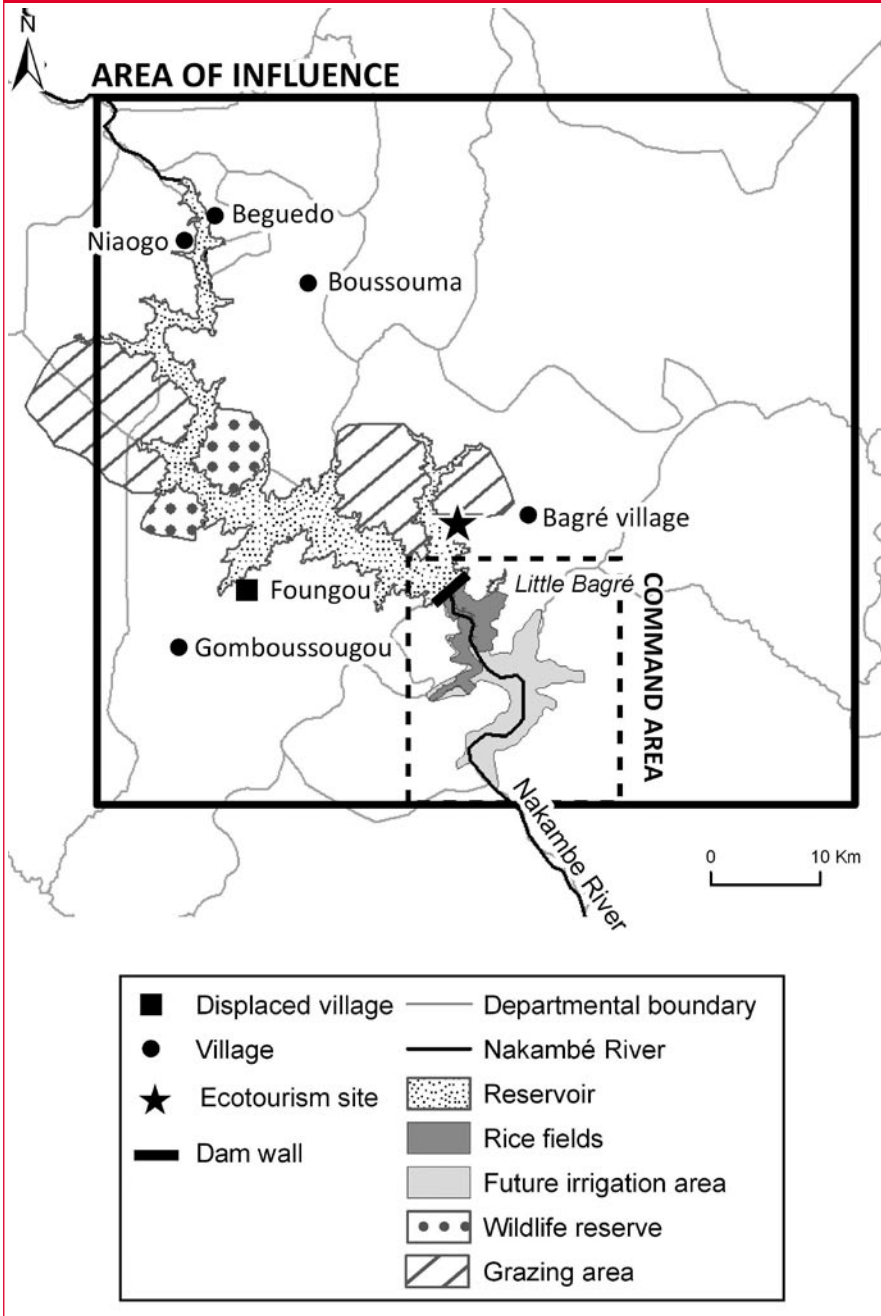
Once pesticide spraying campaigns had cleared these areas of the fly that spreads river blindness, lands were either designated as protected areas for wildlife and plants, or, slopes permitting, as appropriate for hydro-agricultural development. Despite being put to little use, these lands were customarily owned by indigenous Bissa populations.

Before the reservoir was filled in 1994, the local economy was based largely on agriculture, both subsistence (primarily millet) and cash crops (particularly market gardening). Alongside this, hunting and trade were focused on thriving markets such as that at Béguédo. Pastoral activities were first and foremost in the hands of the Peul, to whom the Bissa farmers entrusted their cattle.

The cultivation system was relatively uniform across the whole area and consisted of:

- village fields, located around the houses, in which red sorghum was grown, along with maize, groundnut and vegetables; since these fields were in continual use, large amounts of organic fertilizer were spread on them;
- outfields, further from the people's homes, devoted to millet and white sorghum, sometimes intercropped with cowpea.

Figure 5. The Bagré dam area



Source: BNDT IGB, PROGEREF, Google Earth 2006 image, survey

Once onchocerciasis had been eradicated, agriculture spread rapidly and the area under production increased by 10 per cent a year. There was also a diversification of the crops being grown, with cash crops (cotton) and fodder introduced. Rice, cassava, tobacco, gourd and sweet potato were all grown, along with dry-season market gardening at Niaogo and Béguedo, predominantly onions.

1.3 The dam's aims

The hydro-electric dam was intended to achieve multiple objectives in developing the Bagré area through the rational and sustainable management of the available natural resources. In addition to improving self-sufficiency and food security through irrigated agriculture, the dam was to produce hydro-electricity, increase livestock farming, fishing and aquaculture, and promote ecotourism.

1.4 Legal and institutional framework

The *Maîtrise d'Ouvrage de Bagré* (MOB) was founded in 1986 as the public institution responsible for constructing the hydro-electric and hydro-agricultural infrastructure. Once the dam was filled, management of the hydro-electric facilities passed to the national electricity company, *Société Nationale d'Electricité du Burkina*, SONABEL.

The MOB's mission then evolved to include directly managing the area's land, to encourage the development of agricultural, pastoral, forestry and tourist facilities. As the land was formally expropriated by the state, the MOB legally replaced customary leaders in their traditional role of land and resource allocation following customary land rights.

1.5 Background to its construction and development

In 1972, once the area had been identified as favourable for dam construction, the Burkinabé government (through the Volta Valleys Development Agency or *Autorité pour l'Aménagement des Vallées des Voltas/AVV*) built a 2,500,000m³ retaining reservoir known as the 'little Bagré' to allow the cultivation of irrigated rice.

The Bagré Project proper was then launched in June 1986, with the creation of the MOB. Measuring 4.3km long and 30m high, the dam wall was completed in 1993, and the reservoir filled in July 1994. The installed capacity is 16 megawatts and power generation, initially planned at 44 GWh/year, had risen to more than 70GWh/year by 2009.

2. Economic and social transformations caused by the dam

2.1 Few local people displaced but significant migrations

The only village that had to be relocated by the authorities, in 1992, was Fougou, which was situated right in the middle of what was to become the reservoir. Its 618 inhabitants were resettled in Boussouma and Gombousgou municipalities. Prior to relocation, the village possessed the following infrastructure:

- 1 well for drinking water, sunk in 1987
- 2 primary health clinics
- 20 Bissa plots totalling some 204 huts
- 27 Mossi plots totalling some 60 huts.

This resettlement programme was relatively minor when compared to the demographic changes that took place due to migration. The population of the direct area of influence virtually doubled between 2000 and 2010, from 22,237 to 40,649, primarily due to inward migration of people from the surrounding area. The local nature of this migration meant that, despite its significance, the area's ethnic structure remained predominantly the same: Bissa (71.14 per cent) followed by Mossi (18.74 per cent) and then Peul (8 per cent).

2.2 Transformation of livelihoods

2.2.1 Increased pressure on land

The dam's construction and the creation of development hubs led to increasing pressure on the land and the local population's fallow system was thus gradually replaced by continuous cultivation.

These days, migrants find it as difficult as the local people to gain access to land. Demographic growth, alongside the declining availability of land, has led to a gradual fragmentation of plots and those people who still have reserves of land are now having to travel further to reach their outfields.

2.2.2 Degradation of natural resources

There has been widespread degradation of the vegetation in the Bagré area. This is due to the developments that have taken place and over-exploitation of the remaining forest areas, which are used particularly for growing traditional rain-fed crops. The villagers now have to travel long distances to find, or indeed to buy, firewood. This also creates a problem for those smoking locally-caught fish. Non-timber forest products, which used to play an important role in nutrition, construction and traditional medicine, are now often replaced by purchased products.

2.2.3 Changes in production systems

The local people were not systematically compensated for their loss of land with irrigated plots for rice growing, for three main reasons:

- The MOB launched a call for tenders in order to allocate the irrigated plots but, when selecting the successful candidates, set conditions that few local people could fulfil (such as number of assets, draft animals).
- The local people were not interested in rice growing at that time. This was due partly to bad memories of the “little Bagré” experience⁷ and partly to the low market price for rice at that time, coupled with a formal ban that had been imposed on growing any other crops on the irrigated rice plains.
- Some of the people who did obtain irrigated plots preferred to rent them out to migrants rather than farm them themselves; this led to their confiscation for failure to respect the established terms and conditions.

The Bagré dam has led to significant changes in production methods for those Bissa farmers who have not received irrigated plots:

- There has been little change in the village fields near their homes, which are generally used for growing maize, as these receive large amounts of organic fertiliser to ensure their fertility.
- In the outfields, however, the fallow system has almost completely disappeared due to pressure on the land: millet, sorghum, cowpea, groundnut are all now grown there. The decline in fallow land is forcing farmers towards a more intensive use of mineral and organic fertilisers in order to prevent declining yields.
- Pastoralism is an important activity that ensures that pastoral areas are put to good use and provides the necessary natural fertiliser with which to maintain soil fertility. Since their rain-fed lands were expropriated to make way for the MOB’s facilities, some producers are no longer able to maintain a large enough herd to meet their fertiliser needs.
- In terms of equipment, animal traction (yoke of oxen and plough) and sprayers are increasingly being used, particularly to combat the growing weed problem that emerges as fallow lands disappear.

Farmers that have been allocated irrigated plots focus primarily on rice production (with an average 0.75ha plot per family). This is highly intensive cultivation that enables yields of up to five tonnes per hectare per harvest, with two harvests a year; it does, however, take up most of their resources and labour. Few rice growers also cultivate outfields, either because they have received no land from the MOB, what they have received is of poor quality, or because they lack sufficient labour. Some of these farmers do not own a yoke of oxen, preferring to rent the animals for specific production tasks rather than maintain them all year round.

7. The producers recall this as a project that limited their autonomy and never resulted in the intended economic outcomes.

The farmers on the irrigated plots often have to hire in labour to supplement their own, supplied largely by local families who have not benefited from such plots. The irrigated perimeter thus acts as a source of employment.

The pastoralists are Peul families who make a living from the trade in cattle and milk. Their herds are predominantly female breeding cattle. Since the reservoir was filled in 1994, the Peul in the area no longer move seasonally to grazing grounds outside the country but now move within the local area, to Zabré and Pô, in search of the first green pasture. At the start of the rainy season, they return to their fields.

This change in transhumant routes is due to the improved availability of water and the demarcation of pastoral areas where they can pasture their animals.

2.3 Increased number of conflicts over land

Because of the increasing pressure placed on the land, some local people are beginning to question the legitimacy of the MOB allocating non-irrigated land to settlers for rain-fed farming. Local people have even attempted to remove some settlers, leading to increased conflicts over the land. Alongside this, some local people have chosen, without authorisation, to occupy the 1500ha area of newly irrigated plots intended for agribusiness.

Conflicts are also recorded between agricultural farmers and pastoralists due to the damage caused to fields by animals during the rainy season.

3. Measures to compensate for the negative impacts of the dam

3.1 Good infrastructure compensation for the displaced population

The MOB provided people who had to be relocated with 100 square metre plots on which to rebuild their homes plus the necessary construction materials.

Fongou was provided with community infrastructure of a better quality and quantity than that in their old village:

- seven wells
- a literacy centre teaching the national languages of Burkina Faso
- a three-classroom primary school
- a health and social promotion centre
- a shop
- a medical centre
- a pharmaceutical storeroom.

Each household received a year's supply of food but no compensation was provided for lost farmland.

3.2 Insufficient compensation for the dam's impacts on livelihoods

Generally speaking, the Bagré dam project did not anticipate compensating the local people, whether their land was lost due to flooding, resettlement or the development of the different facilities around the dam. This was apparently justified by the low population density in the area, which gave rise to the idea that the land was not in use.

Although the local people affected by the project received no compensation, the government did endeavour to prioritise them in the allocation of plots inside the irrigated perimeter. In fact, 'the inhabitants of Bagré, former users and land owners of the project site area' were an explicit priority. The authorities envisaged that those displaced or affected would be transformed into irrigated rice producers but, in practice, this idea has not been as successful as they had hoped.

4. Recognition of rights and benefit sharing

4.1 What rights of the local population were recognised?

Land use under the Bagré project was determined on the basis of the 1996 Land Law, which stipulates that all rural lands are owned by the state (*Domaine foncier national*). The local farmers therefore legally only have rights of use.

The farmers themselves see things very differently, and believe the lands belong to a family lineage or village, whether they are being used or not. According to Bissa tradition, land not claimed by a family is managed by the village chief. Any activity (such as farming or hunting) carried out on those plots must first be authorised by the village council.

While it can be argued that the state's investments in the new facilities (irrigated plots, flood recession areas, and so on) legitimises its control over the irrigated areas, the legitimacy of settling migrants on non-irrigated lands (rain-fed farmlands) is far more questionable.

4.1.1 Limited involvement of the local population in decision-making

At the time the dam was built, environmental regulations in Burkina Faso were such that no compulsory socio-environmental impact assessment (SEIA) was required. The Bagré project was, however, the object of a brief 'environmental study', even though this was not a legal obligation. This study enabled the local population's concerns to be taken into consideration, particularly the concerns of those who were to be resettled.

These people were therefore able to choose a new location for their village although this was, in the end, abandoned as it was too far from the dam and did not offer the necessary conditions for agricultural production. This period of dialogue with the local people was thus clearly not a true period of consultation that permitted viable decisions to be made.

4.1.2 Lack of legal recourse

The local people have not taken any cases to court although this would seem to be largely due either to their lack of awareness of this possibility or their scepticism as to the judiciary's independence.

4.1.3 Steps towards bringing local people into the management of the dam and its benefits

The Bagré reservoir has been an aquacultural economic interest area (*Périmètre Aquacole d'Intérêt Economique/PAIE*) since January 2004. This has enabled the establishment of fishery resource management structures and methods that include all stakeholders.

Hydro-electric production is managed by SONABEL, which uses 85% of the dam's water to drive its turbines. The agreement signed between the Burkinabé government and SONABEL gives this latter 'complete freedom to operate its turbines'.

Any restrictions that the PAIE's management committee or the local water committees (see below) might impose appear to have little impact on SONABEL's decisions. Local villages have been flooded on several occasions when the sluice gates were opened to evacuate surplus water (in 1994, 1999, 2007, 2008 and 2009), causing production losses for the local farmers.

The Bagré local water committee (*Comité Local de l'Eau/CLE*) was established in 2007. This structure is not a legal entity as such but consists of representatives from the administrative and technical services, the local authorities, including municipalities and village development committees (*Conseil Villageois de Développement/CVDs*), users and civil society organisations. It initiates development actions, implements protection and restoration activities and provides advice on water issues to the decentralised government structures and local authorities. The aim is to ensure that all stakeholders are involved in local water management although the committee does not yet have the dynamism and resources it needs to ensure it succeeds in this.

4.2 What benefits does the dam offer the local community?

4.2.1 Good yet still partial access to electricity

In 2009, 96.95 per cent of the electricity produced was provided to the capital, Ouagadougou and the areas of Fada N'gourma, Tenkodogo, Garango, Niaogo, Béguedo, Koupéla, Pouytenga, Goughin, Zorgho and Mogtédou. Only 1.64 per cent was used within the Bagré and Zabré areas.

Apart from the electrification of the Bagré work site (a village created by the MOB), SONABEL has invested locally in an electrification campaign for 14 farming villages created and developed by the MOB. One of the conditions required to benefit from this electrification was that the land had to have first been divided up into housing lots (*lotissement*), and this explains why Bagré village (the village that gave its name to the project and which is some 10 or so kilometres from the dam), which has not yet undergone this process, has not been electrified.

Even when the land has been sub-divided into housing lots, however, not all municipalities in the vicinity of the dam have benefited from this electrification, Boussouma being one example.

4.2.2 Infrastructure concentrated in the command area

Apart from Fougou village, the infrastructure-building efforts of the MOB were focused on the command area, where it built 3 primary health care centres, 4 schools, 32 boreholes, 16 agricultural produce and inputs stores, 16 houses for agricultural technicians, crop drying areas in each village and access routes to these facilities. This infrastructure was constructed gradually, alongside the hydro-agricultural facilities.

In the pastoral areas outside the command area, the MOB sank 5 wells with hand pumps and watering holes, built 1 cattle vaccination pen, 1 shop, 2 veterinary product sales points and 1 house for a livestock technician, and drilled 2 large diameter wells with pulleys to lift water and fill watering troughs.

The management of these facilities is proving difficult, however; the boreholes, for example, often break down and their joint maintenance is causing problems.

4.2.3 Important hydro-agricultural facilities yet still short of the promises

The aim was to encourage two methods of production within the Bagré project in order to reduce poverty and food insecurity: irrigated rice growing, undertaken by settlers, described as subsistence agriculture; and agricultural entrepreneurship ('agri-business') using modern agricultural methods and intensive production for the national and sub-regional markets.

Of the possible 7400 hectares that could potentially be gravity irrigated, a little less than half (3380ha) has actually been developed since the dam was constructed. While all of the irrigated perimeter on the right bank (1200ha) is being farmed by traditional farmers, the state has decided to set aside 1500 of the 2180ha on the left bank for agricultural entrepreneurs. Although the facilities are complete, the plots have not yet been officially allocated and some of them have now been occupied by traditional farmers.

New settlements within the irrigated perimeter now house 1662 resettled farmers (6 villages on the left bank, farming 680 ha, and 10 villages on the right bank, farming 1200ha). At the time of their resettlement, each farmer was supposed to receive 0.1ha for housing, 0.4ha of village fields, 1ha of irrigated land for rice growing and 1.5ha of non-irrigated land for other crops. These stipulations were not followed, however, particularly with regard to the land for rain-fed crops.

Apart from infrastructure, the MOB was also involved in different support activities for the rice growers, including:

- organising producers into groups attached to an umbrella organisation (*Union des Groupements des Producteurs de Riz de Bagré*, UGPRB)
- providing advice on agricultural practice to rice growers by means of an extension service
- providing state-subsidised agricultural inputs (certified seeds and mineral fertilisers)
- creating and establishing a 32-member seed producers' group in Bagré.

4.2.4 Important pastoral facilities

Two pastoral areas were designated upstream of the dam, Doubégué-Tcherbo (7000 hectares) on the left bank and Niassa (6382ha) on the right. Around 500 pastoralists use these two areas.

The MOB has also been involved in different support activities for the pastoralists, including:

- establishing infrastructure and natural resource management committees
- encouraging the establishment of pastoral area organisations by gathering pastoralists into encampments.

4.2.5 New income generated by fishery resource use

Although there has always been some fishing along the Nakambé, this activity did not really take off until the reservoir was filled in 1994. There are now around 500 fishers (essentially Burkinabés but also some Malians and Nigeriens), 250 (women) fish processors and some 50 wholesalers, making a total of 800 people in all.

These different actors have established 23 fishing groups, 20 fish processing groups and 2 wholesaler associations.

The investments made in the fishing industry have focused primarily on building 15 landing stages around the reservoir and subdividing two fishing villages at Bagré and Fougou (Gombousgou department) into lots.

In addition, the MOB has been involved in a number of different support activities for fishers, including the provision of training and credit for fishers, and the creation of fishing and fish processing groups.

The Fish Farming Project (PEP) financed by the Taiwanese development agency is also worth mentioning as it enables some 120 to 150 tonnes of fish to be sent to market each year, along with the production of around 6,000,000 juvenile fish. The project is equipped with a fish processing unit and a fish food manufacturing unit that can produce up to 3000 tonnes of fish food per year.

4.2.6 Tourism activities still on hold

The government has commenced work on an eco-tourism centre aimed at promoting the Bagré Reservoir's tourism potential:

- recreational tourism along the banks of the reservoir, which can be used as beaches
- cultural and educational tourism based on educational talks, visits to the agricultural plains, the hydro-electric facilities and the country's largest bridge over the Nakambé
- sports tourism based on line fishing, pedalos and outboard motors for water sports, viewing of hippopotamus and birds, etc.

Much of the extensive infrastructure required for the Bagré eco-tourism centre is already in place although the centre is not yet fully up and running.

4.2.7 Financial benefits

SONABEL pays Bagré municipality a sum intended for local development (45 million FCFA in 2009). The local Bagré population does not, however, seem aware of this support, nor do the people feel its impact; meanwhile other municipalities affected by the dam receive nothing.

4.3 Factors limiting the dam's benefits to local economic development

4.3.1 For farmers that have been allocated irrigated plots

The farmers cultivating the irrigated plots face three kinds of problem, all of which place limitations on the benefits they can gain from the dam:

- Difficulties encountered by rice growers' groups:
There are 16 groups covering the whole of the irrigated plain. They form contact points for the MOB, provide inputs, market the rice and manage the water. These groups do not operate effectively, however, and it is all the more difficult to encourage a co-operative spirit when the farmers become group members automatically.
- Acrimonious relations with the MOB:
The MOB's inability to manage some problems with a firm hand has ended up undermining its authority and legitimacy particularly over the non-payment of service charges and the traditional authorities' evictions of settlers who were allocated plots by the MOB in non-irrigated areas. There are persistent disagreements between the MOB and the farmers over how service charges should be paid (by group or individually). The charges are low and some settlers do not pay them at all, raising questions about the long-term maintenance of the irrigation infrastructure.
- Problems marketing the rice:
Marketing problems used to be related to a lack of outlets and the low price producers could command. These problems have only intensified since the dehussing company, *Société de décortilage de grain* Sodegrain went bankrupt and the state sold off the General Equalisation Fund (*Caisse Générale de Péréquation/CGP*).

Marketing has until now been based on agreements between different partners: producers, financial institutions, fertiliser suppliers and the company that buys the harvest. The farmers' pressing need for money, coupled with delays in payments, has led many of them to withhold a part of their harvest, creating difficulties throughout the whole chain.

4.3.2 For livestock farmers

While most pastoralists welcome the reserved area that has been set aside for them, as it has led to fewer conflicts between agricultural and livestock farmers, they are unhappy that its boundaries are not clearly defined and that it has no proper legal status, because this means that former customary owners can refuse to recognise it.

Moreover, the gradual destruction of vegetation, linked to the decline in transhumance, has reduced the availability of fodder in natural pastures and many pastoralists now have to buy in feed to supplement their herds' diet.

While measures have been taken to encourage the production of fodder crops such as maize and cowpea, nothing has been done to enrich the natural grasslands, and nor has the reservoir been used to develop fodder crops such as 'bourgou' (*Echinochloa stagnina*).

Finally, despite the MOB's investments, very little pastoral infrastructure has been created, and this is an obstacle to the sector's development. There is only one livestock market, two slaughter areas, two veterinary pharmacies and two cattle pens in Bagré department. Wells and access corridors to water are insufficient, there are no improved livestock trails and no abattoirs.

4.3.3 For fishers

Average fishery production is 975 tonnes per year although this figure is in general decline, despite the potential for yields of around 1500 tonnes per year. According to the local authorities, the reasons for the dam's fish stocks dwindling, both in quantity and quality, include the circumventing of landing stages, a failure on the part of some fishers to comply with the regulations (use of banned equipment and inappropriate fishing techniques) and a failure to respect spawning grounds.

Fishing remains very small scale. Most fishers have received no formal training in this regard and have been taught their fishing techniques by a relative or friend rather than the technical services. Fishing equipment (canoes, gill nets, casting nets and hooks) is generally of poor quality and often not renewed as necessary due to a lack of financial resources. Fishers have no access to the kind of credit that would enable them to reinvest in newer, more efficient equipment.

All this is exacerbated by a lack of co-ordination between the Ministry of Agriculture and Fishery Resources (responsible for water and fishery resource management) and the Ministry of the Environment (responsible for detection and punishment of offences).

The PAIE structures which have been established (management committee, technical unit and monitoring unit) do not yet seem to have generated a collective dynamic capable of defining and respecting (or ensuring respect for) the rules governing the sustainable use of fishery resources.

5. Synthesis of local people's perception of the effects of the dam

The Bagré dam has significantly transformed the local economy and the living conditions of the local population. A number of benefits can be noted.

- Diversified economic opportunities: farming activity has increased and diversified (off-season crops, rice growing); fishing has developed along with its related income-generating activities such as fish processing. All of this has turned Bagré into an important commercial crossroads that is attracting traders, rice traders in particular, from the region's main towns.
- Improved nutrition: by opening the area up to fishing, market gardening and rice growing, and by encouraging pastoralism, the dam has introduced foodstuffs that were previously rare in the local diet.
- The region has been opened up to the outside world via the provision of rural roads.
- Socio-economic and community infrastructure including schools, watering points, health centres, shops, rice drying areas and the electrification of some villages.

Nonetheless, these benefits have been unequally distributed between the different villages and populations, with the socio-economic infrastructure and production opportunities largely focused on the new villages created around the irrigated perimeter (the dam's direct area of influence).

Local people, whether affected by the loss of their land due to flooding or the development of different zones around the dam, have found themselves excluded from the irrigated perimeter for a variety of reasons and thus from most of the dam's benefits. The vast majority continue to practise subsistence agriculture, only now they face new land and production constraints caused by the dam and the influx of migrants. Some families are now suffering such a critical shortage of land that they have had to ask neighbouring villages for land on which to farm.

Many local families therefore feel that their lands have been confiscated and their living conditions have deteriorated without any corresponding indemnity or compensation, and without receiving any of the dam's direct economic benefits, any village infrastructure or access to electricity.

The recent banning of cultivation along the reservoir banks has therefore been very badly received by the local people, who feel that dry-season market gardening in these areas is one of the few economic opportunities offered by the dam.

These tensions over land are becoming a serious source of conflict. The local people are demanding access to the irrigated lands while the farmers on the rice-growing plains want to obtain both outfields and irrigated plots to cope with the increasing size of their families. The fact that 1500ha have been set aside for agribusiness has been badly received by both the local people and the current settlers alike and, in any case, these plots are likely to be insufficient to satisfy current demand.

This is raising questions as to the MOB's authority over areas that have not yet been developed, resulting in local people taking back outfields that had previously been allocated to settlers, and in local farmers occupying a part of the 1500ha set aside for agribusiness.

1. Geographical and historical context to the dam's construction

1.1 Dam location

The Kompienga dam was the first hydro-electric dam to be built in Burkina Faso, coming into service in 1988. Located in the southeast of the country, the dam site straddles the provinces of Koulpelogo and Kompienga (Figure 6).

1.2 Natural resource use by different social groups prior to the dam's construction

Prior to the dam's construction, the Kompienga River flowed through a 6000 square kilometre catchment area with an extremely low population density. In 1975, for example, the national census listed only 63,000 inhabitants. At that time, scarcely 400km² of the land was under production. Annual rainfall is between 800 and 1000 millimetres.

1.3 The dam's aims

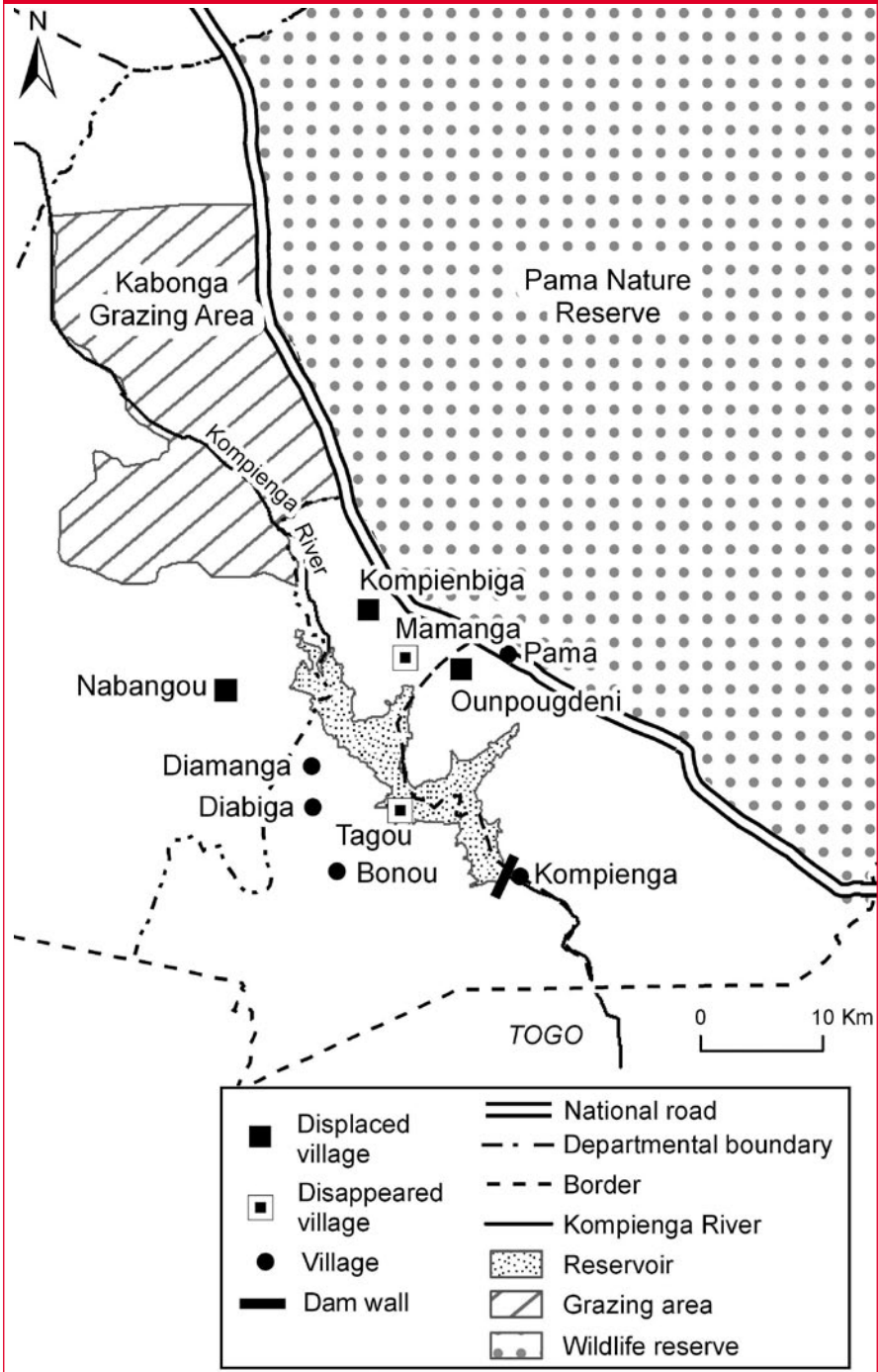
The Kompienga hydro-electric dam marked the launch of a strategy set out in the country's first five-year development plan, 1985-1989, which established energy as an essential factor in the country's development. The Kompienga site had already been identified as suitable for hydro-electric development as far back as 1967.

The Kompienga dam project was designed with the aim of supplying electricity to the country's capital, Ouagadougou, which consumes most of the country's energy production. The hydro-electric power station, with an installed capacity of 14 megawatts (MW), was to produce 43 gigawatt hour (GWh) per year, or more than 20 per cent of the capital's electricity needs. This would enable the oil costs involved in running thermal power stations to be reduced.

Initially, additional objectives were considered in order to gain as much advantage from the dam's construction as possible, and to transform the Kompienga region into an economic hub. Those objectives pertained to:

- **agricultural development:** feasibility studies showed that it would be possible to establish irrigated plots downstream of the dam (700 hectares of gravitational irrigation, and by pumping directly from the lake) and to produce crops on the flood plain (8000ha of land available). The possible crops included rice, maize, sorghum, tobacco and market gardening.
- **fishing:** the potential for fishing and fish farming around the Kompienga reservoir was estimated, according to the biological parameters, at an average of 825 tonnes per year. Part of this production (60 per cent) would be channelled towards the large urban centres, particularly Ouagadougou, in the form of fresh or frozen fish, while the remaining 40 per cent would be consumed locally as smoked or dried fish.
- **tourist activities:** the intention was to promote hunting tourism or wildlife viewing, taking advantage of nearby wildlife protection areas (Arly, Singou) to attract large numbers of foreigners.

Figure 6. The Kompienga dam area



Source: Google Earth image, DGRE. Survey 2010

The feasibility studies for agricultural development around the Kompienga reservoir were carried out prior to publication of the five-year development plan which subsequently prioritised energy production for the country's development. The decree establishing the dam also clearly states that any additional objectives were to remain subordinate to the dam's essentially hydro-electric role. In addition, the electricity produced was not intended to encourage the growth of regional towns but to supply the Burkinabé capital.

Regional development objectives, or objectives aimed at improving the local population's standard of living, therefore seem to have carried little weight in the face of the national development priorities.

1.4 Legal and institutional framework

The *Maîtrise d'Ouvrage de la Kompienga* (MOK) was established in 1984 with the task of supervising the construction of the Kompienga dam. The MOK was a financially autonomous public institution with responsibility for implementing the whole Kompienga hydro-electric dam project. As its mandate did not include supporting the local population beyond the necessary relocation phase, it was dissolved in 1989 when the work of constructing the dam was complete. The Ministry of Land Management was given the task of providing subsequent support to the local population. The MOK handed responsibility for the transfer and resettlement of the local population over to the National Office for Land Management (*Office National pour l'Aménagement des Terroirs/ONAT*).

In legal terms, the population relocations and resettlements necessary for dam construction were not considered expropriations as such, since the people affected did not own the lands on which they were living. In fact, the 1984 Agrarian Reform Law established that the land was state-owned and that individuals could only hold usage rights. Under the terms of this legislation, the state merely had an obligation to compensate for the damage caused to any assets held on those lands.

1.5 Background to its construction and development

The Burkinabé government's desire to build this dam came up against serious questions regarding its technical and financial viability, leading to the withdrawal of a number of donors, the World Bank included. It was in no small part due to the political will of the national authorities that other donors, the African Development Bank (ADB) in particular, were persuaded to increase their contributions, thus bringing a project that the revolutionary government of President Thomas Sankara had made a national priority to a successful conclusion.

The reservoir was filled in 1988 and the facility was officially opened in 1989.

Depending on rainfall, the reservoir covers a surface area of between 16,000 and 21,000ha, measuring up to 40km long and 5km wide. Despite the area's significant precipitation, the small catchment area means that the reservoir has only ever held 1.5 billion cubic metres of water even though its storage capacity has been estimated at 2.5 billion m³.

2. Economic and social transformations caused by the dam

2.1 Few local people displaced but significant migration

Only five villages, comprising 226 families in all, were thought to need relocation in 1984. These were Kompiembiga, Oumpogdédi and Mamanga on the left bank and Nabangou and Tagou on the right. These villages were situated below the 165m line believed to form the maximum water level, despite the fact that technical studies conducted in 1979 and 1981 had projected a flood level of up to 200m, which would thus affect 22 hamlets and villages comprising 552 families (or 6000 people) and 812 farms.

The number of people that had to be resettled because of the construction and filling of the dam was thus relatively small. On the other hand, the dam created a significant influx of migrants from neighbouring provinces, particularly from the Plateau Central region, initially attracted by the jobs created by the dam's construction and then by the economic opportunities offered by agriculture, livestock rearing and fishing. These significant movements of internal migrants were facilitated by the opening of rural roads and the asphalted of the national highway linking Fada N'Gourma to Pama and the border with Togo and Benin.

2.2 Transformation of livelihoods

2.2.1 Increased pressure on land

Although the area initially had a low population density, this soon increased substantially due to the natural growth of the local population and inward migration, rising from 2.6 inhabitants/km² in 1975 to 10.8 in 2006. These figures (still low in comparison to the national average of 51.8 inhabitants/km² in 2006) are deceptive, however, as they are produced on the basis of administrative areas and not the areas that can actually be farmed.

In fact, the area available for cultivation by the local people has been considerably reduced by the presence of the reservoir and of natural conservation areas. If the areas that can actually be farmed are considered, then the demographic densities were actually 116.8 inhabitants/km² in Kompienga and 51.3 inhabitants/km² in Pama in 2006.

According to local farmers, the most fertile lands along the river banks have either been engulfed by water or banned from use by reservoir bank protection measures. The areas available for crop production have thus been in severe decline in recent decades, and the local people's production systems have had to adapt to the significant constraints this has created.

2.2.2 Changes in production systems

The local population's main activity before the filling of the reservoir was agriculture, primarily for subsistence purposes. Given the low population density, slash-and-burn

systems with long rotation periods (land lying fallow for more than 15 years) enabled satisfactory yields to be obtained without the use of additional inputs.

With the rise in population and the decline in available land, fallow periods and soil fertility have decreased, and the weeding of cultivated plots has increased concomitantly. Farmers now have to plough their land and use increasing quantities of inputs (mineral fertilisers and phytosanitary products). Access to inputs and equipment has been made possible through the development of a number of cash crops (cotton, maize, market gardening).

Prior to the dam's construction, livestock rearing was practised primarily by nomadic Peul pastoralists who crossed the area. In fact, the Komienga basin and its surrounding area formed an area of prized pasture, providing between 5000 and 45,000ha of grasslands every year, depending on seasonal variations in the water level. The reservoir created by the dam enabled greater access to animal feed and water, thus stimulating the pastoral sector considerably. The presence of year-round water encouraged the development of sedentary livestock farming and even a system of stall-fed goat and sheep, encouraged by the growing livestock market in Komienga.

2.3 Increase in conflicts

The significant economic and demographic transformations experienced by the region following the dam's construction have had an impact on social structures. Conflicts have arisen in particular over access to land and natural resource use, fundamental issues that shape relations between the different communities and affect the local population's production and investment strategies. The worst conflicts have arisen between:

- the local people and the migrants: the former fear they will lose control of their customary lands to the growing number of migrants (some of whom have already cleared areas without the local people's permission); the latter fear that they will lose whatever land rights they have (the local people are reluctant to grant new land to migrants, there are bans on planting trees or making permanent improvements to plots, and there have even been cases of land being taken away from migrants). These conflicts are generally resolved by the local customary authorities and rarely reach the administrative authorities.
- agricultural farmers and pastoralists: this relates to damage caused to fields by growing numbers of animals passing through areas for which there is great competition (water access corridors are now being encroached for crop growing, for example). These conflicts are generally resolved by the administrative authorities because of the possible compensation resulting from crop damage.
- the local people and fishers: this relates to the fishers' desire to control the groups and unions that are set up to manage the financial resources generated by fishery activities. In 2002-2003, tensions between locals and fishers led to numerous Malian fishers abandoning the region. In 2006, strained relations between the local people and national fishers were tempered when new committees for the fishing groups and the fishers union were established.

3. Measures to compensate for the negative impacts of the dam

3.1 Insufficient compensation for the displaced population

Two forms of compensation were provided for the displaced population:

- collectively, through the provision of communal social infrastructure
- individually, in cash to the value of the estimated losses.

Prior to the dam's construction, the area was very poorly served with communal infrastructure; there was no school or clinic, for example. Following the dam's construction, new boreholes, schools and clinics were established. However, some of these new facilities have only been provided very recently (14 out of the 18 schools were built in 2004-2005) and would seem to be more in response to the demographic growth and development of the zone than in an effort to provide compensation for the dam's negative impacts.

In terms of individual compensation, the following issues emerged during meetings with the different stakeholders:

- Only five villages were compensated for the losses suffered due to their relocation yet other villages were also affected by the rising water level linked to the dam (Bonou village, for example, where the residents were forced to move three years after the reservoir was filled because their homes and fields were being flooded).
- Although preferred resettlement sites were chosen by the people at the time of the socio-economic studies, their choices were not heeded.
- No compensation was provided for cultural damage (religious or burial sites).
- The compensation was very low (5000 FCFA for a hut, 7500 FCFA for a field, for example) and was only paid after much delay. In fact, although the resettlements took place in April 1985 no compensation was paid until 1989; moreover, not all the families that were listed to receive it actually did (although it also seems that some people did not reply to the notification when the time came).
- Villages that lost some of their fields but were not actually relocated (Diabiga, Diamanga, Namontèga) received no compensation for the loss of a part of their farmland.

3.2 Impacts of the dams on livelihoods were not taken into account

No specific activities were planned that would enable those affected to adapt their livelihoods to the new conditions. The Kompienga dam was, however, intended to promote local economic development of benefit to these groups. The following were all planned but never implemented:

- hydro-agricultural facilities (700ha of irrigated crops)
- construction of a tomato processing factory
- fish stocking of the reservoir
- tourist facilities.

ONAT did, however, set up two programmes aimed at improving local people's livelihoods:

- providing farmers with ploughs and oxen, aimed at facilitating the transition from traditional production systems to more intensive systems using modern farming techniques
- supporting income-generating activities for women (soap making, dyeing and weaving).

These two programmes were not as successful as was hoped because they were implemented only sporadically and failed to take into account the amount of credit that would actually be needed to fund the investments.

4. Recognition of rights and benefit sharing

4.1 What rights of the local population were recognised?

The constitution establishes that land and property may only be expropriated in the public interest and then only after fair and prior compensation. In the case of dams, the displacement of local people is not considered an expropriation as such because the people affected do not own the state-owned lands on which they lived. The government did, however, accept the principle of providing compensation for damage caused to any assets found on the land, although this had more to do with the African Development Bank's (ADB) requirements than national legal obligations.

In the worst case, it could be said that the state did not consider the local population to be the holders of any rights at all. Compensation was partial and delayed, and there were no efforts made to ensure that their new living conditions were at least equivalent to those they had enjoyed previously. No official complaint appears to have been made against the MOK, more through lack of any process accessible to the local people and a lack of legal support than because they were satisfied with the relocation process and the promises made.

Under these circumstances, and given that the main aim of the project was not local development, it is hardly surprising that the local people had little involvement in decisions about the dam's construction and management. On the rare occasions that the local people were consulted, for example over the choice of resettlement sites, their requests were not taken into account.

4.2 What benefits does the dam offer the local community?

4.2.1 Direct and indirect benefits

Despite this lack of recognition of their rights and the limited efforts to promote local development, the construction and filling of the Kompienga dam has had very significant indirect benefits for the local people.

The opening up of communication routes for the dam's construction, and above all the asphaltting of Highway 18 linking Burkina Faso with Togo and Benin, has significantly helped to bring the area out of a long period of economic lethargy. By creating and improving the roads, the project has helped to open up the Kompienga region, encouraging its access to internal and external markets.

Fishing now forms one of the main activities around the dam. Although completely new to the province, this activity was providing work for some 800 fishers and 300 women fish processors in 2009.

Pastoralism has also experienced a boom due to the presence of year-round water and the abundance of fodder along the banks of the reservoir.

Agriculture has also benefited, above all in the development of off-season market gardening. Although ONAT does seem to have encouraged this activity during the

1990s by providing inputs and technical advice, many producers took up market gardening without any prior technical support or training, simply because of the available water supply and market opportunities.

The local people generally consider that their standard of living has improved since the dam was built. While it is difficult to separate the consequences of the dam's construction from those of national public policy, access to numerous basic services such as education, health and drinking water has now clearly improved. Electricity, however, is still only available in Kompienga (since 1985) and Pama (since 2005). There is no policy of providing electricity to private houses.

The improved living conditions also have to be seen in the light of the diversified sources of revenue and food that the dam's waters and the opening up of the region have brought about. This has particularly been the case for fishing and market gardening, both heavily dependent upon the dam's reservoir.

4.2.2 Factors limiting the dam's benefits to local economic development

By focusing only on the overriding objective of electricity production, the government failed to develop any other socio-economic activities related to the dam's presence. The local population has spontaneously made the most of the opportunities offered by the dam but often suffers from a lack of clear regulations, something that would enable the benefits to be shared and the conflicts that arise between different natural resource users to be avoided; this is particularly the case for newly-created resources that have no customary management rules in place.

a. Limited access to the water

Reservoir bank protection measures have been implemented to stop the dam from silting up. This has involved establishing an integrated protection zone in which all production activity is prohibited and a buffer zone immediately around this where only activities that do not threaten the protection zone can be conducted. This means that rain-fed agriculture and off-season agricultural activities (market gardening) are prohibited in these areas and there are restrictions on watering livestock along the banks. This has led to a steep decline in market gardening.

The restrictions on livestock accessing the banks, an important source of fodder, are supposed to have been counter-balanced by the demarcation of a pastoral zone at Kabounga. This zone has not yet been fully established, however, and the pastoralists are reluctant to take their herds there because of doubts about the quality of the pasture and because farmers cultivate the land there during the rainy season. Access to water via cattle trails is also unreliable because the trails are not clearly demarcated and local farmers appear either not to know about them or ignore them.

b. Recent rules for fishery resource management

The dam's construction helped establish fishing as a livelihood, one that has become an important economic activity for the region. It has attracted numerous fishing communities from other regions and also other countries, particularly the Bozo from Mali, who have contributed their professional fishing knowledge to the local community.

Until 2005, there were no specific management structures governing this important resource, nor were there any traditional management rules. This goes some way to explain how the problems of over-exploitation and conflicts between local people and fishers have arisen.

Since 2005, the Kompienga reservoir has been established as an aquacultural economic interest area (*Périmètre Aquacole d'Intérêt Economique/PAIE*).⁸ It is governed by a special fishery resource use system which is intended to encourage a joint and participatory management approach likely to bring about sustainable use of resources and social harmony in the area.

The people involved in the Kompienga PAIE are organised into 12 fishing groups, 8 fish processing groups, 1 wholesaler's group, 1 federation of fishing groups and 1 union of fish processing groups. These different players are represented on a PAIE management committee alongside representatives of the decentralised administrative departments, local authorities and the national electricity company. Together with the PAIE's management tools (a management and development plan for fishing and fish farming activities, and a development fund), this organisation seems likely to promote both a better management of the resource and a fairer distribution of the benefits.

4.3 Benefit sharing procedures

As the project's main objective was to create hydro-electric energy to satisfy the needs of Ouagadougou, electricity lines were laid between Kompienga and the capital without any consideration to providing electricity either to the local population at the dam site or to the regions crossed by the lines. The affected populations were therefore excluded from benefits that were enjoyed by people living hundreds of kilometres from the site and who had not, moreover, suffered any inconvenience following the dam's construction. It was only in 2005 that Pama, the administrative capital of the province, was connected to the network, although this did not stretch to any of the villages directly affected by the dam.

It should, however, be noted that SONABEL pays 100 million FCFA each year into Kompienga municipality's budget, a little under 2 per cent of the revenues generated by electricity sales. This fact is not widely known among the inhabitants of Kompienga and, in any case, they have no influence over whether this money is used to compensate for the negative impact of the dam's presence or not. Pama municipality is also affected by the dam but receives no funding, and thus resents SONABEL's financial support of Kompienga municipality, which it sees as an injustice.

The benefits of the hydro-electricity are thus only shared in a limited way, and the local people see them as being virtually non-existent.

8. To form an aquacultural economic interest area, a body of water must meet three conditions: i) it must cover an area of more than 5000ha at low water level, ii) it must be of significant economic importance in terms of fishing, and iii) it must have fishery resources threatened with over-exploitation (Forest Code, Art. 210).

5. Synthesis of local people's perception of the effects of the dam

Overall, the local people have gained a number of benefits from the dam's presence, even though these have not been the result of a proactive state policy of developing the region or improving local conditions. They have been able to take advantage of various opportunities offered by the dam: particularly its natural resources (such as water, fodder and fish) but also its technical and economic opportunities (opening up of the area, access to markets, knowledge contributed by migrants).

The main frustrations local people experience relate to:

- the failure to take the people's wishes into account when they were resettled
- the failure to compensate the villages which were forced to relocate some time later, and villages whose means of existence were affected but who did not have to be resettled
- the reservoir bank protection measures, which severely restrict rain-fed agriculture and dry season agricultural activities (market gardening), along with access to water and pasture for livestock. The local people feel all the more affected by these restrictive measures because, apart from fishing, they do not see what other benefits the dam has brought them.

This last point is probably the most important. It reflects the way in which the area's resources are managed, particularly the way the national electricity company, SONABEL, places its interests (for example preventing the silting up of the dam in order to guarantee electricity production in a context of declining rainfall) over and above those of other dam resource users. This confirms yet again the importance of establishing management structures representative of all stakeholders and which enable decisions to be made that take account of the diverse range of interests at play.

Part 3: Bibliography

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Over 150 large dams have been built in West Africa over the last 50 years. Many more are in the planning stages to meet the region's demands for energy, water and food and their reservoirs will displace many thousands of local people. Success in resettling affected people and in rebuilding their livelihoods has been mixed in the region. This publication reviews detailed experience from six dams in Burkina Faso, Mali and Senegal through the lens of "benefit sharing" with local populations, which asks to what extent the affected communities have indeed benefited from the dam and how the multiple positive consequences from water use have been shared between different actors. The lessons learned from these experiences can guide future decision making.

