

Environmental Management Plan

for the

Mitigation of Environmental Impacts

of the

The Lake Chad Basin Commission (LCBC) Project

entitled

***Reversal of Land and Water Degradation Trends in the Lake
Chad Basin***

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the World Bank

Africa Safeguards Policy Enhancement Team

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Environmental Management Plan

Introduction

The objective of the Lake Chad Basin Commission (LCBC) Project is to focus on the "Reversal of Land and Water Degradation Trends in the Lake Chad Basin". The main environmental problem in the basin countries is the degradation of the natural resource base caused by decades long decreases in the rainfall regime combined with unsustainable land and resource use systems. Inhabitants of the Lake Chad Basin need to adapt their production systems to remain sustainable within the constraints of climatic fluctuations. Two main causes of land and water degradation are: (i) growth of non-sustainable rain-fed agricultural systems that leave soils eroded and depleted or only sustain crop production at very low levels of productivity and (ii) the open access, natural resource use systems that prevails on the vast majority non-agricultural lands. Open access and sustainable management are incompatible. Opportunities for rapid progress in the development of sustainable natural resource systems are probably greater than that for the development of productive, sustainable rain-fed agricultural systems.

The two principal outputs of the project are (1) The Transboundary Diagnostic Analysis (TDA) and (2) The Strategic Action Program (SAP) for the sustainable management of resources in the Chad Basin among the five member countries.

Role of the Pilots in Support of the SAP

One component of the LCBC project is split into six pilot initiatives located in the five LCBC member countries: 1. Waza-Logone Floodplains (northern Cameroon); 2. Komadougou-Yobe Integrated Wetlands (northern Nigeria); 3. Transboundary Desertification Control (Niger and Chad); 4. Lake Chad Shorelines pilot (Cameroon, Chad, Niger and Nigeria); 5. Lake Fitri pilot (Chad); and, 6. Upper Chari Basin Transboundary Project (Central African Republic and Chad).

The present level of development of natural resource management (NRM) systems in the Lake Chad Basin is very low. A principal role of the pilot projects should be the small scale development, testing and adoption of sustainable natural resource management systems on a to identify those that are best suited for large scale application in the SAP. Proven and promising sustainable NRM systems will be critical to the SAP.

Overview of the Environment Management Plan

This Environmental Management Plan (EMP) consists of a set of mitigation, monitoring and institutional measures to be taken during implementation and operation to eliminate adverse environmental impacts of the LCBC project, offset them or reduce them to acceptable levels. This plan also includes the actions needed to implement these measures. The EMP (a) identifies the set of responses to potentially adverse impacts; (b) determines requirements for ensuring that those responses are made effectively and in a timely manner, and (c) describes the means for meeting those requirements.

This EMP only addresses the biophysical impacts of the proposed project e.g. deforestation. The mitigation plans in relation to social impacts e.g. loss of access to resource and / or displacement of populations are addressed in the Process Framework and Resettlement Framework respectively.

Dam Safety

Although the project does not plan to construct dams, the safety of dams (OP 4.37) does enter into the project because the project will rely on the performance of existing dams, and failure of dams upstream to project activities and structures is relevant. Bank procedure therefore requires that independent dam safety specialists inspect and evaluate the safety status of the existing dams, review and evaluate the owner's operation and maintenance procedures and provide a written report of findings. Reviews for the three dams involved in the project (Maga, Tiga and Challawa) were completed by a dam safety expert recruited by the Bank.

There is no direct risk of failure of Maga dam, which is a 30km long earthen structure. However, there is a need to implement management activities to make the operation of the dam safe (water level not to exceed a certain height). The dam is threatened by erosion, wave action, overtopping and seepage. The most viable option for improving the dam is modification to the left abutment spillway. An emergency preparedness plan should also be put in place as soon as possible. The plan should then be updated in accordance with the solution that will be implemented. If the dam fails, several thousand people are at immediate risk to their lives, and approximately 20,000 are at risk of being flooded.

At Tiga the probability of failure is considered high for this 8km zoned earthfill embankment. An emergency preparedness plan should also be put in place as soon as possible. The number of people at risk at Tiga is in the tens of thousands. The main threat is from "piping" (water creating channels through the dam).

At Challawa the probability of failure is considered several orders of magnitude lower than Tiga. The dam is a new 6km zoned earthfill embankment. An emergency preparedness plan should be put in place as soon as possible. The number of people at risk of dam failure is in the tens of thousands. The report states that more information is required to fully appraise the Challawa dam, however the risks appear lower than at Tiga.

The reports concerning the three dams show that the danger of dam bursts is not immediate and that therefore it will not be necessary to prepare resettlement plans as a requirement for proceeding with project preparation. The report does however give recommendations that management actions (e.g. lowering water level in the dam to reduce risk of overflow / failure) be carried out. It is imperative that the management authorities for each dam carry out these recommendations, as put forward in the dam safety report. Furthermore, emergency evacuation plans should be prepared in addition to other actions such as installation of formal warning systems, which are absent at Tiga and Challawa Gorge.

1. Waza-Logone Pilot

Introduction

The project will include continued but increased allocation of water to the floodplain from Maga dam, rehabilitation/creation of a wildlife pond in Waza National Park in an upland forest area, cleaning/enlarging of a channel connecting two streams on the floodplain and developing management plans.

The project area covers 8,000 km², roughly half of which is the Waza Logone floodplain. The area includes both the Waza and Kalamaloue National Parks. The floodplains are highly productive, providing breeding grounds for fish, dry season pastures that support cattle and fertile land for arable crops and forestry products. Over 100,000 people earn all or part of their livelihoods from the floodplains. The area has been degraded because of the construction of the 30km earthen Maga dam and a 20km dike along the edge of the Logone. These structures significantly reduced the flooding of the Waza-Logone floodplain, causing social and environmental problems. The Waza Logone Project was established in 1988 to promote the integrated management of the floodplain. Breaks in the dike were created to increase flooding and restore the ecology on the upper floodplain. The total "average" flooded area has been increased by some 200 km², with very significant local impacts.

Evaluation of Potential Impacts

Activities with potential impacts are:

- Activity: Increased releases of water to the floodplain from Maga Dam;

Impacts:

- Significant benefits to communities in the south and other parts of the floodplain, and to the ecological integrity of Waza National Park.
- Positive environmental and socio-economic impacts.

As these impacts are positive, no mitigation measures are required.

- Activity: Rehabilitation/creation of a wildlife pond in Waza NP

Impacts:

- The principal environmental impacts of this activity would be on the wildlife and on the natural habitats in the Waza NP.
- When wildlife is concentrated around a few dry season water points, they can have marked impacts on the habitats around the water points. The short-term environmental impact of the new pond in Waza NP will be to reduce grazing/browsing pressure around other existing water points and to increase localised grazing/browsing pressure around the new water point.
- If the limiting factor on wildlife populations is the availability of dry season water, then increasing the availability of dry season water may lead to higher wildlife populations in the park. One could easily envisage a scenario whereby one increases the number of dry-season water ponds to the point where water is no longer the limiting factor – where the availability of browse and pasture becomes the limiting factor. Providing too many dry season water points could easily lead to overgrazing / overbrowsing and degradation of the natural habitats of the park. This is almost certainly not a significant risk for the single pond to be funded under this project.
- Changes in vegetation structure around the water point
- Reduce conflict between wildlife and communities at watering sites outside the park.

Most impacts here will be positive or insignificant; however, mitigation measures for the negative impacts are tabulated below.

- Activity: Cleaning/enlarging of a channel connecting two streams on the floodplain

Impacts: It is not entirely clear that this will have the expected impacts or how large the impacts will be.

- The extra water flow will compensate for the decreased wet season flow in the Mayo Vrick, and the flooded area would be expected to increase in this part of the floodplain.
- A number of families/communities, who had moved into the lower parts of the floodplain following decreased flooding, can be expected to move back to their original settlement sites on higher ground within the floodplain. It is clear that the benefits of restored / enhanced flooding are understood and welcomed by the communities. The Resettlement Framework addressing this issue is applicable in this case.

Many activities in this component do not have direct impacts as they are not outputs achievable during the project period (e.g. *An equitable and sustainable allocation and distribution of the sub-basin's water resources*" is unlikely to be achieved during the project life). As such, they are not included in the impacts.

Mitigation

Mitigation measures

| Activity | Impact | Mitigation | Entity responsible for mitigation | Entity responsible for monitoring / surveillance | Performance indicators |
|--|--|---|-----------------------------------|--|---|
| Rehabilitation/creation of a wildlife pond in Waza NP | Increased localized grazing / browsing pressure around the new water point | Spread water points over greater area / limit grazing pressure / increase amount of browse material | LCBC / PSR / PMU | LCBC | Reduction of grazing pressure. Quality of graze / browse material |
| Rehabilitation/creation of a wildlife pond in Waza NP | Changes in vegetation structure around the water point | Maintain an area of upland forest with no water points, as an example of unmodified habitat. | LCBC / PSR / PMU | LCBC | Example of unmodified habitat in upland forest maintained |
| Rehabilitation/creation of a wildlife pond in Waza NP | Overgrazing as a result of water no longer being the limiting factor | None required as impact is insignificant | LCBC / PSR / PMU | LCBC | Signs of overgrazing. |
| Cleaning/enlarging of a channel connecting two streams on the floodplain | Families / communities having to move | Prepare a resettlement plan | LCBC / PSR / PMU | LCBC | Resettlement plan completed, acceptable to |

| | | | | | |
|--|--|--|--|--|---|
| | | | | | World Bank standards. Families / communities moved and compensated. |
|--|--|--|--|--|---|

Dam Safety

It has been strongly speculated in the EA/SA that the Maga Dam is not a safe structure, however the recent report of a dam specialist seems to indicate otherwise. The threat of danger of the dam needs to be qualified by the Bank before further commitments are made to this particular pilot. The only immediate mitigating factor that should be executed is an emergency evacuation plan for the potentially affected areas. The project should provide regular reports on the process of resolving the issues of safety and water release from Maga dam if the Bank chooses to proceed.

Monitoring

The LCBC via the Project Management Unit (PMU) and Project Steering Committee (PSC) will have overall responsibility for the activities of the pilot demonstration activities, specifically coordination responsibilities such as monitoring and evaluation.

Hydrological Studies: Monitoring and Evaluation is seen as a key pilot project component and is a stated objective of the project – “*To develop and implement an effective ecosystem, hydrology, and socio-economic monitoring and evaluation system.*” There appears to be considerable overlap in some of the proposed hydrological studies that are included in the main project and in some of the pilot projects. This potential duplication of effort and potential waste of resources should be investigated.

Project Impacts as well as Lessons Learned: to evaluate social or environmental impacts that are the result of direct or indirect project actions; and to provide a wider evaluation of pilot project performance and impacts to feed in to the development of the SAP, indicating replicability to other parts of the basin. The project has been carrying out detailed monitoring studies in the floodplains for over ten years. The results of this research/monitoring exercise have demonstrated the considerable social and economic value of wetlands and have been used to guide local, national and regional policy development. The systems they have established are now well tried and understood by local staff. This is particularly true of the socio-economic monitoring. However, there are some doubts about the capacity of parks staff to effectively monitor biological parameters within the park, let alone in the surrounding flood plains. It is therefore recommended that alternative options be identified for this activity. Having said this, it is recommended that monitoring in the park specifically address ecological changes in both the areas adjacent to the new or rehabilitated water holes, and in the upland forest areas that are left without dry season water. This needs to be done to determine the ecological impact of the new water point that will be opened with the pilot.

Capacity Development and Training

The pilot project was developed out of previous project proposals and as part of this exercise included discussions with many of the key ministries and agencies that will be involved in project management. At the national level discussions were held with the Ministry of Agriculture and the Ministry of Water and Fisheries in Yaounde and with the National GEF Focal Point, Yaounde. Discussions were also held with IUCN at Waza Logone and with IUCN, WWF and Birdlife International in Yaounde. Some staff members of LCBC were also included in the consultation process.

Although it was not possible to hold discussions with any of the communities within the flood plain, the previous project held extensive consultations with flood plain communities on the restoration of flooding to the upper part of the floodplain, and obtained written consent for their actions from individual households.

Implementation Schedule and Cost Estimates

Budget

| Activities | Year 1 | Year 2 | Year 3 | Total US \$ |
|---|----------------|----------------|----------------|----------------------|
| Spread water points over greater area / limit grazing pressure / increase amount of browse material | \$1,000 | \$500 | \$500 | \$2,000 |
| Maintain an area of upland forest with no water points, as an example of unmodified habitat. | \$500 | \$500 | \$500 | \$1,500 (monitoring) |
| Prepare a resettlement plan of families having to move from channel clearing area | \$4,000 | \$0 | \$0 | \$4,000 |
| TOTAL | \$5,500 | \$1,000 | \$1,000 | \$7,500 |

2. Komadougou-Yobe Pilot – Integrated Wetlands Management

Introduction

The pilot will include clearing blockages on floodplain channels to facilitate flow to floodplains, reducing water consumption and developing systems of negotiated access to common property resources to reduce land/water resource use in the wetlands. This pilot project is a continuation of the existing Hadejia-Nguru Wetlands Conservation Project (HNWCP), which has been working in northern Nigeria since 1987. The Komadougou-Yobe River forms the boundary between Niger and Nigeria before flowing into Lake Chad. The river basin covers an area of 150,000 km², and is the only perennial river system flowing into the northern pool of lake Chad. Following the construction of a number of dams, the flow is now less than 1% of the total input to the lake. The main flow into the river system is from the Hadejia and Jama'are tributaries, which flow into an extensive floodplain (the Hadejia-Nguru Wetlands). The floodplain provides a wide range of resources including agricultural soils, grazing, non-timber forest products, firewood and fisheries. In addition, the wetlands are a unique migratory habitat for many birds, and are a designated Ramsar site. However, the floodplain has come under increasing pressure from drought and upstream water developments. The extent of flooding has declined from 300,000 ha to 100,000 ha, there are signs of increasing salinity in the Hadejia River and there is a threat from the development of agriculture. To date, the project has carried out research on land use, fisheries, grazing pressure, hydrology and bird habitats.

The pilot project proposal aims to extend the work of the HNWCP. The overall objective of the pilot is stated as:

The long-term sustainability and wise use of the wetlands of the Komadougou-Yobe Basin as a means of establishing working methodologies for the integrated management of trans-boundary aquatic ecosystems.

Evaluation of Potential Impacts

The project has one activity that will have a direct impact:

- **Activity:** Clear blockages on floodplain channels to facilitate flows to downstream locations and floodplains.
- Impact:** This activity will have complex impacts that need to be studied case-by-case.
 - river downstream from the point where the canal is constructed or cleared will be deprived of flow
 - area to which the flood is directed will receive increased flooding
 - change in ecosystem function
 -

The other activities are all indirect, with the project "catalyzing" other agencies to take actions to restore a managed flooding cycle that will emulate the natural flooding cycle. The following activities are related to either releasing increased flows from upstream dams, or reducing upstream water demand:

- Action Promote upgrading of existing water management plan for the basin, including catering for rainy season releases.
Impacts:
 - Increased flooding in downstream wetlands
 - Macroeconomic impact of not developing irrigation schemes
- Action: Catalyze redesign of an efficient water intake structure for Kano City Water Supply.
Impacts: are unknown
- Action: Catalyze replacement of gravity irrigation with drip and sprinkler irrigation in large irrigation schemes.
Impacts:
 - Risk of salinization of soils using irrigation systems that are more water-efficient

Within the wetlands areas, the project is proposing to reduce water consumption and develop systems of negotiated access to common property resources to reduce land/water resources in the wetlands.

- Action: Promote residual moisture cultivation and the conjunctive use of surface and ground water in crop production.
Impact: no significant negative environmental impacts
- Action: Promote communal ownership of fisheries.
Impacts:
 - Positive environmental impacts
 - Unknown social impacts
- Action: Promote review of land tenure law for equity.
Impacts: No significant negative social impacts

The project also has specific conservation/protection objectives, linked to the second objective, "*Promote the sustainable use of the biological resources...*":

- Action: Identify critical wetlands for conservation; assist in developing and implementing management plans for critical wetlands. Catalyze designation of additional Ramsar Sites.
Impact
 - Positive environmental impacts
 - Increased pressure on floodplain resources away from these protected areas
 - Changed access to the resource through protected areas
- Activity: Assist to conserve both *in situ* and *ex situ* threatened cultivars
Impacts unknown

Many of the outputs would better be described as long-term development objectives, as they are not an output achievable during the project period e.g. "*Hydrological rhythm of the downstream component of the KYB restored*". Social impacts e.g. loss of access to resource under Ramsar designation of wetland sites are addressed in the Process Framework and Resettlement Framework (see separate documents).

Mitigation

This table refers to the mitigation measures for potential negative impacts of the Pilot, and their monitoring. It does not refer to the broader monitoring activities (e.g. hydrological monitoring) that are the objectives of the project.

| Activity | Impact | Mitigation | Entity responsible for mitigation | Entity responsible for monitoring / surveillance | Performance Indicator |
|-------------------------------|---|-------------------------|-----------------------------------|--|------------------------------|
| Clear blockages on floodplain | Reduced flow in river downstream from the | Monitor unknown effects | LCBC / PMU / PSR with aid of | LCBC | The extent to which physical |

| | | | | | |
|---|--|--|--------------------------------|------|--|
| channels to facilitate flows to downstream locations and floodplains | point where the canal is constructed or cleared. | | NGOs | | measures to redistribute floodplain waters actually do redistribute the waters. Water flow. Areas of flooding affected. The environmental and social impacts of these redistributions |
| Clear blockages on floodplain channels to facilitate flows to downstream locations and floodplains | Increased flow to area to which the flood is directed | Monitor unknown effects | Consultant engineer | LCBC | Area of increased inundation. Water flow. Environmental and social impacts of these redistributions |
| Clear blockages on floodplain channels to facilitate flows to downstream locations and floodplains | Change in ecosystem function | Monitor changes (positive / negative). If changes negative, apply corrective actions. | NGO / environmental consultant | LCBC | Ecological indicators: number of species, population of species, vigour of individuals. |
| Promote upgrading of existing water management plan for the basin, including catering for rainy season releases | Increased flooding in downstream wetlands | Identify all stakeholders and involve them in planning. Get approval from those who will receive more, and those who will receive less water. | Consultant engineer | LCBC | The environmental and social impacts of increased releases of water from upstream dams |
| Promote upgrading of existing water management plan for the basin, including catering for rainy season releases | Macroeconomic impact of not developing irrigation schemes | Audit impacts. If macroeconomic impacts prove negative, use corrective actions | Economist / LCBC | LCBC | Budget / cash flow / profitability / employment levels of irrigation schemes / natural ecosystems |
| Catalyse redesign of an efficient water intake structure for Kano City Water Supply | Unknown impacts | Study potentially negative impacts | LCBC / PSR / PMU | LCBC | Unknown |
| Catalyze replacement of gravity irrigation with drip and sprinkler irrigation in large irrigation schemes | Risk of salinization of soils using irrigation systems that are more water-efficient | | Environmental consultant | LCBC | Salinity of soils |
| Promote communal ownership of fisheries | Unknown social impacts | Ensure establishment or re-establishment of fisheries management system based on biology and ecology of fisheries resource, especially if sound traditional systems exist. | LCBC / PMU / PSR | LCBC | The impacts of community ownership of fisheries on the fisheries resources and on the equitability of the distribution of costs and benefits of the new use / management systems that will be put in place |

| | | | | | |
|---|--|--|---------------------------------|------|---|
| Identify critical wetlands for conservation; assist in developing and implementing management plans for critical wetlands | Increased pressure on floodplain resources away from these protected areas | Identify wetlands for conservation in consultation with local population. Compensate population on resource foregone (e.g. fisheries). Supply other source of wetland resource from sustainable source e.g. firewood, reeds, thatch. | LCBC / environmental consultant | LCBC | Pressure on floodplain in impacted areas (level of grazing, soil erosion) |
| Identify critical wetlands for conservation; assist in developing and implementing management plans for critical wetlands | Changed access to the resource through protected areas | Establish a process of participatory project design and conflict resolution. Identify and document all stakeholders who have traditional tenure or use rights over the area. Negotiate specific mitigating measures with all of these parties. Coordinate with DFID. | LCBC / environmental consultant | LCBC | Socio-economic impacts on stakeholders whose tenure / access rights have been diminished. The environmental and social impacts of negotiated changes to land tenure and resource access rights. |
| Assist to conserve threatened cultivars both <i>in situ</i> and <i>ex situ</i> | Impacts unknown | Study the impacts of conservation of threatened cultivars <i>in situ</i> and <i>ex situ</i> e.g. accidental escapes of cultivars into non-native territory | LCBC / environmental consultant | LCBC | Unknown |

Monitoring

The project includes specific monitoring and research studies, which are not the same as the monitoring of mitigation activities above. The following components are included:

- Baseline surveys of hydrology, ecology and socio-economy of the wetlands.
- Hydrological monitoring.
- Ecological monitoring.
- Socio-economic monitoring.
- Evaluation of all project activities.

The hydrology studies are expected to monitor river flow, groundwater levels, flood extent and water quality. The output will be a hydrological yearbook for the basin. The project also proposes to carry out topographic surveys of river channels, of the exposed floors of the northern pool of Lake Chad and a bathymetric survey of the northern pool of Lake Chad. It will carry out an inventory of the biodiversity and biological resources of key wetlands and develop systems to monitor ecosystem conditions.

The project expects to continue to undertake surveys of baseline socio-economic conditions in and around key wetlands and to monitor changes in socio-economic conditions and the uptake of “wise uses options”. It will evaluate water resources activities, uses, and demands throughout the basin and compare these with water availability. With this information the project will refine the Hadejia-Nguru Wetlands Conservation Project (HNWP) report and extend it to the whole of the Komadougou-Yobe basin.

Implementation Schedule and Cost Estimates

Budget

| Activities | Year 1 | Year 2 | Year 3 | Total US \$ |
|---|--|---|--|---|
| Monitor unknown effects of blockages on floodplain channels to facilitate flows to downstream locations and floodplains. | \$0 | \$0 | \$0 | No additional cost to Komodougou Yobe - M&E system in place |
| Stakeholder identification and approval for water allocation for water planning. Promote upgrading of existing water management plan for the basin, including catering for rainy season releases | Definition of project process – extra funding for documentation of traditional tenancy systems, compensation for resources losses -- \$4,000 | Definition of project process -- monitoring \$1,000 | Definition of project process – monitoring \$1,000 | \$6,000 |
| Establish a process of participatory project design and conflict resolution. Identify and document all stakeholders who have traditional tenure or use rights over area. Negotiate specific mitigating measures with all parties. Coordinate with DFID. | | | | |
| Identify wetlands for conservation in consultation with local population. Compensate population on resource foregone (e.g. fisheries). Supply other source of wetland resource from sustainable source e.g. firewood, reeds, thatch | | | | |
| Study the impacts of conservation of threatened cultivars <i>in situ</i> and <i>ex situ</i> e.g. accidental escapes of cultivars into non-native territory | \$4,000 | \$500 | \$500 | \$5,000 |
| Ensure establishment or re-establishment of fisheries management system based on biology and ecology of fisheries resource, especially if sound traditional systems exist. | | | | |
| Study potentially negative impacts of redesign for an efficient water intake structure for Kano Water Supply | \$4,000 | \$500 – monitoring | \$500 -- monitoring | \$5,000 |
| TOTAL | \$12,000 | 3,000 | 3,000 | \$16,000 |

Capacity Development and Training

Under "Protected areas and conservation", the project is going to identify critical conservation areas, and assist in developing management plans for these areas, one of which they expect to be designated as a Ramsar site. The implicit assumption is that these conservation areas will be effectively protected areas, and that land use that support the primary purpose of biodiversity conservation is allowed. The emphasis is on training staff from line institutions in "community liaising", community based development and integrated resources management.

3. Niger-Chad Transboundary Desertification Control Pilot**Introduction**

The project proposes to work in the areas of sand dune fixation, range management, water point development and agricultural improvements on upland, rain fed sites. This pilot project will address land / resource degradation and desertification in the area to the north and east of Lake Chad in Niger and Chad. This area is the largest "drainage" area in the basin. However, there is virtually no surface flow from this area into the lake. Moving sands and recent "ergs" cover the majority of the area. Wind erosion is a normal phenomenon, and is exacerbated by poor land use practices. Overgrazing and cultivation have resulted in the loss of the vegetation that held the dunes in place. The activities that have direct and significant environmental and/or social impacts are dune stabilization and range management with associated water point development. Range management would involve radical changes to access

to range resources – this could potentially affect indigenous transhumant pastoral groups. The project should be guided by OP/BP 4.12 on the need for participatory processes in drawing up the plans for managing access rights. This specifically includes the need to take account of the needs of vulnerable groups and especially those below the poverty line, the landless, the elderly, women and children, and ethnic minorities.

Under sand dune fixation, dunes that pose immediate threats to important infrastructure or valuable lands will be selected. They will be fixed using a combination of physical and biological techniques. The physical techniques will require large amounts of plant materials to construct a checkerboard-like pattern of fences or barriers across the dunes to be stabilized. These structures are intended to minimize sand movement long enough for biological controls to be put in place. The biological dune fixation measures consist of planting perennial trees and shrubs. If the areas treated are very small, then the impacts will be relatively insignificant. If the project addresses the fundamental reasons that cause stable dunes to become live, the impacts could be very significant.

Evaluation of Potential Impacts

- Activities with significant impacts - Dune stabilization.

Negative impacts:

- Harvesting of large volumes of suitable plant material could degrade sites from where they are harvested
- Risks posed by introduction of invasive species
- Restrictions on the right to practice rain-fed agriculture on fragile, high-risk sites
- Prohibiting open access grazing on live dunes and on sites at risk of becoming live
- Degradation of stabilized areas after project implementation

Positive Impacts:

- Protection of high-value infrastructure
- Restore productivity of areas that had lost most of their productivity
- Demonstrating that desertification can be reversed
- Range management with associated water point and information system development.

Negative environmental impact:

- Increase in vegetation cover could lead to an increase in evapotranspiration

Positive environmental impacts:

- Increased soil cover and increased biomass production
- Increased diversity of herbaceous and woody species
- Greatly decreased wind erosion
- Decrease and/or reversal of dune activation
- Improved habitat for wildlife

Negative social impacts:

- Radical changes to access rights to range resource
- Risk that transhumant populations are left out of management planning
- Risk of conflict because of change in access right
- Risk to disadvantaged groups (e.g. women) of having to increase supervision of livestock under new "range management".

Positive social impacts are:

- Restored productivity and quality of pasture for livestock
- Increased production of secondary products from trees, shrubs, perennial grasses
- Increased food security
- Increased confidence of local people that they can positively influence their environment and their production systems

- Activities with insignificant impacts because of their small scale:

- Improvements in agriculture (develop water points for crops).
- Establishment of a credit scheme for minor local enterprises e.g. purchase of simple agricultural tools, drying equipment for algae, equipment for mining and treatment of natron (hydrated sodium carbonate – $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$).

Social impacts e.g. loss of access to resource under Ramsar designation of wetland sites are addressed in the Process Framework and Resettlement Framework (see separate documents).

Mitigation

The impacts of dune stabilization and range management can be avoided by integrating the mitigation measures and by expanding them to include "forest" management. Uncontrolled open access grazing is one of the leading causes of dune activation. Once dunes become partially or fully active, even low-intensity open access grazing effectively prevents grasses, shrubs and trees from regenerating. As part of the range management, severely degraded areas should be closed to grazing and most extractive activities (e.g. cutting wood and harvesting thatch) should be stopped until the sites recover. As they recover, more and more uses may be allowed as appropriate. Such an approach is the only way to achieve positive environmental impacts on a significant scale. In the Diffa Department, there are hundreds of square kilometers of live sand dunes that have become unstable in the last 30 years. They cannot possibly be treated with the techniques proposed in the project document. It is only through putting an end to open access and the development of management systems that one can hope to restabilize these dunes. By keeping livestock off the live dunes, more cost effective techniques of re-establishing vegetative cover can then be tested. A variety of direct seeding techniques could be used e.g. aerial seeding similar to that done by the government of Mauritania, where spectacular success in areas with as little as 50 mm average annual rainfall are reported.

Mitigation measures

This table refers to the mitigation measures for potential negative impacts of the Pilot, and their monitoring. It does not refer to the broader monitoring activities (e.g. hydrological monitoring) that are the objectives of the project.

| Activity | Impact | Mitigation | Entity responsible for mitigation | Entity responsible for monitoring / surveillance | Performance Indicators |
|---|--|--|--|---|---|
| Dune stabilisation | Harvesting of large volumes of plant material could degrade sites where they are harvested | Import plant material from sites where their harvest is sustainable. Study use of alternative plant materials. | LCBC | LCBC / PMU / PSR | Certification that imported plant material is ecologically sound |
| Dune stabilization | Risks posed by introduction of invasive species (<i>Prosopis</i>) | Study and propose alternative, native species if they exist, if necessary | LCBC / environmental consultant | LCBC / PMU / PSR | Report of alternative species containing alternative species |
| Dune stabilization | Restrictions on the right to practice rain-fed agriculture on fragile, high-risk sites | Increase awareness of necessity of restriction. Offer compensation on a per hectare basis. Launch alternative income activities. | NGOs / LCBC | LCBC / PMU / PSR | Level of awareness of population. Certification that adequate compensation received. Alternative income activities operational. |
| Dune stabilization | Prohibit open-access grazing on live dunes and on sites at risk of becoming live. | Increase awareness of necessity of prohibition. Suggest other livestock rearing methods e.g. tethered, fenced. Provide other sources of fodder. | LCBC | LCBC / PMU / PSR | Level of awareness of population. Alternative livestock rearing methods in place. Amount of fodder provided. |
| Dune stabilization | Degradation of stabilized areas after project implementation | Put institutions, incentives or systems in place for managing or protecting the dunes after stabilization. Create "water point user associations" to generate revenue. | LCBC | LCBC / PMU / PSR | Systems for stabilizing dunes in place. User associations in place and operational. |
| Range management and water point development. | Increase in vegetation cover could lead to an increase in evapotranspiration | Study species that do not increase evapotranspiration. Do not vegetate areas that were not "naturally" vegetated before they | Environmental consultant | LCBC / PMU / PSR | Report of study on plants likely to increase evapotranspiration. |

| | | | | | |
|---|---|--|------------------------|------------------|--|
| | | were degraded. | | | |
| Range management and water point development. | Radical changes to access rights to range resource. | Changes in access rights must be negotiated using participatory planning, stakeholder involvement and include minority and disadvantaged groups. Educate and increase awareness on need to change access rights. Use successful examples e.g. the Pilot Pastoral Project (PPP). Institute "rangeland user associations" and charge fees for use. | NGOs, World Bank, LCBC | LCBC / PMU / PSR | Changes in access rights negotiated. |
| Range management and water point development | Risk that transhumant populations are left out of management planning | Ensure that transhumant populations are consulted. | NGOs, LCBC | LCBC / PMU / PSR | Number of transhumants / % of transhumants included |
| Range management and water point development | Risk of conflict because of change in access right | Increase awareness and educate on need to change access rights. Ensure equitable redistribution of resource, in consultation with inhabitants. | NGOs, LCBC, PMU, PSR | LCBC / PMU / PSR | Number of conflicts developed. |
| Range management and water point development | Risk to disadvantaged groups (e.g. women) of having to increase supervision of livestock under new range management (ban on open access). | Increase awareness and educate on need to change access rights. Supply alternatives e.g. corrals, fences, alternative sources of fodder during new range management | NGOs, LCBC, PMU, PSR | LCBC / PMU / PSR | Survey with disadvantaged groups of time use and possibility of taking on extra work |

Monitoring

These monitoring activities are part of the overall objectives of the project, not monitoring of mitigation activities as above.

The project will implement a pasture monitoring and evaluation system for the whole of the project period. The system will be implemented with pastoralists and their representatives, to provide information on forage availability. However, this is only one of the proposed project activities and if the integrated approach recommended in this report is adopted, then this should be reflected in an integrated monitoring system covering controlled access to rangeland, regeneration of vegetation on dunes, and access to boreholes.

As a starting point, the project will need to document the process of negotiating and formally handing over rangeland access rights and responsibilities to communities.

The key impact of the proposed interventions should be improved vegetation cover. The approach should be to evaluate change in soil cover by vegetation, forage production, species composition and abundance. The World Bank Pilot Pastoral Project (PPP) has developed an effective monitoring system for these and other parameters – they should be consulted and the monitoring system developed should be compatible with the PPP if possible to facilitate comparison of impacts. Subjective evaluations by herders can be supported by simple transect surveys. The use of fixed point photography can contribute to a monitoring program over a number of years.

The project is also proposing to construct boreholes to supplement existing water supplies. The water depth and quality in these should be monitored over the season, along with the animal numbers using each water source.

Implementation Schedule and Cost Estimates

Budget

| Activities | Year 1 | Year 2 | Year 3 | Total US \$ |
|--|--|--------------------------------------|--------------------------------------|-----------------|
| Import plant material from sites where their harvest is sustainable. Study use of alternative plant materials. | Plant species specialist -- \$4,000 | Monitoring - - \$500 | Monitoring - - \$500 | \$5,000 |
| Study and propose alternative, native species if they exist, if necessary | | | | |
| Study species that do not increase evapotranspiration. Do not vegetate areas that were not "naturally" vegetated before they were degraded | | | | |
| Put institutions, incentives or systems in place for managing or protecting the dunes after stabilization. Create "water point user associations" to generate revenue. | Extra funding for compensation for resources losses -- \$6,000 | Monitoring \$1,000 | Monitoring \$1,000 | \$8,000 |
| Increase awareness of necessity of prohibition. Suggest other livestock rearing methods e.g. tethered, fenced. Provide other sources of fodder. | | | | |
| Increase awareness of necessity of restriction. Offer compensation on a per hectare basis. Launch alternative income activities. | | | | |
| Ensure that transhumant populations are consulted. | Part of project process -- \$0 | Monitoring – part of project process | Monitoring – part of project process | \$0 |
| Increase awareness and educate on need to change access rights. Ensure equitable redistribution of resource, in consultation with inhabitants. | | | | |
| Increase awareness and educate on need to change access rights. Supply alternatives e.g. corrals, fences, alternative sources of fodder during new range management | | | | |
| Changes in access rights must be negotiated using participatory planning, stakeholder involvement and include minority and disadvantaged groups. Educate and increase awareness on need to change access rights. Use successful examples e.g. the Pilot Pastoral Project (PPP). Institute "rangeland user associations" and charge fees for use. | | | | |
| TOTAL | \$10,000 | \$1,500 | \$1,500 | \$13,000 |

Capacity Development and Training

Capacity building components are not fully developed, but will be required when the participatory process of determining access rights to the rangeland will start. It is suggested that specialized NGOs and PPP / World Bank specialists be contacted in this task.

4. Lake Chad Shorelines Pilot

Introduction

The project will produce a management plan and monitoring scheme for Lake Chad and its shores according to RAMSAR guidelines. The project area is defined as the shoreline of Lake Chad and the lake itself, although this varies widely (3,000 km² to 25,000 km²). The hydrology of the lake is unique and not fully understood. The southern part of the lake is more like a delta than a conventional lake. The "northern pool" is like a shallow lake, but it only fills from overflow from the southern pool. This did not happen during the 80s and most of the 90s, and the northern pool remained dry, although it received waters again in the past few years. About 120 species of fish have been recorded in the lake. The importance of the lake and its wetlands for migratory birds makes it a site of global biodiversity importance. Cropping on the lakebed and recession agriculture have become important in the recent decades of drought. There are no traditional tenure systems for this and conflicts are common. Large numbers of livestock use the lakebed and the wetland margins in the dry seasons – conflicts are also common between herders and farmers.

In July 2000, the LCBC declared the entirety of Lake Chad a "*Transboundary RAMSAR site of International Importance*", however, as yet none of the countries have designated any specific sites around the lake as Ramsar sites.

Evaluation of Potential Impacts

The only direct activity proposed by the project that could have environmental and social impacts is minor funding for unspecified interventions:

- **Activity:** Provide seed funding for highest priority initiatives identified in the community action plans, within limits of current project resources.

Impacts:

- To be determined
- Risk of inhabitants of region becoming disillusioned if no action is taken

Designating Ramsar sites implies setting up a management plan in consultation with stakeholders, using the participatory method. The impacts will be known once the actions of the management plan are known. However, given the conflicts already in existence in the basin (from the absence of land tenure systems on the lake bed) the management plan will have to address this as a necessary condition.

- **Activity:** Designation of Ramsar sites

Impacts:

- depends on Ramsar management plan according to "wise use"
- risk of inhabitants of region becoming disillusioned if no action is taken

- **Activity:** Carry out management planning exercise for four to six communities around Lake Chad. Development and implementation of community-based natural resource-use action plans.

Impacts:

- restricted access to certain resources or resource areas
- risk of inhabitants of region becoming disillusioned if no action is taken

Social impacts e.g. loss of access to resource under Ramsar designation of wetland sites are addressed in the Process Framework and Resettlement Framework (see separate documents).

Mitigation

This table refers to the mitigation measures for potential negative impacts of the Pilot, and their monitoring. It does not refer to the broader monitoring activities (e.g. hydrological monitoring) that are the objectives of the project.

| Activity | Impact | Mitigation | Entity responsible for mitigation | Entity responsible for monitoring / surveillance | Performance Indicators |
|--|--------------------------------------|---|--|---|--|
| Provide seed funding for highest priority initiatives identified in the community action plans, within limits of current project resources (unspecified) | Unknown (depends on activity funded) | Determine what actions to be funded | LCBC | LCBC | Actions to be funded known |
| Designation of Ramsar sites and development of corresponding management plan | Unknown (depends on management plan) | Designate sites and develop management plan | LCBC / environmental consultant | LCBC | Ramsar sites designated and management plan in place |
| Carry out management planning exercise | Restricted access to certain | Ensure participatory and consultative | LCBC / NGOs | LCBC | Survey stakeholders about degree of |

| | | | | | |
|---|--|--|------|------|---|
| for four to six communities around Lake Chad. Development and implementation of community-based natural resource-use action plans | resources or resource areas | process is utilised to arrive at decisions. | | | consultation employed |
| All activities | Risk of inhabitants of region becoming disillusioned if no action is taken | Be clear about possibilities of project. Make no false promises. | LCBC | LCBC | Survey stakeholders about expectations and promises |

Capacity Development and Training

Capacity building is not fully developed, but will be required when the participatory process of determining access rights to the shoreline of Lake Chad will start. It is suggested that specialized NGOs be contacted in this task.

Implementation Schedule and Cost Estimates

Budget

| Activities | Year 1 | Year 2 | Year 3 | Total US \$ |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Determine what actions to be funded | Within project scope -- \$0 |
| Designate sites and develop management plan | Sensitization role -- \$0 | \$0 | \$0 | \$0 |
| Be clear about possibilities of project. Make no false promises. | | | | |
| TOTAL | \$0 | \$0 | \$0 | \$0 |

5. Lake Fitri Pilot

Introduction

The activities of the pilot are to compile existing studies, to hold a seminar, to conduct new studies and dialogue with stakeholders, to formulate a management plan, approve the plan, and to establish a management platform. None of these would have any direct impacts. Lake Fitri is located 300 km north-east of N'Djamena. Like Lake Chad, it has no outlet and it is not salty. The project area is completely within Chad and has no transboundary component. The annual rainfall is around 3-400 mm and highly variable. The lake is fed by the Batha River that provides around 60% of the annual inflow, and during periods of low rainfall the lake can dry up. Following a series of waterfowl counts in the mid-1980s, attention was drawn to the biodiversity value of the lake and in 1987 the lake was declared a Ramsar site. The key global conservation importance is the very high populations of seasonal migratory birds and afro-tropical waterfowl. The lake environment also supports the endangered red-fronted gazelle (*Gazella rufifrons*) and there are reports of roan (*Hippotragus equinusa*) and tiang (*Damaliscus lunatus*) antelopes, as well as lion, in the wooded area south of the lake. This area also harbours a small elephant population. Two main groups use the lake: sedentary Bilala farming communities and transhumant Arab pastoralists. The rainfall of the area is marginal for agriculture, but rain fed agriculture continues to expand and conflicts between sedentary agriculturalists and transhumant herders have multiplied. Clearly there are already issues of access rights and conflicts between pastoralists and sedentary farmers and between different groups of pastoralists. The project proposes to develop management plans at various scales that will involve negotiation between different user groups, and advocacy to maintain the rights of minority groups.

Social impacts e.g. loss of access to resource under Ramsar designation of wetland sites and / or the displacement of populations are addressed in the Process Framework and Resettlement Framework (see separate documents).

Evaluation of Potential Impacts

The project has two minor unspecified activities that may have direct environmental and social impacts:

- Small-scale development activities; priority should be given to problems linked to ecological issues. These are likely to build on and link with activities promoted by the NGO SECADEV.

The impacts are:

- introduction of exotic species into the project area
- Small-scale conservation inputs (unidentified).

Possible impacts:

- unknown
- Compilation of existing studies, the holding of a "seminar", the conduct of new studies, dialogue with stakeholders, the formulation of a management plan, approval of the plan, and the establishment of a management platform, although this is not clearly defined.

Possible impacts:

- no direct impacts
- risk of inhabitants of region becoming disillusioned if no action is taken

Mitigation

This table refers to the mitigation measures for potential negative impacts of the Pilot, and their monitoring. It does not refer to the broader monitoring activities (e.g. hydrological monitoring) that are the objectives of the project.

| Activity | Impact | Mitigation | Entity responsible for mitigation | Entity responsible for monitoring / surveillance | Performance Indicators |
|------------------------------------|--|--|-----------------------------------|--|---|
| Small-scale development activities | Possible introduction of exotic species | Use of native species | Environmental consultant / NGO | LCBC / environmental NGO | Number of native / exotic species introduced |
| Small-scale conservation inputs | Unknown | Determine activities | LCBC | LCBC | List of activities |
| All activities | Risk of inhabitants becoming disillusioned if no action is taken | Be clear about possibilities of project. Make no false promises. | LCBC | LCBC | Survey stakeholders about expectations and promises |

Monitoring

Activities of this pilot are few, therefore monitoring is minimal. Both have to be developed.

Capacity Development and Training

Capacity building components are not fully developed, but will be required when the participatory process of determining access rights to the rangeland will start. It is suggested that specialized NGOs and environmental specialists be contacted. The Sultan of Yao, the traditional head of the sedentary Bilala people living around Lake Fitri, is arguably the most important individual stakeholder in this project. It is doubtful whether any project for Lake Fitri could be executed without his approval. Significantly the Sultan of Yao stressed the issue of outside organisations coming to the lake, carrying out studies and preparing reports and disappearing, leaving the communities with raised hopes but then no actions.

Implementation Schedule and Cost Estimates

Budget

| Activities | Year 1 | Year 2 | Year 3 | Total US \$ |
|------------|--------|--------|--------|-------------|
| | | | | |

| | | | | |
|--|---|---|---|--|
| Use of native species | Within project scope, except native species specialist -- \$3,000 for development | Within project scope -- \$500 for native species monitoring | Within project scope -- \$500 for native species monitoring | Within project scope -- \$2000 for native species monitoring |
| Determine activities | | | | |
| Be clear about possibilities of project. Make no false promises. | Sensitization role -- \$0 | \$0 | \$0 | \$0 |
| TOTAL | \$3,000 | \$500 | \$500 | \$4,000 |

6. Upper Chari Basin Pilot

Introduction

This pilot proposes a participatory planning approach to develop strategic and sustainable actions designed to reverse current resources degradation. Impacts will be beneficial, although a potential negative impact will be that people will eventually become disillusioned and uncooperative if nothing positive for them comes out of the process. Lake Chad receives the majority of its water from the Chari River system. The Chari pilot project site is defined loosely as the entire upper catchment of the Chari River, lying within the Central African Republic and Chad. The project will establish the basic data sets and monitoring systems that it will need for developing projects in the basin.

Evaluation of Potential Impacts

The project logical framework has eleven activities, none of which have any direct environmental or social impacts.

- risk of inhabitants of region becoming disillusioned if no action is taken

Mitigation

Mitigation measures

| Activity | Impact | Mitigation | Entity responsible for mitigation | Entity responsible for monitoring / surveillance | Performance Indicators |
|----------------|--|--|-----------------------------------|--|---|
| All activities | risk of inhabitants becoming disillusioned if no action is taken | Be clear about possibilities of project. Make no false promises. | LCBC | LCBC | Survey stakeholders about expectations and promises |

Monitoring

Activities of this pilot are few, therefore monitoring is minimal. Both have to be developed.

Capacity Development and Training

Capacity building components are fully developed, but will be required when the pilot is developed.

Implementation Schedule and Cost Estimates

Budget

| Activities | Year 1 | Year 2 | Year 3 | Total US \$ |
|--|-----------------------------|----------------------------|----------------------------|-------------|
| Be clear about possibilities of project. Make no false promises. | Within project scope -- \$0 | Within project scope - \$0 | Within project scope - \$0 | \$0 |
| TOTAL | \$0 | \$0 | \$0 | \$0 |

Integration of EMP with Project

There is very little management of natural resources in the Lake Chad Basin. The present natural resource use systems are characterised by *de facto* open access to resources i.e. no management. The following is a very

preliminary analysis of the present “State of the Art” for sustainable NRM in the Basin. The projects / programs below are resources that could be integrated into the project, as they are representative of the activities of the pilots:

- Range Management – The World Bank has funded the Pilot Pastoral Project (PPP) for four to five years in both Chad & Niger. Early results of the community-based management approach are very promising, but no one has yet attempted to replicate and adapt these pilots to new sites.
- Natural forest management – Harvest of wood products from natural forests is regulated by national forestry services through permit systems. This should not to be confused with management systems that ensure adequate regeneration of the resource harvested. Natural forests subject to such permit systems are undergoing severe degradation all across Africa. The Team was unable to identify any pilot natural forest management initiatives in the Basin. Burkina and Niger (outside of the Basin) are leaders in natural dry forest management in Africa – both countries have developed very successful community-based management approaches. Burkina has over 550,000ha under management.
- Fisheries management – There are very promising/successful, but isolated, examples of good fisheries management to build upon. The traditional system controlled by the Sultan of Yao at Lac Fitri in Chad seems to be an exceptionally successful case. There is a very successful example of community-based river fisheries management involving three villages on the upper reaches of the Chari River in Chad.
- Wildlife management – there are no ongoing pilot initiatives. The UNDP/GEF Manda project in southern Chad proposes to include a community-based wildlife management component.
- Wetlands management (for extractive uses of wetland resources) – None identified
- Groundwater management – None identified
- Watershed management – None identified
- Multiple use NRM / integrated NRM / environmental management – None identified. Most successful or promising examples of natural resources management across Africa remain limited to a single sector. There have been relatively few attempts to integrate management of multiple resources on the same site – such as managing the forest, range and wildlife resources on the same piece of dryland forest.

Once again the above analysis of the “state-of-the-art” for the Basin is very preliminary. The TDA will have to perform a much more complete inventory, but the level of development is probably not much more advanced than this preliminary analysis would indicate. The pilot projects should play a critical role in developing sustainable natural resource management systems that can effectively reverse the degradation of land and water resources in the Basin.