

Extended Abstract for the III International Symposium on Transboundary Water Management

Transboundary Water Management in the Volta Basin

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1. Introduction.....	1
2. GLOWA Volta Project.....	2
3. The Volta basin and its main physical, socioeconomic, -cultural and political features	4
3.1 Physical Features.....	4
3.2 Socio-economic features	4
3.3 Cultural and political Features	5
4 Traditional and colonial water management structures and recent water reforms.....	5
5. Transboundary structure of demand and competition.....	7
6. Transboundary arrangements so far.....	7
7. Conclusion and enduring needs for transboundary water management	8
8. Tables and Figures	9
9. Literature.....	11

1. Introduction

The management of watercourses, rivers, dams and lakes falling within international or inter-state basins can have transboundary impacts, and within such basins, water resources management requires cross-boundary cooperation in order to realize effective joint water management and to avoid future conflicts. While most African transboundary watercourses are already regulated by international agreements¹, the riparian states of the Volta Basin have yet to conclude such a protocol for regulating the management at the international level (van Edig et al 2003, Lautze et al 2005). Likewise, transboundary/transdistrict water resources allocation decisions can be contested at the local level, where traditional structures of authority and power often determine the distribution of water (Opoku-Agyemang 2005) and where most decisions are made on the basis of customary practices as well as indigenous knowledge and belief systems. Any attempts to establish transboundary water management structures therefore need to encompass local knowledge systems in order to develop an Integrated Water Resources Management system (IWRM) and to avoid water-related conflicts. Since conflicts arise largely at local level (Carius et al 2004) we need to understand how local knowledge is used to address future water management needs, particularly in the case of transboundary waters.

The study presented here is part of the GLOWA Volta Project (GVP), an interdisciplinary research project, is one of four pilot studies financed by the German Ministry of Education and Research (BMBF) in order to develop integrated strategies for sustainable and far-sighted water management in basins potentially affected by environmental change. The program was launched in 2000 and has three scientific core themes including:

¹ These include the Protocol on the Shared Watercourse Systems in the Southern African Development Community (SADC, 1995), the Convention Relating to the Creation of the Gambia River Basin Development Organisation (1978), the Agreement for the Establishment of the Organization for the Management and Development of the Kagera River Basin (1977), and the Convention Creating the Niger Basin Authority (1980).

1. Evaluation of the natural variability of precipitation levels, variations caused by human activity and their effect on the hydrological cycle,
2. Analysis of the interactions between the hydrological cycle, the biosphere and land use, and
3. Water availability and conflicting water uses.

In the Volta Basin, growing competition in the demand for water and divergent management objectives have caused conflicts not only among sectors but also between states. In this paper I will present the preliminary findings of research on transboundary water allocation in the Volta Basin. After a brief introduction containing a discussion of the overall objectives and scientific approaches of GVP, I will provide an overview of the region, its main physical, socioeconomic, cultural and political features, and a description of customary and 'modern' water management structures. Thereafter I will focus on issues of Transboundary Water Management by describing the discrepancies between official water sector reforms and traditional approaches to water and land management, which vary from region to region and are in fact not defined according to national boundaries. I will conclude with the formulation of further research needs for an effective integrated management of transboundary waters in the Volta basin.

2. GLOWA Volta Project

The GLOWA Volta project is an integrated, interdisciplinary scientific project led by the Center for Development Research (ZEF) of the University in Bonn. Following a very positive external peer review of the project results to date, BMBF has approved additional funding for the third phase of the GLOWA Volta Project, which will start in June 2006 and will continue through May 2009, at which point project activities will be fully transferred to scientific partners within the Basin.

The principal objective of GLOWA Volta is the development of a scientifically sound Decision Support System (DSS) for the assessment, sustainable use and development of water resources in the Volta Basin. To reach this objective, predictions of both water demand and water supply throughout the basin are required. Since both water demand and supply are dependent on the socio-economic development of the region, it is necessary to analyze both the likely evolution of the physical environment and the development trajectory of society as well. Therefore, the GVP addresses many disciplinary aspects of water resource development; from meteorology and hydrology through pedology and agronomy to economics, socio-anthropology and law. Thus, the foremost scientific challenge of the GVP is to formally link and integrate models from all disciplines involved. Rather than attempting to forge such links at the final stage of the project, innovative integration methodologies have been developed and applied from the on-set. Only on the basis of such integrated analysis can a DSS be developed that is capable of providing guidance to the regional managers of water resources in the Volta Basin.

The project was reasonably successful during Phase I (2000-2003) in applying innovative methods such as the use of scintillometers in combination with remote sensing to bridge the scale gap between regional meteorology and surface hydrology (Schüttemeyer 2005); the design of a common sampling frame for data gathering by social and environmental scientists, and the incorporation of hydrological, economical, and institutional analysis for water use optimisation (Obeng-Asiedu, 2004). During the Phase II (2003-2006) there was a clear shift from proving the feasibility of these new concepts to their practical application. Among the strategic goals of the second phase were the technical integration and delivery of a proto-type DSS. This proto-type development is an ongoing process, and is being conducted in close

cooperation with the Ghanaian Water Resources Commission (WRC), which initiated a pilot watershed management project in the White Volta Basin in which the DSS will be tested.

Under Phase III, the focus will be on (i) integration of Phase I and II research results, knowledge, data and tools, (ii) greater emphasis on economic analysis at aggregated and sectoral levels, and (iii) shift in orientation from research to operational modes, emphasizing delivery of services described in previous phases of GVP research.

Research within Phase III is organized into five Clusters containing 17 subprojects:

1. Water Supply and Distribution (S) Cluster
2. Analysis of Long-term Environmental Change (E) Cluster
3. Water Demand (D) Cluster
4. Participatory Decision Support and Coordination of Technology Transfer (C) Cluster
5. Technical Development of the GVP Decision Support System (I) Cluster

The subproject Transboundary Water Management, which is part of Cluster C, is going to build on preliminary and ongoing investigations into legal and institutional arrangements at local, national and international levels (van Edig et al 2001, 2003, Laube and van de Giesen 2004, 2005, Youkhana 2005) as well as various initiatives advanced by international organizations (GEF-UNEP, Green Cross International, IUCN, UCC) which have recognized the potential for water conflict in the Volta Basin (GEF-UNEP 2002, Goes 2005, Lautze, et al., 2005). Within Ghana and Burkina Faso in particular, different interest groups claim unlimited rights to make use of the water resources within their region of the basin. Whereas southern Ghana is the primary locus of increasing industrial and domestic energy demand, communities in northern Ghana and Burkina Faso need increasing quantities of water for irrigation, and to a lesser extent for domestic water supply (van Edig et al., 2001, Rodgers 2006).

While the riparian countries in the Volta basin are still in the initial phases of establishing a transboundary Commission with formal legal mandate and regulatory authority, it was observed that local solutions for transboundary problems related to land and water management needs can work out quite well in practice. For example, in the Nakanbé Basin of Burkina Faso, farmers organized regular meetings in order to share experiences and to find solutions for problems related to flood and transhumance, which are causing rising tensions between farmers and cattle herders around the border of Ghana and Burkina Faso (GEF 2002, Faure 1996). These practices are necessary to ensure peaceful coexistence between different communities practicing subsistence economy, which are still the predominant economies in the Volta Basin. The ongoing efforts to build a Volta Basin Commission in order to share scientific knowledge and identify management options among the riparian countries need to acknowledge and to incorporate indigenous knowledge, communication structures and networks as well. Local understanding of environmental processes and indigenous strategies to cope with the capricious nature of water and other environmental resources, have to be incorporated into any functioning framework of decision support. Decision makers at all societal levels, local authorities as well as actors in civil society need to be informed about climatic and hydrological dynamics in order to make rational and timely choices, particularly those involving the long-term allocation of societal resources. On the basis of participatory principles, a well functioning, widely accessible and credible DSS can be a useful tool to share knowledge between the scientific community, water management authorities and water users at local levels. Thus, to realize integrated and sustainable management of transboundary waters, technical, political and institutional cooperation between all sectors and societal levels are needed (Mostart 2005, Curtin 2000).

The two main objective of the Transboundary Water Management subproject are therefore to:

1. Identify transboundary water management practices at local level, where principles of customary law and indigenous practices determine the distribution of and access to water.
2. To evaluate the extent to which the legal pluralistic reality can be and has to be reconciled at international level.

3. The Volta basin and its main physical, socioeconomic, -cultural and political features

3.1 Physical Features

The Volta Basin is located in West Africa and covers around 400.000 km² of the sub-humid and semi-arid savannah zone (Figure 1). The basin encompasses the majority of Ghana (70% of land area) and Burkina Faso (63%) and lesser proportions of Togo, Benin, Mali and Cote d'Ivoire, respectively (Table 1). It is in general a low relief basin, with elevations ranging from sea level to 920 m, a mean elevation of 257 m and correspondingly low channel grades. The lower Volta is fed by three major tributaries. To the west, the Black Volta (147,000 km²) drains western Burkina Faso and small areas within Mali and Cote d'Ivoire; the White Volta (106,000 km²) drains much of northern and central Ghana and Burkina Faso, and to the east, the Oti (72,000 km²) drains the north western regions of Benin and Togo. The three tributaries join in northern Ghana to form Volta Lake, impounded behind the Akosombo Dam. This dam and reservoir, completed in 1964, stores roughly 150 billion cubic meters (BCM) and has an installed hydropower generation capacity in excess of 900 MW (Sutherland, et al., 2004). With a surface area of 8,500 km², Lake Volta is among the world's largest artificial lakes.

The Climate is influenced by the movement of the Inter-Tropical Convergence Zone (ITCZ). The average rainfall lies around 1000 mm/yr with a strong north-south gradient and regional and temporal variability. Unpredictable and unreliable precipitation makes rainfed agriculture a risky undertaking throughout much of the basin. Mean annual temperatures are around 30°C and humidity varies between 90% in coastal areas to below 20% in the North during the harmattan and the dry season (MoWH 1998, Andah and Gichuki 2003).

3.2 Socio-economic features

By African standards, the basin is densely settled, with Ghana, at 90 inhabitants per km², possessing roughly three times the mean population density of Sub-Saharan Africa (SSA). Per capita income in Volta Basin countries tends to be lower than the SSA average, although Ghana, at \$447, appears somewhat more prosperous when income is evaluated in Purchasing Power Parity (PPP) terms (\$1,940). Much of Ghana's affluence is located in urbanized regions to the south, however, outside Volta basin boundaries (Rodgers et al 2006).

Basin inhabitants are overwhelmingly rural. Agriculture is the most important economic factor, followed by the tertiary sector and mining (particularly in Ghana). Today 70 – 90% of the population in the Volta Basin depends on subsistence farming. Therefore the agricultural productivity is low in comparison to other regions in the world (WDI 2004). In order to increase agricultural productivity, investments in irrigation are required, particularly in the drier regions of Northern Ghana and Burkina Faso. Small scale irrigation schemes, established by small and medium sized farmers, are also developing rapidly. With respect to the demand for water resources, these attempts to expand agricultural productivity will paradoxically position

the agricultural sector increasingly as a competitor to the power generation sector, arguably no less critical to overall economic developments (Rodgers et al 2006).

The mineral and natural resources industries (gold mining, wood processing) are concentrated in the south of Ghana, largely outside the Volta basin. The search for reliable energy sources to support the growing industrial and municipal sectors is a never ending enterprise. The dam at Akosombo, originally proposed in the 1920's, was constructed by an international consortium in 1961 largely to provide (highly subsidized) hydropower to the Volta Aluminum Company (Valco) (Andreini, et al., 2000). The availability of inexpensive hydropower was, and remains an important engine of economic growth for Ghana, critical to the viability of the mining and industrial sectors, and for surrounding countries which purchase Volta hydropower (Rodgers et al 2006).

3.3 Cultural and political Features

It is difficult to make general statements about the cultural and political particularities such as ethnic distribution and history of the Volta basin as the basin covers the area of 6 riparian countries with different pre-colonial and colonial experiences. National boundaries were, as everywhere in Africa artificially created. Ethnic boundaries are fluid and the statistics as they appear in the national Censuses do not necessarily reflect the diverse socio-cultural realities of the basin population. These numbers also do not capture the social and economic dynamics of rural areas, where most common practices can still be affiliated to pre-colonial customs.

According to official statistics we know that the Volta basin is the domicile for at least 50 ethnic groups, of which the Akan, Dagomba, Mossi, Boba are the most widely distributed. These groups belong to different language families including Kwa (Akan, Gbe), Senufo, Mande, Gur (Dagbani, Mossi), and can be distinguished on the basis of their history (impact of colonialism, religious mission and developments after independency), traditional economy (subsistence agriculture, cattle herders and nomads), belief system (Animists, Catholics, Muslims, Evangelicals), the traditional political structure and regionally specifiable systems (decentralized chieftaincies, centralized and hierarchical kingdoms).

Of course, pre-colonial practices have not remained static over the years but have undergone a continuous transformation process. Nevertheless, the imposition of colonial rules (British, French and German), independence and more recent adjustment programs have each had major influence on the political and social life as well as on customary land and water management systems. In spite of this sequence of major ascendancies, the diversity of traditional regulations was never totally destroyed (Buah 1998, 43ff).

4 Traditional and colonial water management structures and recent water reforms

In the past, surface water was considered as a public good, and any individual or family was assumed to possess a right to it. Most importantly, a river's waters were considered holy and were therefore protected by various means. For instance, in Ghana (Akan), entire activities such as washing clothes, water abstraction, or fishing were prohibited on certain days of the week (Lautze et al forthcoming). Similarly, the Mossi in Burkina treated their water resources as sacred, and maintained certain regulations which were implemented by earth priests and chiefs to protect and to maintain the integrity of water resources. As in the south of the basin, water was a public good and belonged to the entire community. Private property exercised over a small portion of land was permissible as long as public interests were not violated. The extended family structures impeded the concentrated appropriation of land (Azu Crabbe 1998). In general

the management of natural resources like land and water was not that homogenous than often described and were soon revised and refined (Lentz 2006, 5). Legal pluralism and conflicts over properties were also issues in pre colonial regimes and widely contested between lineages and clans. It can be stated that pre-colonial tenure arrangements formed complex indigenous systems that allowed local communities to continue their traditional practices of farm tenure (Lentz 2006, 6).

The British and the French colonial incursions transformed the geographic and institutional landscape of the region. They imposed new territorial boundaries and new concepts of land and water ownership which, in the instance of the British colonialism, were marked by inconsistencies and ambiguities. Under the British colonial system, land and water management were in fact based on two parallel systems, the state sponsored and the community regulated (Lund 2002). The British colonial policies thus allowed the persistence of certain levels of tradition (Lautze et al forthcoming). The impact of French colonial policies on the 'Upper Volta' (now in Burkina Faso) was comparatively marginal due to political inconsistencies (Oxfam 2000). It should be mentioned that the Volta basin became a 'transboundary' basin by virtue of the borders drawn by the British, the French and the German colonial administrations. The British and the French regulated the use of water flowing across colonial boundaries by signing the "Exchange of Notes between France and Great Britain relative to the Boundary between the Gold Coast and Soudan" in 1906, "which effectively stated that traditional 'native' practices relating to water withdrawal and use should be allowed to continue despite the impositions of a new border." (Lautze et al forthcoming, TFDD 2004).

Significant transformations occurred in the late 1990's accompanying water sector reform processes in Ghana and Burkina Faso. As part of the adjustment programs of the World Bank, the reforms were intended to meet economic objectives, reduce poverty and alleviate the effects of increasing water stress. As a result all natural resources within the two countries were nationalised (van Edig 2003, Ministère de L'Environnement de L'Eau 2001). In Ghana and Burkina Faso all water resources were taken to be the possession of the respective presidents. Within the framework of large scale decentralization, new water institutions were established in order to operate at different societal levels and sectors. The Ghanaian Water Resources Commission (WRC) was created in order to implement new water sector policies and to transform the national water resources into economic goods, placing water resources allocation decisions within a demand orientation (Fuest and Haffner 2005). In Burkina Faso the Direction General de l'Eau (DGE) was created, with corresponding objectives. The primary stated goal of the restructuring processes in both countries is the implementation of Integrated Water Resources Management (IWRM) and the optimization of the use of scarce water resources.

We are currently facing a situation in which customary and 'modern' natural resources management institutions exist simultaneously. In Ghana, for example, it can be demonstrated that the concerted efforts to monitor and to coordinate the water sector centrally are facing severe obstacles. In the northern part of the country (the Upper East Region of Ghana), land is still allocated by so-called *tindanas*, who are accepted as the successors of the first settlers of a certain region. Since population density was low originally, and land sufficient for subsistence agriculture widely available, land and water allocation were aligned with the daily needs of the population. Demographic and climatic changes (draughts and seasonal variations) led to the introduction of irrigation techniques, transforming a part of the subsistence-oriented agriculture to more market oriented production patterns. The introduction of different forms of irrigation transformed many of the habitual patterns of the rural population and caused conflicts over land and water (Laube forthcoming).

5. Transboundary structure of demand and competition

The Volta basin provides examples of transboundary issues that are contested at international as well as at local levels. The downstream locations of Akosombo and Kpong Dams, near the basin outlet, frame the primary international conflict over Volta water resources: upstream consumptive use against downstream hydropower. The Akosombo dam with a power generation capacity of 912MW is currently providing Hydropower to Benin, Togo and the Ivory Coast (van Edig et al 2003). Ghana relies on the Akosombo Dam for almost all of its energy supply. Water shortages in the years 1997 and 2003 led to an energy crisis in Ghana and forced the government to import energy from the Ivory Coast. Confronted with these shortages in supply, Ghana attempted to hold Burkina Faso responsible for the low water level in Volta Lake, presumably exacerbated by the latter's increasing upstream construction of dams and reservoirs for irrigation purposes and hydropower generation (van Edig et al. 2002, 81). Burkina Faso, for its part, has elected to produce its own hydropower rather than relying on Ghana's increasingly uncertain capacity to export power. Two major storage reservoirs have already been built in Burkina Faso: Bagre on the White Volta and Kompienga on the Oti (Obeng-Asiedu 2004). Three additional dams are planned. If the proposed hydropower dam in Bui Gorge on the Black Volta is built, it will further complicate efforts to maintain storage in Volta Lake at optimal levels for hydropower production. The assertion that hydropower generation is a "non-consumptive" use of water means little when the point of generation lies downstream from competing, consumptive uses (Rodgers et al 2006).

Transboundary issues with local impacts also occur, for example the flood control problems in Northern Ghana associated with Bagré Dam operations. The opening of spillways in the rainy season has already resulted in health problems, particularly downstream in Burkina Faso and Ghana. In 1999, 48 people died from an outbreak of cholera in northern Ghana following torrential rains and flooding, which also made some 9,000 people homeless (Reuters September 14, 1999). The construction of the Bagré Dam, the resulting attraction of private agro-business and the agricultural expansion in the Nakanbé basin (White Volta Basin) has also caused conflicts between different users at local level. Unfortunately the fact was ignored that different land users relying on the same natural resources but belonging to separate socio-cultural and economic groups already subsisted in the regions around the new irrigation systems. Traditional systems, involving more-or-less formal arrangements for exchanging products and services between different traditional users (e.g *entrustment* or so-called herding contract, in which a farmer leaves all of his animals in the custody of another for shorter or longer periods) exist and provided feasible options, for instance, to integrate animal husbandry into the farming system. Agricultural expansion did not only marginalize pastoralists, who have lost their grazing rights on fallow land, access to water and other resources, but it has also had a negative impact on the (described) entrusting system, important for the adoption of animal husbandry in the farming community (Reenberg et al 2003). The construction of Bagré Dam also encouraged transhumance by Fulani cattle herders, who increasingly entered into conflict with farmers in adjacent Kusasi areas in Ghana.

6. Transboundary arrangements so far

Due to the diverse problems related to transboundary waters and the historical development of land and water management structures, arrangements for the shared water resources exist at different societal levels.

At basin level the "Exchange of Notes between France and Great Britain relative to the Boundary between the Gold Coast and Soudan" was implemented in 1906. This international protocol effectively stated that traditional 'native' practices relating to water withdrawal and use should be allowed to continue despite the

impositions of a new border (Lautze et al. forthcoming). Thereafter there was no comparable international agreement adapted to the Volta basin. Hundred years later in 2004 the Volta Basin Technical Committee (VBTC) was launched in order to start a process of regulating the water management at international level. Thereupon a Memorandum of Understanding was signed at ministerial level between all riparian states in December 2005. The countries agreed upon the establishment of a Volta basin Authority (VBA), which should be realized in summer 2006.

At sub-basin level international research activities are in the process of being coordinated. In the White Volta Basin of Ghana (Nakanbé basin on the burkinabé side) the PAGEV Project, realized by the International Union for the Conservation of Nature (IUCN), has to be mentioned. The PAGEV Project is working on an agreement between the Water Resources Commission (WRC) and the Direction Generale de Ressource Hydraulique, the national water authorities of Ghana and Burkina Faso, and is therefore a cross border initiative. The Global Environmental Facility (GEF UNEP) carried out a diagnosis on problems related to transboundary waters in the Volta basin in 2002. Green Cross International is currently working on transboundary impacts of dams in the region.

At local level transhumance has been increased as a consequence of dam construction and new water and land management structures. People pass the border in order to realize different economic activities: Ghanaian fishermen go to the Bagré dam in Burkina Faso to find new fisheries, cattle herders, who were displaced because of the introduction of larger irrigation projects around the Bagré dam migrate seasonally to Ghana in order to find fallow land for grazing. Traditional courts solve problems related to transhumance with Fulani cattle herders successfully. Thus communication structures exist and function across national boundaries. Likewise, social networks (marriage system) facilitate the access to land for people beyond the border. Investments in irrigation projects in Burkina Faso made marriage between Bissa or Kusasi across the border much more attractive.

7. Conclusion and enduring needs for transboundary water management

These case studies demonstrate the interdependency of policies across sectors, and point to a growing need for policy coordination and strengthened legal and regulatory arrangements (GEF-UNEP 2002) in order to secure win-win outcomes for all riparian states and communities sharing Volta Basin waters. Mechanisms for transboundary cooperation must be based on international agreements. Likewise, transboundary/transdistrict water resource allocations are also potentially contested at local level where principles of customary (non-statutory) law and indigenous practices determine the distribution of water (Opoku-Agyemang 2005). Where local or indigenous allocation and decision-making protocols prevail and where water management problems are largely related to cultural, economic and social issues, international policies and regulation will have a limited impact unless these frameworks are properly accommodated and reconciled. In particular, water bodies not registered or administered by national water authorities are objects of negotiation by strategic groups operating at local and regional level (Laube and van de Giesen 2005). Participatory approaches to cooperation developed locally have often turned out to be sound strategies for conflict prevention, as demonstrated at the Bagré Dam and in the Nakambé River Basin (Kibi 2004).

A central question facing researchers and partners in Phase III of the GVP is how to promote effective joint management of shared water resources on the basis of integrative scientific research. An institutional framework which integrates the interests of diverse user groups, and reflects the legal-pluralistic governance context of the water sector, has yet to be developed for the Volta Basin. In the context of this

subproject, we will therefore examine the implementation process emerging from multiple transboundary institutions and the legal aspects of transboundary water management. We will attempt to determine why previous negotiation processes have rarely been effective, and what the major legal and institutional constraints to future cooperation between Burkina Faso and Ghana are, given the background of legal and institutional pluralism. In this context, we will examine the process of transboundary management not only in light of substantive provisions of international law, e.g. the “no harm” and the „equitable utilization” principles, but also in light of international „procedural law of co-operation”, leading riparian States to a system of reciprocal exchange of information, consultation and notification concerning the respective activities on shared watercourses (McCaffrey, 1997). We will also assess the extent to which the DSS can be applied usefully in resolving these issues.

Evaluations are needed for ongoing pilot projects such as PAGEV (Improving Water Governance in the Volta Basin), a joint initiative of the World Conservation Union & The West African Water Partnership of the Global Water Partnership (IUCN-GWP/WAWP) that supports the sharing of scientific knowledge between Ghana and Burkina Faso and the identification of water management options on the basis of specific water availability scenarios (Goes, 2005). Case studies of successful transboundary collaboration and knowledge transfer in peripheral areas of Ghana and Burkina Faso will also be conducted. Given the numerous initiatives intended to establish international agreements that are currently underway, it will be of paramount importance to understand how local interests and practices will be reflected at transboundary level, and how principles of international (non-navigational) water law might lead to changes at the local level. By focusing on both international and local venues of action, we are likely to bridge the knowledge gap (Evers et al. 2006) between international agreements, national policies and indigenous protocols.

8. Tables and Figures

Table 1 – Spatial Distribution of Volta Basin between Riparian Nations

Country	Country Area Of Volta Basin (km ²)	% of Basin in Country	% Of Country in Basin
Burkina Faso	178,000	42.65	63.0
Ghana	167,692	40.18	70.0
Togo	26,700	6.40	47.3
Benin	17,098	4.10	15.2
Mali	15,392	3.69	1.2
Côte d’Ivoire	12,500	2.99	3.9
Total	417,382*	100%	

Source: Andah and Gichuki, 2003

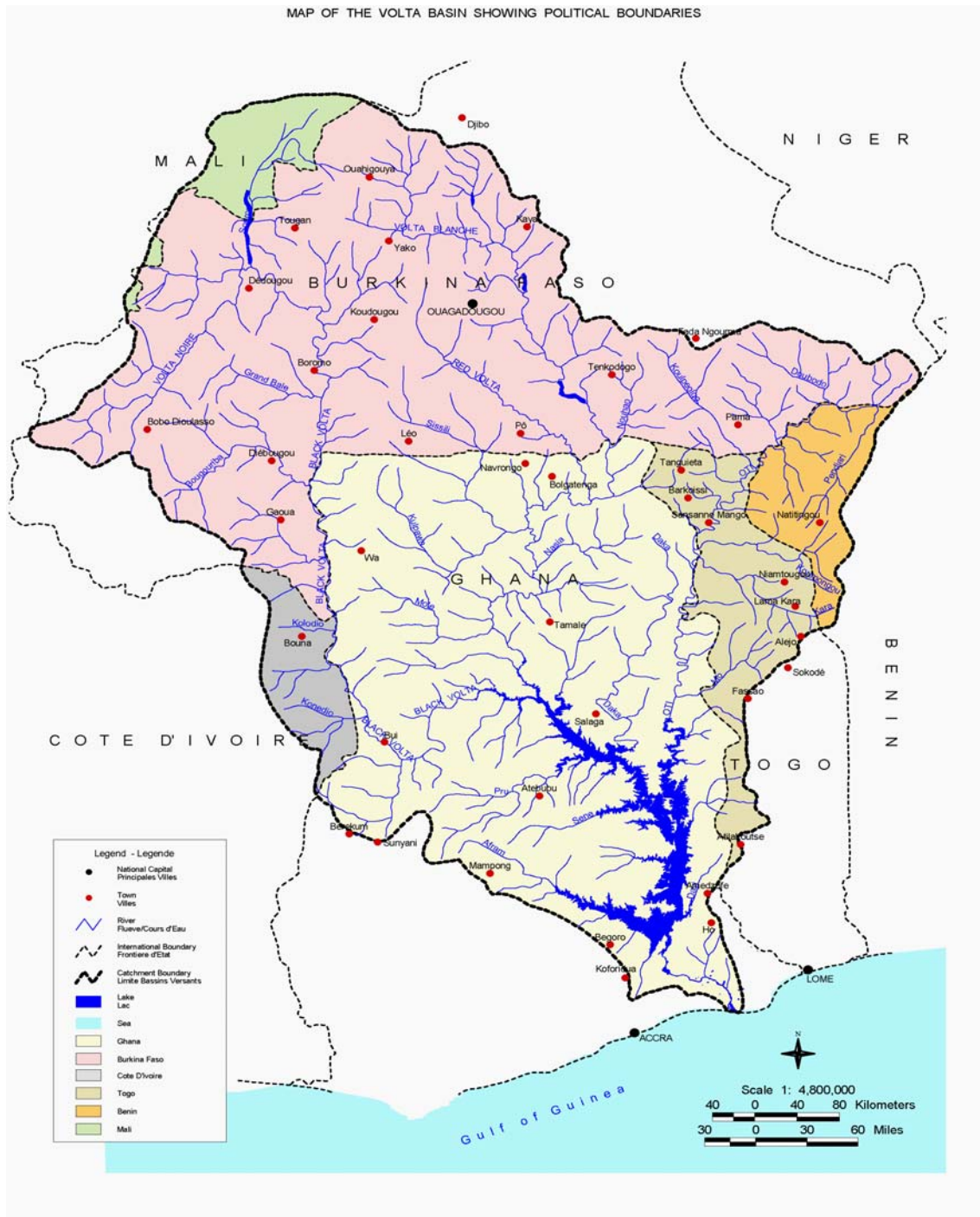


Figure I: The Volta Basin, showing political boundaries and important tributaries
 Source: Andah and Gichuki, 2003

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