

ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROPOSED
GIBE III HYDROELECTRIC PROJECT IN ETHIOPIA'S
LOWER OMO RIVER BASIN

A Commentary by

the

Africa Resources Working Group

May 5, 2008

Contact: Dr. Jeffrey A. Gritzner
Chair, Dept. of Geography
University of Montana,
Missoula, Montana
jeffrey.gritzner@umontana.edu

**ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROPOSED
GIBE III HYDROELECTRIC PROJECT IN ETHIOPIA'S
LOWER OMO RIVER BASIN**

TABLE OF CONTENTS

INTRODUCTION

**ISSUES ARISING IN CONNECTION WITH THE SCOPE AND APPROACH OF THE
2006 ENVIRONMENTAL IMPACT ASSESSMENT**

- 1. Downstream Environmental and Social Conditions in the Lower Omo Basin**
- 2. Transboundary Issues Involving Ethiopia, Kenya and Sudan**

**The Omo Delta and Lake Turkana: An Ethiopia-Kenya Transboundary Issue
The Ilemi Triangle: An Ethiopia-Sudan-Kenya Transboundary Issue**

- 3. Ethiopian Governmental Institutions and Environmental Impact Assessment**

**ENVIRONMENTAL CONDITIONS AND AGROPASTORAL ECONOMY IN THE
LOWER OMO RIVER BASIN: AN OVERVIEW**

- 1. Omo Riverine and Upland Environments: Fragile Ecosystems**
- 2. Indigenous Economies and Their Dependence on the Omo River**

**ISSUES ARISING IN CONNECTION WITH THE GIBE III PROJECT AND
THEIR IMPLICATIONS FOR THE LOWER OMO RIVER BASIN**

- 1. Seismic Activity and Landslide Potential**
- 2. Elimination of Riparian Forest and Loss of Biodiversity**
- 3. Destruction of Recessional Cultivation and Riverine-based Economy**
- 4. Lake Turkana Retreat and Its Ecological Effects in Kenya**

SUMMARY



INTRODUCTION

The Africa Resources Working Group is cluster of scholars (primarily university professors in the physical and social sciences) from Germany, the United Kingdom, the United States and Canada, with extensive experience in research and policy issues within Ethiopia and the East Africa region. Members of the Africa Resources Working Group (ARWG) have recently examined the documents pertaining to the *Gibe III Hydroelectric Project*, and in particular, the 2006 Environmental Impact Assessment (EIA) prepared by the Italian firm Centro Elettrotecnico Sperimentale Italiano (CESI) for the Ethiopian Electric Power Corporation (EEPCo) and the Italian construction firm, Salini Costruttori S.P.A.

After reviewing the 2006 Environmental Impact Assessment (EIA), and related documents, the ARWG has concluded the following.

The proposed dam on the Omo River, known as Gibe III, will have major destructive impacts on the Lower Omo River Basin's fragile semi-arid environment and on the Basin's indigenous population of at least 200,000. The Ethiopian institutions involved have made no effort to prevent or redress this looming crisis.

While this commentary does not purport to exhaust the full range of critical impacts of the proposed Gibe III project that must be considered, it is intended to identify the most major problems associated with the 2006 EIA and to underscore the urgency of the situation at hand.

The Gibe III Hydroelectric Project on the Omo River is a 'public-private partnership' planned as part of the 25-year national energy master plan of Ethiopia. (This plan was based on a study prepared by the Canadian firm, Acres International Ltd., in 2003; a 2005 update of the plan set the objective of tripling the power supply in five years, to 2,842MW by 2010. The planned increase in power generation, however, far exceeds domestic needs, with the surplus (by some estimates – 50%) being exported to neighboring countries. The Gibe III Hydroelectric Project is planned to generate 1870 MW of electricity. The dam is planned at a height of 240 m, with a reservoir of 151 km in length – the second largest in Africa. The cost of the Gibe III project is estimated at \$1.7 billion, for which foreign financing is currently being sought. The EEPCo predicts the export of 200MW to both Djibouti and Sudan, and 500 MS to Kenya.¹

ISSUES ARISING IN CONNECTION WITH THE SCOPE AND APPROACH OF THE 2006 ENVIRONMENTAL IMPACT ASSESSMENT

1. Downstream Environmental and Social Conditions in the Lower Omo Basin

The 2006 Environmental Impact excludes substantive consideration of environmental and social conditions in the majority of the zone downstream from the proposed Gibe III project, even though this zone will clearly absorb the preponderance of environmental and social impacts.

¹ The basic characteristics and history of the Gibe I, Gibe II, and Gibe III projects are described in two important recent reports: "The Gilgel Gibe Affair. An analysis of the Gilgel Gibe hydroelectric projects in Ethiopia." Campagna per la Riforma della Banca Mondiale (CRBM). 2008; "What Cost Ethiopia's Dam Boom?" A look inside the Expansion of Ethiopia's Energy Sector. International Rivers (Terri Hathaway). 2008.

- **The 2006 EIA fails to consider the potential impacts of the Gibe III project on environmental and social systems throughout the vast area of the Lower Omo River Basin that extends from the planned Gibe III project to the Omo River's terminus at the northern end of Kenya's Lake Turkana. At least 200,000 indigenous people – primarily pastoral and agropastoral – reside in this region. Arguably the most economically and politically marginalized peoples within Ethiopia, the overwhelming majority of these people are dependent upon the Omo River for their economic survival.**

More than nine different ethnic groups indigenous to the region have developed complex socioeconomic and ecological practices that are intricately adapted to the harsh and often unpredictable conditions of the region's semi-arid climate. Recessional (or 'flood') cultivation along the Omo River and in the Omo delta is a major component of these practices. This cultivation is accompanied by a multiplicity of other riverine-based production activities, including fishing, plant and animal food gathering, and (limited) hunting. A comprehensive analysis of the potential impacts of the proposed Gibe III project on these highly vulnerable indigenous economies and on the delicate environmental conditions throughout the downstream zone – from 'dam to delta' – is clearly essential. Despite the presence of an extensive professional literature concerning both the social and environmental aspects of the Lower Basin during the past forty years, however, the EIA does not include this information and perspective.²

- The 2006 report notes that 'a separate and subsequent EIA' will be prepared for the downstream region, but there is no justification for this approach. To the contrary, large dam construction necessitates detailed attention to the relationship between these zones. Environmental impact assessments prepared by and for international agencies have generally conformed to this principle for many years. This principle was a key component of the conclusions drawn by the World Commission on Dams, a multi-stakeholder body co-sponsored by the World Bank, in a 2002 report.

Despite increasing adherence to this principle by international finance and development organizations, as well as recently established procedures by the Ethiopian government itself, construction of the Gibe III project was initiated without any review whatsoever of downstream environmental and social assessment, let alone one with full review of downstream environmental and social concerns. There has in fact been no review of even the narrowly focused 2006 EIA.

The 2006 EIA blatantly discounts the possibility of serious downstream environmental and social concerns as a consequence of the proposed project. Among many disclaimers in the report are the following:

‘There will be ‘negligible impact’ on livelihood bases of the population...’

‘There are no tribal people in the project area whose traditional lifestyles could become compromised through the implementation of the proposed hydropower project,’ and

‘No adverse direct or indirect impacts are anticipated in respect of sensitive habitats...’

- The 2006 EIA, in its 'Bounding and Scoping' section (p. 43) states that 'The physical boundaries of the EIA comprises the reservoir area up to the dam and the area immediately downstream from the

² This literature is from a multiplicity of professional disciplines, including geology, geomorphology, archeology, paleontology, ecology, anthropology, sociology and cultural geography.

dam, given the importance of Omo river [sic] flow for Turkana Lake, although sited in Kenya State..'[sic]³ The '*project area*' is comprised of the hydropower plant – including the planned 240 m high dam, penstocks, a powerhouse with ten power generating units and switchyards, along with the approximately 151 km long intake reservoir, and associated physical infrastructure of roads (temporary and permanent), construction sites for building and services, and settlements. Virtually the only impacts considered by the 2006 report are from this '*impact area*' – largely equated with the 'project area' and the 'impound area'. This narrow purview of the report is clearly reflected in the report's Environment Impact Matrix (p. 45) for 'construction stage and operation stage activity.'

The EIA's few statements acknowledging 'downstream' conditions (for example, on pp. 11, 12, 22, and 114-111) refer to only a small segment of the Omo River contiguous with the project area, not to the conditions along the Omo River in its roughly 675 kilometer trajectory from the proposed Gibe III project to its terminus at Lake Turkana, let alone for the Lower Omo Basin more generally. Statements scattered through the EIA asserting the importance of 'hydrological effects (including those involving erosion),' 'sediment cycling,' 'downstream flow volume,' 'groundwater table changes,' 'recharge of Lake Turkana,' and 'fisheries development' concerns, are not substantiated, and instead remain entirely unexamined.

While the EIA states, 'the cultures and people of the Lower Valley of the Omo are in fact studied for their incredible diversity,' no account is taken of them within the assessment itself.

2. Transboundary Issues Involving Ethiopia, Kenya and Sudan

The Gibe III project will have major transboundary impacts, specifically, in northwestern Kenya, where both the Omo River Delta and Lake Turkana are located, and in the Ilemi Triangle of southeastern Sudan. In more general terms, the highly fragile riverine, lacustrine and grassland ecosystems, while having many unique features, are regional in scope, transcending national boundaries.

The 2006 EIA, by excluding the entire downstream ecology and the indigenous economies residing in the Lower Basin, human population, has also precluded even a minimal consideration of a regional view. Only an integrated approach to these issues can genuinely contribute to a positive policy framework for the regions of all three nations concerned. International institutions are likely in the best position to call for such an approach, and by doing so, avoid potentially calamitous consequences.

Two specific transboundary issues, geographically defined, are outlined here: Lake Turkana (impact issues are deferred to a later section) and the Ilemi Triangle.

The Omo Delta and Lake Turkana: An Ethiopia-Kenya Transboundary Issue

³ The EIA continues with a rather comprehensive list of 'most important and major environmental issues,' including riverine vegetation and other vegetation that might be affected by *construction* activities, including terrestrial and aquatic fauna, economic development, and dislocation of people [emphasis added].

- The Omo River is a transboundary river. It contributes at least 80 percent of the waters of Lake Turkana (some estimates are close to 90 percent).⁴ Its terminus is at the northern end of Kenya's Lake Turkana, and most of the Omo Delta is in Kenya. A sharp reduction in the Omo's downstream flow volume such as would accompany the Gibe III project, would cause a significant retreat of Lake Turkana (see section below).

Lake Turkana, in northwestern Kenya, is a 250 kilometer long closed drainage basin with a 7500 square kilometer body, Satellite imagery studies indicate that at least 500 square kilometers of deltaic sediments have been newly exposed during the past twenty-five years through a combination of sedimentation and lake-level recession.

- Much of the Omo Delta, as well as the northern and northeastern shorelines of Lake Turkana, is already intensively utilized for recession cultivation, livestock herding and settlement by the region's agropastoralists (who also engage in fishing). Lake retreat, with the accompanying loss of seasonal floodwaters, nutrients and sediments, would severely stress and possibly eliminate these agropastoral systems. Unavoidably, these changes would bring more pressure to bear on the remaining resources in the entire Kenya-Ethiopia (and Sudan) border region. (A number of more specific concerns are summarized in a later section.)

- There are clear precedents for the omission of Ethiopia-Kenya transboundary concerns with regard to the Omo River, prior to the 2006 Gibe III EIA. For example, the World Bank, in a 2004 document, states 'There is no significant use of the Omo River by any other country and the river enters Lake Turkana within the boundaries of Ethiopia. It should therefore be relatively easy to negotiate a 'no objection' from Kenya should that be required for multilateral/bilateral funding.' The World Bank was already actively investigating the economic potential for hydroelectric development along the Omo River by the early 1970s (including with field-based investigation in the Lower Omo), and so was well familiar with the region.

The Ilemi Triangle: An Ethiopia-Sudan-Kenya Transboundary Issue

- The Ilemi Triangle is a large triangular piece of land (approximately 14,000 square kilometers) located at the junction of Kenya, Sudan and Ethiopia. While generally mapped as part of Sudan, it is claimed by each of the three nations.

Since the land was first claimed by Ethiopia's Menelik and the British response with the 'Maud Line,' giving the Triangle to Sudan, and then Anglo-Ethiopian agreement of 1907 when Ethiopia gained jurisdiction over most of it. Multiple shifts among the region's governments occurred in the next years, both in terms of border definition (primarily, the southern border) and military presence.⁵ Since 1914,

⁴ Lake Turkana also receives input from the Kerio River and the Turkwel River. The Turkwel River is already dammed and this action has been documented to have seriously compromised even the river's capacity to recharge the Turkwel Basin's floodplain aquifer and to contribute at least minor amounts of water to Lake Turkana.

⁵ Key shifts in control occurred in Sudan in 1914, and in 1924 in Sudan and Kenya (with alternating military presence). These shifts have predominantly been between Sudanese and Kenyan policing (with Ethiopia's role on the Triangle's eastern border), Italy's claim over the Ilemi in 1936. and these replaced by British troops in 1941 after the British routed the Italians. More surveying was conducted in the 1940s. Although Sudan gave up active control since its independence

however, the Kenyan government has actively policed the area, with new boundary demarcations in 1914, 1924, and subsequent times. (??) The Ilemi Triangle has actually never been adequately surveyed to delineate national jurisdiction, at least to the satisfaction of the three countries involved. It remains a contested area by all three nations: Kenya, Ethiopia and Sudan.

Until recently, the Ilemi was considered to be essentially ‘empty,’ or ‘wasteland’. This situation has now dramatically changed. The Ilemi’s proximity to the lengthy war in Sudan, along with the intensive oil and gas development in southern and south central Sudan, have led to major new linkages between South Sudan and Kenya. Road development and major travel and interchange related to extractive industries, other industrial and agricultural development, physical infrastructure construction and all sorts of political and economic exchanges now dominate the relationship. A recent surge in oil and gas exploration in the region has awakened interest in the Ilemi, as well. Sudan, Kenya, and Ethiopia are all making new agreements with international energy corporations and there are new concessions for exploration in the Ilemi itself, in the extreme northwest of Kenya, and most recently, in the Lower Omo Basin of Ethiopia.

Arms trafficking has accompanied all of these economic changes so that weapons are now readily available to all indigenous groups in the region. There are reports of certain ethnic groups being supplied with firearms by their own governments, either directly or with their tacit approval. To a degree, some of them may be viewed as ‘proxy’ defenders of their respective home country borders.

- For many decades, at least five different ethnic groups have utilized the Ilemi Triangle lands, establishing settlements and economic activities ranging from livestock herding, opportunistic cultivation (for example, in open basin pans with water collection) and hunting, to engaging in trade and, at times, political conflict with one another.⁶ This long standing presence of so many groups in the Ilemi has established a web of relationships with areas deep inside Sudan, much of the Lake Turkana region, and the entire Lower Omo River Basin – thus, joining this tri-country region into ‘one system’ of resource utilization. Although now formally closed to use by the region’s indigenous groups, by an inter-governmental agreement, they apparently continue to use it whenever possible (and are considered ‘poachers’ by authorities). The close connections among groups along the Omo River (including the Delta) in northwestern Kenya, and well into the ‘Sudanese’ Ilemi, continue.⁷

Major losses of indigenous groups’ cultivation lands and dry season grazing for livestock along the Omo River, among other potential changes, would have major consequences for livelihood and ecological conditions in this tri-country region. The dramatic dislocations and disruption of economy that would result from by the Gibe III project could easily provoke cross-border conflict that would be difficult if not impossible to contain, particularly in light of the struggles underway in southern Sudan. Presently, a most fragile peace is maintained in the region.

in 1956, the government does still claims the area (as does Ethiopia). Kenya and Ethiopia have made numerous smaller agreements about the jurisdiction of local areas.

⁶ These groups are discussed in later sections, but they include the Turkana, Dasanech, Nyangatom, Toposa, Suri, and, at one time, the Didinga.

⁷There is considerable Nyangatom and Dasanech settlement and cultivation along the Kibish River (a large ephemeral river bordering the Ilemi on the East – directly west from the Omo River) and the Nyangatom interact closely with the closely related Toposa further into the Ilemi, for example.

3. Ethiopian Governmental Institutions and Environmental Impact Assessment

Ethiopian governmental institutions, both federal and regional, have failed to consider the potential impacts of the proposed Gibe III project on the environment and peoples of the Lower Omo River Basin. The incapacity of Ethiopian government units to carry out their responsibility to oversee environmental policies, including environmental impact assessment, precludes the effective evaluation and monitoring of environmental problems, including those associated with the proposed hydroelectric development in the Lower Omo River Basin.

- The 2006 EIA repeatedly refers to the necessity for Ethiopian legal and policy institutions to play a key role in assessing, monitoring and mitigating potential environmental and social problems arising from the Gibe III Hydroelectric Project.

These statements are in agreement with Ethiopian law requiring both federal and regional governmental agencies to designate an environmental unit that can ensure the harmonization of government actions with environmental protection requirements and standards. (No such requirement is made of private enterprise). Largely at the behest of international agencies such as the World Bank, the Ministry of Water Resources (MoWR), Ethiopian Electric and Power Corporation (EEPCo), the Ethiopian Roads Authority (ERA) and other offices have established their own environmental units. The 2002 Environmental Pollution Control Proclamation, moreover, granted the right of civil society organizations and individuals to undertake judicial and administrative proceedings in order to redress environmental damages caused by government action.

- In 2002, the Environmental Protection Authority (EPA) was created by Executive Proclamation, largely at the behest of international agencies, including the World Bank. The EPA is responsible for ‘preparing environmental protection policies’ and ‘ensuring that these are implemented’. Its charge includes the oversight of EIAs, including for watershed development, issuing or withholding of approval on EIAs, and ‘guaranteeing’ public participation in this process. It is clearly the key ‘watchdog’ for hydroelectric and other major capital projects.
- Two reports detailing Ethiopia’s Master Plan for Energy, and specifically the Gibe III project (as well as Gibe I and II) with its combined roles of the Ethiopian state and private investment (Salini Costruttori S.p.A.), were released early in 2008 by the non-governmental organizations International Rivers and CEE Bankwatch Network/Campagna per la Riforma della Banca Mondiale (CRBM). Both reports are highly critical of the project’s planning and implementation phases and both identify key institutional problems pertaining to environmental impact assessment for the proposed Gibe III project. The following are some of the assertions made by these reports.
 - Despite the environmental safeguard roles formally prescribed for several government agencies, real power rests with the EEPCo, and to a lesser degree the Ministry of Mines and Energy (MME). Both institutions steadfastly pursue new hydropower generation and a national energy portfolio geared to the objective of tripling Ethiopia’s power generation.
 - About half of the power generated by Gibe III project will be exported to countries in the region. Foreign investment in transmission lines to Kenya, Sudan and Djibouti (in the future possibly to Yemen, Eritrea and Somalia) is planned or under study.

- Although given responsibility for oversight of the proposed Gibe III project (and all other hydroelectric projects), the EPA did not even receive a copy of the EIA for review, including after construction was well underway (and reportedly has been 25-30% constructed). The Authority stated that it also did not receive an EIA for the Gibe II project.
- Construction of Gibe III began in July of 2006 without an environmental permit and with no agency oversight whatsoever – indeed, as this commentary suggests, without fundamental baseline studies and impact analyses of conditions throughout the Lower Basin, including the zone downstream from project construction.
- Compliance with the EIAs produced by EEPCCo and Salini Costruttori for the Gilgel Gibe I and Gilgel Gibe II projects have been judged by the World Bank to be ‘satisfactory’. Field-based observation, however, suggests otherwise. Among the problems recorded were extensive social dislocation and increasing poverty with resettlement, worsening health conditions – including increased incidence of some diseases (especially malaria), promised but undelivered social services, and ‘compensation’ for local populations.
- The European Investment Bank’s Project Summary Information of the Gibe Power Plant project states ‘The proposed mitigation measures result from extensive consultation with the local population.’ Implementation of mandates for ‘public consultation’ or ‘participation,’ with the solicitation of ‘public support’ must be skeptically regarded.
- Reports of recent ‘survey’ in the lowermost Omo River Basin (including the Delta region) of indigenous peoples’ ‘opinions’ regarding the planned Gibe III development must be regarded as highly unreliable at the very least.

● Exceedingly limited funding for EPA staffing and operations, including personnel for EIA evaluation (three individuals, according to the EPA), along with other constraints – such as a one week period provided for the Authority’s review of EIA reports, strongly suggest the preclusion of any effective evaluation of large capital projects, such as the Gibe III, and more generally, the imposition of environmental standards across sectors of the economy.⁸ It is paradoxical that the agency-level incapacity of the EPA is coupled with a strong figure as its head: the Authority’s current director is a well-known environmentalist who is internationally recognized, including for his critical stance on the issue of genetically modified organisms and their potential environmental and social impacts. Given these limitations on the EPA’s ability to function in the ‘check and balance’ system mandated by Ethiopia’s 2005 National Energy Master Plan, it is understandable that external critics of the process often dub it as ‘window dressing’ by the Ethiopian government and the international agencies involved.⁹

The EPA’s inability to implement its charge of ‘preparing environmental protection policies’ and ‘ensuring that these are implemented’ should not be surprising in view of the fact that the EPA is firmly under *Executive control*, and is therefore not in a position to fundamentally question or exert significant influence in matters concerning large capital projects that are identified by the Executive as ‘in the national interest.’ It is well known that lack of transparency and accountability, accompanied by

⁸ There are numerous accounts of the EPA’s ineffectiveness, and the Ethiopian government’s disregard for the implementation of environmental standards in both agricultural and industrial sectors. The vast majority of the more than 400 factories in Addis Ababa – where government regulation could most easily be asserted – simply discharge their wastes directly into the environment.

⁹ Institutional problems associated with the Environmental Management Plan (EMaP] and the Environmental Monitoring Plan, both mandated by the Gibe III 2006 EIA charged with overseeing the ‘implementation of the EIA,’ are similar to those of the EPA. A number of agencies and offices deemed necessary for EIA-associated project phases are either are still in ‘draft phase,’ or in some cases, reportedly nonexistent.

fear of government reprisal for dissent, is pervasive in Ethiopia, including in matters of environmental and human rights.

It is unlikely that an objective evaluation of the social and environmental impacts of the proposed Gibe III project will be forthcoming from the Ethiopian government. There remains, therefore, a pressing need for such analysis.

ENVIRONMENTAL CONDITIONS AND AGROPASTORAL ECONOMY IN THE LOWER OMO RIVER BASIN: AN OVERVIEW

The Lower Omo Basin is internationally recognized both for its extraordinary biodiversity and for having one of the few remaining ‘pristine’ riparian forests in semi-arid Africa, and at least until very recently, some regions of extraordinary grassland and wildlife. There remains strong potential for conserving this natural heritage area of Ethiopia and for a program of sustainable development that protects the environmental integrity of the region, including its expansive grasslands and wildlife. There is an extraordinary diversity of indigenous pastoral and agropastoral economies within the region: for the most part, these economies have maintained sustainable resource use patterns for centuries, have ushered in changes – largely, economic and political in origin – that have resulted in widespread resource deterioration and poverty. Major reliance on recessional cultivation has resulted. Together with other production types and livestock herding, these production systems depend upon the annual flooding and seasonality of the Omo River.

1. Omo Riverine and Upland Environments: Fragile Ecosystems

- Together with the specialized environments created by the Omo River, the geographical convergence of different ecological zones in the Lower Omo Basin contributes to the region’s unusually high biodiversity, especially for a semi-arid region. Mosaic-like vegetation matches the region’s widely varying habitats, which include, in addition to the Omo River, large and small ephemeral watercourses, relict beach ridges, floodplains and basin pans, scattered volcanic highlands and volcanic outcrops, hot springs, tuffaceous exposures, and unique lacustrine habitats surrounding Lake Turkana.¹⁰

- The perennial Omo River is one of the last relatively large rivers remaining in semi-arid Africa that is little regulated (except by the Gibe I and Gibe II projects). With source waters in the highlands of Ethiopia, the river gradually descends to the Lower Valley and through a series of gorges in the northern part of the Lower Valley. In the gorge area (including along the Omo National Park, for example), the river is bordered by a mixture of riparian forest-woodland, mixed with a variety of dry community types. Continuing southward, the Omo opens into a relatively open section of predominantly grassland, where it forms a strongly meandering system, then continues to its terminus at the northern end of Lake Turkana.¹¹

¹⁰ The region’s high biodiversity, compared with other semi-arid regions of Africa, also stems from the area being a confluence of sharply contrasting ecological zones.

The Omo River's annual flooding and inundation of banks, or natural levees, is essential to the survival of the unique riparian forest. Both northern and southern riparian forests contribute to the Lower Basin's high biodiversity. The dominant species of higher altitude zone forests, such as those near the Mago, Mui and Mara tributaries, are different from those in the lower, meandering portion of the river.

- Ground water recharge in periodically active and relict floodplains and other depositional units lateral to the present channel also requires waters from the Omo River, whether from flooding or lateral inundation: precipitation in the region is too limited and erratic to be able to contribute much in the way of recharge. With sufficient moisture, vegetation in these areas – mostly grasses and wooded scrub that is irregularly distributed, serves to prevent excessive evaporation from soils, as well as large-scale sheet erosion.¹² Since precipitation is low and erratic, ground water recharge is a critical factor in the maintenance of both riverine zone and floodplain ecosystems.
- Large wildlife populations have been recorded in recent years in the Lower Basin, although many have now become severely depleted. Eland, oryx, topi, Buell's zebra, hartebeest, lion, leopard, cheetah, elephant, bat-eared foxes, gazelle, gerenuk have long populated the Lower Omo Basin's grassland communities. Riparian forest and woodland areas support a rich wildlife population including hippo, elephant, crocodile, at least three species of primates, kudu, bushbuck, waterbuck leopard, and a wide variety of bird species including fish eagle, goliath heron and dwarf bittern.
- Both riverine and upland plains environments in the Lower Basin are comprised of ecosystems that have unique resources and features, but these ecosystems are highly fragile. While the semi-arid grasslands are regional in scope, the levels of ecological integrity of the Omo riverine system and Lake Turkana also have fundamental regional significance. Already, certain environmental restoration measures will likely have to be taken, if these lands – stretching from the Ilemi Triangle eastward to the fringing highlands, east of the Omo River, and from Lake Turkana northward beyond the Omo National Park and the Mago National Park, are to remain a strong part of Ethiopia's national heritage and part of its potential future sustainable resource base and economy. There is enormous potential for ecotourism development in the region, for example, which could be a key component of an Ethiopian program to mount an environmentally and economically sustainable resource management program in this ecologically and culturally unique region.

2. Indigenous Economies and Their Dependence on the Omo River

- At least 200,000 indigenous people reside within the Lower Omo Basin, and its extraordinarily high cultural diversity is internationally recognized. At least eight distinct ethnic groups reside in the central portion of the Lower Basin: the Mursi, Bodi, Kwegu, Suri, Aari, Karo, Nyangatom and Dasanech.¹³ These eight groups represent three different language families: Cushitic, Nilo-Saharan and Omotic. They are primarily agropastoral, combining livestock herding with recessionary cultivation (or flood retreat cultivation), most of which occurs along the Omo River or its tributaries. Cultivation is now an essential part of the economy for the vast majority of the

¹² There is documentation of high salinization levels in the lowermost Omo, at Omorate, where a large agricultural project was instituted, but failed, and that high levels of evaporation have resulted.

¹³ Research in recent years has shown that these ethnic groups are relatively new to the Basin, in fact, emerging as distinct groups only a couple of hundred years ago following their migration into the region. They vary greatly in population size – from several hundred to at least thirty or forty thousand.

population. In recent years, an increasing proportion of the Lower Basin's population has engaged in cultivation – the relationship of this shift to degradation of grasslands and the region's herding economy is an important topic for investigation.

Neighboring indigenous groups are also dependent on Omo River resources, although in more periodic and sometimes less direct terms. These groups include the Me'en, Hamar, Dizzi, Chai, Arbore, Toposa¹⁴ and Turkana, among others.

- Recessional cultivation and livestock herding are the two fundamental pillars of livelihood throughout the Lower Omo Basin. But they are part of a whole system that most of the region's indigenous groups share: a *survival strategy system* that has evolved through centuries of cultural knowledge and an intricate understanding of the natural environment. These are basically *risk-minimizing* systems that are essential for coping with their harsh and often unpredictable environment.

The agropastoral survival strategies in the Lower Omo Basin include: (1) accumulation of maximum material capital, or cultivation land (usufruct rights) and livestock (primarily cattle, but also goats and sheep) for meeting immediate subsistence needs but also as a means of economic security; (2) high mobility of livestock herds, with flexible seasonal movements between upland plains and riverine zone (in order to cope with changing conditions)¹⁵; (3) economic diversification – recessional cultivation and livestock herding, with secondary production activities including food gathering, fishing, bee-keeping, chicken raising, and household commodity production – most of which are focused in the riverine zone¹⁶; and (4) extensive exchange networks – for material (and social exchange), particularly involving recessional cultivation and livestock production.¹⁷

This survival strategy system has evolved in such a way as to minimize the risk of economic failure by maximizing options among subsistence activities and the distribution of their products. This type of economy is critically important in view of the unpredictable, but nearly inevitable, occurrence of natural hazards, such as prolonged drought or disease epidemics. This 'risk minimizing economy' presupposes access to sufficient land and riverine resources, however, if catastrophic losses are to be prevented.

- In this region of highly erratic rainfall in both amount and distribution, recessional cultivation is a key component of subsistence for almost all ethnic groups, especially during periods of prolonged drought or livestock disease epidemics. Shifts to cultivation by a household or village may be temporary or permanent, depending upon circumstances given the apparent increasing environmental deterioration and declining livestock potential of the Lower Basin, however, the transition to cultivation has likely become permanent for most households.

¹⁴The Toposa were earlier noted to be closely related to the Nyangatom, who themselves range widely between the Omo River, the Kibish River and westward into the Ilemi Triangle.

¹⁵ Changing conditions including water availability, pasturage and browse, and stock disease occurrence, as well as available labor, residency agreements and other social factors.

¹⁶ Including gourds, cooking pots and utensils, clothing, canoes and other products.

¹⁷ Exchange of milk (and meat) for grain/other cultivation products; exchange of rights to livestock and access to cultivation, material loans and gifts to meet short term & long term food (and broader economic) needs; fostering of complex and stable social reciprocity to serve the above.

- Recessional cultivation is practiced in the widest possible range of habitats, including on point bars, river banks (including on very steep slopes), natural levee backslopes, active floodplains, throughout the Omo Delta, along the Omo's tributaries (e.g., the Mago River) and some of the larger ephemeral channels, and opportunistically, in rain-fed basin pans and floodplains. These cultivation systems are 'sustainable' ones that have evolved in tandem with the Omo River's annual flood, with planting occurring just after the waters recede. Consequently, the Omo River's *amount* and *seasonality* of flow are critical elements for its success.

Sorghum, millet, maize, peppers, squash, tobacco and a variety of beans constitute much of region's planting. While the technology used by the vast majority of households engaged in cultivation remains basic – mainly hoes, machetes and digging sticks – this should not be confused with low productivity. To the contrary, recessional cultivation systems, practiced for thousands of years along rivers in Africa, are *highly productive systems*, given high solar input and other factors. The product harvested is variously used for consumption and for exchange – both internal to ethnic groups and among them, through the region's complex trading patterns.

- A few more specific aspects of the survival strategies serve to underscore the importance of riverine resources to the survival of the region's indigenous population.

- The Omo River is also essential to indigenous economies of the Basin for livestock herding, which occurs all year (depending on the locale), but particularly during dry seasons and in times of prolonged drought, when pasturage and browse are largely in the surrounding plains,
- Exchange of food and materials among villages engaged in livestock herding and cultivating are essential to both types of communities. While primary exchange involves milk for grain, livestock – particularly goats and sheep – are also 'traded up' for cattle – an important method of rebuilding herds. Labor cooperation and other forms of social exchange, including gifts and loans – a critical means of wealth redistribution – are pervasive throughout all levels of the region's social systems.
- All indigenous economies in the Lower Basin engage in production activities other than herding and recessional cultivation. These types of *subsidiary production* play a vital role in the survival of large segments of the population, especially during prolonged drought periods or other times of extreme hardship. While specific types of production vary among groups, they include: gathering of food and other plants; fishing – particularly in the Omo River and Lake Turkana; chicken raising; crafting of cooking pots (utensils and gourds); bee-keeping; woodcutting and charcoal sale; and occasional hunting. The majority of these subsidiary activities are dependent upon riparian environment resources and, in most economies, the level of dependence on these resources increases with poverty level.

- Despite its relative geographic isolation from major social changes underway in East Africa and the Horn region during the nineteenth century and early decades of the twentieth century, the Lower Omo Basin was significantly impacted. Early explorers and plunderers caused some havoc and disruption of culture and economy. Early British colonial and monarchical military incursions began, notably including those accompanying Menelik's creation of an Ethiopian empire. These incursions easily overwhelmed the poorly armed pastoralists and agropastoralists of the region. The rinderpest epidemic of the 1890s dealt an additional blow to the livestock economy. Already, the long process of displacement from lands on which they had once moved freely, and loss of access to resources vital

to their livelihood systems, was underway.

Northern and southern portions of the Lower Omo Basin experienced different versions of expropriation (for example, ‘soldier settler’ seizures in the northern area, and displacement by national boundary definition in the southern area), but the impacts were in terms of their impact on livelihoods. In the southern region, new border agreements between British colonial systems in Kenya and Sudan, on the one hand, and the Ethiopian monarchy, on the other, designated specific land areas for entire ethnic groups, with little cognizance of who some of them were, let alone their population size or livelihood needs. (A series of agreements and new ‘boundary lines’ in the Ilemi Triangle were established, for example.) Displacement also occurred in more indirect terms, through land titling, in both regions of Ethiopia and Kenya that were well removed from the Lower Omo region. However, expropriated groups were forced to seek new lands, thus initiating ‘waves of displacement.’ All in all, these changes produced a disruption of the long-term sustainable but fragile agropastoral economies throughout the Lower Omo Basin.

World War II brought new waves of new external power impacts – from Italy during its occupation years, and then the routing forces of the British (who actually bombed the southernmost Omo region). Ironically, throughout these decades, in addition to being dubbed ‘primitive,’ most of the indigenous peoples were considered to be ‘warlike’ by the very forces engaged in dispossessing them. Meanwhile, a new process began that has continued and progressed to increasingly dangerous levels – namely, the acquisition of firearms. By the post-World War II years, certainly, the effects of these various types of dispossession reverberated throughout the entire region, with numerous clashes among ethnic groups reflecting their growing need to claim the shrinking available resource base.

- The past few decades in particular have ushered in both an era of new types of intervention and impact on the region, especially by the ‘modernization’ processes underway in Kenya and Ethiopia. Crisis level droughts occurring in the 1970s and in 1984-85 resulted in countless deaths from hunger and disease. These disasters would have been even more catastrophic for indigenous peoples throughout the region, had it not been for the Omo River and its recessionary cultivation potential. During these two decades, most agropastoralists experienced huge livestock losses and developed new settlements and economy focused on cultivation – a transition that has become essentially irrevocable.¹⁸ This has been particularly evident in the southern section of the Lower Basin, where the Nyangatom and Dasanech peoples have been not only subjected to these natural disasters, but have been restricted from their traditional use of the Ilemi Triangle region, and forced to compete with one another for the rapidly diminishing grassland resources. Movement of their livestock to the Omo River for grazing has been greatly hampered by the presence of tsetse. It is within this context that the recent migration of the Dasanech, in particular, into newly exposed Omo Delta lands should be understood.¹⁹

Indigenous groups in the northern section of the Lower Basin have also been dealt a major blow to their economies in recent years. The establishment of the Omo National Park (1966) and the Mago National Park (1979) has particularly impacted the large Mursi group which has long resided along the Mago and Omo rivers. Their situation is largely shared by the neighboring ethnic groups – the Bodi, Kwegu, Dizzi, Aari and Kara. Despite the fact that these peoples have long been settled in and

¹⁸ This expansion of cultivation has been particularly striking in the Omo Delta region, where lake retreat and exposure of new sediments (affecting 500 sq. km) have facilitated large numbers of in-migration (mostly by the Dasanech group), but also in multiple sites all along the Omo, including on the steepest river banks.

¹⁹ These two groups have a combined population of approximately 50,000.

sustainably exploited the resources in and around the territories allocated to the two national parks, recent park authority and government policies have severely restricted their access to these areas, and instead, have regarded them as ‘invaders,’ or ‘poachers.’ The Mursi and the neighboring groups continue to cultivate along relatively steep riverine slopes and in other suitable localities that they are still able to access. To date, the government has given no attention to their plight, let alone made an effort to redress their worsening situation.

Recent processes of environmental degradation and decline of indigenous economies have rendered these systems highly vulnerable to development interventions - particularly those of high magnitude, such as the proposed Gibe III project.

ISSUES ARISING IN CONNECTION WITH THE GIBE III PROJECT AND THEIR IMPLICATIONS FOR THE LOWER OMO RIVER BASIN

In view of the 2006 EIA’s failure to consider the entire range of downstream environmental and socioeconomic impacts of the proposed Gibe III project, these concerns are emphasized in the section below. While the issues raised here are by no means inclusive of those that must be considered in a full review of the Gibe III project proposal, they serve to effectively underscore the seriousness of the issues raised by the proposed development.

1. Seismic Activity and Landslide Potential

There is sufficient evidence of recent seismic activity in the region around the proposed Gibe III project to suggest the possibility of a seismically determined event, possibly with catastrophic results. Available data and perspective from petrology, geochronology and geochemistry concerning the issue is not included in the EIA. To the contrary, the possibility of any such event is rejected by the report. Extensive and rapid sediment trapping in the reservoir presents the danger of earth swelling and landslide – a potential that is also ignored by the EIA.

‘Concerning the impacts on [sic] physical environment, there are no confirmed occurrences of geothermal activity in [sic] dam area and because of its distance from the major Ethiopia seismic centres, located in the rift valley, any tectonical event would have negligible effects and impact on the project area.,’
2006 EIA. (p. 11, 117, Conclusions)

- The topography in the Gibe III region is strongly developed along a structural grain parallel to a rift. In part, this structural grain is developed along a system of faults that permeate the area. It appears that Pliocene units are confined to the canyon, including a tuff that is approximately 2 Ma old, and basalt approximately 4 Ma old. Woldegabriel and Aronson (1987) describe this part of the rift system as ‘failed.’ The ‘failed rift’ is a system partially formed but interrupted through migration. Woldegabriel describes the walls of the Omo Canyon as fault controlled.²⁰

²⁰ Giday Woldegabriel. (1987) Volcanotectonic History of the Central Sector of the Main Ethiopian Rift: A Geochronological, Geochemical and Petrological Approach. Ph.D. Thesis, Case Western Reserve University, August, 1987; G. Woldegabriel and J. L. Aronson. 1987. ‘The Chow Bahir Rift: A ‘failed rift in Southern Ethiopia. Geology 15, no.5, pp. 430-433

Faults between Sodo and the Omo River are young and active. Hot springs occur within the region and these are generated by geothermal activity.

The active fault system, considered in combination with the occurrence of hot springs, suggests the possibility that tectonic movements are not finished in the area. A query of recorded earthquake activity of between 4.1 and 5.4 magnitude, even within the past twenty five years, reveals at least sixteen such occurrences between 5-8° N. and 36-38° E. Some of these earthquakes have been within close range of the project area.

There is record, for example, of a 4.7 magnitude earthquake near the town of Arba Minch in 1999 (approximately 98 km from the proposed dam) and a 5.0 magnitude earthquake just east of the town of Sodo (about 63 km from the dam site) in 1989. Evidence of an eruption of Mt. Wenchi (a volcano on the Nile-Omo divide at the headwaters of the Gibe) within the past 200 years – one that devastated everything downstream – is also available. This volcanic highland consists almost entirely of ash: hence, the mountain is explosive.

In addition to the above quote, the 2006 EIA dismisses the possibility of significant seismic activity in the region of Gibe III in other statements. For example, ‘Gouin’s study [1979] shows that the most part of earthquakes’ epicentres [sic] is related to the major rift structures. The power plant region is 100 km far [sic] from the most active seismic centers. Consequently, the energy given by each earthquake would be considerably attenuated in the dam site (p. 50).

- The proposed Gibe III project may promote the possibility of a major landslide. Impoundment at Gibe III will change the base level of the river in the immediate area: local aquifers are fracture controlled, and there is a possibility that some ‘slip surfaces’ (landslide soles, for example may become lubricated so that rock masses are more likely to slide. Although dismissed in the EIA, this type of event is a possibility.

The 1963 disaster of Vaiont in northern Italy clearly illustrates the significance of these issues.²¹ In Vaiont, more than 2600 people were killed when 260 million cubic meters of a slide block moved suddenly into the newly filled Vaiont Reservoir – behind a very tall dam that blocked a deep valley. The intensive landslide occurred within seconds and displaced more than half of the reservoir’s water, generating a giant wave that reached a height of 250 meters and then created a massive wall of water that swept into nearby villages and towns, destroying everything in its path. The dam itself remained intact. In the Vaiont case, the rockslide and ensuing flood could have been readily foreseen by logical consulting. *The cause of the landslide may also be pertinent to a consideration of the Omo situation.* The sedimentary rocks of the Vaiont River Valley include layers of shale, a clay-rich rock. And the rocks comprising the nearby mountain (Mt. Toc) tilt steeply toward the reservoir. When the dam was finished in 1960, filling of the reservoir introduced groundwater into the shale layers, causing them to swell and become slippery. At first, the mountainside began slowly creeping down slope at a rate of half an inch per week. As filling continued and more groundwater seeped into the mountain, the rate of slippage increased to eight inches per day, and ultimately to 30 inches per day, just before the 1963 disaster.

The EIA states that the ‘bedrock’ at the dam site, slope stability, ‘compensation flow from the dam’ and other geologic characteristics should be *monitored* [emphasis added] before and

²¹ <http://seis.natsci.csulb.edu/bperry/Mass%20Wasting/VaiontDam.htm>

during the construction phase. Within the Geology, Seismology or Hydrology sections of the EIA (totaling 5.5 pages), there is no significant recognition of any of the above concerns.

- The problem of sedimentation in the Gibe dam/reservoir complex requires quantitative assessment. Contrary to the 2006 EIA projections, ARWG calculations from fill rates in the Omo Basin indicate that the 11.75×10^6 cubic meter reservoir capacity might be reached in only a few years. This rate and extent of sedimentation presents a fundamental problem for the Gibe III project.

The EIA acknowledges the significance of sediment trapping by the reservoir for downstream conditions. For example, the report states:

“The sedimentation inside the new reservoir created upstream the dam will be considerable due to suspended materials in Omo River, but in any case [sic] contained within the reservoir dead capacity is very large and adequate [sic] to cope with the sediment transport.”

‘The sedimentation inside the new reservoir created above the dam will be abundant due to suspended materials in the Omo River ... giving an average yearly sediment transport of $51.150 \text{ Mm}^3/\text{yr}$ ’ (p. 131).

“During operation stage the main impacts are linked to the reduction of downstream flooding in extension and frequency of occurrence due to the water shortage above the dam (positive impact) and to the solid transport that the occurrence of the dam will hold and stored [sic] in the basin, without being carried towards the downstream part of the Omo River region till Turkana Lake (potential negative impact)” (p. 12).

Yet the 2006 EIA concludes, ‘the amount of sediments is minor when compared to the size of the reservoir and is contained in its dead capacity’ (p. 144).

Completion of the Gibe III project will cause a major reduction of sediment and nutrient replenishment in soils of cultivation areas and in natural habitats throughout the riverine *and* delta regions, and reduction of nutrients essential to fish populations throughout downstream reaches of the river, the delta and Lake Turkana.

This sediment and nutrient replenishment is essential to the continued biological reproduction of these downstream habitats. This major impact is accompanied by sediment build-up within the Gibe III reservoir. (The 2006 EIA acknowledges that one third of the reservoir will likely be silted in within a relatively short period of years.) The loss of sediment deposits and nutrient replacement will contribute to the degradation of both terrestrial vegetation and aquatic resources.

The loss of sediment deposits and nutrient replacement will contribute to the degradation of both terrestrial vegetation and aquatic resources and will accelerate the loss of cultivation and other riparian subsistence production systems, including fishing – the ‘last resort’ for many of the local economies in the Lower Omo Basin.

2. Elimination of Riparian Forest and Loss of Biodiversity

The Gibe III project will produce a reduction of approximately 60 percent of the Omo River's downstream flow volume, initiating a 'drying out' of much of the riverine zone, and elimination of the riparian forest – one of the last pristine forests in drylands Africa. Most of the other ecosystems associated with the Omo River's approximate 675-kilometer flow from the proposed Gibe III project site to Lake Turkana, and with the Omo Delta, would be either highly stressed or destroyed. Biodiversity within the region would be significantly lowered, as would much of the natural resource base essential for the indigenous groups dependent upon the Omo River. The 2006 EIA fails to recognize or adequately consider all of these impacts.

'No adverse direct or indirect impacts are anticipated in respect of sensitive habitats.' 2006 Environmental Impact Assessment.

- **Africa Resources Working Group (ARWG) calculations indicate that the downstream flow volume would be reduced by approximately 60 percent during the reservoir filling, over a period of five years or more. The precise amount of reduction will depend on a number of factors, including the amount of contribution to the Omo system by its tributaries.**²²
- Lake Turkana receives at least 80 percent (possibly as high as 90 percent) of its source waters from the Omo River. ARWG estimates that a reduction of 60 percent of flow volume would lower the level of Lake Turkana by at least 7 meters (or 53.5 km³), from reservoir filling alone. The level of Lake Turkana primarily controls changes in the Omo River's channel, and the differential between the lake's present level altitude of 365 m and the proposed Gibe III altitude of 655 m, is 290 m. Consequently, the Omo's channel will undergo a downcutting process, toward the establishment of a new equilibrium with the lower level of Lake Turkana.²³
- The deep gorge, just downriver from where the Gibe III project is proposed, will become an entrenched valley, with considerable loss of river waters on its relatively steep slopes, silt berms and other habitats. Throughout its actively meandering flow through the lowlands to its terminus at Lake Turkana, the Omo will cease meandering and the present meanders will entrench: this will effectively eliminate a wide range of microhabitats and their biota (see below).
- Major reduction of the Omo River's maximum flow, as well as its annual flow volume would result in the cessation of flooding of the natural levees (or bank overspill) in the vast majority of the

²² This estimate of reduction in downriver flow is based on the annual flow volumes of the Gibe, the Gojeb and the Omo Rivers (available from recent records, the total volume of the reservoir to be filled (approximately 1.62 x 10⁸ cubic meters), available precipitation records for each sub-basin (the contribution of each sub-basin to the Omo's downriver flow was estimated). Most of the river from the Hamar range (east of the lower river) and the Omo Basin lowland do not generally reach the Omo River (thus is regarded as a minor input). The total reservoir volume is calculated at 150 km x 6 km x .24 km (240m height).

²³ Downcutting by the Omo would be partially modified by the occurrence of two basaltic outcrops along the channel.

river's trajectory through the Lower Basin (only some localities in the lowermost region would likely receive flooding, and then only temporarily or in greatly reduced form). Silt berms, (except for the lowermost ones) would no longer be flooded. Downcutting in the Omo's channel would further reduce the high water maximum.²⁴ As the maximum level lowers, the newly exposed riverbanks are highly susceptible to erosion of sediments into the river.

- Overbank spill (flooding) from the Omo River onto the natural levees as well as into floodplains and other riparian environments would cease throughout most of the downriver zone.²⁵ Active floodplains in the Lower Basin will migrate southward, as Lake Turkana recedes. Lateral inundation of floodwaters – the other critical source of moisture for riparian vegetation, will largely cease, as well, depending on conditions at different locales. In general, water movement into low-lying backswamps, channel cut-offs, cracking systems will cease, along with backup of floodwaters at the Omo River's junction with tributaries (notably, the Mago River).

- Reduced downstream river water movement into floodplain and other riverine environments would lead to severe reduction of groundwater recharge throughout the Lower Basin, since this process is largely dependent on Omo River waters. Other sources of recharge would not compensate for this loss, since precipitation is generally highly limited and unreliable. Massive-scale drying out of sediments and soils in floodplains would occur, with sheet erosion prevailing over soil infiltration and extensive loss of plant cover. With denudation and lack of river water replenishment, evaporation in the A soil horizon would generally increase, concentrating salts at the surface. Salt concentration in the newly exposed B soil horizon would also increase. Eroding sediments and salts may be transported by sheet erosion into the Omo River. (Reports of salinization in the failed agricultural scheme at Omorate along the lowermost Omo River's eastern shore, and in other locales of this highly aridic environment, serve to underscore the seriousness of the soil denudation, erosion and salinization process in the region.)²⁶

- **At least 125 square kilometers of riparian ('fringing') forest will be eliminated, by ARWG estimates. The area of forest death would be about 290 square kilometers if riparian closed canopy woodland were included.** These are highly conservative figures, for several reasons: (1) The estimate of 125 sq. km is calculated only for forest cover from the dam site to the southern extent of continuous forest (at 4.855° N) – a distance of 625 km, including the Omo's relatively sinuous channel segment, and it assumes an average forest/woodland width of 100 meters - a highly conservative figure. (2) The 125 square kilometer estimate does *not* include those forests along the lower reaches of Omo tributaries where they intersect the Omo channel and where substantial flooding and seasonal water back-up presently occur, resulting in some 300-400 meter wide forests. (3) Even the 290 square kilometer figure reflects only well-developed *forest and closed canopy woodland*, not the extensive *open* woodland adjacent to the river that will be subjected to massive scale

²⁴ River banks would be newly exposed by this downcutting and by the absence of water bringing new sediments. Soil erosion into the river would occur in large scale.

²⁵ Natural levee heights vary, but even at the southernmost extent of the forest, the levee is 5 meters in height.

²⁶ The prevention of downstream sediment transport because of sediment-trapping in the reservoir, on the one hand, and sediment deposited into downstream reaches of the Omo through increased sheet erosion, on the other, is difficult to estimate in terms of their effect on the river, the delta and Lake Turkana; these processes would vary greatly from region to region, depending on the river's morphology, specific flow volumes, the sediments involved, local topographic character, and other factors.

drying out, should river flooding and inundation be reduced. (4) Both estimates exclude extensive wooded habitat scattered throughout the Omo Delta and along the lowermost river.

Riparian forest canopy trees are predominantly shallow-rooted, so they are quickly killed when river flooding is eliminated. The Omo River's fringing forest and woodland are adapted to annual flooding or inundation, in most years, and also to periodic flooding or inundation that corresponds with biological 'readiness' of woodland or forest plants for germination or growth. Both types of river water delivery are key to the successful regeneration of these riparian systems, and both would be eliminated by the Gibe III project.

Experience with river basin development in a myriad of semi-arid environmental contexts has demonstrated that massive kill of riparian forest can occur within only a few years, following hydroelectric project construction. This experience is documented for the Awash River Basin in Ethiopia, as well as the Tana River and Turkwel River in Kenya, several rivers in Sudan, and elsewhere in east and northeast Africa.

None of the above dimensions of riverine forest and woodland destruction are taken into account in the 2006 EIA.

- The Omo River's forest and woodland habitats, along with silt berms and wetlands, support a variety of wildlife, including leopard, lion, bush buck, warthog, buffalo, kudu, elephant, hippo, monitor lizards, colobus monkey, baboon, grevet monkey, crocodile, and a host of bird species. This habitat will be largely eliminated by the Gibe III development. While these species are noted in the area 'in and around the Gibe III Reservoir Area' (at five sample sites) by the 2006 EIA (p. A6016514), their endangerment is discounted even in the 'project area'; their distribution and vulnerability in the downstream riparian zone is not included at all.²⁷

The EIA's only substantive acknowledgment of loss of woody vegetation pertains to that flooded when the reservoir is filled 'about 18.3 Mm³ forest biomass' and 'about 2.1 Mm³ woodland biomass' (p. 12). The EIA report then concludes, however, that this loss 'will not bring about marked differences in the carrying capacity as there are large areas of unutilized land resources in the area' (p.13).

- The destruction of flooding regime and seasonal patterns of hydrological changes will directly affect the feeding patterns and the reproduction of fauna throughout riverine, floodplain and delta environments. Animal species eliminated will range from micro fauna of all types to insects, amphibians and fish species (see below), the fish eagle and numerous other water-loving birds, crocodile, hippo, elephant, kudu, bushbuck, buffalo, leopard, colobus monkey, grevet monkey and baboon, monitor lizards and a wide range of reptiles. The habitat of most of these animals would be largely eliminated by the Gibe III development. Quite apart from the intrinsic importance of wildlife in biodiversity terms and those of utility for the region's indigenous economies, recent recognition by the Ethiopian government and international conservation agencies of the potential for

²⁷ The internal inconsistency and failure to address these specific issues is illustrated by the following two statements by the EIA that appear consecutively. 'Impact on landscape due to the project will be significant, involving a total modification of the middle Omo valley characteristics.' 'Concerning *biological environment*, no adverse direct or indirect impacts are anticipated in respect of sensitive habitat' (p. 12).

conservation, park and tourism development in the Mago and Omo National Parks region indicates that there is increasing awareness of its importance to Ethiopia's (and Kenya's) national heritage.

There are significant species and ecological differences between the riverine forests of relatively higher altitudes, such as those in the Omo National Park and the Mago National Park near the proposed Gibe III dam, and the forests of the meandering river in the lowlands toward Lake Turkana. Neither of these riparian forest types, however, will survive the loss of riverine waters and sediment that will result from the Gibe III construction. A new succession of largely exotic species will invade these areas, bringing a sharp reduction in riparian biodiversity. This will include the loss of wildlife. No account is taken in the EIA of these riverine forest systems – neither the species distribution nor their ecological relationships in plant communities. The professional literature regarding plant communities that is cited and utilized in the EIA report is wholly inadequate; it is apparent that no effort was made in this regard. The same situation applies to the Gibe III impacts on fauna, including wildlife of major importance.

‘Maintaining Minimum Flow’ of the Omo River

The EIA notes (in several places within the 2006 report) the importance of maintaining some ‘minimum flow’ of the Omo, and clearly proceeds with the assumption that this will be ‘sufficient’ to avoid any significant, or serious, ecological problems downstream. There are even several references within the report regarding the ‘possible need’ for release of water stored in the reservoir for more than minimum flow. The report states that ‘during dam activity state, the river downstream the dam has only [sic] contribution due to the minimum flow. The *minimal flow* to guarantee the biology life in the stretch downstream the dam should be at least equal to the low flow of the river’ (p. 16) [emphasis added].

Maintaining ‘minimum flow’ would be insufficient for preserving the downstream ecosystem. The reasons for this are partly outlined above. Two additional points are relevant here. First, since the EIA is almost devoid of any consideration of the livelihood needs of the Lower Basin's 200,000 indigenous people, there is no planning component whatsoever for such concerns (it is highly questionable that there could be a satisfactory one). This point was stressed in the earlier section on Ethiopian institutional capability. The lack of transparency and accountability within Ethiopia render even those institutions with the best of intentions nearly powerless in trying to cope with pressing indigenous peoples and environmental issues. Second, since approximately 50 percent of the electricity generated at the planned Gibe III project is intended for export to surrounding countries and the generation of foreign exchange, it is not possible to predict a scenario whereby reservoir waters will be ‘sacrificed’ from these commercial goals in order to meet the barest subsistence needs of the Lower Basin's long term agropastoral and pastoral inhabitants and to preserve the invaluable riparian resources of the nation.

It is a well-known fact that downstream flood simulation through periodic, or seasonal, large-scale release of dammed river waters has not yet been implemented in a large hydroelectricity project within drylands sub-Saharan Africa.²⁸

²⁸ Such actions have been called for in a number of contexts, including in environmental impact assessments, planning documents of all sorts, and at the World Commission on Dams, where a set of consensus-based priorities for future considerations of large dam construction were formulated.

3. Destruction of Recessional Cultivation and Riverine-Based Economy

The proposed Gibe III project's precipitous reduction of Omo River downstream flow volume would eliminate most of the sites for recessional cultivation. The 2006 EIA fundamentally excludes consideration of the indigenous economies within the Lower Omo River Basin, and therefore, the barest survival needs of 200,000 indigenous pastoral, agropastoral and cultivating residents in the region.

- For indigenous agropastoralists throughout the Lower Omo Basin, recessional cultivation is a 'last resort' in their economies. This is true in two regards.

First, there is 'no way back' to a more pastoral life for the vast majority of those who have taken up or increased their reliance on farming in response to overgrazing of rangelands and herd decline, even if they attempt to rebuild herds through 'trading up' with agricultural product – when it is available.

Second, food product from recessional cultivation, if destroyed, cannot be replaced by the secondary production activities including fisheries, gathering of wild foods (mostly fruits) and hunting, as these activities are dependent upon the very riparian (and delta) ecological communities that would be destroyed by changes resulting from the proposed development.

In broader terms, the indigenous economies of the Lower Omo Basin, particularly the eight 'core groups' identified earlier, are subjected to an "options squeeze" whereby the choices available to them for further adaptation to their changed circumstances are severely curtailed, if not blocked altogether. Territorial restriction of their movements - for settlement and herding, and displacement from herding and cultivation lands have been identified as major causes for ecological and economic decline that have produced this 'squeeze'.²⁹ Political conflict among particular groups, especially as resources decline and economic struggles have intensified through throughout the region, has worsened these conditions.

- A summary of this 'option squeeze' on the Lower Basin's indigenous survival strategy systems may be summarized from the information presented in preceding sections.

The 'southern' groups in the Lower Basin have a shared history of declining herding economy, deteriorating rangeland or 'plains' resources, and increasing reliance on recessional cultivation as their primary subsistence activity. Moreover, ethnic groups in the lower region have attempted to cope with their declining circumstances, by (1) migrating into new lands, such the 500 square

²⁹ Population growth has been casually observed within the region, but reliable data is lacking.

kilometers of newly exposed Delta lands (accompanying lake retreat) in Kenya³⁰, where seasonal flooding has regenerated grazing resources and cultivation lands, and where fishing resources are available, (2) forming large settlements along the Kibish River (at the Ethiopia-Sudan/Ilemi Triangle border), with major recessional cultivation, (4) cooperating economically with closely related groups in surrounding areas³¹, and (3) by engaging in secondary production activities, particularly fishing (in the Omo River, as well as Lake Turkana), whenever possible.

All of these efforts at adjustment are precarious, at best. Some of them are continually thwarted (e.g., movement in the Ilemi region and movement into parts of Kenya). Most of them will be either directly destroyed by the river's cessation of flooding and retreat of proposed Gibe III – namely: virtually all of recessional cultivation in the delta and along the river; the vast proportion of grazing by livestock in riverine area; and gathering of food, since most of it is carried out in the forest and woodland areas that would be eliminated.

There have already been expropriations of the agropastoral lands for 'modernization' projects in the lowermost Omo Basin. Besides a number of relatively small, to date, land areas allocated to missionary installations and projects, government military and administrative buildings and the settlement around them, private holdings, and physical infrastructure such as road-building, a World Vision agricultural project (a failed rice project) and a 30,000 ha 'biofuels' oil palm and jatropha irrigation agricultural plantation owned by an Italian energy corporation, Fri El-Green Power, have been involved. The Government of Ethiopia has now been quoted as planning additional, larger plantations. All of these developments are located in the riparian area, i.e., that most crucial for the survival of already thoroughly stressed local economies.

The 'northern' indigenous groups within the Lower Basin face a contrasting but similar set of circumstances underlying their vulnerability to effects of the proposed Gibe III project. The establishment of the Omo National Park (1966) and the Mago National Park (1979) has particularly impacted the large Mursi group who has long resided along the Mago and Omo rivers. The neighboring ethnic groups – the Bodi, Kwegu, Dizzi, Aari and Kara, largely share their situation. Despite the fact that these peoples have sustainably exploited the resources in and around the territories of the two national parks for many years, recent park administrative/government policies have severely restricted their access to these areas, and instead, have regarded them as 'invaders,' or 'poachers'. The Mursi and the neighboring groups continue to cultivate along relatively steep riverine slopes and in other suitable localities that they are still able to access, as well as to engage in secondary production activities – most of which are dependent upon riparian resources. To date, the government has shown no cognizance of their plight, so there has been no effort to address their worsening situation. (Nor have the region's indigenous people been included in any governmental decision-making processes regarding development and conservation in the region). The options open to the Mursi and their neighboring groups, even at the present time, are extremely limited, and this squeeze on their economic survival efforts would be compounded by the radical reduction of river flow.

The elimination recessional cultivation, along with riparian resources for other subsistence activities within the riparian zone of the Lower Omo Basin – would catalyze a major economic collapse throughout the region.

³⁰ This migration has been primarily by the Dasanech group. They have also pushed into the lands East of the Omo River and all along the eastern banks of the Omo River channels, and along the northeastern shoreline of Lake Turkana, in Kenya.

³¹ Nyangatom settlement is (reportedly) dominant in the Kibish River area, with significant Dasanech presence. Nyangatom close social relations and economic cooperation with the Toposa group in the Ilemi region is a case in point, but this requires movement of Nyangatom – with their stock animals, through this politically closed area.

4. Lake Turkana Retreat and Its Ecological Effects in Kenya

● An assessment of the overall impact of the proposed Gibe III project on the Great Rift Valley Lake Turkana, in Kenya, must begin with the direct impact of reduced flow into the lake, since the Omo River constitutes at least 80 percent of Lake Turkana's source waters. Reduction in flow volume from reservoir filling would be the primary impact. An estimate of the minimum drop in the level of Lake Turkana's waters, as a result of the proposed Gibe III project, can be made by combining an estimate of the probable loss of water during the filling of the Gibe III reservoir with an estimate of the lake's total water volume. Based on a combination of calculations from satellite imagery, published flow data, Cerling's (1986)³² work in the Turkana Basin, the following estimate is a reasonable approximation.

Estimates for the relative amounts of water derived from above and below the proposed dam are:

Gibe River flow at Abalti : $6.16 \times 10^9 \text{ m}^3/\text{yr}$.

Total flow at the proposed Gibe III dam: $1.13 \times 10^{10} \text{ m}^3/\text{yr}$

Flow for regions below the dam: $6.72 \times 10^9 \text{ m}^3/\text{yr}$.³³

Total input from the Omo River (as the sum of the two numbers above) is therefore:
 $\times 10^{10} \text{ m}^3/\text{yr}$ ³⁴

Evaporation, recalculated to account for the above estimated value of Omo inflow, is estimated to be:

2.85 m/y.

On the basis of these figures, the effect of reduced flow on Lake Turkana can be established.

Assuming that flow at the dam site will be maintained at that of the lowest month of the year (as stated in the EIA) – $5 \times 10^8 \text{ m}^3/\text{yr}$, the added flow from parts of the drainage basin below the dam would result in a total inflow from the Omo River during filling of:

$7.32 \times 10^9 \text{ m}^3/\text{yr}$.

Over the first five years, this would lead to a loss of about 53.5 km³ of water from the lake, corresponding to a drop of about **7 meters**. This should be considered to be a conservative estimate: an alternative estimate, based on other available data, is **10 meters**.

Using bathymetric data for Lake Turkana, it is possible to predict that the Omo Delta and the northern section of the lake will desiccate, and the shorelines would recede to almost the half-way point, southward along the lake.

Concentration of ions in the lake will increase from about 2330 to approximately 2800 mg/liter. The effect of this increased concentration on fish populations and on the usefulness of the lake for watering livestock, and for human consumption will need to be determined.

³² T. Cerling. "A mass-balance approach to basin sedimentation: constraints on the recent history of the Turkana basin." *Palaeogeography, Palaeoclimatology, Palaeoecology*, 54, p. 63-86 .1986

³³ Water from the Hamer range or the Omo Basin lowland is excluded because most of this water does not reach the Omo River; instead, it evaporates in floodbasins and seasonally inundated pans, and does not reach the lake. Its effect, therefore, is at best, minor.

³⁴ This estimate is also given by Butzer (1971) but it is distinctly higher than that given by Cerling (1986).

- Additional loss of flow into the lake may result evaporation of Omo channel waters that are reduced in volume, following impoundment, and from water withdrawals from the river for economic development projects, notably irrigation agriculture plantations.
- The loss of *seasonality* of river flow and input to Lake Turkana, in addition to the precipitous reduction in flow *volume*, would affect a wide range of biota dependent upon seasonal fluctuation in environmental conditions. In combination, flow volume reduction and elimination of seasonality may be predicted to have profound impacts on the ecological, economic and cultural features of the Turkana Basin. Empirical investigation regarding each of the following dimensions of potential change – in all probability, including a reduction in biological diversity and resource availability - is essential to an accurate environmental (and social) impact assessment.
 - Lake Turkana’s aquatic ecosystem would likely be affected by volume, seasonal rhythm *and* chemical changes caused by the proposed Gibe III project. Possible effects range from impacts on the blue-green algae /phytoplankton species that are uniquely characteristic of the lake, to significant impact on the fish populations present. A 1972-1975 fisheries survey provided much ecological information regarding the 48 species of fish recorded: of these 48 species, 12 are confined to the delta region of Omo River inflow. Particularly those species in the littoral (lake margin to about 4 meters depth) region are likely to be affected, and these include several species, including tilapia (*Oreochromis niloticus*) and catfish (*Clarias lazera*) that are important in local economies. As noted in earlier sections, subsistence fishing has become significant – sometimes essential – in the survival strategy systems of the region’s declining indigenous economies (this includes certain segments of the Turkana people, of Kenya). As in the Lake Victoria region of East Africa, conflict over reduced fisheries resources would likely emerge, and continue to escalate. Kenyan commercial fisheries, already subjected to strong fluctuation in recent years, would also likely be severely impacted.
 - A salinity increase in the lake is likely to severely affect the aquatic salinity of the lake, which is already barely potable. The possible changes in salinity are an important subject for empirical investigation.
 - The Omo Delta and northern shoreline area, for example, have long provided habitat for a unique abundance of hippopotamus and Nile crocodile, with extraordinary numbers of water birds. This entire area would be the first part of Lake Turkana to undergo major destruction of habitat and wildlife. Consequently, the unique floral and faunal systems of Lake Turkana would likely be threatened with major destruction. The lake is now internationally recognized, including as a World Heritage Site for its abundance of wildlife, as well as unique floral and faunal species – many of which are barely described or understood, from an ecological perspective.
 - Local economies dependent upon recession cultivation (primarily in the Delta, but also in certain shoreline localities), lakeside livestock grazing and watering at the lake, and fishing would all likely be significantly impacted by lake retreat and chemical changes (salinity increase, in particular). In turn the region’s livelihood systems – particularly those of the Turkana, Dasanech, Rendille and other groups in Kenya.

- Tourism at and around Land Turkana is likely to be severely impacted for many years, depending on the permanence of environmental change in the entire Basin. Although sport fishing and tourism have undergone wide fluctuations in recent years, their future development would likely be in serious question.

In view of Lake Turkana's unique character within Kenya and its relatively undisturbed character - when compared with much of the northern Kenya and broader East African region, the above combination of changes would most likely result in a serious decline in the region's biodiversity and its indigenous economies. It is possible that Lake Turkana will undergo massive drying out, should the planned Gibe III (and Gibe IV) hydroelectric projects be completed. When viewed within the context of possible climate change underway in this region of sub-Saharan Africa, the transformations outlined above may be profound, or even irrevocable, should the proposed Gibe III project be taken to completion.

SUMMARY

The following problems are a partial summary of the issues raised in the preceding pages of commentary. They are clearly interrelated problems, linking environmental, economic, sociocultural, human rights and political conflict dimensions of the predictable effects of the proposed Gibe III project, as it will affect not only Ethiopia, but also northwestern Kenya and southern Sudan.

- There is substantial evidence of seismic activity in the proposed Gibe III dam/reservoir area, so that the occurrence of a major seismic event is a distinct possibility. The result of such an occurrence would be catastrophic. Earth swelling and accumulation of sediment in the proposed reservoir, presents another potential catastrophe - a landslide comparable to that of Vaiont, Italy.
- Major biodiversity losses will be incurred in both riverine and 'upland plains' (or savanna) zones of the Lower Omo River Basin. The region is internationally recognized as having exceptional floral and faunal biodiversity, largely because of its unique situation as an 'ecotone' region with high speciation and unique ecological communities.
- The precipitous loss of Omo River downstream flow, conservatively estimated to be 60% below the proposed Gibe III dam and reservoir, would destroy hundreds of square kilometers of the Omo riparian forest and woodland: the Omo riparian forest is one of the last, if the *the* last, largely pristine riparian forests in semi-arid regions of Africa. The destruction would be irreversible.
- Malnutrition and poverty in the southernmost Omo River Basin would be increased as a result of the proposed Gibe III project. The virtual collapse of agropastoral economies throughout the region, for example, would result from the cessation of most recessional (flood) cultivation along the Omo River and in the Omo Delta. Riverine resources are critical to the region's herding economy and to subsidiary forms of production (e.g., food gathering) that have provided 'stop-gap' measures during times of hardship. Subsistence fishing in the Omo River, increasingly a critical means of survival as poverty conditions have worsened in recent decades, would be largely eliminated.
- The above processes will irrevocably undermine the capacity of the most of the region's 200,000 indigenous peoples to *adapt* to their radically altered conditions, leaving them even more susceptible to prolonged drought, climate change and other hazards. Full-scale economic collapse is likely to occur for a large proportion of this population, arguably the most marginalized peoples of Ethiopia,

rendering them fully ‘aid-dependent’. (This process would be worsened by recently proposed economic development projects in the region, notably including large export-oriented biofuel plantations along the proposed ‘regulated’ Omo River.)

- The environmental and socioeconomic destruction noted would produce transboundary changes that are likely of equal significance. Kenya’s Lake Turkana would drop in level between 7 and 10 meters. The northern end of the lake and the Omo Delta would desiccate, leading to massive loss of wildlife habitat, settlement and economic activity throughout the delta and along the lake’s northern shoreline. The fisheries of Lake Turkana would be severely affected, with spiraling conflict over reduced fishery and other resources. Tourism and other commercial activities would also be impacted negatively.
- Indigenous economies dependent upon the lake, including those in Ethiopia and throughout much of northwestern Kenya, will be seriously affected: The Ilemi Triangle, largely in Sudan but remaining a contested area among Ethiopia, Sudan and Kenya, would also be severely impacted by new population pressures upon this politically fragile area. This region is one of strong potential political and military conflict among ethnic groups in Sudan, Kenya and Ethiopia.
- These projected changes in southwestern Ethiopia and northwestern Kenya will likely provoke strong local protest by local ethnic groups over dispossession and loss of livelihood. Current political conditions within Ethiopia strongly suggest that any popular protest is likely to be met with repressive measures and human rights violations.
- All of the forms of environmental and social destruction outlined in the sections above point to the likelihood of the eruption of widespread regional violence.

The EIA prepared by the Gibe III developers (EEPCo and Salini) presents a fundamentally flawed formulation and analysis of the potential environmental and social impacts of the project. The fact that the proposed Gibe III project would be imposed upon an area of pervasive malnutrition and environmental deterioration underscores the egregious nature of *externalizing* all concerns of indigenous economy and environmental integrity.

There is an urgency to consider the unviability of the ‘trade-off’ between energy development for the purpose of generating foreign exchange (from approximately half of the power generated), on the one hand, and the destruction - inadvertent or not - of the economic systems of the indigenous population of 200,000 in the southern Omo Basin, as well as the priceless natural heritage of Ethiopia and Kenya, on the other.

Despite the construction of the Gibe III already underway, there are still alternative forms of energy development that should be considered. An energy development on the Omo River that avoids the unacceptable trade-off identified above, for example, could lead to a formulation of a program of small dams, with fundamental attention to the maintenance of maximal river flow (and seasonality of that flow). There is precedence for this approach, with evidence of success from the standpoint of serving the needs of national energy demand. This type of approach to energy development could be

complemented by the development of alternative energy sources. There is no consideration of alternatives to the proposed Gibe III in the 2006 EIA whatsoever.

The institutional realities of the Ethiopian political system are such that none of the key issues identified in this commentary are acknowledged, let alone given substantive consideration in the 2006 EIA. Equally unacceptable is the fact that the Gibe III project has already been underway without cognizance of this breach of responsibility, and in fact, without a process of EIA (let alone *adequate* EIA) review at all.

It may well be that candor between critics and supporters of the proposed project would reveal the following: A *truly thorough EIA* – one accurately portraying the nature and status of the region’s indigenous economies and environmental conditions - would reveal that the size, design and inevitable effects of the Gibe III project would be disastrous for the region’s indigenous population and environmental integrity, for Kenya’s economy, and for the region’s political stability. Such an EIA would also reveal that no amount of agency *monitoring*, or ‘*voting*’ by an indigenous population utterly unaware of the true consequences of the development, would render the project viable.