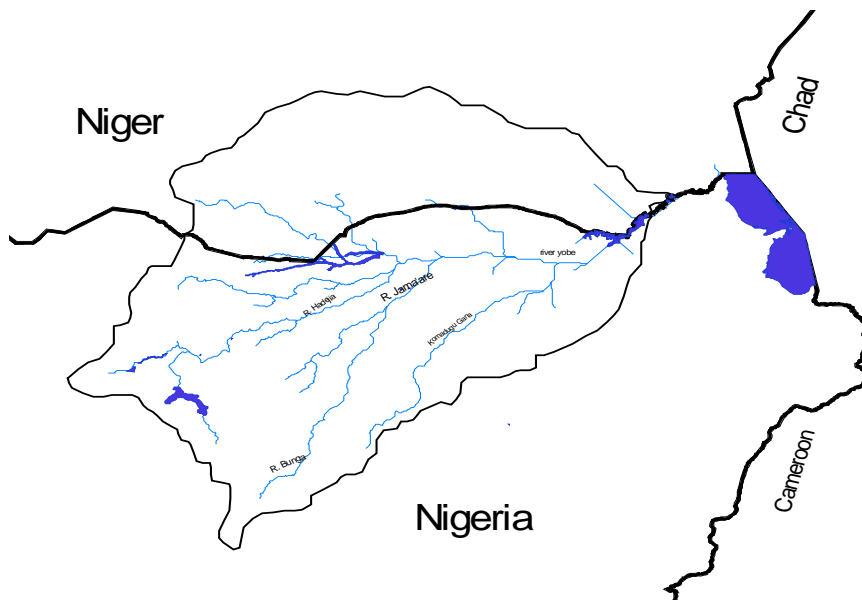




FMWR-IUCN-NCF KOMADUGU YOBE BASIN PROJECT 2006

CATCHMENT MANAGEMENT PLAN

for integrated natural resource management of
Komadugu Yobe Basin



Final Report



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Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Executive Summary

The objective of the Catchment Management Plan (CMP) for the integrated land and water resources management of the Komadugu Yobe Basin (KYB) is to propose an action plan, targeted at resolving identified water problems and challenges as well as instituting integrated natural resources management instruments in the region, to achieve equity of allocation, efficiency of use and overall sustainable development in the basin.

The KYB is a semi-arid to arid sub-catchment of Lake Chad Basin. It is drained by deteriorating Hadejia and Jama'are river sub-systems. In response to this deterioration of the KYB water situation and the community concern over its impact on their livelihood, the Hadejia-Jama'are-Komadugu-Yobe Basin Coordinating Committee (HJKYBCC) was formed in 1999 to coordinate and foster cooperation towards adaptive Integrated Water Resources Management (IWRM) across the basin in Nigeria. It directed that a water audit be prepared to assess water use in the basin, comment on the effects of the projected increase, and assess the livelihood and potential impact of further increases in the future.

HJKYBCC, through the Federal Ministry of Water Resources (FMWR) entered into a joint initiative with the West Africa Office of The World Conservation Union (IUCN-BRAO) and the Nigerian Conservation Foundation (NCF) to collaboratively implement the Komadugu Yobe Basin Project (KYBP). Among the KYBP components are Water Audit, Decision Support System (DSS) and Catchment Management Plan (CMP), aggregated and shortened as **KYBP Water Auditing**.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



This CMP document, prepared as part of the KYBP, was developed in a participatory manner, emerging from stakeholders' participation, utilizing the water management principles that were defined and articulated as part of the Regional Land and Water Resources and Development Planning Study commissioned by Federal Government of Nigeria from the Petroleum (Special) Trust Fund. Some of the recommended strategic actions/activities are already being implemented. The document, providing an overview of strategies for the integrated land and water resources management of the basin, is divided into seven parts including an Introduction and an Appendix of four annexes.

As much as possible, the CMP has tried to comply with relevant internationally accepted standards and guidelines for planning, development, monitoring and implementation of IWRM. These included (i) water auditing to assess: the water quantity and quality, environmental protection and conservation, prevention of land degradation, socio-economic and institutional framework with a view to achieving water balance in the basin; and (ii) developing a suitable DSS that will facilitate decision-making on equitable water allocation between riparian states, a dynamic tool designed to develop an integrated basin management programme for the KYB.

The CMP has two components and a total of nine strategies, each with several activities yielding different outputs. The strategic actions were identified by such stakeholders as the Federal, State and Local governments, private institutions, Non-Governmental Organisations (NGOs), Community-Based Organisations (CBOs) and resource users. The goal of these actions is to strengthen strategically important institutions and prepare them to effectively manage water resources in the basin in an integrated and sustainable manner. The CMP seeks to provide a

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



means of harnessing relevant water resources management instruments and fostering their incorporation into Millennium Development Goals (MDGs) and National Economic Empowerment and Development Strategy (NEEDS) policies, programmes and plans, while interacting with other natural resources management models.

The scope of the CMP and the process of preparing it have been limited by the lack of authentic National Water Resources Management Strategy and inadequacy of data and information. That notwithstanding, the draft National Water Policy was used to define strategic framework and guiding principles with accompanying institutional and human resources frameworks in which to establish an IWRM for the basin. Broad consultation with stakeholder has been essential in developing the plan.

The active watersheds supplying surface water to the basin and the Lake Chad are located in Plateau, Kano and Bauchi States, outside the limit of the conventional basin. Like the rest of Nigeria, KYB has had its share of population pressure, the adverse consequences of the droughts of the 1970s and 1980s and the effect of uncoordinated and fragmented water resources development activities on the natural resources of the basin. It is not exempted either from institutional conflicts. For example, two River Basin Development Authorities, instead of one, are responsible for water management in the catchment, principally covering the States of Kano, Jigawa, Bauchi, Yobe and Borno, with only one poorly financed HJKYBCC coordinating its water management.

The traditional farming system in the basin is predominantly fed by its scanty and seasonal rainfall and its deteriorating stream flows. There is therefore a need for an

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



integrated, equitable and coordinated approach to resource management within the framework of an overall national water management strategy. The strategy in the CMP presents: a vision of sustainability, a strategic policy framework for its management, and an action plan to achieve the vision.

Three lessons learned from this exercise are: (1) **access to data and information on land and water resources development are not sufficiently open**; (2) **research institutions and public policy managers are not interacting enough to facilitate free exchange of information and capacity-building for the stakeholders and key protagonists in the KYB**; and (3) **public participation generates tangible benefits, foster cooperation in the process of developing and implementing strategic actions**.

The key strategic development issues and challenges are: **water scarcity and the future development; socio-economics; ecology; physiographic and anthropogenic actions; and legal and institutional issues and challenges**.

This study presents the most recent estimates of available water resources in the basin. The figures indicate that serious water scarcity problems are likely to arise during drought periods where the water demands exceed the available resources in every sub-catchment. The drainage ratio in the basin lies between 0 and 1 and water availability for domestic supply is less than 50% of the WHO standard.

Potentials for upstream-downstream water-related conflicts between different user groups are looming large as natural physiographic features of KYB and the anthropogenic actions of the people therein are combining to aggravate water-

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



related problems of the basin. Improved legal and institutional reforms and actualisation would help to reduce these difficulties.

The role of water in achieving the Millennium Development Goals and National Economic Empowerment and Development Strategy cannot be over emphasized. Water is life; it improves health, combats poverty and ensures environmental sustainability. The document has been developed and guided by the concepts of equity of allocation and access to water resources, efficiency of use in the management of water resources and environmentally sound management of the catchment.

The plan foresees a number of reforms. It differs from most strategic plans in that it contains a set of strategic actions designed as catalysts to address priority concerns targeted at correcting or mitigating the critical problems as mutually agreed by the stakeholders.

The first component of the CMP is **Implementation of Integrated Basin Management System** and two of its five strategic actions are: (1) Strengthening Capacity and Social Mobilization with four activities, each with its well defined outputs, and (2) Establishing Partnerships with three activities, each with its own different outputs.

The second component of the plan is **Sustainable Use of Water Resources and Environmental Restoration**. This component contains four strategic actions with a total of twelve activities with a combined total of over 35 outputs. Normalisation of flows and fostering efficiency and multiple use of water are two of the strategic actions in this component.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Implementation of the CMP requires adequate investment and proper scheduling. It is hoped that domestic and external assistance, national and international, private and public, would come to the KYB to actualize its CMP. The cooperation and goodwill as well as the understanding of all stakeholders and lead institutional partners in the implementation process of the CMP would be most welcome. Some US\$125 million would be needed over a 4-year period to implement the plan. The institutions identified as potential key partners will ensure the necessary degree of participation, decentralization and integration in all activities designed to promote integrated water resources management in the KYB.

There are at least eight risks identified. Three of these are inter-state and inter-institutional competition, fragmented and poorly defined institutional legal framework, and scarcity of national and local resources. The problem of sustainability cannot be taken lightly either. It rests principally on sustainability of funding. Funding must come from within; over-dependence on external funding is an open invitation to doom for the plan.

Eight critical elements of sustainability are also identified. Some of them are public involvement as well as economic, social, environmental and technical aspects. Monitoring and evaluation are the responsibilities of the FMWR and the Federal Ministry of Environment. With the strengthened HJKYBCC in place, a functional Technical Advisory Committee and an active Wetlands Conservation Agency instituted, among other things, the CMP stands a good chance of succeeding.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Contents

Executive Summary	iii
Table of Contents	ix
Abbreviations and Acronyms	xi
1 Introduction	1
2 Background	5
2.1 Preamble	5
2.2 Scope of Catchment Management Plan	9
2.3 Catchment Management Plan Preparation Process	10
2.4 Geographical Characteristics of Komadugu Yobe Basin	11
2.5 Why is a Catchment Management Plan important?	13
2.6 Lessons Learned from KYB Project Water Auditing and Catchment Management Plan	15
3 Setting the Context: Key Strategic Development Issues	19
3.1 Water Scarcity and Future Development	19
3.2 Socio-Economics	21
3.3 Physiographic and Anthropogenic Actions	22
3.4 The Governance Issues and Challenges	23
4 Strategic Guidelines for the Management of the KYB	33
4.1 Water's Role in Achieving the Millennium Development Goals and National Economic Empowerment and Development Strategy	33
4.2 The Guiding Principles	38
4.3 Guidelines for the Selection of Priority Areas and Actions	39
5 Strategic Actions and Selected Activities	47
5.1 Structure and Basic Components	47
5.2 Component I – Implementation of Integrated Basin Management System	49
5.2.1 Strategic Action I.1	49
5.2.2 Strategic Action I.2	52
5.2.3 Strategic Action I.3	55
5.2.4 Strategic Action I.4	58
5.2.5 Strategic Action I.5	60
5.3 Component II- Sustainable Use of Water Resources and Environmental Restoration	63
5.3.1 Strategic Action II.1	63
5.3.2 Strategic Action II.2	64
5.3.3 Strategic Action II.3	67
5.3.4 Strategic Action II.4	70
6 Implementation of the CMP	73
6.1 Investment Requirements and Implementation Schedule	73
6.2 Potential Stakeholders in the Implementation Process of the CMP	75
6.3 Governmental Investments in the Basin – Federal and State Medium-Term Action Plans	77
6.4 Risks and Sustainability	79
6.4.1 Risks	79
6.4.2 Sustainability	81
6.5 Monitoring and Evaluation	83

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Contents cont.

Selected Bibliography	85
APPENDIX of Four Annexes	89
Annex I: Principal Stakeholders in the Drafting and Implementation of the CMP	90
Annex II: Socio-Economic, Environmental and Institutional Challenges	92
Annex III: Some Thoughts on Recommended Planning Process and Informed Decision-Making	108
Annex IV: The Development of Guiding Principles	114

Catchment Management Plan

for integrated natural resource management of

Komadugu Yobe Basin

Abbreviations and Acronyms

ABU	Ahmadu Bello University
ADP	Agricultural Development Project (part of State Ministries of Agriculture)
ArcView	Geographical Information System software package (by ESRI Inc.)
BaSADP	Bauchi State Agricultural Development Project
BaSMRD	Bauchi State Ministry of Rural Development
BaSWSB	Bauchi State Water Board
BoSADP	Borno State Agricultural Development Project
BoSMWR	Borno State Ministry of Water Resources
BoSWC	Borno State Water Corporation
BRAO	West Africa Regional Office of IUCN
BUK	Bayero University Kano
CAZS	Centre for Arid-Zone Studies (University of Maiduguri)
CBDA	Chad Basin Development Authority
CBO	Community-Based Organisation
CMA	Catchment Management Authority
CMP	Catchment Management Plan
CTS	Centre for Trans-sahara Studies (University of Maiduguri)
DDT	Diphenyl-Trichloroethane
DFID	Department for International Development (U.K.)
DH&H	Department of Hydrology and Hydrogeology (FMWR)
DSS	Decision Support System
EIA	Environment Impact Assessment
FAO	United Nations Food and Agriculture Organisation
FMARD	Federal Ministry of Agriculture and Rural Development
FME	Federal Ministry of Environment
FMWR	Federal Ministry of Water Resources
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIS	Geographical Information System
HJKYBCC	Hadejia-Jama'are-Komadugu-Yobe Basin Coordinating Committee
HJRBDA	Hadejia Jama'are River Basin Development Authority
HJKYB	Hadejia Jama'are Komadugu Yobe Basin
HVIP	Hadejia Valley Irrigation project
ITCZ	Inter-Tropical Convergence Zone
IUCN	International Union for the Conservation of Nature (The World Conservation Union)
IWRM	Integrated Water Resources Management
IWRMES	Integrated Water Resources Management Environment System
IWRMIS	Integrated Water Resources Management Information System
JAC	Joint Advisory Committee
JSADP	Jigawa State Agricultural Development Project
JSMWR	Jigawa State Ministry of Water Resources
JWL	Joint Wetlands Livelihood
KCWS	Kano City Water Supply
KNARDA	Kano State Agricultural and Rural Development Authority
KRIP	Kano River Irrigation Project
KSMWR	Kano State Ministry of Water Resources
KSWB	Kano State Water Basin
KYB	Komadugu Yobe Basin
KYBP	Komadugu Yobe Basin Project
KYCCC	Komadugu Yobe Catchment Coordinating Council
KYCMA	Komadugu Yobe Catchment Management Authority
LCBC	Lake Chad Basin Commission
LEAP	Local Environmental Plan
LGA	Local Government Area or Local Government Authority
MDGs	Millennium Development Goals
NCF	Nigerian Conservation Foundation
NEAZDP	North East Arid Zone Development Programme

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Abbreviations and Acronyms cont.

NEEDS	National Economic Empowerment and Development Strategy
NGO	Non-Governmental Organisation
NNJC	Nigeria-Niger Joint Commission
NWRI	National Water Resources Institute
NWRMP	National Water Resources Master Plan
O&M	Operation and Maintenance
PCBs	Polychlorinated Biphenyls
POPs	Persistent Organic Pollutants
PPP	Public-Private Partnership
RBDA	River Basin Development Authority
RUP	Resource Use Planning
SCF	Stakeholders Consultative Forum
SEEDS	State Economic Empowerment and Development Strategy
SLGP	State and Local Government Programme
SMWR	State Ministry of Water Resources
TAC	Technical Advisory Committee (of the HJKYB)
ToR	Terms of Reference
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
WANI	Water and Nature Initiative
WCA	Wetlands Conservation Agency
WES	Water Supply and Sanitation
WHO	World Health Organisation
WRECA	Water Resources and Engineering Construction Agency
WSSD	World Summit on Sustainable Development
WUA	Water Users Association
YSADP	Yobe State Agricultural Development Project
YSMWR	Yobe State Ministry of Water Resources

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Part **1: Introduction**

The objective of the Catchment Management Plan (CMP) for the integrated land and water resources management of the Komadugu Yobe Basin (KYB) is to propose an action plan, to be reviewed periodically, targeted at resolving identified water problems and challenges as well as instituting integrated natural resources management instruments in the region, to achieve equity of allocation, efficiency of use and overall sustainable development in the basin.

The call for integrated catchment management strategy¹ places an overarching emphasis on catchment/basin-based planning and assessment. The Water Auditing and decision-support systems developed for integrated water resources management try to take into account the myriad of complex and interrelated issues and challenges.

The CMP is one of the outcomes of the initial phase of the collaborative project (KYBP) of Federal Ministry of Water Resources, the World Conservation Union and Nigerian Conservation Foundation Project on Improving Land and Water Resources Management in the Komadugu Yobe Basin of north-eastern Nigeria and south-eastern Niger Republic. The project commenced in 2005 with an initial phase of two years and three months. The phase one has the objective of improving institutional framework for managing water resources in the Komadugu Yobe Basin.

The CMP was developed in a participatory manner, taking into account water management principles that were defined and articulated as part of the Regional Land and Water Resources Development Planning Study commissioned by Federal Government of Nigeria from the Petroleum (Special) Trust Fund. The draft document

¹ The actual language of the ToR is “Catchment Management Plan” but we would have preferred to use the word “strategy” rather than “plan” to emphasise the dynamic and change-oriented nature of the process

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



from this earlier study, which was based on intense study involving broad public participation, was used as one major input towards the development of this new CMP. This was complemented with diagnostic study/Master Plan of the Lake Chad Conventional Basin (1989-1992) and the recommendations of Lake Chad Basin Commission (LCBC) Ministers of Environment (1989) with the results of the knowledge based studies of Joint Wetlands Livelihood (JWL) and KYB projects as well as all the outcomes of various stakeholders' consultative meetings by both KYBP and its partner projects (i.e. DFID-JWL and LCBC-GEF). These identified the key natural resource management issues and the causal-chain matrices that link the critical issues with the set of measures to address them using rapid assessment from among the stakeholders. Furthermore, the Action Plan for IWRM that emerged from a week long workshop held in Dutse in December 2004 along with the stakeholders' selected pilot activity components of the KYBP and LCBC-GEF were built upon to develop this CMP.

Apart from these materials, this document also draws on a number of related earlier studies. Consequently, some of the recommended strategic actions/activities are already being implemented. Full implementation of the CMP would, however, take place during the follow-up phase(s) of the KYB, LCBC-GEF and DFID-JWL projects. The CMP would emerge from Stakeholder participation. This draft document is therefore intended to serve as a communication brief to seek for further input and comments from stakeholders. There would also be need for continuous reappraisal and reverberation between sectoral or partial solutions and catchment-based integrated water management and vice versa – the whole and its parts, the macro and the micro.

This document was initially circulated to all the six riparian states as well as the Diffa Region of the Niger Republic and each of their responses have been considered in producing this improved version. This version had been presented for final

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



consideration of the HJKYBCC. The decisions of all concern were published and/or are to be published for public consumption.

The KYBP Water Audit and CMP identified several areas where IWRM implementation can be improved upon. However, there are good causes for satisfaction in the progress the stakeholders have made together in talking to one another and in the implementation of some significant water management initiative.

The CMP provides a catalyst and an overview of strategies for the integrated land and water resources management of the basin. It describes the process and the context, as well as the recommended strategic actions needed to turn around the deteriorating land and water resources situation, the peculiar ecological considerations as well as the legal and institutional framework for its implementation in the KYB.

The report is divided into seven parts including this introduction. **Part 2** presents the background, the CMP preparation process and basic content of the plan, including its national and international ramifications, as well as some lessons learned by KYBP in course of implementing the project. It also contains the description of the principal geographic, hydro-climatic, environmental and socio-economic characteristics of the basin as well as anthropogenic influences, within the context of sustainable development of the basin. **Part 3** examines the context for the implementation of integrated water resources management of KYB and reviews the water management issues in the basin. The challenges, problems and potentials are highlighted in relation to socio-economic considerations, water resources availability and uses, land and soil degradation. It is of a summary nature and intended to stimulate greater stakeholder participation. It should therefore, not be considered as exhaustive, but rather as a dynamic document to be continuously modified as more knowledge is gained and mutually agreed strategies are found.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Part 4 deals with the strategic guidelines and its interaction with the programmes of National Economic Empowerment and Development Strategy (NEEDS) and Millennium Development Goals (MDGs). This is followed closely in **Part 5** by the presentation of the strategic catchment action plan that is designed to be implemented over a period of between four and five years, together with its components and activities. The Concluding part (**Part 6**) deals with the investment requirements and presents the CMP implementation strategies and schedule.

The Annexes constitute the seventh part. They contain a list of the major stakeholders and participants that have been involved in the development of the KYBP and an amplification of socio-economic, environmental and institutional challenges. They also include some thoughts on recommended planning process and informed decision making as well as the synthesis of the Guiding Principles that emerged from the past broad and intense public participation presented herein for further consultation and comments.

Part **2** **Background**

2.1 Preamble

This CMP document has been prepared as part of the KYBP Water Auditing and Catchment Management Planning Study (Water Auditing). The recommended consultation and planning process is part of developing an integrated water resources management strategy for sustainable development of the KYB.

The KYB is a sub-catchment of the larger Lake Chad Basin. It is situated in the Sudan-Sahel zone of northeast Nigeria and southeast Niger covering an area of 148,000 km², out of which 84,138 km² is in Nigeria (57% of basin area). The basin is drained by two main river sub-systems. The first sub-system, the Yobe River, is formed by the Hadejia and Jama'are tributaries, which create the Hadejia-Nguru floodplain at their juncture. The second sub-system is the Komadugu Gana (or Missau) River, which historically has been seen as a tributary of the Yobe River (Figure 2.1).

The repeated droughts of the 1970s and 1980s have resulted in significant environmental changes, which in turn led to some decline in agriculture, livestock and fisheries as well as threatened the socio-economic well being of people living in the basin. During the last 30 years, parts of KYB have been at the forefront of watershed development aimed at tackling the challenges of poverty alleviation and more recently environmental sustainability. The period witnessed unprecedented development at the upper reaches of the basin, which led to significant socio-economic advances but this was at a cost of several environmental degradation and some socio-economic dislocations. In response to the increasing evidence of deterioration of the Komadugu Yobe Basin's (KYB's) water situation and the river system, as well as the growing community concern over their impact on their livelihood, the Coordinating Committee of Hadejia-Jama'are-Komadugu-Yobe Basin

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

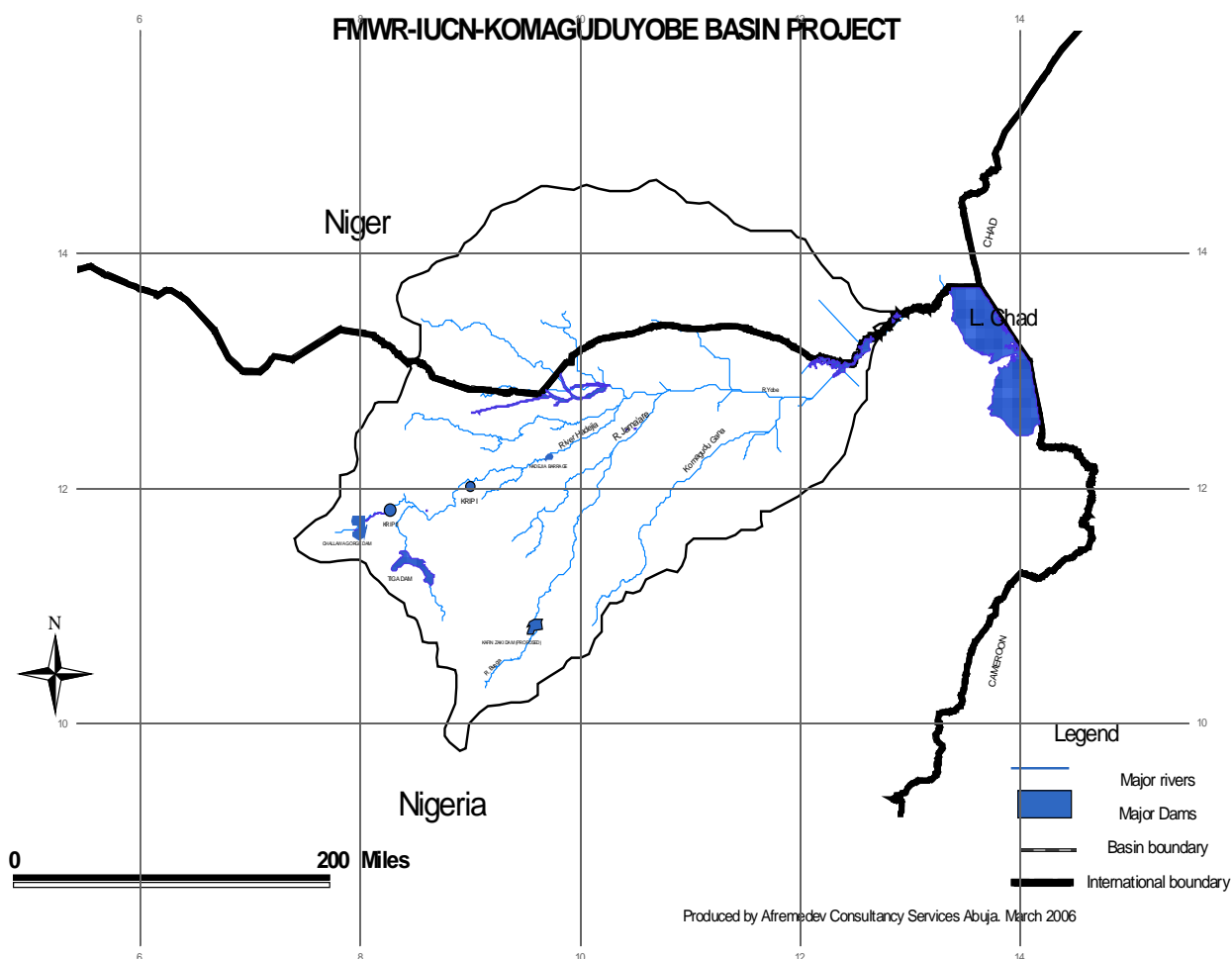


Figure 2.1: Location of the Komadugu Yobe Basin

(HJKYBCC) (essentially, the same as KYB) was formed in 1999 to coordinate and foster cooperation towards adaptive Integrated Water Resources Management (IWRM) across the basin in Nigeria. Prompted by the dire situation in the basin, HJKYBCC directed that a water audit be prepared to assess water use in the basin, comment on the effects of the projected increase, and assess the likelihood and potential impact of further increases in the future.

Hamstrung by lack of funds to implement this and other water management related interventions that were considered necessary to set the stage for IWRM, the

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



HJKYBCC through the Federal Ministry of Water Resources (FMWR) entered into a joint initiative with the West African Office of World Conservation Union (IUCN-BRAO) and the Nigerian Conservation Foundation (NCF) to implement the Komadugu Yobe Basin Project (KYBP) for Improving Land and Water Resources Management in the basin. The KYBP components include Water Audit, Decision Support System (DSS) and Catchment Management Plan (CMP). These knowledge based studies are what was aggregated as **KYBP Water Auditing and Catchment Management Planning of KYB or abbreviated as Water Auditing**. The CMP component of the study is providing an opportunity to identify and build upon the successful components of existing water programmes and policies, and where relevant, to rethink and modify those strategies that have been less successful or that have resulted in adverse consequences. The CMP prepared is primarily for the six Nigerian states of Plateau, Kano, Jigawa, Bauchi, Yobe and Borno. It cannot possibly include the portions of KYB in Niger Republic at the moment, largely because of the difficulties in obtaining data for that portion.

The development of this CMP reflected the structure of Nigeria as a Federal unit and the basic values of the country's Constitution, while recognising the international considerations. The plan and process embody the ideals of the NEEDS and MDGs as well as translate the provisions of the Water Resources Decree No 101 of 1993 for the benefit of all Nigerians within the catchment. In achieving these goals, it was considered essential at the onset of the study that the CMP complied with relevant internationally accepted standards and guidelines for planning, development, monitoring and implementation of Integrated Water Resources Management.

Various activities were identified as necessary components of a successful development of an acceptable CMP. These included (i) water auditing to assess: the water quantity and quality, environmental protection and conservation, prevention of land degradation, socio-economic and institutional framework with a view to achieving water balance in the basin; and (ii) developing a suitable Decision Support

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



System (DSS) that would facilitate decision-making on equitable water allocation between riparian states, a dynamic tool designed to develop an integrated basin management programme for KYB.

The CMP preparation process had its origin from an earlier study: the Regional Land and Water Resources Development Planning Study commissioned by Federal Government of Nigeria from the Petroleum (Special) Trust Fund. The draft document from this earlier study, which was based on intense study involving broad public participation, was used as input towards the development of this new CMP. This was complemented with the results of the water auditing and decision support system. It however relied heavily on the outcome of various stakeholders' consultative meeting by both KYBP and its partner projects (i.e. DFID-JWL and LCBC-GEF), where upon eight critical themes were identified for the basin. Furthermore, the pilot activity components of the KYBP and LCBC-GEF selected by the stakeholders have been included among the strategic action plan. This way, more than 50 federal, state, local and municipal organisations, NGOs, private companies, international institutions and bodies from Niger Republic were directly or indirectly involved in the development of this CMP, through participation in a series of public events. The eight themes are:

- Political and institutional weaknesses including the absence of and lack of implementation of IWRM instruments;
- Top-down approach;
- Capacity building;
- Data collection, rescue, update and dissemination;
- Vulnerability to extreme events;
- Potentials for water allocation conflict;
- Poverty arising from water-related economic and social risks; and
- Poor biodiversity management.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



2.2 Scope of Catchment Management Plan

The CMP as presented has two major components, each divided into relevant strategic action areas, with duly-justified and lineated activities, each with its own expected outputs, objectives, benefits and beneficiaries, institutional partners, estimated budgets and tentative schedules. The two components focus on those positive changes required to ensure IWRM namely: in the enabling environment, in institutional roles, and in management instruments. These are all intended to foster institutional strengthening, sustainable development, protection of biodiversity, land and water conservation and rational use.

The CMP is built on a number of priority strategic actions that were identified by such stakeholders as the Federal, State and Local governments, private institutions, and NGOs. The overarching goal of these actions is to strengthen strategically important institutions and prepare them to effectively manage water resources in the basin in an integrated manner. Moreover, because of the trans-boundary nature of the basin, it is hoped that the experience gained can be replicated or at least adapted for application in Niger and indeed other riparian States of Lake Chad Basin. Furthermore, the actions are the doable to begin the process of moving towards more sustainable development and management of land and water resources in the basin. It is firmly linked to MDGs and NEEDS and cover institutional, financial and technological changes; with emphasis on meeting basic human needs and access for the poor.

This document summarises the principal strategic action, implementation of which must necessarily entail the active participation of Federal and state bodies, and of the Non-Governmental Organisations (NGOs) that are active in the basin. The CMP, therefore, should be regarded as a working document, to be used by HJKYBCC and other Federal and State Governments organisations, and by local governments for improving strategies and methodologies, with the aim of promoting sustainable development in the basin.

Catchment Management Plan for integrated natural resource management of Komadugu Yobe Basin

Box 2.1: Key Messages from World the Summit on Sustainable Development (WSSD)

Some generic messages derived from Article 26 of the WSSD plan of Implementation that are useful in developing CMP include:

- Strategies should help countries and regions move towards integrated water management and more efficient use of water resources – employing the full range of policy instruments
- Strategies should cover institutional, financial and technological change and promote action at all levels
- The river (or water) basin should be used as a basic unit for integrating management
- Strategies should give priority to meeting basic human needs, take extra care to ensure access for the poor
- Strategies should address the challenge of balancing the need to restore and protect ecosystems with the needs of other water users
- Ecosystem protection should consider land and aquatic ecosystems
- Aquatic ecosystems critically depend on the amount, timing and quality of water flows
- Environmental flow requirements have been defined in many different ways around the world and globally range from 20 to 50 percent of the mean annual flow in a basin
- Stakeholder participation, capacity building, monitoring performance, and improving accountability of public institutions and private companies are all elements of an effective strategy
- Strategies should respect and be adapted to local conditions

It provides a means for harnessing relevant water resources management instruments and fostering their incorporation into MDG and NEEDS policies, programmes and plans, while also interacting with other natural resources management models.

2.3 Catchment Management Plan Preparation Process

The scope of the CMP and the process of preparing this consultation document have been limited by the lack of authentic National Water Resources Management Strategy and the quality and quantity of data and information available to inform the management process. The Federal Ministry of Water Resources has been developing a National Water Resources Management Strategy to review and redefine national water management policy. The process is still inconclusive although a draft National Policy is in circulation. That notwithstanding, the draft National Water Policy was used to define strategic framework and guiding principles with accompanying institutional and human resources frameworks in which to establish an IWRM for the basin. The Institutional and Strategic Frameworks are outlined in **Parts 3 and 4**, respectively.

Broad consultation with all stakeholders is essential in developing CMP. The choice of primary literature used in the process of developing the CMP was guided by this.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



The document emphasises strategy rather than the concept of a “Plan” by focusing on dynamic issues. Consequently, the process would be an on-going dialogue of consultation and review. This consultation document and subsequent document that would emerge from the Stakeholder Consultative Workshop to further review the document should therefore be seen as part of this process and not as an end in themselves.

2.4 Geographical Characteristics of the Komadugu Yobe Basin

As noted in the preamble, the KYB is a sub-catchment of the larger Chad Basin, covering an area of 148,000 km², 57% of which lies in north east Nigeria and the rest in south east Niger. It represents approximately 35 percent of the conventional basin of Lake Chad. The Nigerian sector of KYB accounts for 95% of the basin’s total contribution to the lake.

Prior to drought of 1970s and 1980s, it contributed substantial volume of water to the northern pool of Lake Chad. The active watershed basins that supply surface water to the basin and the Lake Chad are located outside the limit of the conventional basin in Kano, Bauchi and Plateau States.

The climatic features of the basin are made up of three different types ranging from the north east to the southwest:

- (i) Sahelo-sudanian climate, with an average annual rainfall of between 300 to 600 mm corresponding to an area of mixed agriculture and livestock activities;
- (ii) Sudano-sahelian climate, with an average of 600 to 900 mm of rainfall suitable for cultivation of maize, cotton, cowpeas and rice; and
- (iii) Sudan-savannah climate, with 900 - 1200 mm of mean annual rainfall suitable for varied crops and fisheries.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Rainfall is seasonal and limited to between May and October in the Nigeria portion, shorter than that in the Niger sector. This highly seasonal nature of the rainfall is the result of the annual migration of the Inter-Tropical Convergence Zone (ITCZ). Annual potential evaporation tends to vary between 1,800 mm and 2,400 mm across the basin, though lower rates are recorded at Jos on the raised Plateau.

A notable feature is the climatic instability characterised by occurrence of three drought periods in the last century. The droughts were characterised by significantly below average rainfall and a shift southwards of the average isohyets occurring in the early 1950s, 1970s and particularly the 1980s. To this spatial overall deficit there is often some temporal irregularity of rainfall.

As a result of population pressure, the drought of 1970s and 1980s coupled with uncoordinated water resources development, the natural resources of the basin has displayed signs of degradation. For instance, sheet and wind erosion leading to formation of sand dunes, fertility reduction and drying-up of some floodplains/wetlands have been observed. In the field of livestock and fisheries, herds have been decimated and fish stocks have diminished.

The geological formation of the upstream part of the catchment consists of mainly impermeable basement complex rocks which dip away to the east where it is covered with the permeable sands, gravels and clays of the Chad formation. Alluvial sediments are at present overlying the Chad formation close to the rivers. Much of the catchment is relatively flat with the only significant hills (the Jos Plateau) rising in the south-west from where the headwaters of the Jama'are River and to a lesser extent the Kano River begin.

The main rivers of the basin are the Hadejia and Jama'are Rivers that meet in the Hadejia-Nguru Wetlands to become the Yobe River that drains to Lake Chad. Historically the Yobe has been estimated to contribute only about 1-2 % of the total

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



flow into Lake Chad (LCBC, 1992). However the hydrology of the basin is complex. Both the Hadejia and Jama'are river systems are 'gaining' rivers until they cross the geological divide between the basement complex and the Chad formation after which their flows begin to decrease. The hydrology of the internationally significant Hadejia-Nguru Wetlands is very complex and has been the subject of numerous studies. Seasonal flooding plays an essential role in maintaining the ecological system of the wetlands and enables both flood and recession farming to be conducted in the wetland region and along the lower reaches of the rivers.

2.5 Why is a Catchment Management Plan important?

Water resources development and management within the KYB is generally fragmented, with ill-defined and often conflicting responsibilities between government agencies and stakeholders concerning all aspects of land and water management. These institutional conflicts are highlighted within the Nigerian sector of the Komadugu-Yobe catchment having currently two RBRDAs responsible for water management in the catchment, principally covering the States of Kano, Jigawa, Bauchi, Yobe and Borno, with only HJKYBCC coordinating water management. The body has not met even once in the last two years.

Scarcity of water is a major constraint to further development in the semi-arid conditions that are prevalent in the catchment. A substantial portion of the available water sources that can possibly be economically exploited have already been developed or are in the process of being developed.

The Hadejia river system is substantially controlled by Tiga and Challawa Gorge dams. These two major dams feed Kano River Irrigation Project (KRIP), Hadejia Valley Irrigation Project (HVIP) and contribute to Kano City Water Supply (KCWS). The completion and rehabilitation of KRIP (Phase 1) HVIP (stage 1 phase 1) is

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



underway and the development of their Phase 2 are proposed. The Jama'are River is presently uncontrolled; but plans exist to build a dam at Kafin Zaki.

The traditional farming system in the basin is predominantly rainfed. Flood recession farming is an important supplementation in the Hadejia-Nguru Wetlands and along some parts of the Yobe River. Farmers in the downstream areas depend largely on river flow because rainfall is too low and unreliable. Small-scale irrigation which pumps water from shallow aquifers, river and floodplain has been stimulated in the catchment through World Bank assisted subsidies under the auspices of the National Fadama Development Programme. These developments have led to some concern over possible over-abstraction of groundwater in the basin.

Much of this development is uncoordinated, resulting in an inequitable water distribution in the catchment and environmental damage; particularly downstream. Similarly, the operations of the major reservoirs are uncoordinated; combined with an absence of an overall water management strategy for the catchment. There is therefore a need for an integrated, equitable and coordinated approach to resource management within the framework of an overall national water management strategy. The objective of a **Catchment Management Plan** is to serve primarily as catalyst to provide for an integrated and proactive ecosystem-based approach to the planning, management, monitoring and maintenance of developments within the catchment; seeking equitable, efficient and environmentally sound solutions to the overall advantage of the entire community in the catchment.

The **CMP** should identify issues affecting natural resources in the catchment and ask how all sections of the community can effectively work together to address these issues. This catchment management strategy presents:

- (i) a vision of sustainability for the catchment;**
- (ii) a strategic policy and institutional framework for its management, and**
- (iii) an action plan to achieve this vision.**

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



2.6 Lessons Learned from the KYBP Water Auditing and Catchment Management Plan

During the process of Water Auditing and drafting of this CMP consultation document, experiences were gained and lessons learned that will serve as useful references in reviewing the document. The most significant of these are as described below.

Data Availability

The terms of reference for the study predisposed that data collated, checked and analysed as part of the National Water Resources Master Plan (NWRMP) would be readily available for updating to provide the basis for the development of the database necessary to inform the process of preparing the catchment management plan. However, on completion of the NWRMP, the original data was not presented to the FMWR in either hard copy or digital form, and was therefore unavailable to this study.

Similarly, review of the socio-economic and institutional framework as well as land-use changes were not included in the ToR and developing a CMP is a policy related study, which must not only examine physical systems but also the human systems, because both are critical to IWRM. As a matter of fact the institutional aspects are even more critical to developing CMP; without effective institutions there can be no IWRM.

This placed an additional requirement upon the study to recreate aspects of the NWRMP database relating to Hydrological Area VIII, assess the validity of the data contained in the NWRMP report and place greater emphasis on collation of base data from alternative sources than would otherwise be the case. It also meant that none of the digital structure was available to be built upon and requiring the study to start from a point considerably less advanced than originally anticipated. The available

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



data, taken from the final planning documents contain little indication of how the data was derived, its quality, or what limitations, if any, should be placed on the use of the data for planning purposes. There were also clear discrepancies and inaccuracies in the presented digital and spatial data sets.

The subsequent process of data collection and collation during the study was constrained, in part, by a lack of cooperation from some government institutions in the catchment in identifying and releasing data, reports and information. In other cases, where data was offered, it was done at an inappropriately high cost.

There are still gaps in the knowledge of interactions in processes involving water and soil use, flow levels and biodiversity and their respective repercussions in relation to the Jos Plateau and the floodplains of the Basin.

It is imperative to ensure open access to information and data relating to land and water development to all parties involved in the planning process if sustainable catchment management is to be entrenched.

One of the lessons that was clearly demonstrated is that **research institutions and public policy managers should interact more, exchange information and facilitate continuous capacity building for the stakeholders and key protagonists in the basin. Another lesson learnt was public participation generates tangible benefits, foster cooperation in the process of developing and implementing strategic actions.**

Public involvement in the various activities including preparation and execution of projects as was demonstrated by DFID-JWL, LCBC-GEF and KYB projects, revealed immense interest in themes relating to water in the basin both in academic and environmental circles and among water-resources management staff, which gave rise to a number of innovative and practical suggestions as well as considerable resource

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



mobilisation. Stakeholder consultative workshop that brought together the principal stakeholders in the basin facilitated the identification of the underlying causes and critical themes. Similar forum would be used to review and rank the recommended actions and responses received on this consultation document.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Part **3**: **Setting the Context:** **Key Strategic Development Issues**

An appreciation of the context in which land and water resources are used and managed, the farming systems and population as well as the understanding of the institutional framework to identify the potential flash-points for conflicts among stakeholders are essential prerequisite for diagnostic assessment and analysis. This would set the context and facilitate the development of objective, relevant and priority intervention mechanisms toward the integrated water resources management and water efficiency plans to meet the World Summit on Sustainable Development (WSSD) action target. The key strategic development issues and challenges are: water scarcity and future development; socio-economics; ecology; physiographic and anthropogenic actions; and legal and institutional issues and challenges.

3.1 Water Scarcity and Future Development

Water scarcity and its potential for generating conflict were identified by United Nations Environment Programme (UNEP) as one of the most serious problems of the new millennium. For a couple of decades, however, they have already been dire issue and challenge for most of the communities living in the basin. In future, it is projected that this scarcity of water would deepen and could become a major constraint to socio-economic development in the basin. For the predominantly agrarian communities in the basin, which is largely semi-arid, rivers are a lifeline. Poverty reduction strategy in the basin, further development of the basin's untapped hydrological potential for agriculture, domestic and industrial water supply would remain a critical need. This is so because they directly address one of the basin's core vulnerabilities, that of the temporal and spatial variability in rainfall, as well as the uncertainty of climatic conditions. Meanwhile, a greater portion of the available sources that can possibly be economically exploited have substantially been developed or are in the process of being developed. The study has revealed that

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

even in an 'average' year the water requirements within the Hadejia system have reached a point where further development or expansion will deprive others of water (see table 3.1).

Table 3.1 Summary of Annual Water Resources and Requirements within the River Basin*

River System	Available surface water Resources (10 ⁶ m ³ yr ⁻¹)	Mean river flow reduction (10 ⁶ m ³ yr ⁻¹)	Present Water Requirements (10 ⁶ m ³ yr ⁻¹)		Potential Water Requirements (10 ⁶ m ³ yr ⁻¹)	
			Formal	Informal	Formal	Informal
Hadejia	556 – 4,127 (mean 2,286)	493 ^a	894	765	2,287	2,241
Jama'are	801 – 3,498 (mean 1,837)	919 ^b	0	1,577	1,388	1,954
Yobe	381 – 2,551 (mean 1,188)	855 ^c	58	274	111	529

Notes:

^a Wudil to Hadejia and Hadejia to Likori

^b Foggo to Gashua

^c Gashua to Yau

Formal = Evaporation and domestic water supply from reservoirs and irrigation schemes

Informal = All other users (eg flood and small scale agriculture and contribution to the Yobe River), these partly depend on natural flow diversions

*Source: KYBP, 2006

The average water resources within the Jama'are and Yobe river sub-systems can satisfy current water requirements. However, depending on the catchment demand estimates used, the potential water requirements for the Jama'are sub-system would soon exceed the carrying capacity of the available land and water resources in a mean year, if "business as usual" scenario persists. This study presents the most recent estimates of available water resources in the basin. **The figures indicate that serious water scarcity problems are likely to arise during drought periods where the water demands exceed the available resources in every sub-catchment.**

Water quality and water quantity are two sides of the same coin. Degradation of water quality through various kinds of pollution, by definition reduces the amount of 'fresh' water, and is therefore counter productive to water quantity management. However, there is little or virtually no water quality and sediment transport monitoring in the basin. Yet, the recent World Bank Kano State Environmental Action Plan identified water pollution as a high priority for action. This urgency was brought

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



about by concern over increases in industrial and agricultural waste, combined with inadequate waste management and treatment, and increases in non-point pollution, due to farm runoff and the increased use of fertilisers and pesticides, leading to an increase in eutrophication. This has manifested itself by a spread in water hyacinth in the reservoirs, while downstream there is some concern for groundwater contamination.

Almost all water in the basin is already consumed (negligible flow into the Lake Chad). As a result the downstream wetlands have been the first to suffer. For river basins, the level of water scarcity has been quantified by the drainage ratio (Bos, 1996; Bos *et al.*, 2005) which is defined as:

$$\text{Drainage Ratio} = \text{Total Drained Water from Area} \div \text{Total Water Entering the Area}$$

If this formula is applied to the basin, the drainage ratio of between 0 and 0.1 would be recorded which is classified as very scarce with severe sustainability problems.

3.2 Socio-Economics

The consequence of the rapid population growth and urbanisation is that fewer individuals living in rural areas will have to produce enough food to meet their own needs as well as those of the growing urban population. Thus crop yields will have to increase by way of intensification and expansion of irrigated areas – both of which will place further pressure on freshwater resources. The Global Water Partnership (2000) estimated that by 2025, per capita water consumption will be 100 litres per day in cities and 50 litres per day in rural areas. The combined effects of these would increase water shortages, resulting in:

- ◆ Reduction in future land-use options (loss of land for agriculture and urbanisation) and reduced agricultural productivity;
- ◆ Increased costs of alternative water supplies;

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

- ◆ Major human migrations, with far reaching transboundary implications; and
- ◆ Greater potentials for upstream-downstream water-related conflicts between different user groups.

Water supply infrastructures are still not fully developed and will put further pressure on the provision of safe drinking water and sanitation, especially in the urban areas. Currently, access to water in urban areas is hardly more than 50 litres per capita per day, and in rural areas this is generally less than 20 litres per capita per day. The relatively low Gross Domestic Product (GDP) of all the riparian States in the basin attests to the poverty that is prevalent. This could deteriorate if improved water management is not put in place to counteract the expected climate change and variability. Water conflicts among different stakeholders and between upstream and downstream communities are beginning to emerge and if not tackled could constitute a constraint to development in the basin, because of the demands and pressures that would continue to be placed on the limited water resources infrastructure.

3.3 Physiographic and Anthropogenic Actions

Over 70% of the basin can be classified as arid and semi-arid, with Niger and North-eastern Nigeria (Borno and Yobe States) having the highest level of aridity. The basin has been affected by the prolonged sahel drought, which made water availability at certain times critical for the riparian States. The major impacts of environmental changes on water resources in the basin have been those related to changes in stream flow, the pollution of existing supplies especially around Kano city, the invasive water weeds that have clogged the river channels causing frequent wet and dry season flooding and changes in the water table. Climate change and preliminary variability predictions suggest an aggravation of the situation, with a decrease in rainfall, runoff and recharge in large parts of the basin.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

Table 3.2 Anthropogenic actions in the Komadugu Yobe Basin

Anthropogenic Actions	Characteristics
Land use and settlement patterns	Poorly planned land use and insufficient enforcement has resulted in large-scale conversion of prime agricultural land to urban settlements as well as conversion of native vegetation into fields with monocultures of grain and pasture valley bottoms ("fadamas") that has tended to overexploit the shallow aquifers and encroach on stream banks. Consequently, land degradation, sand-dune, erosion, siltation and water pollution are now common features in the basin.
Invasive species	The clumps of <i>Phragmites australis</i> – reeds and <i>Typha domingensis</i> , both invasive species that took hold in the 1990s, grow in the shallow waters, gradually these clumps have been spreading and encroaching the rivers thereby eliminating all the open water and impeding drainage. Currently they now clog many of the river channels, leading to flooding of communities along the river banks while the clumps also provide habitat for quelea birds.
Infrastructure works	The concentration of the dams upstream, and poorly sited intake structures for Kano City Waterworks, many of which were built without adequate planning certainly without Environmental Impact Assessment studies has disrupted river flow regimes and proven to have been damaging to creatures that depend upon the quality, quantity, frequency and rhythm of river flow for sustenance.
Fire	Most communities set fire to the land during the dry season to "remove the bush" and make way for new growth on which to graze their livestock. Such fire often goes out of control, destroying extensive farmlands, crops, forest and wildlife habitat.
Deforestation	Native vegetation, especially trees have been cut down for firewood and at times to make way for cattle pastures and farmlands. Such deforestation has heightened desert encroachment, reducing habitat for native wildlife species. More than 2,000 hectares of forest was lost between 1976/78 and 1993/95.
Environmental contaminants	A study revealed traces of contaminants such as agrochemicals and heavy metals in sediments but the aquatic animal tissues were not tested. This is particularly more prominent around Kano city.
Liquid effluents and solid wastes	Poor state of sanitation in both the urban and rural communities throughout the basin has resulted in increased generation of solid wastes as well as industrial , agro-industrial processes, including effluents from tannery being dumped in the rivers without treatment.
Predatory and overfishing	Predatory and overfishing are threatening to exhaust stocks of some commercially valuable species of fish.
Irrigated Agriculture	There has been little control over the development of irrigation activities in the upper regions, with inadequate record of water utilisation for abstraction for irrigation. There are no quantitative measuring devices on almost all the irrigation schemes- both formal and informal systems.

3.4 The Governance Issues and Challenges

The critical theme of governance (political, legal, policy and institutional) and in particular utilization of IWRM instruments in the KYB raises special concerns, because it is at the heart of KYBP. Its strategic importance in addressing many other critical issues affecting the basin is not in doubt. It holds the key to identifying the priority interventions to address most of the problems. The constraints arising from governance weaknesses have for long been recognized by both the decision-makers

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



and other stakeholders. The major constraints of governance can be classified in terms of their socio-political or root causes, namely:

- Poor data and substantial knowledge gap on the part of decision-makers with regard to environmental problems, IWRM policies, best natural resources management practices and instruments and yet better environmental management depends on the ability to measure and regulate the natural resources and provide basic services at important points in a river basin;
- Legal and policy frameworks for the basin are presently very weak characterised by inadequate implementation of the available regulatory instruments many of which are not aligned to IWRM;
- Fragmented and overlapping roles and unclear mandates of institutions has led to the uncoordinated water developments throughout the basin;
- Generally, inadequate stakeholder preparedness for effective participation, in particular the communities are ill-prepared to participate effectively in common resources management, although they are now being assisted by DFID-JWL Project to acquire some of the required capacity to do so; and
- Insufficient consultation and political will, absence of grassroots advocacy groups, and low levels of citizen participation at all levels.

Poorly enacted and implemented laws and lack of awareness on the part of decision-makers with regard to water resources legislation and policies has caused and exacerbated water resources problems that, in turn, hamper the implementation of actions required for integrated catchment management. Although considerable efforts were made to collect climate, hydrology, soils and socio-economic data in the past, this was not sustained beyond the 1980s. The data are scattered and of varying quality. Even then more information of better quality and greater detail is collected on surface water resources with little or no attention to quality and to groundwater resources even though most of the rural communities in the basin rely on groundwater for their domestic and agricultural water requirements.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

Table 3.3: Major Government Institutions involved in Water Resources Management in KYB

Federal Bodies	
Ministry of Water Resources ➤ Hadejia Jema'are River Basin Development Authority (HJRBDA) ➤ Chad Basin Development Authority (CBDA) ➤ National Water Resources Institute (NWRI) ➤ Lake Chad Basin Commission (LCBC)	Ministry of Agriculture & Rural Development ➤ National Fadama Development Project ➤ Agricultural Research Institutes
Ministry of Power and Steel ➤ National Electric Power Authority	Ministry of Science and Technology ➤ Lake Chad Research Institute
Ministry of Aviation ➤ National Meteorological Organisation	Ministry of Housing and Urban Development
Ministry of Transport ➤ National Inland Waterways Authority	National Planning Commission ➤ North East Arid Zone Development Programme (NEAZDP)
Ministry of Works	Ministry of Health
Ministry of Foreign Affairs ➤ Nigeria-Niger Joint Commission (NNJC)	Ministry of Solid Minerals
Ministry of Integration and Cooperation in Africa ➤ 2 nd Commissioner on Lake Chad Basin Commission	Ministry of Education ➤ Federal Universities at Maiduguri, Bauchi, Kano
Ministry of Environment	Chad Basin National Park, Maiduguri
Centre for Arid-Zone Studies (CAZS), University of Maiduguri	Centre for Trans-sahara Studies (CTS), University of Maiduguri
State Government Bodies	
Kano	
KSMWR	Ministry of Water Resources
WRECA	Water Resources and Engineering Construction Agency
KNARDA	Kano State Agricultural and Rural Development Authority
KSWB	Kano State Water Board
LGAs	Local Government Authorities
Jigawa	
JSMWR	Jigawa State Ministry of Water Resources
JSADP	Jigawa State Agricultural Development Project
LGAs	Local Government Authorities
Bauchi	
BaSMRD	Bauchi State Ministry of Rural Development
BaSWB	Bauchi State Water Board
BaSADP	Bauchi State Agricultural Development Project
LGAs	Local Government Authorities
Yobe	
YSMWR	Yobe State Ministry of Water Resources
YSADP	Yobe State Agricultural Development Project
NEAZDP	North East Arid Zone Development Project
LGAs	Local Government Authorities
Borno	
BoSMWR	Borno State Ministry of Water Resources
BoSWC	Borno State Water Corporation
BoSADP	Borno State Agricultural Development Project
LGAs	Local Government Authorities

Insufficient knowledge and appreciation on the part of decision-makers with respect to the desired water resources policies for IWRM has been the most critical factor in

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



the emergence and exacerbation of numerous governance problems in the basin. Such problems have tended to generate others that have all culminated in hampering actions required to institute IWRM for the basin.

All things considered and all legal factors taken into consideration, the planned IWRM should be launched in consultation with traditional rulers and Local Government Area (LGA) officials. The emphasis should be on traditional rulers because throughout the basin, the natural resources (fisheries, forest, water and land resources) are customarily vested in these traditional rulers. All the enacted legislations reviewed tend to recognise this position by providing in most cases that consultation with traditional rulers regarding customary law practices and LGA officials representing grassroot level administration be carried out before any resource base is brought under any legislation. For instance, no land or forest may be declared a grazing reserve or forest reserve without the LGA and in particular traditional rulers' knowledge. Most communities point to the role of traditional rulers in granting fishing rights, and generally hold them responsible for granting farmlands and to redressing issues associated with agriculturists who encroach on grazing reserves or stock routes.

The legal framework for resource use plan should be extended to the recognition of the role and place of customary law in the lives of the people of the basin. Even State Ministry of Agriculture officials concede this much by acknowledging that theoretically the Commissioner for Agriculture has the power and authority to grant fishing right (licence) yet in practice, only traditional rulers or their appointed representatives can grant permission for fishing in any waters to which the public has access.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



In particular, two national water-related legislations are relevant to the KYB. These are the Water Resources Act, Cap W2, 2004 and the River Basin Development Authority (RBDA) Act, Cap R9, 2004. The Water Resources Act has not been fully implemented as its governing “Rules” have been found unsuitable. The most significant import of the Act is that it reaffirms federal ownership of interstate water courses which include the major rivers of the Hadeji-Jama’are-Komadugu-Gana-Yobe system. The RBDA Act under which the Hadejia Jama’are River Basin Development Authority (HJRBDA) and Chad Basin Development Authority (CBDA) operate emphasizes development of irrigation agriculture without imposing any concomitant legal responsibility for pollution control and watershed management. Furthermore, there is currently no separation of regulatory and user functions, which have been combined in the RBDAs. The law as it presently stands make no clear distinction in their roles as water resources managers and as developers thus, simultaneously clothing them with the character of both gamekeeper and poacher. The law has thus inhibited and compromises their role as professional water resources managers. Additionally, the Water Resources Act, and the RBDA Act suffer from lack of provision requiring their operators to undertake watershed management responsibility as part of the their programme for resource sustainability. These lacunas in their enabling laws perhaps explain why these RBDAs do not pay any much regard to the sustainable use of water through an IWRM approach methodology.

It is therefore recommended that governments should seek to amend both Water Resources and the RBDA laws with a view to making the FMWR and indeed the RBDAs, IWRM-oriented. Under the present rule-oriented Water Resources Act, the place and role of stakeholders in the administration and management of the nation’s water resources is not provided for. Currently, there is no formal platform other than those facilitated by JWL, IUCN and LCBC-GEF projects as part of their stakeholder mobilization efforts, to involve upstream and downstream communities throughout the KYB in watershed management to take care of environmental degradation e.g.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



erosion, siltation, flooding and pollution which threatens the economic life of downstream investments and undermine sustainability. This defect in the law has since been acknowledged by the government and the FMWR as the executing arm. The National Council on Water Resources with the active support of FMWR has created a Coordinating Committee and its Technical Advisory Committee (TAC) for HJKYB in an attempt to reach-out to all governments, stakeholders identified in the basin including NGOs, Community-Based Organisations (CBOs), the private sector communities and institutions as well as the other line ministries and professional groups, pending the enactment of a new law or an amendment of the existing one to facilitate broad participation and cooperation. The bodies are, however, weak in the absence of any statutory provision yet on their composition and functions.

The effect and reach of **the National Park Services Act, Cap N65 in the basin** is restricted to Dagona where it applies to the Chad Basin National Park situated there. Section 30 of this law forbids utilization of virtually every kind of natural resources for livelihood that are within limits of the park. Prima Facie it provides illustration of legal constraint but a closer study revealed room for compromise between park authority and host communities, which should be gainfully explored. In particular, the Section 46 of the Act, allows for consultation between Park service and the local community to declare the area surrounding a National Park as a "*multiple-use area*". Section 48 on its part requires the Board and management committee of the Park to consult with and take into account the views of the local community.

Many other institutional weaknesses that have hampered the effective use of water resources management tools were traced to cumbersome decision-making process, and to the following:

- Lack of continuity of government policies, and regular review of legislation and policies which in turn, leads to constraints and insufficient human capacity to implement programmes; the inadequate funding of "software"

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

priority programmes; shortage of equipment and poorly defined operational structures; and lack of interest in studies for facilitating the implementation of administrative and technological solutions; and

- Excessive concentration on short-term actions and emergency response, to the detriment of more effective medium and long-term approaches. These results in the exacerbation of potential conflicts and in the commitment of available scarce resources to actions that have little or questionable impact, and continuous postponement of those actions that could have more lasting effect. An example of the later is capacity building in the agencies responsible for the use of management instruments and investment in equipment and management reforms.

To a great extent, the governance problems and the failure to deploy IWRM instruments derive from structural flaws in the current decision-making process. There are currently two RBDAs within the basin, with no coordination except through HJKYBCC, which is neither a statutory body nor does it have any direct influence on the activities of the two RBDAs. Meanwhile, there is also fragmentation of ill-defined and often conflicting responsibilities among many players engaged in water resources and environmental management in the basin. Their programmes are not harmonized nor coordinated. Consequently, these problems reflect upon the lack of capacity on the part of the communities to participate effectively in basin management. Such unpreparedness have tended to accentuate existing problems, with members of local communities being reluctant to assume the role of agents for change, by shunning responsibilities and adopting a narrow mind-set that makes them opposed to all attempts at instituting sustainable management practices in the basin. These have in part contributed to the inequitable water distribution and environmental degradation. This situation in the basin is combined with the absence of an overall national water resources management strategy/catchment management plan and the uncoordinated operation of the large dams. This situation calls for significant institutional reforms that would facilitate the development of a co-ordinated organisation within a

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



coherent and sustainable catchment planning process to ensure the efficient, equitable and environmentally sound use of the basin's resources.

Inadequate stakeholders' (especially communities) preparedness for effective participation has exacerbated some existing problems, especially when individuals are reluctant to take on the role of agents for change. Community participation is a key factor for reinforcing executive and legislative actions. Reluctance on the part of communities to fully participate in the implementation of key programmes, projects or activities is indicative of failure of stakeholders to exercise citizenship rights. Such communities also forego opportunities to provide their democratic representatives and managers with vital information, views, demands and priorities for incorporation into management plans and government appropriation act.

Among the many undesirable consequences of the prevailing governance problems are:

- The failure to establish basin-wide water management agency and the RBDAs' inability to constitute their advisory committee as provided in their enabling legislation;
- Scarcity of adequately trained personnel and dwindling financial resources made available to the RBDAs to meet demands and priorities, as well as inadequacies in terms of operational equipment and infrastructure required to conserve and regulate water allocation and utilization;
- Limited understanding of and compliance with Environmental Impact Assessment (EIA) laws, even on the parts of those responsible for deploying IWRM instruments, along with a lack of systematic process for mobilizing the society, applying water-use charges, and in enforcing environmental and water resources regulations; and
- Reluctance in exchanging information on environment, water resources and socio-economic management issues.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Insufficient political will and motivation, public apathy at all levels would need to be reversed, to facilitate measures necessary for strengthening environmental and water resources management institutions in the basin. Identification of suitable approaches to reduce the identified governance weaknesses, that would facilitate and transform risks into challenges, and that would shift the emphasis from recounting problems to identification and utilisation of opportunities for solving them, would require a commitment to transparent and participatory decision making by all key stakeholders. Contemporary management theory teaches us that three basic approaches are essential: *shared information, capacity-building, and public participation*. Information sharing would foster convergence between the demands of communities and the action of managers and decision-makers. Enhancing the capacities of the key agencies responsible for developing and implementing public policy would further enhance convergence between stakeholders' interests and decision-makers' actions. On the other hand, public participation is the best means of ensuring that outcomes would encompass the full array of pertinent issues, fears and interests at stake.

The solution of the legal and institutional problems of the KYB calls for the active cooperation of all stakeholders. Indeed the present state of water resources management in the basin requires an equitable apportionment of water between the various sectors which includes irrigation, domestic and industrial water use, traditional food production systems and the ecosystem on one hand, and the regions (upstream and downstream state and communities) on the other. If long term damage to ecosystem and water engendered conflicts are to be avoided then the present uncoordinated exploitation and use of the basin's water resources must cease. The region and indeed the Nigerian nation must embrace an integrated management of the land, water and aquatic living resources of the basin so as to attain their efficient and sustainable use for the present and for posterity.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Part **4:** **Strategic Guidelines for the Management of the KYB**

4.1 Water's Role in Achieving the Millennium Development Goals and National Economic Empowerment and Development Strategy

Water is life – safe drinking water is essential for health and increasing the level of access to water is important for income generation. The empirical and conventional wisdom suggest that water is a major constraint to the basin's rural economic growth especially in the arid and semi-arid portion (finite land & water resources versus growing demand). Effective water resources management is therefore an essential ingredient to virtually all the Millennium Development Goals (MDGs) as table 4.1 summarises and therefore by simple extension it is the cornerstone of National Economic Empowerment and Development Strategy (NEEDS). The role of water in improving health, combating poverty and hunger, ensuring environmental sustainability and reducing gender inequalities would be briefly discussed.

The Federal Government's NEEDS is targeted at implementing the following long-term strategies: 6% annual growth of GDP; develop public-private partnerships (PPP) to stimulate rapid infrastructure development for provision of safe water for domestic and other uses to create new jobs including commercial agriculture; environmentally sustainable development, greater participation of citizens in decision making and strengthening democracy. Investments in water resources development, for domestic water supply, sanitation, irrigation provided for in the mid-term strategy and MDGs, comprise a large portfolio of projects for the future. Serious doubts persist as to how sustained growth in the nation can be financed and there is a pre-eminent need to attract private sector investment. Regardless, it is clear that agriculture will remain the major economic activity and driving force for development in the basin. It is important to bear in mind that immense areas of land in the basin have not yet been

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



utilized, and that the current method of utilization of many of the land that are being used are not sustainable. This underscores the importance of understanding that sustainable development in the basin has to be based on three-tripod of “water-land-energy”. Water is the most critical limiting factor to long-term sustainability and it was for this reason, that the water auditing was conducted to assess the role of water-resources management in sustainable development of the basin.

(a) Improving Health

Safe drinking water and adequate sanitation impact significantly on health, overall economic development and equity. Water-related diseases are the most common cause of illness and death among the poor and children in particular. Effective water management has significant health impacts in terms of vector-borne diseases and water contamination. Vector-borne illnesses such as malaria and schistosomiasis (bilharzias) are passed on humans by mosquitoes and snails that breed in aquatic ecosystems. For instance, improving irrigation techniques to avoid standing or slow running water can have a big impact on malaria control. Similarly, improved disposal of household wastewater eliminates a choice breeding ground for mosquitoes.

The poor lack safe drinking water and are thus disproportionately affected by water-related diseases. They also spend much more of their income on water than do the rich. Improved delivery of safe water and sanitation reduce the possibility of biological pathogens and chemical hazards that could cause diarrhoeal diseases. Similarly exposure to Persistent Organic Pollutants (POPs) such as dioxin, Dichloro-Diphenyl-Trichloroethane (DDT) and Polychlorinated Biphenyls (PCBs) is another danger. These constitute a source of water contamination produced as they are released into the soil, air and water by way of poor agricultural and industrial practices as well as via improper waste disposal. Evidence points to links between exposure to POPs and in incidence of cancers and tumors. There are also links between exposure to POPs and: learning disorders and changes in temperament;

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

reproductive disorders; birth defects among many others. When integrated into the food chain, their damaging effects on ecosystem and human health are prolonged.

Table 4.1 Water - A Cross-cutting Resource for the Millennium Development Goals

MDGs and Associated Targets	How improved water resources management and access to water benefits each of the eight MDGs:
ERADICATE EXTREME POVERTY AND HUNGER	
Target 1: To halve the proportion of the world's people whose income is less than \$1/day	Water is a critical factor of production in agriculture, industry and economic activities Investments in water infrastructure/services as a catalyst for local/regional development Reduced vulnerability to water-related hazards reduces risks in investments and production Reduced ecosystem degradation makes livelihood systems more secure Improved health increases productive capacities, reduces burden on those who care for the sick
Target 2 : Halve the proportion of the worlds people who suffer from hunger	Water is a direct input to irrigation for expanded grain production Reliable water for subsistence agriculture, home gardens, livestock, tree crops Sustainable production of fish, tree crops and other foods gathered in common property resources (also affects poverty when such goods are sold for income) Reduced urban hunger due to cheaper food prices Healthy people are better able to absorb the nutrients in food than those suffering from water-related diseases, particularly worms
ACHIEVE UNIVERSAL PRIMARY EDUCATION	
Target 3: To ensure that children everywhere complete a full course of primary schooling	Improved school attendance from improved health and reduced water-carrying burdens, especially for girls Having separate sanitation facilities for girls and boys in schools increases girls' school attendance
PROMOTE GENDER EQUALITY AND EMPOWER WOMEN	
Target 4: To ensure girls and boys have equal access to primary and secondary education	Community-based organisations for water management improve social capital of women Reduced health and care-giving burdens from improved water services give women time for productive endeavours, education, economic empowerment activities Water and sanitation facilities closer to home put women and girls at less risk of sexual harassment while fetching water and searching for privacy Higher rates of child survival are a precursor to the demographic transition towards lower fertility rates; having fewer children reduces women's reproductive responsibilities
REDUCE CHILD MORTALITY	
Target 5: To reduce by two-thirds the death rate for children under five	Improved quantities and quality of domestic water and sanitation reduce main morbidity and mortality factors for young children Improved nutrition and food security reduces susceptibility to diseases
IMPROVE MATERNAL HEALTH	
Target 6: To reduce by three-fourths the rate of maternal mortality	Improved health and reduced burden from fetching water over long distances reduce risks Improved health and nutrition reduces susceptibility to anaemia and other conditions that affect maternal mortality Sufficient quantities of clean water cut down on life threatening infections Higher rates of child survival are a precursor towards lower fertility rates; and fewer pregnancies per woman reduces maternal mortality
COMBAT HIV/AIDS, MALARIA AND OTHER DISEASES	
Target 7 & 8: To halt and begin to reverse the spread of HIV, malaria, other major diseases	Better water management reduces mosquito habitats Better water management reduces risk for a range of water-borne diseases Improve health and nutrition reduce susceptibility to /severity of HIV/AIDS and other major diseases
ENSURE ENVIRONMENTAL SUSTAINABILITY	
Target 9 & 10: Integrate the principles of sustainable development into policies and programmes; reverse loss of environmental resources and to halve the proportion of people who are unable to reach or afford safe drinking water	Improved water management, including pollution control and water conservation is a key factor to maintaining ecosystems integrity Development of integrated water resource management within river basins creates situation where sustainable ecosystems management is possible and upstream-downstream conflicts are reconciled Biodiversity conservation, combating desertification is furthered by sound water management
Target 11: To achieve a significant improvement in the lives of at least 100 million slum dwellers	Improved domestic water supply and sanitation as well as better water management reduces pathogens, chemical hazards and poverty to which the slum dwellers are exposed

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Water containers typically hold 20 litres of water, which weighs 20 kg. Carrying such heavy loads, commonly on the head, for long distances each day can result in headaches, fatigue or even serious injury to head, neck, spine and pelvis, which in turn can cause problems during pregnancy and childbirth.

(b) Combating Poverty

According to United Nations Development Programme (UNDP) report, about 70% of Nigerians, majority of them women are classified as extremely poor because they live on less than US\$1 a day (UNDP, 2003). Although, Nigeria does not experience chronic hunger, substantial portion of the population are on the brink of starvation and large number of children under five die from malnutrition every day. Improving access to safe water and sanitation as well as for agriculture are essential to fighting poverty and hunger. Meeting the MDG targets in this area will depend on improved water management and continued expansion of access to water. Ensuring adequate food supply, poverty alleviation at community and household level simply cannot be achieved in the basin given the current water management situation.

Reducing the ill health and diseases through improved water supply and sanitation frees the time spent on caring for the sick (particularly women) for more productive activities, keeps the children from missing school with positive impacts on income and livelihood. Lower health costs also mean more disposable income. Furthermore access to safe water near the home saves time for women and children; time that can then be spent on productive activities and education. Today under-performing irrigation systems and poor water management practices have worsened water shortages in the basin. Excessive extraction for irrigation has affected water tables in many places. Pesticide, herbicides and fertilizer used in agriculture threatens groundwater quality. Invasive species have covered huge water areas, clogging river and irrigation channels, threatening the infrastructure, flooding communities and leading to collapse of fisheries and other means of livelihood.

Catchment Management Plan for integrated natural resource management of Komadugu Yobe Basin

Box 4.1: Integrated Management

The sustainable management of water resources involves four main components:

- ✓ **physical appropriate (design, construction, operation and maintenance, the prevention of environmental degradation);**
- ✓ **financial/economic acceptability (cost effectiveness and cost recovery);**
- ✓ **social/institutional acceptability (equity , user-participation and ownership), and**
- ✓ **legally enforceable (laws, regulations, strategies).**

Strategies and programmes need to integrate fully these dimensions of land and water resources management to ensure sustainability. This approach requires a framework that integrates the efficient and equitable management of land and water resources with ecologically sound use

(c) Ensuring Environmental Sustainability

Environment is central to poor people's sense of well-being, economic empowerment and control over their own lives. For most of the poor, ability to live a long and healthy life, having sufficient resources to earn a living and seeing their children grow to adulthood is predicated on the state of the environment, including water resources. It determines their ability to choose jobs and livelihoods, to assert some cultural and religious values, to find adequate time for education and leisure, to cope with crisis and to enjoy freedom from conflicts, exploitation and fear. Retaining as much water as possible in the basin is a question of survival, but being arid, a substantial proportion of rainwater is lost through seepages, evapotranspiration, and percolation. Achieving sustainable development in the basin thus has significant implications for reducing poverty and hunger.

Catchment Management Plan for integrated natural resource management of Komadugu Yobe Basin

Box 4.2 Management Issues at increasing levels of water scarcity

The turn of the water screw

The crucial scarcity in dealing with water may not be scarcity of the natural resource – water – but the scarcity of social resources needed to adapt to water scarcity (FAO, 2000). The significance of this message is made clear by considering how managers can deal with increasing water scarcity over time:

- At the first turn of the water screw, the remedy is to get more water, this goal is predominantly accomplished by water storage and transfer in time and space;
- At the second turn the effort is redirected towards efficiency measures, predominantly end-use efficiency. The goal is to get **more benefit per drop**; and
- The last turn of the water screw is reallocation of water rights. This requires profound changes in national policies, since achieving allocative efficiency could mean withdrawal of water rights of irrigation schemes that generate a low value per unit of water. The food needed by growing populations will then need to be imported and paid for by industry and services sector. This will require large-scale social restructuring and entails risks of tension and conflicts, within countries and between sectors and population groups with different stakes in the new socio-economic environment.

Based on FAO 2000 and Yevjevich 1995

4.2 The Guiding Principles

This document is based on a set of principles and accompanying strategic framework derived from the guiding principles set out in the Dublin Conference Statement and reaffirmed during the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992. These principles were first published for public comment in November 1998. They are presented in this CMP for further discussion and consultation.

This Consultation Guide has been developed and guided by the three concepts of

- ✓ equity of allocation and access to water resources
 - ✓ efficiency of use in the management of water resources
 - ✓ environmentally sound management of the catchment
- 'Rai Dangin Goro, Ruwa Ake Bashi'**



Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Box 4.3: The DUBLIN principles show the way

Four simple, yet powerful messages were provided in 1992 Dublin. They were the basis for the Rio Agenda 21 and for the millennium Vision-to-Action. **The four principles are:**

- 1. Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment** *i.e. one resource, to be holistically managed*
- 2. Water development and management should be based on participatory approach, involving users, planners and policy-makers at all levels** *i.e. manage water with people – and close to people*
- 3. Women play a central role in the provision, management and safeguarding of water** *i.e. involve women all the way!*
- 4. Water has an economic value in all its competing uses and should be recognized as an economic good** *i.e. having ensured basic human needs, allocate water to its highest value and move towards full cost pricing to encourage rational use and recover costs*

4.3 Guidelines for the Selection of Priority Areas and Actions

The CMP preparation process was based on the causal chain analysis methodology and information garnered from Water Auditing. It recognises the specific characteristics of the Komadugu Yobe Basin, among which are:

- The need for water resources management in the basin to accommodate local, State and even international obligations. It is thus necessary to consider proposals for water and natural resources utilisation and management that are imbued with mechanisms that take into account the diverse standpoints of users and stakeholders, not only in Nigeria but also in Niger;
- The need for institutional interaction between the various federal, state and local agencies in Nigeria, as well as those in Niger and the need to implement inter-institutional networking provided by Lake Chad Basin Commission (LCBC) as a prime objective in the basin;
- The need to preserve the unique biodiversity of the basin, which is dependent upon maintaining the integrity of the hydrological system, as well as that of the

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

entire ecosystem, which has become vulnerable to several anthropogenic alterations;

- The need for land management that promotes sustainable settlement patterns and that include economic incentives, mechanisms and actions aimed at preserving and restoring the environmental integrity of the component sub-basins; and
- The need for developing proposals for the efficient utilisation of the river system that would reconcile demands for economic development with the maintenance of the underlying ecosystems and environmental quality as well as the maintenance of the stability of river beds and banks.

Aside from these specific characteristics, other guidelines were also considered. Inclusion of the goals of the draft Nigeria's National Water Resources Policy resulted in the definition of actions that meet the expectations of both MDGs and NEEDS. These actions, whenever possible, were made comprehensive to encompass all of the problems and their causative factors identified in **Part 3** and seek to treat them in an integrated and consistent manner, avoiding isolated or sectoral approach. Nonetheless, such a holistic approach could not apply to some issues, which, out of necessity, had to be tackled by means of more narrowly focused and targeted initiatives. Such issues have to ultimately and incrementally contribute to the overall resolution of the larger issue of efficient utilisation of water resources that are equitably allocated and that ensure environmental sustainability. On the other hand, since not all problems occur with the same intensity throughout the basin, the scope of strategy for dealing with them needs to be tailored to local needs.

In view of all of the foregoing, priority actions were selected based upon:

- a sound technical basis, directly selected by the stakeholders as relevant to solving the critical problems of the basin;

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

- a coordinated approach, addressing the greatest possible number of problems in partnership with the institutions that are potentially involved in their implementation;
- the ability to produce measurable benefits, which will be monitored and evaluated throughout the course of the project implementation;
- public participation, particularly those organised by KYB, LCBC-GEF, and DFID-JWL projects;
- the potential to be wholly or partially replicated within the basin or in similar areas in Nigeria or in the Lake Chad Basin;
- its direct contribution to the livelihood and well-being of the local population and to sustainable development;
- its ability to be implemented without entailing the risk of any negative social impact on the local communities and at the same time be environmentally acceptable;
- capacity building and development of leadership potential among the communities and institutions that would be involved; and
- institutional sustainability, in technical and financial terms, in order to guarantee continuity beyond the various on going projects (KYB, LCBC-GEF, DFID-JWL).

Water resource is the most critical limiting factor to sustainable economic development of the basin. Population growth, urbanisation and economic development are putting increased pressure on the limited freshwaters of the basin. Majority of the more than 15 million people that inhabit the region rely directly on the natural resources for their livelihoods through dryland and irrigated agriculture, fishing, livestock herding among other things. The basin has witnessed significant climatic variability, depicted by extensive droughts and increased desertification. These have all combined to increase pressures on the water and other natural resources of the basin which in turn has led to a number of physical changes in recent years. The most visible have been desertification, the siltation of river channels and infestation of invasive *Typha* grass that has aggravated flooding in

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



areas where it was previously uncommon and drying up of some of the river channels. The impact of these on the population has been the deepening of poverty particularly on the rural population who rely primarily on natural resources for their livelihoods, peace and security is being threatened by potential and real conflict over access and equitable allocation of water. This informed the formation of Coordinating Committee for the basin (HJKYBCC).

Some of the stakeholders in the basin have gradually been coming to terms with the situation. They have already commenced dialogue to initiate IWRM in the basin starting with the September 2004 workshop in Kaduna that identified the key resource management issues and the week long workshop in Dutse that confirmed the key issues, refined and developed measures into an Action Plan for IWRM in the basin. The major challenge facing HJKYBCC is therefore that of consolidating its position as forum for determining strategic programme for the basin with the aim of integrating water resource management in the sustainable development of the basin as democratically conceptualised by the stakeholders.

Accordingly, the priority challenges facing the HJKYBCC are issues of an operational nature, including determination of operational mechanisms to ensure its sustainability; to provide for its technical, financial and administrative support; to confirm its assignment of responsibilities; to provide a framework for its decision-making procedures; and to accommodate its restructuring into a council including the restructuring of its technical advisory committee and formation of state advisory bodies.

To this end, the CMP should as a matter of priority include strategies for the decentralized implementation of IWRM tools to enable the HJKYBCC, on the basis of Water Audit and other technical information and with legal support, to address the issues and make decisions that will ensure the sustainable development of all of the basin. However, in view of the size and complexity of the basin, there is a need to

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



stimulate and strengthen intermediary channels of communications between the traditional rulers, the civil society and basin committee, in line with the realities of each state, and to ensure that the views of bodies such as the emirate councils, tributary or local government committees and the State advisory councils are heard and considered by the basin's Committee.

The strengthening of such channels would assist in enabling the Coordinating committee's decision-making agenda, to incorporate relevant issues of concern in the basin, and in ensuring that decisions made when the committee is in session are preceded by ample discussion within the affected state and sub-basins, thereby guaranteeing that the views of all the various stakeholders are effectively represented.

Consequently, the principal actions foreseen are:

- ◆ Review and provide the legal framework to ensure sustainability of HJKYBCC;
- ◆ Establish a functional Technical office for the HJKYBCC;
- ◆ Creation of State Advisory Councils;
- ◆ Creation of State Technical Advisory Committees; and
- ◆ Creation of a Hydrological Basin Agency, including:
 - merging the existing two RBDAs and redefining the legal responsibilities of the agency
 - provision of adequate resources for the Basin Water Agency
 - providing technical secretariat for the HJKYB Council
 - Implementing approved Strategic Plan for the Basin Water Agency.

Although they may contain some similar elements, the CMP and the Strategic Plan for the Basin Water Agency have quite distinct objectives, content and execution schedules. **The CMP is a document containing a set of strategic actions designed as catalysts to address priority concerns targeted at correcting or mitigating the critical problems as mutually agreed by the stakeholders.** Its

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



scope, however, encompasses integrated management actions that would be applied throughout the entire KYB.

It is significant to emphasise that CMP is **designed to act as catalyst**. This means the actions should aim to enhance and strengthen the many national, state and local government programmes which have the primary responsibility for providing the basic services. Consequently, such basic actions as providing domestic water services, irrigation facilities among others that can be solved by individual stakeholder are not included in CMP. Essentially, it is intended to serve as **a negotiated policy document containing policy, legal and institutional reforms and investments needed to address common resources management issues**.

The Strategic Plan for the Basin Water Agency, in its full version, would be a much more comprehensive document. Indeed, it would be built on CMP and would be conceived as a continuous and dynamic process, subject to periodic review, focussed on long-term horizons, expressed through scenario analyses that would examine future conditions for the development within the river basin. The drafting of such plans will be built on implementation of some actions and institutions that would emerge from CMP involving complex participative process under the coordination of the *new* Komadugu Yobe Catchment Management Authority (KYCMA)² and subject to approval of KYB Coordinating Council³.

Components of Strategic Basin Plan, could be grouped into two major categories: policy and management, relating mainly to essentially creating the enabling environment and 'soft-ware' actions of 'non-structural' nature; and the services and works, relating to 'hardware' actions of a 'structural' nature, comprising the more direct corrective interventions to be effected in the basin. The CMP contribution

² Technical Advisory Committee (TAC) in the interim

³ Hadejia-Jama'are-Komadugu-Yobe Basin Coordinating Committee (HJKYBCC) in the interim

Catchment Management Plan
 for integrated natural resource management of
Komadugu Yobe Basin

within the scope of future basin plan would essentially be closely related to the lines of action that could be envisioned under the policy and management component. In view of time limitations, only the very critical physical service and works, that are, absolutely necessary to set the stage for equitable allocation of the basin's waters



Figure 4.1: Probable Structure of the Comprehensive KYB plan and its interface with CMP

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



would be selected for inclusion in CMP. In view of this, and with a view to providing greater clarity for the purposes of selecting suitable priority strategies from the attached draft Basin Action Plan and others that were suggested, it is recommended that all strategies that are policy and management oriented and the works necessary to implement them be encompassed by this CMP. All other services and structural works that could not be accommodated as well as any action of long-term nature be left for subsequent definition in the Comprehensive Strategic Plan of KYB to be decided later.

Part **5**: **Strategic Actions and Selected Activities**

5.1 Structure and Basic Components

In the selection of projects for the CMP, two types of actions were prioritized: actions that seek to minimize the principal negative aspects diagnosed; and actions that aim to establish a sound enabling environment, as well as effective technical and management base for integrated water resources management (IWRM) in the basin.

With respect to actions of the first type, the size, heterogeneity and complexity of the basin means that it would be impossible to accommodate all actions that would treat the full scope of all the problems facing the basin at the same time. For this reason, the adopted strategy favored is to select the priority interventions for inclusion in CMP that meet the criteria set out in **Part 4** that would lead to rapid and favorable outcomes in resolving the principal problems, but which could be implemented on pilot scale and be easily replicated or adopted for other parts of the basin.

The structure of the CMP and its basic components, in order to fulfill the goals set under the draft National Water Resources Policy, the KYB, LCBC-GEF and DFID-JWL projects, would be focused on the promotion of technical-institutional strengthening and partnership with the society as a whole. This would be achieved and consolidated through policy reforms, and implementation of participatory and stable water resource management system to which CMP would set the stage and contribute. This would consist of development and adaptation of the regulatory framework, institutional reforms and technical and management instruments required for an Integrated Basin Management System. Furthermore, it will seek to reinforce institutional linkages, while also fulfilling the civic role of providing environmental training and education for the society.

Catchment Management Plan
 for integrated natural resource management of
Komadugu Yobe Basin

It would be made to work in tandem with the on-going effort towards universal access to water for domestic supplies, agriculture and sanitation with a view to fulfilling social-inclusion goals enunciated under the NEEDS (2003-2007). The CMP was thus structured into two major components, namely: contributions to the introduction of an Integrated Basin Management System and its array of technical and management instruments; and secondly contributions to the sustainable use of water resources and the restoration of environmental quality, as depicted in Figure 5.1.

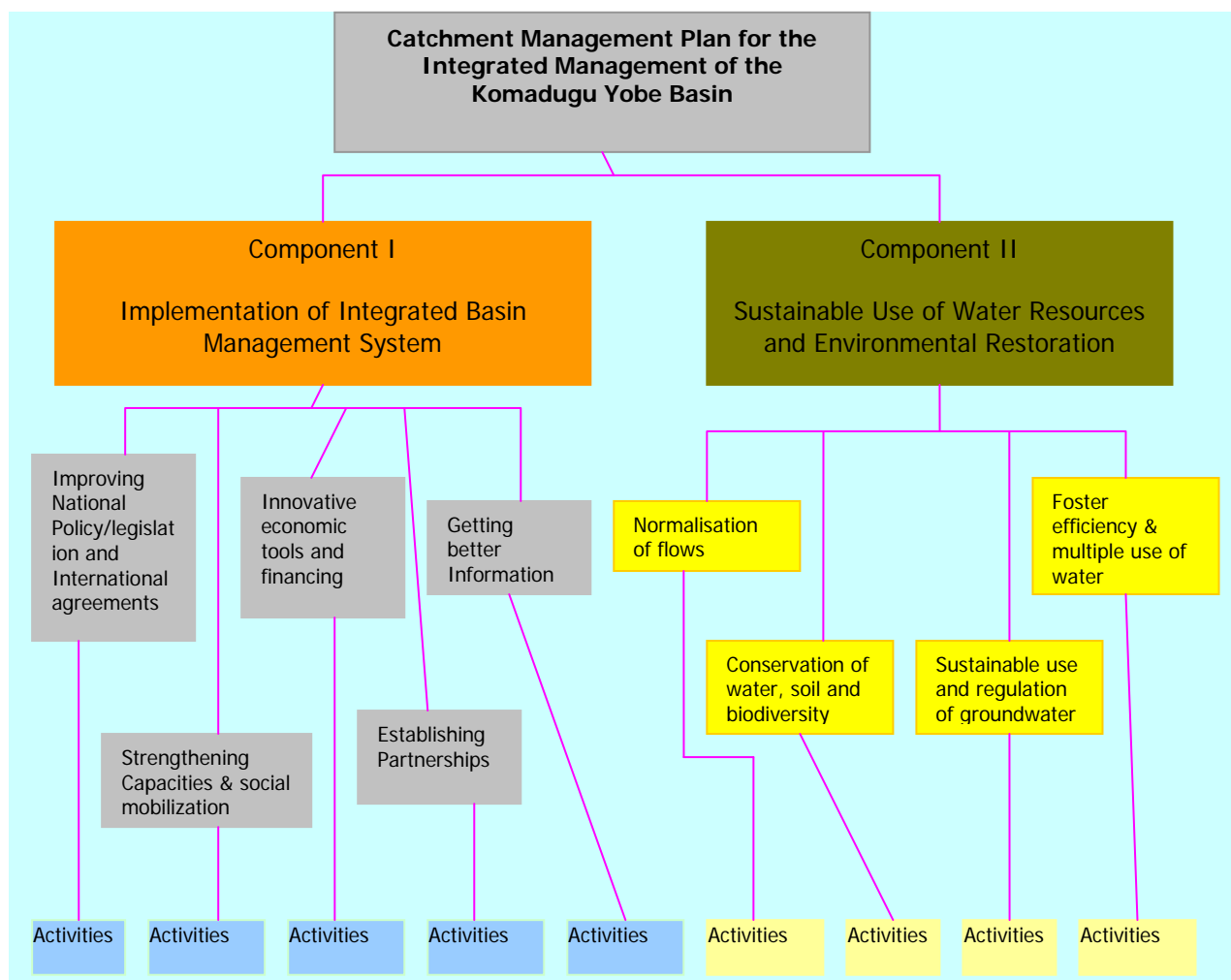


Figure 5.1: Structure and Basic Components of the CMP

5.2 Component I – Implementation of Integrated Basin Management System

5.2.1 Strategic Action I.1- Strengthening Capacity and Social Mobilization

This strategic action is divided into three main activities, which will be briefly discussed below:

- ◆ I.1.1. Promoting publicity campaign, raising awareness, social mobilization and environmental education on rational water use and environmental management, including drafting curriculum for primary and secondary school levels that considers peculiarities of each state and involving restoration of areas with outstanding ecological and historical value.
- ◆ I.1.2. Establishment and strengthening of formal channels of communication with local stakeholders through identification, capacity building, and inclusion of community representatives and leaders (including traditional authorities and LGAs) in all new IWRM-related decision-making structures and processes.
- ◆ I.1.3. Decision-Support Systems for basin that would facilitate equitable allocation of resources.
- ◆ I.1.4. Assist communities to develop a planned response to impending floods and other similar emergencies (in the absence of early warning system), and conflicts over land and water resulting from these sudden changes, through local community-based Resource Use Planning (RUP).

I.1.1 Promoting publicity campaign, raising awareness, social mobilization and environmental education on rational water use and environmental management, including drafting curriculum for primary and secondary school

Social mobilization occurs only when individuals seek to achieve common objectives, which requires an awareness of the importance and public-spiritedness of the said objectives. In order to mobilize public support for IWRM, planned and coordinated

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



public involvement and enlightenment must be promoted. Accordingly, this activity would result in:

- Increase capacity of local, state and national institutions and joint bodies to apply IWRM principles;
- training programmes, seminars and workshops to promote shared understanding of IWRM issues among planners, decision-makers and leaders across the basin;
- curriculum for primary and secondary school levels that considers peculiarities of each state and involving restoration of areas with outstanding ecological and historical value; and
- broader water engineering and water management curricula in tertiary institutions to include awareness and skills on ecosystem protection and sustainable water use through cooperation with appropriate institutions.

1.1.2 Establishment and strengthening of formal channels of communication with local stakeholders through identification, capacity-building, and inclusion of community representatives and leaders (including traditional authorities and LGAs) in all new IWRM-related decision-making structures and processes

To ensure that the objectives of IWRM activities planned for the basin are in harmony with those of its most critical stakeholders (i.e. the local resource users and regulators), formal channels of communication need to be established and maintained with key individuals who have the capacity to represent these groups' interests, to enter into dialogue with higher (mainly State and Federal) level decision-makers, and to inform public opinion and mobilize public support effectively at the community level. These channels consist of various platforms for dialogue and decision-making (1) between riverine communities in different sub-catchments of the basin, (2) between LGAs and Emirates within and across these sub-catchments, and (3) through inclusion and active participation of members of these platforms in all riparian state water fora (e.g. state IWRM committees) and all similar basin level fora

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



(e.g. the HJKYB-TAC and Stakeholders Consultative Forum (HJKYB-SCF)). The establishment and strengthening of these formal communication channels will entail:

- Identification of acceptable (preferably democratically elected) representatives and leaders of local stakeholder groups from each of the major sub-catchments in the basin;
- Capacity-building of these community representatives and leaders in both the social and technical aspects of IWRM-based catchment management; and
- Inclusion of these trained community representatives and leaders in all IWRM-related decision-making bodies in the basin, not as token representatives but as active members with equal voice.

1.1.3. Decision-Support Systems for basin that would facilitate ecosystem approach to resources management and more equitable allocation of these resources

This activity entails the development of suitable support systems for decision-making, including development of simulation models for quantitative and qualitative analysis of the basin's environment but more especially land and hydrologic condition as well as hydraulic structures (dams, canals, sub-catchments, pumping facilities, diversions, etc.). It is envisaged that the following management instruments would be produced:

- Technical specifications, comprising the following modules: (i) Database module, (ii) simulation module, and (iii) Dialog module;
- Manuals, which should include (i) User Manual, and (ii) Model Reference manual with numeric solutions and frameworks;
- A computer program for the DSS; and
- Website for accessing the DSS.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

1.1.4. Assist communities to develop a planned response to impending floods and other similar emergencies (in the absence of early warning system), and conflicts over land and water resulting from these sudden changes

This activity entails the establishment and institutionalization of forecasting and decision support systems based on local knowledge. Suitable responses would be documented and disseminated to enable the communities help themselves before formal help can reach them. This would be supported with a suitable radio and mobile phone communication networks. The following products are envisaged:

- An Emergency Response Action Plan for floods, droughts, conflicts and other similar natural resource based emergencies in the basin;
- Engagement (e.g. through workshops, short courses, seminars, etc.) with representatives of public authorities and organized civil society, with a view to setting criteria, identifying priority areas for actions aimed at mitigating the effects of the emergencies and enlightening the communities on the most appropriate response to the emergencies;
- Resource Use Planning with communities, traditional authorities and LGAs in areas prone to floods, droughts, conflicts, and other similar emergencies;
- Mobile communications between dams operators and the local communities;
- Capacity-building of local communities in hydrological phenomena;
- Radio programmes that would prompt and provide guide to the appropriate response s to forecast floods, droughts, conflicts, etc.;
- Database of all key community representatives and leaders' mobile phone contacts, from across the basin, and an agreed system of information relay.

5.2.2 Strategic Action 1.2 – Establishing Partnerships

This strategic action is divided into three main activities, namely:

- ◆ 1.2.1. Support and reorganize the HJKYB Coordinating Committee through instituting a truly Basin Management Agency that covers the entire basin and

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

representing the interests of all stakeholders including traditional institutions, civil societies (NGOs, CBOs) and with its technical advisory committees, secretariat and funding mechanisms.

- ◆ 1.2.2. Harmonization of programmes of federal, state and local government bodies and other participants in the system to remove duplication and maximize performance.
- ◆ 1.2.3. Propose actions to be implemented by the two countries.

1.2.1. Support and reorganize the HJKYB Coordinating Committee through instituting a truly Basin Water Management Agency that covers the entire basin and representing the interests of all stakeholders including civil societies (NGOs, CBOs) and with its own technical advisory committee, secretariat and funding mechanisms

This activity is being subjected to in-depth study considering models across the world drawing on the experiences from other countries using different models. This study is expected to be completed within the next one year. Meanwhile, the existing HJKYB Coordinating Committee should be strengthened, with a budget line to facilitate a smooth operation of the proposed CMP.

1.2.2. Harmonization of programmes of Federal, State and Local government bodies and other participants in the system to remove duplication and maximize performance

This activity seeks to promote harmonization and coordination between CMP activities and the actions of governments and stakeholders involved in the KYB, with a view to promoting convergence of efforts, multiplication of results, and minimizing duplication and wastages. As an activity targeted at harmonizing and integrating joint actions among Federal, State and Local government programmes, the envisaged actions and outputs/results shall include the following:

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

- integration agreements between the States and the Federal Government to standardize management instruments;
- events to promote harmonization, integration and coordination involving those responsible for planned and on-going interventions through dialogue and greater interaction of local and regional planners with the aim of fostering convergence among the various programmes;
- preparation of common “annual agenda of interventions” that would encompass plans and targets of each of the cooperating institutions complete with a framework for resolving potential conflicts and ways of promoting convergence; and
- setting of criteria and procedures for harmonizing and matching budgets and timelines for action among the cooperating Federal and State government agencies.

1.2.3. Propose actions to be implemented by the two countries

This activity seeks to promote coordination of the CMP actions among the stakeholders in the KYB within the two countries with a view to: networking links among institutions that would enable future cooperation in the area of transboundary IWRM issues and facilitating the convergence of efforts and synergy. As the activity is designed to promote integration among the institutions within the basin, with a view to fostering joint activities, its expected outputs/results shall include:

- Supporting exchange of visits to events designed for promoting integration, coordination and joint planning of actions being pursued in the two countries, including workshops and meeting among technical staff, planners and those responsible for execution of water policy;
- Inclusion of, in the Basin Information System, data available in Niger and Nigeria and regularly sharing of such information among the institutions; and

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

- Enhancing cooperation among agencies in the two countries that share the basin to facilitate systematic data collection and exchange of information within the context of the Nigeria-Niger Joint Commission (NNJC).

5.2.3 Strategic Action I.3 – Getting Better Information

For sound decision-making and integrated management of water and related ecosystems, a comprehensive hydro-meteorological database, socio-economic issues and clear knowledge of the environment and ecosystems functions and conditions are required. To strengthen this knowledge increased investments in data collection, research and technology are needed. This strategic action is therefore divided into three main activities, which will be briefly discussed below:

- ◆ I.3.1. Reactivate and establish hydro-meteorological network, monitoring, analysis and dissemination of hydro-meteorological and socio-economic information in the basin by all tiers of government (including reintroduction of geographic societies in primary and secondary schools).
- ◆ I.3.2. Undertake land resources planning including remote-sensing techniques and geographic information systems (GIS), mapping and zoning at community level (including continuing research under this intervention).
- ◆ I.3.3. Establishing of mechanisms such as clearing houses, ranges to provide local managers and the general public with appropriate information on the rational water use, protection and wise use of ecosystems.

I.3.1. Reactivate and establish hydro-meteorological network, monitoring, analysis and dissemination of information in the basin by all tiers of government (including reintroduction of geographic societies in primary and secondary schools)

Most of the hydrometric system in the basin were designed and installed for uni-functional system, rather than for informing multiple uses. The density of the stations is inadequate and not properly monitored and the data seldom disseminated among stakeholders. This activity would therefore involve adjustment of the existing system

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



as well as expansion and consolidation of the network. The expected outputs/results would include the following:

- A restructured and expanded network for the collection of hydro-meteorological data, based on articulate specifications for, standardization of equipment employed at manned and unmanned stations, and the arrangements necessary for the operation and maintenance of various classes of the stations;
- Regular collation, assessments and compilations of hydro-meteorological, environmental and socio-economic information for wide circulation among all stakeholders in the basin; and
- A website for information dissemination.

1.3.2. Undertake land resources planning including remote-sensing techniques and geographic information systems (GIS), mapping and zoning at community level (including continuing research under this intervention)

IWRM requires a “knowledge based institutional responses” which has to have greater access to appropriate technical knowledge, data and information readily available to all stakeholders in a manner that is comprehensible to all. This activity would seek to articulate improved land resources planning by way of appropriate and adequate socio-economic and environmental data and information including the use of remote sensing techniques, GIS, mapping and zoning at community level. This would be supported by continuing research. The expected outputs/results shall include:

- Information system on socio-economic and land resources planning in the KYB involving consolidation and operation of a suitable geo-referenced database, making information on socio-economic and land resources available using, *inter alia*, the internet;
- Land Use Mapping of the basin: completing the map of land use and settlement patterns in the entire basin in ArcView format; with an element

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

- to support implementation of a piezometric monitoring network designed to provide more detailed knowledge on dams and groundwater resources; and
- Processing and dissemination of cropping patterns and other information on fishing and livestock.

1.3.3. Establishing mechanisms, such as clearing houses and ranges, to provide local managers and the general public with appropriate information on the rational water use, protection and wise use of ecosystems

To prepare the public opinion and institutions in the basin for the implementation of IWRM, activities will be needed to broaden public knowledge and enlist their support and participation. To this end, clearing houses or public rangeland to provide not only managers and planners with appropriate information on rational use, protection and wise use of ecosystems on continuing basis, but also provide same and educational materials to the public while respecting the regional sensibilities and characteristics of each state. Implementation of this activity essentially entails the identification of the target audiences, the most appropriate media, language and strategies for reaching each audience. It would also use the opportunities of clearing houses, public rangeland and parks to place the topic of rational water and natural resources management onto the public agenda. The outputs/results expected from the activity are:

- Establishment of public clearing house in each state, and a number of rangelands or public parks stocked with adequate educational and enlightenment materials including holding of field days, and publication of handbills and other materials to be used by local government; and
- A programme for mobilizing the public on continuing basis in support of rational water use and conservation of the environment.

5.2.4 Strategic Action I.4 - Improving National Policy/Legislation and International Agreements

Law, as a vehicle for orderly change, and the related supporting institutional arrangements are vital for IWRM at local, state, national, and transboundary levels. The National legislation needs to be developed to be able to regulate economic activities that adversely affect water related ecosystems. Improved legislation would also reduce fragmentation between governmental institutions responsible for water management, ecosystem protection and sustainable use. Much also remains to be done to update existing bilateral agreements on transboundary waters to incorporate IWRM approach. Consideration needs to be given to the various multilateral water and environmental agreements that the nation is signatory to such as: the World Summit on Sustainable Development, the Ramsar Convention on Wetlands, the United Nations Framework Convention on Biological Diversity, the United Nations Economic Commission Europe's environmental conventions, as important tools for sustainable water management. Benefits from cooperation under these instruments should be maximized and duplication of efforts avoided. Accordingly, this strategic action is divided into two main activities, which will be briefly discussed below:

- ◆ I.4.1. Support for research and studies to collect, analyze and synthesize information, best practices to review, harmonise existing policies and propose draft bills, edicts and bye-laws that conform with IWRM principles, including establishing criteria for water-use licensing, charges, conflict-management and definition of monitoring strategies.
- ◆ I.4.2. Organise public debate and dialogue to gain further inputs and review the draft policy, bills, edicts and bye-laws.

1.4.1. Support for research and studies to collect, analyze and synthesize information, best practices to review, harmonise existing policies and propose draft bills, edicts and bye-laws that conform with IWRM principles, including establishing criteria for water-use

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



licensing, charges, conflict-management and definition of monitoring strategies

The activity aims to create mechanisms for harmonizing the strategies and policies for monitoring and enforcing water use regulations, employed by all the States that share the basin and the Federal authorities. The establishment of a regulatory framework for integrated management of the river basin is of great strategic importance for the implementation of many management instruments including licensing the use of water resources. The activity also includes economic survey to assess the impact of the cost of water on the final prices of products in other sectors in the basin to provide inputs for defining the mechanisms, criteria and amounts to be charged from the various types of water users and for defining negligible usage levels. It must be noted that in no circumstances does this imply total or even partial transfer of ownership of water, since Nigerian law vests such rights in the governments and such right are inalienable. Water use charges would merely serve as authorization to use water resources. A process of wide consultation is recommended to precede enactment of enabling legislation and implementation of the regulatory process for IWRM, thereby achieving a broad consensus among the executive, legislative and judicial branches, which is essential for ensuring that legal regulations will become effective.

The expected outputs/results of this activity shall include:

- harmonised laws relating to water resources by way of conducting technical studies to assess conflicts and the overlap of land, environmental and water resources laws, developing proposals for reviewing these regulations with a view to instituting integrated management instruments (use authorizations, water use charges, classification of water bodies, information systems, basin plans, enforcement and control mechanisms);
- consolidated guidelines for the implementation of water resources management instruments in the basin; and

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

- Report of studies for the identification and consolidation of fiscal and compensatory mechanisms for the use and conservation of natural resources.

1.4.2. Organise public debate and dialogue to gain further inputs and review the draft policy, bills, edicts and bye-laws

Public debate and seminars are important instruments for enlisting the involvement of the key stakeholders, raising public awareness, gaining further inputs to adequately review, sensitize and gain support of the public to changes in policy, draft bills, edicts and bye-laws so as to garner support and acceptance of the policies when introduced. The output/result shall be:

- Emergence of publicly accepted revised policy, draft bills leading to the passage of the bills by National Assembly and its ascension into an act by Mr. President.

5.2.5 Strategic Action I.5 - Innovative economic tools and financing

Over the past decade, the concept of payment for water and environmental services in order to increase the financial resources to manage, protect and sustain the water-related services and ecosystem has gained popular acceptance and emerged as a powerful tool for sustainable water resources management. Different economic instruments are available including taxes and charges on users of water services and polluters of water and environment, subsidies and compensation for the protection of water-related ecosystems, markets and trading schemes for water and environmental services. Water and environmental service transactions need to be site-specific and would require comprehensive research involving accurate economic evaluation that would also consider non-monetary criteria such as social, ecological and equity concerns. Ultimately, legislation would be required that would strike the needed balance and coordinate funding for water management between different actors involved (e.g. hydropower operators, farmers, foresters, water utility, etc.). Consequently, this strategic action is divided into three main activities, as follows:

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

Accordingly, this strategic action is divided into two main activities, which will be briefly discussed below:

- ◆ 1.5.1. Support for research to establish criteria for water-use licensing, charges, conflict-management and definition of monitoring strategies.
- ◆ 1.5.2. Improving accountability and service delivery leading to improved maintenance culture.
- ◆ 1.5.3. Introduce payment for water services for bulk users.

1.5.1. Support for research to establish criteria for water-use licensing, charges, conflict-management and definition of monitoring strategies

This activity will support research designed to improve the regulatory framework in the basin. The expected outputs/results of this activity shall include:

- Establishment of a range of economic incentives to best practices, improved pricing, ways of enforcing polluter-pay, user-pay principles (including consideration of the ability to pay), licensing criteria;
- Establishment of conflict management and participatory monitoring strategies;
- Establishment of criteria for subsidies and compensation for the protection of water-related ecosystems;
- Review and establishment of suitable mechanisms for water and environmental services marketing and trading; and
- Criteria for charges on the use of ecosystem resources.

1.5.2. Improving accountability and service delivery leading to improved maintenance culture

This activity would involve interventions to remove inconsistencies, strengthen regulation, improved service delivery and use. It would essentially support actions at separating responsibility for water regulation from that of usage and moving management of land and water resources in the basin to the lowest appropriate levels. Involving all stakeholders, including women, to ensure ownership and the

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



integration of local experience and traditional knowledge would further reduce cost of service delivery and thus making the services more affordable. The private sector would be encouraged to play more prominent role not only financially but also tap their wealth of practical experience.

The expected outputs/results of this activity shall therefore include:

- Removal of policy inconsistencies that would separate responsibility for water regulation from agencies that are also engaged in service delivery functions as well as strengthen participation of vulnerable and disadvantaged groups;
- Delegation of management of land and water resources in the basin to the lowest appropriate level;
- Efficient delivery of cost effective water services that is sustainably managed; and
- Greater public-private sector partnership in mobilizing resources in water management and provision of services.

1.5.3. Introduce payment for water services by bulk users

Over the past decade, the concept of payment for environmental services has emerged, in order to increase the financial resources of agencies to recover cost of service delivery while protecting and restoring water-related ecosystems. While State Government may wish to subsidise services to individuals, bulk users need to pay for water services. They in turn can then recoup the cost from their customers and individual water-users. This activity would seek to actualize introduction of payment for water delivery by bulk users. The expected outcomes/results shall include:

- Formation of all bulk users as statutory bodies;
- Emergence of Water Users' Associations as advocate of improved service delivery from bulk-users; and
- Regular payment of bulk water charges.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



5.3 Component II - Sustainable Use of Water Resources and Environmental Restoration

5.3.1 Strategic Action II.1 - Normalisation of flows

This strategic action is divided into two main activities, which will be briefly discussed below:

- ◆ II.1.1. Clearing of blocked channels of reeds and *Typha* weeds as well as siltation at key locations that include Burum Gana (20/60 km), Old Hadejia River (25/100 km), and Kafin Hausa (5/120 km); among others such River Katagum and Komadugu Gana.
- ◆ II.1.2. Construction of flow proportioning structures at three locations, Likori, Magujin-Idi and Miga to facilitate equitable distribution of water so that areas currently flooded can have relieved of unwanted water while those that are without flow can have some.

II.1.1. Clearing of blocked channels of reeds and Typha weeds as well as siltation at key locations that include Burum Gana (20/60 km), Old Hadejia River (25/100 km), and Kafin Hausa (5/120 km); among others such as River Katagum and Komadugu Gana

This activity involves identification of all critically silted locations or stretches heavily infested by weeds downstream of the Tiga and Challawa Dams. The communities assisted by Federal and State agencies would desilt and clear channels of weeds to enable river flow to be reestablished. This would involve consultation to establish close contact with the communities, acquisition of necessary logistic and provision of technical support by Federal and/or State agencies, joint public-private clearing of the blocked channels, monitor and evaluate as well as maintain regular clearing. The expected outcomes/results shall include:

- Silt and Aquatic Weeds Management Plan; and
- Cleared river channels, free of reeds, *Typha* weeds and silt that hinder river flows.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

II.1.2. Construction of flow proportioning structures at three locations, Likori, Magujin-Idi and Miga to facilitate equitable distribution of water so that areas currently flooded can be relieved of unwanted water while those that are without flow can have some

This activity involves construction of flow proportioning structures at three locations, effective mobilization of the adjoining communities to operate and maintain the structures, installation of critical stage boards, preparation of flow release guidelines, installation of adequate monitoring and evaluation systems for river flows and ways to control and regulate the flows to ensure equity of water allocation and avoid floods and other emergencies. The expected outcomes/results are:

- Three flow proportioning structures at Likori, Magujin-Idi and Miga;
- Flow release guidelines and operation manuals for operation and maintenance of the structures;
- Workshop and seminar to train operators and mobilize support of the communities; and
- Regulated and uninterrupted river flow.

5.3.2 Strategic Action II.2 – Foster efficiency and multiple use of water

This strategic action is divided into four main activities, which will be briefly discussed below:

- ◆ II.2.1. Promote rational water use in irrigation and other bulk-water uses.
- ◆ II.2.2. Support hydro-environmental and operational studies on multipurpose dams, including their induced artificial flooding, aimed at providing support for downstream water-related activities while resolving identified problem.
- ◆ II.2.3. Assist in fostering the development of fishing and aquaculture.
- ◆ II.2.4. Assist in sustaining livestock rearing activities.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

11.2.1. Promote rational water use in irrigation and other bulk-water uses

This activity aims to promote the economic, social and environmental sustainability of irrigation systems and other bulk water users like Kano Municipal Water Utility by way of reducing water and energy losses, seeking to achieve optimum crop yields per unit of area based on optimizing water use and promoting the integration of irrigation technology and introduction of appropriate water management instruments. To this end, it will be necessary to, among other things, study and select the best high value crops responsive to irrigation and that are more water-efficient, the optimum method of operating existing facilities, ways to minimize water losses during land preparation, ways of minimizing risks of soil salinization, good irrigation scheduling to more effectively use rainfall, improve land leveling, adopt sprinkler or drip irrigation, line channels and night storage structures, select crops, crop varieties and cropping systems that shade the ground effectively and use mulches where appropriate to reduce losses due to evapotranspiration.

Some of the products envisaged are:

- A water efficiency plan with model and software for calculating water supply and irrigation needs and releases;
- A database on soils, climate, crops, irrigation scheduling and management instruments to achieve desired optimum performance using appropriate extension services to disseminate/forecast information to water users;
- A manual/plan and facilities on “How to Manage Water Resources in Urban, Peri-urban and Rural Areas” including use of waste-water for productive purposes, increased groundwater recharge, rainwater harvesting techniques, ways of minimizing risk of ground and surface water pollution, flood control, conjunctive water use, etc.;
- Courses to disseminate information by means of workshops, seminars and technical publications;

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

- An adjustable concrete weir across River Challawa downstream of Intake No. 6 of Kano Municipal Water Supply; and
- Appropriate devices for measuring flows into turnouts for various users.

11.2.2. Support hydro-environmental and operational studies on multipurpose dams, including their induced artificial flooding, aimed at providing support for downstream water-related activities while resolving identified problems

This activity will provide support for comprehensive inventory studies of the economic feasibility and environmental analyses of all dams existing and proposed in the basin, assessments of their impacts on the basin, always from the standpoint of multiple water uses. This would lead to preparation of the following manuals and products to support the multi-purpose operation of dams and the occasional generation of artificial floods:

- Compendia of studies on dam and other infrastructures for decision-making purposes;
- Reports on the technical, economic and environmental feasibility of making regular releases and creating artificial floods downstream from the Tiga and Challawa Gorge dams, considering aspects relating to their impact on the riparian population and ecosystems; and
- Compendia of strategies for restoring healthy river ecology.

11.2.3. Assist in fostering the development of fishing and aquaculture

This activity would seek to produce the following outputs/results:

- A database, continually updated, containing details on, *inter alia*, aquaculturists/fish farmers, reservoirs and other water sources as well as suppliers of basic aquaculture inputs;
- Short courses on fish-breeding for fish-farmers and extension workers;
- Manuals for extension workers, covering such issues as fish breeding systems and processing techniques;

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

- Setting up facilities for the reproduction of native fish species, fish rearing and distribution; and
- Training schemes for fish breeding in net tanks and in irrigation channels using improved technologies.

II.2.4. Assist in sustaining livestock rearing activities

This activity would seek to produce the following outputs/results:

- A database, continually updated, containing details on, *inter alia*, livestock farmers, pasture sites and livestock routes as well as suppliers of basic veterinary inputs;
- Short courses on sedentarization of livestock farmers and extension workers;
- Manuals for extension workers, covering such issues as livestock breeding systems and processing techniques; and
- Setting up facilities to enhance veterinary services.

5.3.3 Strategic Action II.3 – Conservation of water, soil and biodiversity

Four main activities are recommended as listed below and further discussed thereafter:

- 💧 II.3.1. Support the preservation of wetlands, control of erosion, restoration of degraded areas and the creation of measures to control point and non-point pollutions.
- 💧 II.3.2. Assist in creating a Wetland Conservation Agency in the Federal Ministry of Environment to ensure continuity of various projects.
- 💧 II.3.3. Ensure environmental flows in order to protect the ecosystems that underpin sustainable water resources management.
- 💧 II.3.4. Studies to ascertain the problems of the communities upstream of the dams.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

11.3.1. Support the preservation of wetlands, control of erosion, restoration of degraded areas and the creation of measures to control point and non-point pollutions

The aim of this activity is to promote measures to assist organizations and communities that seek to restore and/or preserve basin's representative ecosystems, including the Hadejia-Nguru Wetlands. The activity will provide support to any action targeted at the restoration of native vegetation around the wetlands, in aquifer recharge and restoration of river banks. The envisaged outputs/results shall include:

- Maps of critical areas of deforestation, soil-loss and wetland degradation in the basin, at an appropriate scale;
- Effective land-use, land management and remedial works and practices which are capable of stemming erosion, destructive flooding and social unrest;
- A workshop on draft legislation on erosion control best practices involving decision-makers, legislators, organizations and stakeholders from the most critically affected communities; and
- A pilot project on sustainable agricultural and urban storm-water drainage management practices, to assess socio-economic and environmental viability and replicability of the projects.

11.3.2. Assist in creating a Wetlands Conservation Agency in the Federal Ministry of Environment to ensure continuity of various projects

This activity will seek to support the creation of Wetlands Conservation Agency (WCA), while at the same time permitting identification and delineation of wetland areas requiring permanent environmental protection and determination of the levels of protection needed that would not jeopardize livelihoods of the communities around them. It will also permit assessment of water-exchange mechanisms, sediment transport mechanisms and nutrient concentrations and cycling in the wetlands. The envisaged outputs/results shall be:

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

- Demarcation of the bio-ecologically sensitive wetlands in Nigeria, but more especially in the basin;
- A draft Management Plan for the WCA; and
- Workshop for presentation of interim results and a seminar for dissemination of the final results, and a proposal for the creation of the WCA.

11.3.3. Ensure environmental flows in order to protect the ecosystems that underpin sustainable water resources management

This activity will stimulate provision of environmental flows. After providing for the basic needs of the community, the only water that should be provided as a right should be the environmental flow requirements – in order to protect the ecosystems that underpin our water resources, now and into the future.

It is necessary to define the requirements of the environmental reserve in terms of water quality and water quantity. While the aim of protecting water resources is clear, the definition and selection of an acceptable level of protection may change over time.

Mechanisms and powers needed to ensure water for these purposes must be identified and provided. In many of the sub-catchments all available water has already been allocated without taking these into account. Where the needs of the Environmental Reserve cannot be met because of existing developments, provision must be made for active intervention to protect the water resources. The envisaged outputs/results shall include:

- A diagnostic analysis, to establish criteria for environmental flow requirement, propose actions to achieve the flows including priority areas for implementation, socio-economic evaluations and conceptual studies to determine flows to guarantee enough access to water for basic domestic water supply and sanitation in the basin;

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

- Improvements in environmental sanitation systems and return flows into the river systems;
- Action Plans for Drought and Flood Relief, entailing a series of workshops and seminars, with participation of various stakeholders; and
- A seminar with representatives of all tiers of government and of organised civil society to present draft result of the studies and to articulate the way forward to implement them.

11.3.4. Studies to ascertain the problems of communities upstream of dams

This activity is expected to produce the following outputs/results:

- The extent of land degradation; and
- Socio-economic and cultural impacts on the upstream communities.

5.3.4 Strategic Action II.4 - Sustainable use and regulation of groundwater

This strategic action would involve two principal activities:

- ◆ II.4.1. Spearhead research and studies on the development, utilization, management and protection of shallow and deep aquifers in the basin.
- ◆ II.4.2. Dissemination of knowledge on the development, utilization, management and protection of shallow and deep aquifers in the basin, and establishment of guidelines for sustainable exploitation of the groundwater.

11.4.1. Spearhead research and studies on the development, utilization, management and protection of shallow and deep aquifers in the basin

This activity is expected to provide information with which to analyze groundwater characteristics/parameters of the basin. The envisaged outputs/results shall be:

- A network of groundwater monitoring points;
- Groundwater level profiles; and

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



- Groundwater extraction patterns over time and space in the basin.

11.4.2. Dissemination of Knowledge on the development, utilization, management and protection of shallow and deep aquifers in the basin, and establishment of guidelines for sustainable exploitation of the groundwater

This activity aims to improve the knowledge base on the aquifers in the basin. The envisaged outputs/results shall be:

- A diagnostic analysis of the current state of knowledge on the lithological and structural framework of the basin's existing aquifers and the storage, circulation, abstraction, recharge quality and utilization of their waters;
- Delineated pilot areas, including the physical and geometric characterization of the aquifers, their hydraulic and hydrodynamic features, water uses and exploitation characteristics and water quality; and
- A comprehensive evaluation and consolidation of knowledge and the establishment of guidelines for the sustainable use and protection of groundwater in the basin.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Part **6**: **Implementation of the CMP**

6.1. Investment Requirements and Implementation Schedule

The purpose of the strategic actions selected under the Catchment Management Plan is to foster environmentally sustainable development within the basin. These actions can be adopted by each state but must be harmonised with other concerned states. In order to implement such actions and strategies, investment programmes of the Federal Government of Nigeria, the riparian state government that share the basin, their local governments and projects supported by the bilateral and multilateral agencies operating in the basin will have to be drawn up.

Significant investments have been made and/or are planned to be made in the basin. Some of these projects are financed by such Federal Government agencies as HJRBDA and CBDA, as well as several state governments' agencies, whereas others are being or may be co-financed by bilateral and multilateral agencies such DFID-JWL, FMWR-IUCN-NCF KYB and LCBC-GEF projects.

Currently, a number of these are being implemented or planned as part of the programmes and activities needed to concomitantly usher in sustainable development of the basin. These are the CMP activities that are crucial for achieving the environmental benefits stemming from the mitigation of transboundary environmental problems that affect sensitive aquatic ecosystem.

It is pertinent to state that although the CMP strategic actions are intended to ensure sustainable development within the basin, these do not include basic services and identified routine environmental impact assessments and their mitigation measures required in complying with the EIA act and regulations in Nigeria.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

Table 6.1: Implementation schedule, monitoring and evaluation of the CMP

Strategic Actions	Main Activities	Proposed Time Frame		Estimated Cost in US\$
		Commencement Date	Completion Date	
Component I: Implementation of Integrated Basin Management System				8,600,000.00
I.1 Strengthening Capacities and Social Mobilization	I.1.1. Promoting publicity campaign, raising awareness, and social mobilization on IWRM	June 2006	December 2009	400,000.00
	I.1.2. Establishment and strengthening of formal communication channels with local stakeholders	June 2006	January 2009	1,000,000.00
	I.1.3. Decision Support Systems for basin that would facilitate equitable allocation of resources	June 2006	December 2007	100,000.00
	I.1.4. Assist communities to develop a planned response to impending floods, droughts, conflicts, etc. through RUP	June 2006	December 2009	900,000.00
I.2 Establishing Partnerships	I.2.1. Reorganize the HJKYB Coordinating Committee	June 2006	June 2007	500,000.00
	I.2.2. Harmonization of programmes of federal, state and local government bodies, etc.	June 2006	December 2009	100,000.00
	I.2.3. Propose actions to be implemented by the two countries	June 2006	September 2007	100,000.00
I.3 Getting better information	I.3.1. Reactivate and establish hydro-meteorological network, monitoring, analysis and dissemination of information	June 2006	June 2009	2,000,000.00
	I.3.2. Undertake land resources planning including remote-sensing techniques and geographic information systems (GIS), etc.	June 2007	June 2010	1,800,000.00
	I.3.3. Establishing of mechanisms such as clearing houses, ranges to provide local managers and the general public with information	January 2007	December 2009	500,000.00
I.4 Improving National Policy/Legislation and International agreements	I.4.1. Support for research and studies to collect, analyze and synthesize knowledge, best practices to review, harmonise existing policies and laws, etc.	July 2006	June 2007	500,000.00
	I.4.2. Organise public debate and dialogue to gain further inputs and review the draft policy, bills, edicts and bye-laws	July 2007	October 2007	100,000.00
I.5 Innovative economic tools and financing	I.5.1. Support for research to establish criteria for water-use licensing, charges, conflict-management and definition of monitoring strategies	July 2006	January 2007	100,000.00
	I.5.2. Improving accountability and service delivery	July 2006	December 2009	450,000.00
	I.5.3. Introduce payment for water services by bulk users	July 2006	June 2007	50,000.00
Component II: Sustainable Use of Water Resources and Environmental Restoration				16,150,000.00
II.1 Normalisation of flows	II.1.1. Clearing of blocked channels of reeds and <i>Typha</i> weeds as well as siltation	June 2006	December 2006	4,400,000.00
	II.1.2. Construction of flow proportioning structures at three locations	June 2006	January 2008	2,500,000.00
II.2 Foster efficiency & multiple use	II.2.1. Promote rational water use in irrigation and other bulk-water users	June 2006	December 2007	1,550,000.00
	II.2.2. Support hydro-environmental and operational studies on multipurpose dams	July 2006	June 2007	900,000.00
	II.2.3. Assist in fostering the development of fishing and aquaculture	January 2007	December 2009	300,000.00
	II.2.4. Assist in sustaining livestock rearing activities	July 2006	December 2010	300,000.00
II.3 Conservation of water, soil and biodiversity	II.3.1. Support the preservation of wetlands, control of erosion, restoration of degraded areas	June 2006	January 2010	1,500,000.00
	II.3.2. Assist in creating a Wetlands Conservation Agency	January 2007	June 2007	200,000.00
	II.3.3. Ensure environmental flows to protect the ecosystems	July 2006	December 2010	150,000.00
	II.3.4. Studies to ascertain the problems of the communities upstream of the dams	September 2006	August 2007	100,000.00
II.4 Sustainable use and regulation of groundwater	II.4.1. Spearhead research and studies on the management of groundwater in the basin	July 2006	December 2010	3,500,000.00
	II.4.2. Dissemination of Knowledge on the management of groundwater in the basin	July 2006	January 2011	750,000.00
Total (Component I + II), US\$				24,750,000.00

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



The implementation cost of the nine strategic actions in the CMP is estimated at US\$24.75 million, proposed to be funded by Federal and States governments as well as through future multilateral investment towards phase II of KYB, LCBC-GEF and possibly DFID-JWL projects. The cost is split into US\$8.60 million to execute Component I, and US\$16.15 million to execute Component II, in accordance with the estimation for each strategic action as presented in Table 6.1. The associated investment by both Federal and State Governments in the basin cannot be projected accurately at the moment. It is however, estimated, based on the aggregate investment by all governments on water resources in the basin in recent years, that is consistent with the CMP, a conservative associated investment would not be less than US\$100 million over the four-year period, some of which could also be in the form of counterpart funding. This means that the projected investment on water related activities consistent with CMP in the basin would be about US\$125 million over four years. A tentative disbursement schedule is as shown in Table 6.1.

The implementation period for all planned actions and activities under the CMP would be approximately four years, although time overrun cannot be totally ruled out. Each activity has been scheduled as shown in Table 6.1. These would need to be more carefully reviewed by all the stakeholders to reflect not only consensus in the choice of the strategic actions but also of the activities, the timing and indeed the investments, so as to fully reflect the various concerns and needs of the contending stakeholders.

6.2 Potential Stakeholders in the Implementation Process of the CMP

The success of the CMP preparation and implementation would largely be dependent on intense participation of all stakeholders and the degree of support it enjoys from the general public. To do this it must seek to address the interest and concerns of all parties involved in the basin. The stakeholders that have been involved in the various consultation processes leading to the preparation of this CMP would also be engaged

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

Table 6.2: Potential Stakeholders and lead institutional partners

Strategic Actions	Main Activities	Lead Institutional Partners
Component I: Implementation of Integrated Basin Management System		
I.1 Strengthening Capacities and Social Mobilization	I.1.1. Promoting publicity campaign, raising awareness, and social mobilization on IWRM	KYBP; DFID-JWL; DFID-SLGP, LCBC-GEF; NGOs/CBOs (to mainstream in all levels of activity); Media
	I.1.2. Establishment and strengthening of formal communication channels with local stakeholders	DFID-JWL in partnership with KYBP and LCBC/GEF; Media
	I.1.3. Decision Support Systems for basin that would facilitate equitable allocation of resources	KYBP; LCBC-GEF; DFID-JWL
	I.1.4. Assist communities to develop a planned response to impending floods, droughts, conflicts, etc. through RUP	KYBP; LCBC-GEF; DFID-JWL; State IWRM Committees to catalyse support from LGAs and Traditional Authorities for planned response
I.2 Establishing Partnerships	I.2.1. Reorganize the HJKYB Coordinating Council & a basin wide Water Management Agency	FMWR (HJKYB-TAC)
	I.2.2. Harmonization of programmes of federal, state and local government bodies, etc.	FMWR (HJKYB-TAC); State IWRM Committees, line Ministries in Federal, States Government Agencies and Partner Projects in the basin
	I.2.3. Propose actions to be implemented by the two countries	LCBC-GEF and NNJC (JAC to facilitate)
I.3 Getting better information	I.3.1. Reactivate and establish hydro-meteorological network, monitoring, analysis and dissemination of information	FMWR; SMWRs; NEAZDP; FADAMA2 (KYBP in liaison with DH&H to catalyse); UniMaid (CAZS)
	I.3.2. Undertake land resources planning including remote-sensing techniques and geographic information systems (GIS) etc.	FME; FMARD; KYBP; LCBC-GEF to support State Governments; DFID-JWL to support LGAs and communities in local mapping and zoning
	I.3.3. Establishing of mechanisms such as clearing houses, ranges to provide local managers and the general public with information	FME; FMWR and LCBC with assistance from DFID-JWL and State IWRM Committees
I.4 Improving National Policy/legislation and International agreements	I.4.1. Support for research to collect, analyze and synthesize knowledge, best practices to review, harmonise existing policies and laws, etc.	KYBP; DFID-JWL and LCBC-GEF (HJKYB-TAC and JAC to facilitate at national level)
	I.4.2. Organise public debate and dialogue to gain further inputs and review the draft policy, bills, edicts and bye-laws	FMWR supported by line Ministries in Federal and States (HJKYB-TAC & JAC to facilitate at national level)
I.5 Innovative economic tools and financing	I.5.1. Support for research to establish criteria for water-use licensing, charges, conflict-management and definition of monitoring strategies	KYBP and HJKYB-TAC to catalyse
	I.5.2. Improving accountability and service delivery	All Water Service Delivery Agencies (HJKYB-TAC to pilot with KSWB, KRIP)
	I.5.3. Introduce payment for water services by bulk users	FMWR (HJKYB-TAC to pilot with KRIP, HVIP, KSWB)
Component II: Sustainable Use of Water Resources and Environmental Restoration		
II.1 Normalisation of flows	II.1.1. Clearing of blocked channels of reeds and <i>typha</i> weeds as well as siltation	LCBC-GEF to assist FMWR; FME; DFID-JWL; RBDAs, who together with State IWRM Committees; LGAs; Traditional Institutions & Communities to implement and maintain
	II.1.2. Construction of flow proportioning structures at three locations	EIA by DFID-JWL, DFID-SLGP and FME; Design and construction by RBDAs; Operation and maintenance by LGAs with support from RBDAs
II.2 Foster efficiency & multiple use	II.2.1. Promote rational water use in irrigation and other bulk-water users	RBDAs; KSWB; ADPs; Other Bulk Users to be catalysed by KYBP, DFID-JWL and LCBC-GEF
	II.2.2. Support hydro-environmental and operational studies on multipurpose dams	KYBP in liaison with LCBC-GEF and HJRBDA
	II.2.3. Assist in fostering the development of fishing and aquaculture	FMARD; RBDAs to be catalysed by KYBP, DFID-JWL and LCBC-GEF
	II.2.4. Assist in sustaining livestock rearing activities	FMA; FME; RBDAs to be catalysed by KYBP, DFID-JWL and LCBC-GEF
II.3 Conservation of water, soil and biodiversity	II.3.1. Support the preservation of wetlands, control of erosion, restoration of degraded areas	NCF (IUCN); LCBC-GEF and assisted by KYBP and DFID-JWL to catalyse at national and regional level through FME
	II.3.2. Assist in creating a Wetlands Conservation Agency	NCF (IUCN); LCBC-GEF and assisted by KYBP and DFID-JWL to catalyse at national and regional level through FME
	II.3.3. Ensure environmental flows to protect the ecosystems	NCF (IUCN); KYBP, LCBC-GEF and assisted by DFID-JWL to catalyse at national and regional level through HJRBDA, FMWR & FME at especially the wetland areas
	II.3.4. Studies to ascertain the problems of the communities upstream of the dams	BUK; ABU; UniMaid (CAZS) to be catalysed by KYBP
II.4 Sustainable use and regulation of groundwater	II.4.1. Spearhead research and studies on the management of groundwater in the basin	KYBP; LCBC/GEF; UniMaid (CAZS); NEAZDP
	II.4.2. Dissemination of Knowledge on the management of groundwater in the basin	KYBP and LCBC-GEF; and assisted by DFID-JWL to catalyse at national and regional level through FMWR, FMARD, FME, HJRBDA, CBDA, ADPs, and NEAZDP

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



in the implementation of the activities under the CMP, although the degree of their involvement may have to be altered over the course of time (see table 6.2).

In defining roles for the stakeholders, it would be necessary to harmonize approaches to public policies and the interests of the various sectors involved in the basin, with the view to harnessing their technical and managerial capabilities or their capacity to generate data and information. Table 6.2 provide a preliminary list that will be discussed and updated as the implementation proceeds. The institutions identified as potential key partners will ensure the necessary degree of participation, decentralization and integration in all activities designed to promote integrated water resources management in the KYB.

Prior to launching any activities under the CMP Actions, the proposed HJKYBCC must be consulted. The Committee would keep track of the activities of Federal and State governments in water resources and environment and harmonise them such as to assuage frail nerves and engender renewed confidence between the communities. In the interim TAC of HJKYBCC would be the body implementing most of the activities allocated to FMWR, guided by Technical Cooperation Agreements among the riparian State Governments. The principal role of the TAC, acting on behalf of HJKYBCC, in this regard would be to provide informational inputs for technical, scientific and economic activities, and would be required to regulate and provide support to the process of integrated land, water and environmental resources management. These would allow for equitable allocation of natural resources to the States and, in particular, ensure the rational use of the available water by all the stakeholders.

6.3 Governmental Investments in the Basin – Federal and State Medium-Term Action Plans

Consolidating the information to obtain total investments in governmental Strategic Actions proved almost impossible to collect and collate. The NEEDS, State Economic

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Empowerment and Development Strategy (SEEDS) and MDG policy documents only contained representative global investment in water sector. The specific information that was readily available were the annual budget which gave so much prominence to hardware and service programme, to almost complete neglect of institutional strengthening and capacity building. Consequently, funding for institutional strengthening and integration of the Integrated Water Resources Information System with appropriate information systems to be devoted to environmental issues will come primarily from multilateral investments and grants. The provision of essential water services would have to be stepped-up and hence the investments by Federal and the six riparian State Governments would have to be increased substantially, and a portion of these would be agreed by the HJKYBCC to be set aside for capacity-building and public sensitisation, to ensure sustainability of the programme.

It is worth noting that no specific allocations were identified for raising public awareness of the importance of sustainable environmental development, or of the need for rational water resources management. Enhancing public awareness of the links between these two themes and of the need to promote soil conservation and mitigate the negative impact of economic activities on water courses is however very critical to ensuring successful public participation, which can only be achieved by means of educational and social communications initiatives.

Strategies for promoting sustainable development have yet to be fully appreciated by governmental agencies at all levels. The need to foster this approach through the educational institutions and public arena was most evident in all the states, but most especially in the local communities most vulnerable to negative environmental impacts. Thus, despite the meagre budgetary provisions for promoting public awareness on sustainable environmental development, the importance of guidelines for disseminating the knowledge on rational and environmentally sustainable utilization of water resources and management techniques must be vigorously

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



championed by the HJKYBCC and catalysed by the IUCN-WANI, LCBC-GEF and DFID-JWL projects.

6.4 Risks and Sustainability

6.4.1 Risks

From the perspectives of governments, KYBP and indeed entities and key stakeholders in the basin, it was acknowledged that the CMP implementation process would entail some risks. Some of these risks would be mitigated by certain activities suggested as part of the CMP while others would simply require greater resolve to embrace participatory processes by all stakeholders. Following are some of the most significant risks, not necessarily in order of their importance, along with suggested means to mitigate them.

Inter-state and inter-institutional competition – there are conflicting vested interest at stake among the states and indeed even within the states between the water users which must be resolved. It is for these reasons that we recommended strategic action aimed at strengthening links and encouraging partnership between the stakeholders to minimize this risk.

Fragmented and poorly defined institutional and legal framework – there are too many institutions trying to do the same thing that are not talking to each other. Furthermore, discrepancies exist in the laws and regulation that apply to environment and water resources. CMP actions targeted at improving partnership and improving national policies/laws governing the basin's water and fostering better international ties on the transboundary issues will help minimize these problems.

Incipient nature of awareness on sustainable environmental management – despite the global importance currently enjoyed by this theme, it is nonetheless obvious, that the environmental conservation dimension is not yet fully appreciated

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



by all institutions in the basin. This problem has been exacerbated by the differences between the upstream and the downstream regions and stakeholders, and the fact that activities in the former have a major influence on the latter. The KYBP, JWL and GEF commitment to supporting activities to deploy IWRM instruments, and their commitment to social mobilisation, training and capacity building will all contribute to alleviate this critical risk.

Dependence on the socio-economic livelihood and performance of specific sectors – certain CMP strategic actions seek to address problems caused, directly or indirectly, by the principal economic activities (livelihood) pursued in the greater part of the basin; namely agriculture, fishery and livestock rearing. CMP activities that aim to normalise flows in the rivers, improve efficiency and multipurpose use of water, conserve water, soil and biodiversity while fostering sustainable use of groundwater will certainly help to mitigate this risk.

Cultural resistance to some water resources policy instruments – the introduction of some management instruments, and in particular innovative economic tools and financing instruments like bulk water use charges, will inevitably meet with resistance. However, CMP's clear and straightforward criteria and guidelines, to be established through ample public participation as well as improve operation and maintenance of water services will hopefully weaken such resistance.

Dispersion of actions – the sheer size of the basin encompassing at least five states and numerous local governments in Nigeria, there will inevitably be political pressure to share out scarce funding among a host of beneficiaries. By forging links and harmonising programmes of water resources and environment, and between federal and state agencies as well as between the various stakeholders, these CMP activities would contribute in reducing this risk.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Scarcity of national and local resources – there are still shortages of human and financial resources in some agencies of governments at all levels that could seriously jeopardise implementation of the envisaged integrated basin management approach. The NEEDS, SEEDS and MDGs medium-term plans assign high priority to government actions at closing water services gap, whereas the CMP would help encourage greater institutional strengthening and capacity building.

Allocation constraints of Medium term Action Plans – there is the risk that the sheer volume of resources proposed for service provision that are hardware related in nature, that is equivalent to around ten times the projected cost of CMP, could constrain allocation of counterpart financing by federal and state thereby jeopardizing the sustainable operation and maintenance of the systems. Hence the importance and need to keep strict liaison between these programmes and the KYBP/GEF incremental funding.

6.4.2 Sustainability

Any programme that cannot be sustained over time, or which relies entirely on external funding, would ultimately be doomed to fail. This among other issues require that we assess the elements that will ensure the long-term sustainability of CMP, and to ensure that they are well entrenched. Some of the critical elements identified are briefly discussed below.

Public involvement – effective public participation in the implementation of the CMP, has been the cornerstone mechanism for strengthening the organisation of water users and establishing the necessary conditions to ensure sustainability of the strategic actions that have commenced. This is also the underlying motive behind public-involvement guidelines and support being accorded priority in the CMP.

Legal and institutional framework – the proposed legal and institutional framework to be defined at the federal level and to which the States would be required to adapt, would be such that integrated water resources management –

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



especially the links with land and soil management, and between the quantity and quality of water resources available for multiple use as well as for sector-specific planning must be instituted in conformity with the principle of sustainable development.

Social aspects of sustainability – comprising actions that raise the living standards of both urban and rural populations through improved health and increased income; greater sense of security in relation to flooding; and fostering of communal associations and greater public participation in decision making on issues relating to the basin would need to be vigorously pursued.

Economic aspects of sustainability – including the promotion of more efficient use of water; the implementation of instruments aimed at building awareness of the economic value of water; adoption of licensing criteria that would assign priority to the most effective and efficient allocation of water resources; reduction of transportation costs through increased use of waterways, thereby raising the competitiveness of products originating from the basin; and generation of new opportunities for earning livelihoods through the development of ecotourism are some activities that would be implemented.

Environmental aspects of sustainability – based on the adoption of rational water use; the restoration of degraded areas; application of sustainable development models for the exploitation of the basin's natural resources; establishment of legally protected areas such as the ecological corridors through the proposed Wetlands Conservation Agency; implementations of pollution controls; heightened public awareness with respect to environmental issues and the proper use of water resources; and the rational use of water to improve the living standards of the population.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Technical aspects of sustainability – comprising of the principal strategic issues for enabling the introduction of integrated basin management instruments; such as the basin information system, establishing the licensing criteria, equitable and affordable water-use charges, classification of water bodies, including the planning and ranking of priorities and investments that are proposed to be implemented as demonstration projects in CMP.

Financial aspects of sustainability – utilising the multiplier effects expected from implementation of CMP strategic actions that would produce positive outcomes and stimulate the development of optimum production models suitable for the basin that would result in substantial increase in goods, services and income to be generated.

Integrated Water Resources Management Information System (IWRMIS) and Environment System (IWRMES) – only through the complete adherence to the implementation of these systems, along with their various management components (such as licensing and inspection criteria, classification of water courses, information systems upgrade, water-use charges and comprehensive water resources planning) can the sustainability of the CMP be guaranteed. Without strong political will and commitment to their implementation, complemented with harmonised, integrated and effective action on the part of the various federal, state and local government agencies involved, the HJKYBCC and its TAC as and as the general public would not be able to achieve the desired results.

6.5 Monitoring and Evaluation

With respect to monitoring and evaluation, FMWR in liaison with FME, as the national executing agencies would be responsible for the technical quality of the programme. The external donors may also choose to define their monitoring and evaluation mechanisms in compliance with their requirements. However, effective implementation of the CMP would require the involvement of many other institutions at various levels of governments. This would require efficient and effective

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



monitoring and evaluating mechanisms on the part of executing agencies to ensure that the CMP strategic actions are advancing harmoniously towards their set objectives. The HJKYBCC needs to be regularly informed and kept abreast of the progress of the actions being implemented under CMP, in order to guide their decision-making.

Output generated by the CMP implementation process would provide important inputs for effective integrated basin management with the CMP itself providing the seed agenda for action by all tiers of governments. In this context, it is worth stressing the importance of implementing the IWRMIS, through Project Steering Committees, members of which should undertake and provide support actions on monitoring and evaluation on an on-going and systematic basis over the short, medium and long term.

The meetings of these Project Steering Committees should precede and follow the HJKYBCC sittings to review projects in consonance with the approved CMP document and supporting protocol for the establishment of the IWRMIS (a written agreement among the governments and other stakeholders involved) that would contain, at the minimum, indicators of:

- Disbursement performance and indicators of the tangible progress of the CMP;
- Performance standards for institutions, rated "as planned" and "as is";
- Management performance standards; and
- Technical performance standards for strategic actions and individual activities.

Thereafter, quarterly reports are to be issued and circulated to all major stakeholders, while half-yearly reports shall be examined at meetings of the Project Steering Committees, so as to ensure that desired progress is achieved under each of the activities.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



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Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

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Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

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Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



APPENDIX

of Four Annexes

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

Annex I: Principal Stakeholders in the Drafting and Implementation of the CMP

FEDERAL GOVERNMENT AGENCIES

Ministry of Water Resources

- Hadejia Jama'are River Basin Development Authority (HJRBDA)
- Chad Basin Development Authority (CBDA)
- National Water Resources Institute (NWRI)
- Lake Chad Basin Commission (LCBC)

Ministry of Agriculture & Rural Development

- Project Coordinating Unit
- Agricultural Research Institutes

Ministry of Power and Steel

- National Electric Power Authority

Ministry of Science and Technology

- Lake Chad Research Institute

Ministry of Aviation

- National Meteorological Organisation

Ministry of Housing and Urban Development

Ministry of Transport

- National Inland Waterways Authority

National Planning Commission

- North East Arid Zone Development Programme (NEAZDP)

Ministry of Works

Ministry of Health

Ministry of Foreign Affairs

- Nigeria-Niger Joint Commission

Ministry of Solid Minerals

Ministry of Integration and Cooperation in Africa

- 2nd Commissioner on Lake Chad Basin Commission

Ministry of Education

Federal Universities at Maiduguri (Centre for Arid Zone Studies – CAZS), Bauchi, Kano

STATE GOVERNMENT AGENCIES

Kano

KSMWR Ministry of Water Resources

WRECA Water Resources and Engineering Construction Agency

KNARDA Kano State Agricultural and Rural Development Authority

KSWB: Kano State Water Board

Jigawa

JSMWR Jigawa State Ministry of Water Resources

JSADP Jigawa State Agricultural Development Project

Bauchi

BaSMRD Bauchi State Ministry of Rural Development

BaSWB Bauchi State Water Board

BaSADP Bauchi State Agricultural Development Project

Yobe

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



YSMWR	Yobe State Ministry of Water Resources
YSADP	Yobe State Agricultural Development Project
NEAZDP	North East Arid Zone Development Project
Borno	
BoSMWR	Borno State Ministry of Water Resources
BoSWC	Borno State Water Corporation
BoSAD	Borno State Agricultural Development Project

LOCAL GOVERNMENT AGENCIES

Local Government Authorities (LGA)

BASIN COMMITTEES

NON-GOVERNMENTAL ORGANISATIONS

NCF

INTERNATIONAL BODIES

LCBC

IUCN

NNJC

INSTITUTIONS FROM OTHER COUNTRIES

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



Annex II: Socio-Economic, Environmental and Institutional Challenges

A2.1 Socio-Economic

The 1991 National Census Data indicate that about 15 million inhabited the basin. At an official average of 2.4%⁴ population growth per annum the projection for the year 2025 could be over 34 million from the figure of 15 million in 1991 (FMAWR&RD, 1995). The degree of urbanisation in West Africa is expected to reach 65% by 2025 (UNEP, 2005). These and migration in pursuit of livelihood by the pastoralists, fishermen and environmental refugees as a result of increased desertification, have intensified the competitions for scarce land and qualitative water resources in the basin, resulting in frequent conflicts. Similarly, the growing human and animal population, are in part responsible for the cultivation of marginal land, increased deforestation, depletion of grazing land and reduction of fallow period which have seriously degraded the land in Nigeria (FAO/IBRD, *ibid*).

In a study of the relationship between land resources, population pressure and level of agricultural inputs in agricultural system in Nigeria, FAO concluded (FMAWR&RD, 1992) as follows:

- as at 1975, the population of Nigeria had already exceeded the carrying capacity of the land resources under rain-fed with low levels of inputs defined as traditional agriculture with fallow but without inorganic fertilizer and conservation;
- Using 1987 estimated population at state level, only four out of the then 21 states and FCT (Cross River, Gongola (now Adamawa and Taraba), Kaduna and Niger) could support their population using rain-fed at low levels of inputs. Even at intermediate level of inputs (agrochemicals and conservation) seven states were deemed unable to support their population namely: Anambra (present Enugu and Anambra), Akwa Ibom, Imo, Katsina, Lagos, Ondo, and Oyo.
- Given the low level of usage of agrochemical inputs in Nigeria, the carrying capacity of land in most parts of Nigeria must be close to that of low input levels. This means that close to 40 million Nigerians are being supported in excess of the carrying capacity of the land resources through literally mining the soil to support them.
- Furthermore, the estimates of the carrying capacity of the land resources were based upon the climatic data for the period 1930-60. It is a known fact that since then, Sahelian drought has intensified with southward movement of desertification into the Komadugu-Yobe Basin by approximately 100km. It therefore noted that as a result of these the potential supporting capacity of the land in the basin should have decreased by as much as 30 percent.

The predominant socio-economic activities within the basin are agriculture, animal husbandry and fishery, all of which are closely tied to land and water resources in the basin. Agriculture systems which although is mainly subsistence, however, constitutes the main activity, followed by animal husbandry and then fishery. Commerce is also very important especially around Kano and Maiduguri.

It is reported that past development projects, geared towards increased agricultural production, have not been sustained. Similarly, the report revealed that animal husbandry is predominantly nomadic and therefore not efficient to sustain appreciable growth. The report concluded that although the movement of the livestock in pursuit of water and pasture is dependent on rainfall which has been

⁴ The National average growth is 2.83% per annum

Catchment Management Plan **for integrated natural resource management of** **Komadugu Yobe Basin**



decreasing, nevertheless, it believed that the number of animals within the basin has been increasing steadily (LCBC, *ibid*).

The same report stated that fishermen and fish have adapted well to the unpredictable characteristics of the water resources of the basin. This probably explains the reluctance of the fishermen to embrace modern methods that were introduced to them in several projects. Fishery, therefore continue to be traditional in nature, but constitutes a very important source of income for the population, even though lack of credible statistics has tended to underestimate its economic importance (LCBC, *ibid*).

Three main types of agricultural practices prevail in the basin: rain-fed, flood recession and irrigated agriculture. Crops with relatively short cycles which are adapted to the vagaries of the climate in the region are cultivated under rain-fed agriculture in the sahelian parts of the basin. These include sorghum, millet, maize, cotton, groundnut and cowpeas. At the extreme northeast of the basin, in the semi-arid zone, where rainfall could at times be less than 350mm, agricultural practices are localised around the oasis where small vegetable gardens and date-palm tree plantations are cultivated. The southern portion of the basin, where rainfall is more, crops such as sorghum, millet, cotton and rain-fed rice are cultivated.

In the flood plains, flood recession agriculture is practiced for the cultivation of such crops like rice, millet, sorghum, and where flooding permits small irrigated vegetables are cultivated. Irrigated agriculture is practiced mainly along the rivers and streams banks except at the formal irrigation schemes, located in the upper reaches of the basin; and mostly grow rice, wheat, sesame and vegetables (Ruthenberg, 1972).

The other four factors: water resources; land-use and soil resources; peculiar ecological characteristics and institutional dimensions that significantly influence the integration of land and water management in the basin would also be briefly reviewed.

A2.2 Water Resources

Supply of water to the basin's river system is dominated by the contribution from the headwater regions underlain by the basement complex rock. A network of river gauging stations was installed in the 1960s and 1970s to monitor the flows. The information from these gauging stations have been used together with rainfall data to develop the water balance model as part of the decision support system described in [KYBP Water Audit](#).

Water is a critical strategic resource in the basin. The basin experiences both temporal and spatial irregularity and unreliability of rainfall, while the socio-economic activities of majority of the population are dependent on adequate access to water. The great drought in the basin of 1972-1974, led to increased water supply focussed development interventions in the basin. Although moderate rains returned in the late 1970s, the drought reoccurred and reached its climax in 1984. Prior to these drought and the water supply focussed development on Hadejia river system in the 1970s and early 1980s, the Komadugu-Yobe fed a considerable volume of water to Lake Chad (LCBC, *ibid*) Similarly the contribution of these rivers to flood recession agriculture, pastureland and ground water recharge has been substantially reduced. Meanwhile, groundwater resources in the basin are increasingly being depleted. Such large-scale water constraints is very difficult, nay, almost impossible to economically manipulate. Drought has to be seen as a part of life in the basin.

Generally, the artificial constraints upon the river systems have further increased the complexity of the hydrology. The Hadejia River system is thought to be substantially controlled by both the Tiga Dam (closed in 1974) on the Kano River and the Challawa Gorge Dam (closed 1992) on the Challawa River.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

These dams feed two large, partly finished, formal irrigation schemes (Kano River Irrigation Project – KRIP, and the Hadejia Valley Irrigation Project - HVP) near Kano and Hadejia respectively. Both also contribute to the Kano City water supply. Currently, excessive dry season releases are required from Tiga and Challawa reservoirs, because of the inefficient condition and configuration of the Kano City water Work intakes. These excessive releases not only cause wasteful depletion of the limited reserves but it has led to detrimental dry season flooding in the environs of the Marma channel and Nguru Lake.

Several other irrigation projects abound in all the states, as shown on Table A2.1, and the completion of KRIP (phase1) is on-going. As a result of these, the discharge in the Yobe River at Gashua is largely dependent on the flows from the Jama'are River, which is uncontrolled now, but there is a plan to build a dam at Kafin Zaki also. Plans also exist for building a structure at the upstream end of the Nguru Wetlands to control the destination of the wetland's inflow. This is known as the Likori split flow proportioning structure; it is in fact already being constructed.

Table A2.1: Estimates of Areas under Irrigation in the KYB

River System	Revised Potential (ha)	Developed (ha)	Cropped (ha)
Abir	1,000	130	130
Baga (Kirenowa)	1,000	500	500
Gashua	1,000	250	500
Gari	4,200	950	1,900
Galala	1,500	0	0
Jakarade	2,000	160	160
Tomas	2,300	400	800
Jakara	2,000	50	50
Jere Bowl	1,300	0	0
Yobe	1,600	700	1,400
South Chad	22,000	22,000	7,000
Kano River I	22,000	13,285	24,000
Kano River II	40,000	150	0
Watari	1,350	600	700
Kafin Ciri	660	0	0
Magaga	600	100	0
Hadejia Valley	12,500	2,075	1,500
Small Scale Yobe	1,000	120	30
Small Scale Borno	4,490	2,770	2,720
Small Scale Bauchi	500	50	90
Small Scale Jigawa	3,180	1,000	1,200
Small Scale Kano	1,000	500	800
ADP Fadama	140,000	12,500	12,500
Shadoof	10,000	10,000	10,000
Total	277,180	68,290	65,980

Source: Modified NWRMP (1995)

Management of water resources in drought prone region like this has many aspects. Clearly, not much can be done about rainfall quantity, timing and location. Rain seeding has only limited success and is still not economic. The major opportunity lies in efficient use of rainwater by increasing groundwater recharge, increasing soil water holding capacity, reducing evaporative losses from reservoir surface and irrigated fields. Reliable urban and rural water supply and water conservation are increasingly becoming crucial. Meanwhile, because the earlier water development interventions were executed without environmental impact assessment studies, it would be necessary to comprehensively review them and to implement repairs of environmental damage caused by such projects to downstream and floodplain users.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

Table A2.2 Irrigation water requirements upstream of Hadejia Town

River System	Potential (ha)	Developed (ha)	Present Water Requirements (mm ⁻¹ yr ⁻¹)	Potential Water Requirements (10 ⁶ m ³ yr ⁻¹)	
				Potential	Developed
Kano River I	22 000	13 285	1 700	374	226
Kano River II	40 000	150	1 700	680	2.6
Watari	1 350	600	1 700	22.9	10.2
Kafin Ciri	600		1 700	10.2	-
Gwarzo Road near Challawa	570		1 700	9.7	-
Hadejia Valley	12 500	2 075 (6109)	3 600	450	75 (220)
Small Scale Jigawa (formal and informal)	3 180	1 000	1 300	41.3	13
Small Scale Kano (formal and informal)	1 000	500	1 300	13	6.5
ADP Fadama	100 000	12 500	1 300	1 300	162
Shadoof	10 000	10 000	900	90	90

Source: Modified IUCN (1997)

A2.3 Land and Soil Resources

The environment is being subjected to increased stress arising from rapid population growth and the destructive pressures on land and water resources, particularly on the more fertile land. This has led to the changes in land-use development in the region as illustrated in table A2.2. There has been a significant increase in the area under cultivation with almost corresponding decrease in woodlands/grassland/shrubs.

The destructive pressures on land and water, has also led to reduction in the fallow period (to one year in five, or less) in the rotation (Aitcheson et al, 1972). In the past, it was traditional to observe a long fallow period of up to 20 years so that the organic matter content (soil nutrient status) of the predominantly sandy soils could be maintained, and the viability of parasitic weeds reduced. This in turn helped to conserve the available water capacity that fosters viable agricultural production under the irregular rainfall patterns.

The combination of these has resulted in lower soil nutrient status, and higher erodibility index. Consequently, land area experiencing gully erosion, sand dunes as well as disturbed forest have increased remarkably as can be seen in table 3.3. The effect of these on fertility is however, not very clear at the moment.

In the past, the traditional remedy was to manure fields either by bringing manure to the fields or by allowing livestock to graze on crop residues in the field. These practices are rarely in existence today as a result of conflicts between farmers and pastoralists which has broken the synergy that existed between them (Hadejia, 1993). The remedy that is now promoted includes the provision of short-day/early-maturing seed varieties which in turn require both crop-protection and fertilizer, the availability of which is fraught with problems.

As a result of all of these problems, there has been a significant drop in the yield from rainfed farming system because of the increased 'risk' even as the overall utilisation and dependence on that practice has been on the increase (FAO/IBRD, 1991). On the other hand, the trees and shrubs that are edible for humans and animals, which hitherto provided safety-net in drought years, have been depleted (NEAZDP, 1991).

The increased dependence on the use of inorganic fertilizer has been attributed to loss of nutrients to the dams upstream. The silt-load of floodwater that replenished the nutrient of floodplain soils in the past may have been severely reduced due to the deposition of same in the dams (Olofin, 1991). The most significant effect of the dams have been to reduce the groundwater levels in areas fed or

Catchment Management Plan for integrated natural resource management of Komadugu Yobe Basin

recharged by the Hadejia river further downstream in Jigawa state with increased groundwater recharge in areas immediately downstream of the dams within Kano State (FDID, 2001).

The weed infestation have compounded the problems, resulting in costly investment such as South Chad Irrigation Project (SCIP) and several other smaller schemes being abandoned due to lack of access to sufficient water. This may in the long run alter the demographic distribution and concentrate population on or near permanent water courses as the tubewells and hand-dug wells on the periphery of the floodplain shallow aquifer dry up or become marginal especially in drought years (NEAZDP, 1991a).

Invariably therefore, the most important landscapes in the basin are all associated with water. Human-influenced landscape changes such as in river channel, gully formation, sediment load, dune reactivation and dune formation among others are poorly documented. **It would be worthwhile to create a land-based environmental baseline. The Lake Chad as well as the Hadejia-Nguru and the Borno wetlands all deserve special care and attention.**

A2.4 Other Ecological Considerations

Over time, many of the native plants and animals have been taken out thereby disrupting the natural controls on weeds. This has been most noticeable all across the fadamas and wetlands. In combination with various contributory factors, the invasive spread of waster reeds and *Typha* grass (locally known as 'kachalla') over the last 20 years along the wetlands' network of river channels and into the fishponds and fadamas has aggravated poverty and threatened the ecosystems. The reeds and the bulrush, *Typha domingensis*, both invasive species that took hold in the 1990s, now clogs many of the river channels. *Typha* grass now covers roughly between 70-80% of the total enclosure of the Ruwankanya reservoir and Hadejia Barrage, escalating build-up of silt deposits and dramatically reducing their carrying capacity. The reed also is blocking spillways, large-scale irrigation canals and invading every tributary, night storage reservoirs and pond. It has also severely limited the efficiency of Tiga Dam's outlets and the intake channels of Kano River Irrigation Project and Kano Urban Water Supply intakes. Several other problems have accompanied the spread of the *Typha*, such as:

- *Typha* provides a vast breeding ground for freshwater snails, mosquitoes and other insects which has led to increased incidence of diseases like bilharzias and malaria in humans and liver fluke in livestock;
- *Typha* provides roosting place for quelea birds resulting in extensive crop damage, particularly rice and millet;
- *Typha* increases almost threefold the evapo-transpiration losses from the surface of the rivers, ponds and lakes;
- The associated rise in the ground water table has caused potash intrusion of the surrounding land, thereby salinising the soil and rendering it useless for agriculture and grazing; and
- Blockage of narrower, shallower stretches of river channels, thus reducing and diverting river flow causing flooding of farmlands, roads and settlements.

Unfortunately, there is for now no sustainable solution to the eradication of these weeds and they are likely to continue to grow and cause more damage and untold hardship to the wetland communities until better management of reservoirs and water-flows as well as protection of native species are introduced.

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

Table A2.3: Land Use Development Changes in the Basin.

Land Use Category (km ²)	Bauchi ⁵		Borno		Jigawa		Kano		Yobe		Total		
	1976/78	1993/95	1976/78	1993/95	1976/78	1993/95	1976/78	1993/95	1976/78	1993/95	1976/78	1993/95	Change
1. Intensive(crop) agriculture	20,026	27,338	9,606	10,681	8,496	15,940	17,470	15,691	7,826	7,879	63,424	77,529	14,105
2. Extensive (grazing) agriculture	11,049	12,050	19,392	25,885	7,746	561	574	538	10,334	10,583	49,095	49,617	522
3. Flood Plain Agriculture	882	1,163	-	-	1,795	2,341	274	258	1,272	1,824	4,223	5,586	1,363
4. Extensive Agriculture with Denuded	26	137	242	871	1,265	832	-	772	1,433	4,379	2,966	6,991	4,025
Sub-total Agriculture	31,983	40,688	29,240	37,437	19,302	19,674	18,318	17,259	20,865	24,665	119,708	139,723	20,015
5. Shrubs/Grasses	14,833	15,593	27,981	17,477	1,201	473	460	909	14,240	8,674	58,715	43,126	-15,589
6. Trees/Woodlands/Shrubs	14,754	3,571	-	-	-	-	817	171	-	-	15,571	3,742	-11,829
7. Discontinuous Grassland	683	956	1,830	3,641	692	1,122	-	-	3,024	2,841	6,229	8,560	2,331
8. Grassland	-	470	127	2,082	-	-	-	-	744	415	871	2,967	2,096
9. Grasses	-	-	8,742	6,466	48	556	-	-	3,735	4,578	12,525	11,610	-915
Sub-total Woodland/Grassland/Shrubs	30,270	20,590	38,680	29,666	1,941	2,151	1,277	1,080	21,743	17,508	93,911	70,005	-23,906
10. Shrub/Sedge/Graminoid Freshwater mash/Swamp	770	622	4,200	4,029	1,075	701	176	347	1,344	782	7,565	6,481	-1,084
11. Graminoid/sedge/ Freshwater Mash	-	-	4,200	482	251	45	-	-	-	-	4,451	527	-3,924
Sub-total Freshwater Swamp/Mashland	770	622	8,400	4,511	1,326	746	176	347	1,344	782	12,016	7,008	-5,008
12. Gullies	-	1,403	-	1,023	-	-	-	803	123	609	123	3,838	3,715
13. Sand Dunes	-	-	429	892	-	-	-	-	416	1,835	845	2,727	1,882
Sub-total Degraded land	-	1,403	429	1,915	-	-	-	803	539	2,444	968	6,565	5,597
14. Disturbed Forest	-	1,322	-	-	-	-	-	-	-	-	-	1,322	1,322
15. Undisturbed Forest	2,367	125	-	-	260	3	-	-	-	-	2,367	128	-2,239
Sub-total Forest	2,367	1,447	-	-	260	3	-	-	-	-	2,627	1,450	-917
16. Urban	-	-	57	140	-	-	-	-	-	-	57	140	83
17. Reservoir	-	175	-	-	-	45	250	335	-	-	250	555	305
18. Irrigation Project	-	-	27	411	-	-	46	109	-	-	73	520	447
Sub-total Miscellaneous	-	175	84	551	-	45	296	444	-	-	380	1,215	835
Total Land Area (km ²)	66,034		74,363		23,089		20,430		44,716		228,632		
Population (1991)	4,291,000		2,595,000		2,832,000		5,638,000		1,411,000		16,767,000		
Population Density (persons/km ²)	65		35		123		276		32		73		

Source: FORMECU

⁵ Only part of Bauchi State is in the Basin

Catchment Management Plan for integrated natural resource management of Komadugu Yobe Basin

The river systems also support the Hadejia Nguru Wetlands (HNW), which is Nigeria's premier Ramsar site that is of immense local, national and international economic and ecological importance. RAMSAR is an international convention that recognises certain wetlands that have worldwide significance, because of the biodiversity they support. The HNW in particular is reported to harbour over 370 species of birds, 33% of which are migratory as well as about 100 species of fish. There are also some endemic plant species of agronomic importance which are threatened with extinction and which have attracted strong conservation interest. These include a local variety of rice cultivated between Gashua and Geidam stretch (IUCN, 1997).

A2.5 The Existing Legal and Institutional Framework

In view of their importance in addressing critical issues relating to the KYB, legal and institutional weaknesses and obstacles to implementing integrated water resources management tools are topics that merit close attention. Integrated Water Resources Management means decision making on development and management of water resources for various uses that takes into account the needs and desires of all users and stakeholders. To pursue IWRM requires that we assess two situations: the context in which policies are pursued and programs developed, and secondly the level at which actions and decision-making occur and by extension where integration occurs. For this purpose, three contexts would be examined: the constitutional or policy and legal context; the organizational or water resource management context; and the operational or water use context.

A2.5.1 Legal Context

There are currently several basic policies, rules, regulations, laws and factors which influence the governance of water resources management. These range from the constitution, specific federal government policies, to non-statutory documents, such as NEEDS document and UN summit and conference declarations such as MDG, NEPAD etc, both of which influence the integrative natural resources management and decision-making process. All of these are however, fairly recent development, dating back to 1992 and onwards.

The constitution is the supreme law of the nation and therefore any law or conduct that is not consistent with the constitution is invalid. Essentially, therefore all provisions and especially constitutional obligations must be mandatory. It should be noted that unlike the 1979 Constitution that was in tandem with integrative principles and the Water Resources Decree 101 of 1993, the current constitution is silent on many aspects of provision of water services and on water resources management. The legislative list on aspects of water resources development and management as contained in 1979 and 1999 constitutions are shown in Box A2.1.

[Water Resources Act cap. W2 of 2004](#), was first promulgated and published in the supplement to official Gazette No. 27, Vol. 80, September 1993. It is the highest extant legislation governing water resources management in Nigeria. It confers on the Federal Government represented by the Federal Ministry of Water Resources (FMWR) the responsibility for controlling the use of both surface and groundwater resources **traversing more than one state** throughout the Federation. It is based on three important principles:

- ✓ a link between the right to use water and the ownership of land adjacent to that water (the riparian principle),
- ✓ a separation between private (water drawn from small streams or wells which gave too little, water to have potential for communal benefit) and public water; and between water in the rivers that are restricted to a state and those traversing more than a state, and
- ✓ the African customary law which saw rivers and the water in them as common good which belongs to the nation as a whole and are available for common use by all citizens, but which should be controlled by the state in the public interest.

Catchment Management Plan

for integrated natural resource management of

Komadugu Yobe Basin

Box A2.1: Legislative List on Land and Water Related Functions as Contained in the Constitution

1979 Constitution

➤ State Legislative List:

- Fishing and fisheries in rivers, lakes, waterways, ponds and other inland waters in the State.
- Land that is to say, rights in or over land, land tenures including the relation of landlord and tenant, and the collection of rents.
- Production, supply and distribution of goods.
- Public health sanitation and hospitals.
- Water, that is to say, water supplies, irrigation and canals, drainage and embankments, water storage and water power, subject to the provisions of the Federal Legislative list.

➤ Federal Legislative List:

- Fishing and Fisheries other than fishing and fisheries in rivers, lakes, waterways, ponds and other inland waters within Nigeria.
- Maritime shipping and navigation including:
 - a Shipping and navigation on tidal waters, and
 - b shipping and navigation on River Niger and its effluents any such other inland waterways as may be designated by the National Assembly to be international waterway or to be interstate waterways etc.
- Meteorology.
- National Parks being such areas in a State as may with the consent of Government of that State be designated by the National Assembly as National Parks.
- Water from such sources as may be declared by the National Assembly to be sources affecting more than one State.

➤ Concurrent Legislative List:

- the regulation of the right of any person or authority to dam up to otherwise interfere with the flow of water from sources in any part of the Federation.
- Environment.
- Tourism

1999 Constitution

➤ Concurrent Legislative List:

- The generation, transmission and distribution of electricity.

➤ Federal Legislative List:

- Fishing and Fisheries other than fishing and fisheries in rivers, lakes, waterways, ponds and other inland waters within Nigeria.
- Maritime shipping and navigation including:
 - a Shipping and navigation on tidal waters, and
 - b Shipping and navigation on the River Niger and its effluents any such other inland waterways as may be designated by the National Assembly to be an international waterway or to be interstate waterways; etc
- Meteorology.
- National Parks being such areas in a State as may with the consent of Government of that State be designated by the National Assembly as National Parks.

The Water Resources Law implies effective control of water resources usage throughout Nigeria, which requires that a detailed inventory of surface and ground water resources and present usage be made readily available and should provide instrument for ensuring the availability of water for current and future generations, establishing appropriate quality standards for various types of water use. In essence it should provide guidelines for integration of water resources, environmental and land-use management. Unfortunately, the Act is deficient in most of these.

The most significant flaw of the Act is that it did not flow from a comprehensive policy nor from judgements of the courts. Its principal deficiencies are the absence of clear premises and instruments, absence of provision on quality control of the water, water right transfer, groundwater control and defined criteria within which Federal Government would be committed to carry out the public trust obligations bestowed on it by the law. This probably may have been responsible for the difficulty in

Catchment Management Plan for integrated natural resource management of Komadugu Yobe Basin



enforcing the law. It is nevertheless, regrettable that more than ten years from when the Act was promulgated it remains to be enforced.

The constitutional provisions are not in harmony with the Act. The Constitution provides Federal Government with the sole responsibility for the management of interstate water resources, but unlike the 1979 constitution, the responsibility for certain water use sectors (such as fisheries, municipal use) and the environmental issues (such as certain conservation and pollution control functions) are not on the concurrent legislative list. However, in reality water resources management in the catchment has been in the hands of a plethora of institutions.

On the other hand, the Federal Environmental Protection Agency (FEPA) Act No 58 in 1988 established the agency as an integral part of the Presidency, on the model of the U.S. EPA and with the *"responsibility for the protection and development of the environment and biodiversity conservation and sustainable development of Nigeria's natural resources in general and environmental technology, including initiation of policy in relation to environmental research and technology"*; and without prejudice to the generality of the foregoing, it was required to co-ordinate the management of the environment across ministries, prepares periodic master plans for the development of environmental sciences and technology, and establishes national standards for pollution and procedure for environmental impact assessment for all development projects etc. To further compound the inherent contradiction in the two legislative instrument the Part II of the Act empowers FEPA to establish water quality standards and effluent limitations for existing and new point sources for the interstate waters of Nigeria.

Environmental Impact Assessment Act no. 86 of 1992 empowers FEPA or its successor to ensure that all major development projects as defined by them, including the utilisation of water resources, are undertaken in a manner that does not result in unacceptable environmental impacts. In essence, the decree requires that every major project undergoes a FEPA or successor – approved EIA process prior to its implementation. It also empowers FEPA or its successor to shut down all offending projects and prosecute the operators, but in reality it has not done either.

A2.5.2 The Institutional Arrangement

As observed earlier, five State Governments and several Local Government Authorities (through traditional institutions) share responsibilities over the land and water resources with Federal Government in the greater portion of the Komadugu-Yobe Basin, which also straddles the international borders with Niger. In such a context, it is of utmost importance that all inter-boundary, federal and state agencies as well as the authorities in Niger assume co-responsibility for water resources management in the Basin. Table A2.4 lists the Nigerian institutions concerned with water resources management operating in the Basin.

Stakeholders/institutions in the process of integration of land and water resources management for sustainable agricultural development comprise those actors involved in decision making at all levels; that are interested and/or are affected parties. To ensure sustainability, water resources management requires holistic approach, balancing the competing needs on the resource which could be domestic, municipal, agricultural, industrial, and environmental in nature. The institutions must therefore be extended to include those actors involved in land and water related sector that are in competition for finite land and water in a basin.

Although there are a large number of water management agencies, administrative units, land and water users and other stakeholder groups, not all of these play a significant role in the allocation and conservation of these resources. Such institutions would therefore not be strategic to the success of the integrative arrangement of water resources management at operational level even though they should be consulted when formulating policies and programmes. A general distinction could therefore

Catchment Management Plan for integrated natural resource management of Komadugu Yobe Basin

be made between “operational partners” who are involved in the integrative processes, and the “consulting partners” that should be consulted in the decision making process on policy, legislation and plan/programme development as well as in the provision of relevant data and information for IWRM. Both groups of stakeholders are listed in Appendix III. These stakeholders are all important in the shared responsibility for integrated water resources management for sustainable development of the Basin. It is also pertinent to state here that Table 3.4 does not carry a complete list of the institutions involved in all aspects of water resources management. Water is a pervasive resource and its management and uses touch almost all aspects of society, the economy and the environment.

In particular it does not exhaustively list the national, state and local departments within the ministries, nor the NGOs or private sector firms. It is important to note that in addition to the list of institutions in Table A2.4, there are currently at least eight apex organs of government which have statutory responsibility for policy formulation, approval and/or coordination for land and water resources management throughout the federation, all of which impact on water resources management. These institutions are: the National Assembly; the National Council of State; and at least six National Councils, namely those of: Water Resources, Housing and Urban Development, Transport, Environment, Solid Minerals, Aviation as well as Agriculture and Rural Development. The advisory role and the day to day implementation of the decisions of National Councils of Water Resources, Housing and Urban Development, Transport, Aviation, Environment as well as Agriculture and Rural Development are vested in the Federal Ministries of Water Resources, Housing and Urban Development, Transport, Aviation, Environment, Solid Minerals and Agriculture and Rural Development respectively. Due to the dependence of other sectors of the economy on this critical resource, however, several other statutory and non-statutory institutions are active in either policy, organisational, and operational aspects of the management of land and water resources. These other institutions include:

- State Houses of Assemblies of Bauchi, Borno, Jigawa, Kano and Yobe;
- Federal Government and State Executive Councils of Bauchi, Borno, Jigawa, Kano and Yobe states;
- Federal Ministries of Finance, Industry, Culture and Tourism, as well as National Economic Commission; and
- National Emergency Management Agency (NEMA), and Office of Minister for Special Duties (Ecological Funds).

From all of the foregoing it is obvious that water resources management is currently fragmented. It remains to be seen whether they have been adequately carried out. The subsequent sections would describe briefly the current status of the discharge of these functions in the agencies and civil societies. This will enable us to identify the gaps or deficiencies, especially those that could have important implications for integrated management of water resources for sustainable development in the basin.

The Federal Ministry of Water Resources is the apex national coordinating body in the water sector. It is responsible for policy formulation and the national coordination of development and management of water resources. It also plays a supervisory role over the River Basin Development Authorities (RBDAs) within the basin. The FMWR has the responsibility for the control and allocation of use of both surface and ground water resources throughout Nigeria for interstate rivers, and for all other rivers State Governments have corresponding responsibility.

In 1996 the Ministry conceived a broad strategy for the ultimate utilisation of the water resources in the basin. The strategy was however not based on comprehensive assessment of available water resources in the basin, nor of articulate estimate of water demand in the Basin. The strategy, amongst other suggestions, recommended the creation of a statutory body to coordinate water development in the basin. This position was also strongly advocated by Yobe State during the National Water Resources Council (NWRC) meeting of 1999 in Calabar. In response to the increasing evidence of

Catchment Management Plan for integrated natural resource management of Komadugu Yobe Basin



deterioration of the Komadugu-Yobe Basin's (KYB) water situation and the river system, as well as the growing community concern over their impact on their livelihood, the NWRC approved the formation of Coordinating Committee of Hadejia - Jama'are – Komadugu - Yobe Basin (HJKYBCC) (essentially the same as KYB) to coordinate and foster cooperation towards adaptive Integrated Water Resources Management (IWRM) in the Basin.

The FMARD is responsible for the formulation and execution of agricultural policies. It also supervises through the Project Coordinating Unit (PCU), the ADPs which are responsible for agricultural extension and farmer-owned and managed small scale irrigation using shallow aquifers in the fadamas. The ADPs of all States in the Basin are in the current second phase of National Fadama Development Programme. No licensing is currently required to exploit the shallow aquifers, although vigorous monitoring of ground water is enforced.

Until June 1999, when it was scrapped and merged with Federal Ministry of Environment (FME), Federal Environmental Protection Authority (FEPA) reported to the office of Secretary to Federal Government (SGF). Neither the defunct FEPA, nor the FME has had established mechanism for interacting with other related institutions and organs of government and FEPA even proceeded at times along a parallel course. For example, in 1991, FEPA published water quality standards without reference or consultation with the Department of Water Supply and Quality Control in the FMWR which also has responsibility for water quality control and is supposed to operate National Water Quality Laboratory for the purpose of enforcing quality control.

The FME was created for the first time in July 1999. It is successor to FEPA and include the Departments of Land Resources and Forestry that were transferred from the Federal Ministry of Agriculture and Rural Development as well as the Departments of Soil Erosion and Flood Control of from the Federal Ministry of Water Resources. Although, the FME and FMWR should be strongly interlinked in many activities, this has not been demonstrated in the Basin. It is not clear the level of coordination between implementation of Water Resource Act 101 Of 1993 and FEPA Act 59 of 1992 especially in relation to water quality monitoring and control. It should be acknowledged however, that water quality and quantity management in a catchment cannot be separated. Furthermore, the FEPA Act is yet to be reviewed to reflect the current institutional realities, nor is it clear whether the Act has been repealed.

FME is the apex institution of Federal Government responsible for the management and protection of the nation's environment. It commissioned a macroeconomic study and an environmental impact assessment (EIA) of the water resources development projects in the Jama'are River basin. The study was however inconclusive. It was intended to identify suitable strategies for the management of water resources in the basin that would be economically beneficial, environmentally safe, as well as socially and politically acceptable.

The River Basin Development Authorities (RBDAs) were first established in 1973, but it was not until in 1976 that they became a nationwide institution. The subsisting Decree on the RBDAs is Decree No. 35 dating back to 1987. In spite of several fundamental changes and reforms between 1988 to date, including the increase in the number of the RBDAs, partial commercialization of their activities, and change of the name to River Basin and Rural Development Authorities signifying increase scope of their mandate, the enabling decree has remained the same. Their functions as contained in the said decree are as follows:

- ✓ to undertake comprehensive development of both surface and groundwater resources for multipurpose use, with particular emphasis on the provision of irrigation infrastructure and control of flood and erosion, and for water management;
- ✓ to construct, operate and maintain dams, lakes, polders, wells, irrigation and drainage systems for achievement of the Authority's functions and to hand over all lands to be cultivated on irrigation schemes to farmers;

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin

- ✓ to supply water from completed storage schemes to all users for a fee to be determined by the Authority with approval of the Ministry;
- ✓ to construct, operate and maintain infrastructural services, such as roads and bridges linking project sites, provided that such services are included and form an integral part of the list of approved projects; and

Table A2.4: Major Federal and State Government Institutions involved in Water Resources Management in KYB

Federal Bodies	
Ministry of Water Resources <ul style="list-style-type: none"> ➤ Hadejia-Jema'are River Basin Dev. Authority (HJRBD) ➤ Chad Basin Development Authority (CBDA) ➤ National Water Resources Institute (NWRI) ➤ Lake Chad Basin Commission (LCBC) 	Ministry of Agriculture & Rural Development <ul style="list-style-type: none"> ➤ National Fadama Development Project ➤ Agricultural Research Institutes
Ministry of Power and Steel <ul style="list-style-type: none"> ➤ National Electric Power Authority 	Ministry of Science and Technology <ul style="list-style-type: none"> ➤ Lake Chad Research Institute
Ministry of Aviation <ul style="list-style-type: none"> ➤ National Meteorological Organisation 	Ministry of Housing and Urban Development
Ministry of Transport <ul style="list-style-type: none"> ➤ National Inland Waterways Authority 	National Planning Commission <ul style="list-style-type: none"> ➤ North East Arid Zone Development Programme (NEAZDP) – OP
Ministry of Works	Ministry of Health
Ministry of Foreign Affairs <ul style="list-style-type: none"> ➤ Nigeria-Niger Joint Commission 	Ministry of Solid Minerals
Ministry of Integration and Cooperation in Africa <ul style="list-style-type: none"> ➤ 2nd Commissioner on Lake Chad Basin Commission 	Ministry of Education <ul style="list-style-type: none"> ➤ Federal Universities at Maiduguri, Bauchi, Kano
State Government Bodies	
Kano	
KSMWR	Ministry of Water Resources
WRECA	Water Resources and Engineering Construction Agency
KNARDA	Kano State Agricultural and Rural Development Authority
KSWB	Kano State Water Board
LGA	Local Government Authorities
Jigawa	
JSMWR	Jigawa State Ministry of Water Resources
JSADP	Jigawa State Agricultural Development Project
LGA	Local Government Authorities
Bauchi	
BaSMRD	Bauchi State Ministry of Rural Development
BaSWB	Bauchi State Water Board
BaSADP	Bauchi State Agricultural Development Project
LGA	Local Government Authorities
Yobe	
YSMWR	Yobe State Ministry of Water Resources
YSADP	Yobe State Agricultural Development Project
NEAZDP	North East Arid Zone Development Project
LGA	Local Government Authorities
Borno	
BoSMWR	Borno State Ministry of Water Resources
BoSWC	Borno State Water Corporation
BoSADP	Borno State Agricultural Development Project
LGA	Local Government Authorities

Catchment Management Plan

for integrated natural resource management of

Komadugu Yobe Basin

- ✓ to develop and keep up-to-date a comprehensive water resources master plan, identifying all water resources requirements in the Authority's area of operation, through adequate collection and collation of water resources, water use, socioeconomic and environmental data of the River Basin.

There are two RBDAs in the Komadugu Yobe catchment. These are Hadejia-Jama'are River Basin Development Authority (HJRBDA) and Chad Basin Development Authority (CBDA). In spite of their name, the boundaries of the RBDAs do not on the whole correspond with watersheds or catchment of the major river basins. Instead, their boundaries follow more closely those of the state boundaries. The operational area of HJRBDA comprises the upper reaches of the catchment falling within northern parts of Bauchi State, and the whole of Kano and Jigawa states, while that of the CBDA comprises the lower parts of the catchment comprising the whole of Yobe and Borno states as well as the northern parts of Adamawa State.

They were intended primarily to ensure water resources management in the Basin but in reality they are engaged more in implementing FGN's water supply and irrigation services and programmes in the catchment. They are exclusively funded by the FGN and although they are supposed to be able to recover cost of their operation and maintenance from the beneficiaries of their projects, in reality the charges are too meagre and hence rely on treasury handout, which has been insufficient to support adequate O&M.

Each RBDA has a Board comprising a Chairman, the representative of the FMWR, the Chief Executive Officer of the RBDA and some other members, all appointed by the President. Each Authority is also to have an Advisory Committee that includes the heads of the Federal and State agencies involved with water resources in the Authority's area of operation, and the heads of departments of States Agencies in their domain responsible for agriculture, irrigation, fisheries, forestry and livestock. Regrettably, the advisory committees have not been reconstituted by either of the RBDAs in the past 23 years.

The inconsistencies of their boundaries also create difficulties to full cooperation with other agencies in water resources management and development. Consequently, the two RBDAs have independently been harnessing and abstracting water in the catchment. To date, the following irrigation projects have been developed by HJRBDA: Tiga, Ruwan Kanya and Challawa Gorge reservoirs, as well as Kano River Irrigation Project - Phase I (KRIP-1). The completion of KRIP-1 and Hadejia Valley Irrigation Project Stage 1 of Phase 1 (HVIP 1-1) are ongoing. Meanwhile, the development of Kafin Zaki and Kawali Diversion structures along with other irrigation development are being planned. On the other hand, CBRDA has most of its development on the fringes of Lake Chad outside the Komadugu Yobe catchment, namely: South Chad Irrigation Project phase 1 and 2 (SCIP-1&2) and Alau Dam, as well as partially developed Baga Polder Irrigation Project, but the downstream irrigation development for Alau Dam at Jere Bowl is being planned.

These RBDAs are now almost entirely water service and development oriented without adequate regard to integrated and holistic management required for environmental consideration. There is currently little or no direct coordination between HJRBDA and CBRDA except through the FMWR.

In considering the future of the RBDAs it is important to stress that for operational reasons it is globally recognised that

- ✓ **water management should be decentralised to the level of hydrological boundaries, i.e., the river basin, which seldom concur with administrative and/or political boundaries;**
- ✓ **it is particularly important to separate the role and institution of 'gamekeeper' namely the water resources management from those of 'poachers', i.e., the irrigation, water**

Catchment Management Plan

for integrated natural resource management of

Komadugu Yobe Basin

- supply and sanitation delivery functions. Currently, the RBRDAs are both water resources managers as well water services providers; and
- ✓ RBDAs were supposed to be independent entities with high level of administrative and financial autonomy, and each has to have a Board which answers directly to the Minister for Water Resources and to report to the FMWR for even routine matters as their financial limit is mere ₦ 20,000,000.00 per transaction.

State Organisations

The State Ministries of Agriculture and Natural Resources (SMANR) and Ministries of Water Resources (SMWR) jointly play similar roles on land and water resources management to those of FMARD and FMWR respectively at the State level with some modifications. The State Irrigation Department (SID) and the ADP belong to SMANR in some States, but statewide coordination of water resources development and management belong to SMWR. In some States (e.g. Kano, Bauchi) SID resides in SMWR.

The advent of HJRBDA and CBDA have however eclipsed the role of SIDs in their area of jurisdiction, and the problem now is that these SIDs continue to maintain sizable staff, although limited funds have rendered them virtually idle. The informal division of responsibility within the Basin is that those irrigation projects of more than 500 ha are generally transferred or handled by the RBRDA. But there is apparently no forum within the states for formal discussion and coordination of activities between the RBRDA and the SIDs or even State Water Boards.

Kano State government has invested much more than any other state to develop Bagauda, Watari and several medium to small-scale dams (over 20), as well as abstracting groundwater from the Hadejia system of the catchment for municipal and agricultural water requirements. Jigawa State abstracts groundwater through wash bores and tube wells, and surface water through canals for irrigation also form the Hadejia sub-system. Bauchi State abstracts some groundwater for irrigation and municipal use, as well as some surface water from the Jama'are sub basin through direct pumping for small scale irrigation. Borno abstracts surface water from the Yobe River for both small and large scale irrigation and groundwater for municipal and small-scale irrigation.

State Water Boards (SWB)-The responsibility for the treatment and delivery of municipal and rural water supply and sanitation lies with the State governments. Each has agency/agencies to manage and develop the systems. It is indicated that one of the conditions precedent to World Bank intervention in the National Water Supply Rehabilitation Programme (NWSRP) is the existence of a state agency that is solely responsible for water supply, while the requirement of the FMWR Nationwide Rural Water Supply Programme is the existence of an agency responsible for development, operation and maintenance of rural water supply schemes.

Consequently, almost all the States in the catchment now have a separate agency for urban water supply and another for rural water supply.

The primary responsibility of the SWBs is to supply water to towns and cities within their respective States. They are involved in water resource development and monitoring, and have some reservoirs, treatment plants, and network of hydrological data collection stations. In Kano State the SWB and WRECA have a well-developed network of hydrological data collection stations while HJRBDA is relatively not as involved in hydrological data collection in the state whereas Bauchi State is the converse; it has none and relies on Upper Benue RBDA for their data. This highlights the need for institutional reforms in the basic data acquisition and collation. This should however, be done cautiously, with full consideration of the relative strength of the agencies in evolving suitable policy.

Their degree of interaction with the FMWR varies, depending on whether the State was a beneficiary of the World Bank National Water Rehabilitation Fund. The FMWR coordinated the fund and by

Catchment Management Plan for integrated natural resource management of Komadugu Yobe Basin

implication this improved harmonization and cooperation with the SWBs that were beneficiaries of the Fund, while it lasted. However, because the RBDAs have not been involved in the programme this tended to further distance the SWBs from the RRDA. Generally, the degree of cooperation and interaction of the SWBs with RBDAs and FMWR other than on NWSRP remains very limited.

The FEPA Act 59 of 1992, required the President to encourage States and Local Government Councils to set up their own Environmental Protection Bodies for the purpose of maintaining good environmental quality in the areas of related pollutants under their control subject to the provisions of the Act. Consequently, between 1995 and 1998 most State Governments promulgated Edicts establishing their State Environmental Protection Agency intended to complement the roles and functions of FEPA. State EPA are however, primarily engaged in urban sanitation and solid waste disposal, whereas their primary roles/functions are to enact and enforce state regulations, set control criteria, produce guidelines and environmental quality standard for effective prevention, re-mediation, and control of point and non-point sources of pollution and degradation of the environment.

The States Agricultural Development Projects: The Agricultural Development Project (ADP) deals mainly with rainfed agriculture but are now involved in promoting small scale, farmer owned and managed irrigation using shallow aquifers of the *fadama* under the auspices of the World Bank through National Fadama Development Project. The projects are farmer-managed using pumping systems which are owned by farmers, but with the drilling (for washbores and tubewells), done by the ADPs. This project is tackling some of the institutional issues faced by HJRBDA, such as cost recovery and provision of credit for small farmers, and some of these farmers are also participants in the schemes operated by the HJRBDA.

The North East Arid Zone Development Programme (NEAZDP) is a joint programme of Federal Government, Borno and Yobe State Government with European Union and like the ADPs, the NEAZDP is also engaged in organising and assisting farming communities within its operational area to abstract both surface and groundwater in the catchment mainly for irrigation.

Local Government Authorities: More than 49 Local Government Authorities have their domain within the catchment. It was reported that they are all involved in one way or the other in the abstraction of water for small scale irrigation purposes. This could not be confirmed during the field visits. Nonetheless, the involvement of the Local Governments and District Authorities in irrigation development projects would be vital especially in the mobilisation of farmers for water conservation practices.

DFID-JWL, FMWR-IUCN-NCF KYBP and LCBC-GEF are essentially serving as informed specialised institutions, engaged in advocacy and catalysing the community to be involved in best management practices to conserve the environment toward actualising sustainable development of the catchment with a specific focus on the preservation of Wetlands, IWRM and inculcating new ecological values and supporting livelihoods. Collectively they have facilitated the formation and active involvement of **Stakeholder Forum in the basin**. Presently there has been ongoing discussion on water management issues developed through a Stake Holders Forum in which the various States, RBRDAs and several water users are represented. In this way the forum aims to come to a more integrated planning which tries to incorporate mitigating measures of negative impacts of the various plans brought forward.

Regional Organisations: The Basin water resources include waters whose origins are external and internal to the nation. These are therefore shared resources covered by international and bilateral agreements and protocols. Nigeria currently, is a member of two regional bodies which impact on the water management of the catchment. These are:

- ◆ **The Lake Chad Basin Commission (LCBC):** LCBC was established in 1964 by Chad, Cameroon, Niger and Nigeria with the goals of ensuring the rational and equitable development of

Catchment Management Plan for integrated natural resource management of Komadugu Yobe Basin



the natural resources of the Lake Chad region. Alarmed by the shrinking of the Lake Chad, The LCBC with the assistance and cooperation of UNEP, UNSO and FAO prepared a Master Plan for environmentally sound management and development of the natural resources of the Lake Chad conventional basin. LCBC has its headquarters in N'djamena, Chad.

- ◆ **Nigeria/Niger Joint Commission (NNJC):** The Nigeria/Niger Joint Commission (NNJC) with its headquarters in Niamey, Niger Republic was established under a bilateral relation to monitor and recommend the development options within the following four major drainage basins common to both countries.

Annex III: Some Thoughts on Recommended Planning Process and Informed Decision-Making

Roles of Non Government Organisations (NGOs)

The primary aim of NGOs in the catchment (such as IUCN) have been to provide independent, non-governmental work aimed at benefiting society and the environment and to undertake impartial, critical analysis of existing obstacles and mistakes on the part of the respective government.

These advantages and skills should be harnessed to the mutual benefit of all in the catchment. To enhance the role of NGOs in the planning process, through water resources development and management their involvement would need to be consolidated in the planning process through appropriate partnership and institutional arrangements with governments through representation at the State Water Forum. Development work undertaken by NGOs in the catchment also needs to be coordinated between NGOs; perhaps within an NGO basin forum.

Local Government Authorities

The Local Government Authorities within the Hadejia-Jama'are-Komadugu-Yobe Basin may be required to work actively with the State Government, local residents, community organisations, village committees, NGOs, business, trade unions and other groups to begin the process of moving towards sustainable development.

The promotion of sustainability in local communities is critical to any success in ensuring the and this challenges traditional structures and the procedures of local government. In order to ensure integrated consideration of social, economic and environmental conditions within the local government area; public participation and partnership in decision making and problem solving at a local level, together with the consistent implementation of long term strategies, the following institutional reforms and planning procedures are recommended:

- ✓ **each Local Government Authority (LGA) should be encouraged to set up a representative, multi-sectoral planning body or 'stakeholder forum' as the coordinating and policy and advisory group for developing and monitoring a long-term sustainable development action plan;**
- ✓ **LGAs should be encouraged or even mandated to carry out some form of assessment of existing local social, economic and environmental conditions;**
- ✓ **regularly convene a consultation programme of specialist working committees comprising of representatives of community groups, NGOs, local businesses, mosques and churches, professional groups and unions to identify proposals and priorities for action;**
- ✓ **develop and implement a Local Environmental Plan (LEAP), with specifically defined targets and time schedule;**
- ✓ **establish monitoring and reporting procedures which would hold the LGA, Business and communities accountable to the agreed action plan;**
- ✓ **establish, in accordance with the UNICEF supported water supply and sanitation units (WES) coordinate and support all activities of this sub-sector within the LGA;**

Catchment Management Plan for integrated natural resource management of **Komadugu Yobe Basin**



Additionally, in all cases, but particularly in urban areas, a range of measures including **planning and building regulations and land management approaches** could also be used in the future to require sustainable use and management of storm water and waste water thereby minimising environmental damage and the wastage of valuable resources.

Comprehensive Strategic Action Plan

The drafting of a **Comprehensive Strategic Action Plan** for the basin to provide the opportunity for all stakeholders to learn from the successes and failures involved in the process of developing and implementing the CMP and to extend it to cover comprehensively all other service related action plan and stakeholders. Any lessons learnt can then be applied to other catchments throughout Nigeria. Developing such a comprehensive strategic action plan within a National Water Resources Management Strategy has the advantage of:

- ✓ **providing a 'test basin' for developing the plan and the strategy;**
- ✓ **providing a 'test basin' for the proposed institutional framework to ensure cooperation from all stakeholders;**
- ✓ **developing and reviewing the procedures for producing the plans;**
- ✓ **providing the 'real world' environment for testing and evolving strategy, and**
- ✓ **ensuring that all the community has a voice in the process of developing the strategy**

'think regionally; act locally'

The Catchment Management Authority should progressively develop a Comprehensive Strategic Action Plan for the catchment for the development and management of water resources within its water management area. These strategies must be in harmony with the National Water Resources Management Strategy. In the process of developing this strategy, a Catchment Management Authority must seek cooperation and agreement on water-related matters from the various stakeholders, and periodically review the plan.

We suggest, that the CMA should be water management and regulatory in nature, and serve the interests of equity, efficiency and environmental sustainability. Any functions carried out by a CMA should be carried out within the parameters set by the KYCCC and be in conformity with the national policy and standards. The board of directors and governance structure of CMAs should balance the requirement to reflect the interests of various stakeholders with the need to ensure the effective management of the catchment. CMAs can have a wider or more restricted range of functions delegated to them depending on the requirements of the specific catchments within their jurisdiction; their capacity to undertake the management tasks and the policy decisions on the overall approach.

As part of the consultation process we suggest that the functions of the proposed Catchment Management Authority should be:

- ✓ **through consultation with all interested stakeholders to develop and review the catchment management strategy;**
- ✓ **to advise all stakeholders on the protection, use, development, conservation, management and control of water resources in its water management area;**
- ✓ **to coordinate the related activities of water users and of the water management institutions within its area;**

Catchment Management Plan for integrated natural resource management of **Komadugu Yobe Basin**

- ✓ to promote the coordination of its implementation of any applicable development plan in terms of the Integrated Water Resources Management Strategy;
- ✓ to ensure community participation in the protection, use, development, conservation, management and control of the water resources in its water management area;
- ✓ to maintain and where appropriate improve existing river flow regimes in the water ways of their catchment management area, and in collaboration with the Ministry of Environment;
- ✓ to protect, enhance and conserve the diversity and extent of the natural ecosystems within the riverine, estuarine and wetland environments; and
- ✓ to improve and maintain water quality and quantity standards and regulations.

Monitoring and Enforcement

Monitoring and enforcement of water quality and water quantity should be carried out by the CMA, in close collaboration with the Federal Ministry of Environment and State Environmental Protection Agencies. The Authorities responsibilities should include but not be limited to:

- ✓ **water quality monitoring and the enforcement of standards;**
- ✓ **water quantity monitoring and enforcement;**
- ✓ **data collection and collation; and**
- ✓ **the protection, conservation and enhancement of the riverine, wetland and estuarine environments.**

The Preparation of Specialist Plans

The Authority should be represented in the community and stakeholder forum envisaged below, and in collaboration with all stakeholders through the State forum;

- ✓ **coordinate and prepare specialist plans (aquifer management plans/wetland management plans), and**
- ✓ **prepare sub-catchment management plans, in line with the development of the overall catchment management plans and State Business and asset management plans.**

Community Water Management Areas

Water resources need to be managed at the lowest most appropriate level in the catchment. Designated community water management areas based around existing traditional community social structures (emirate councils); and further developed through new or existing water users associations and fadama users associations could ensure that all the community is an active participant, both in managing and developing the catchment strategy.

Such formal and informal local community organisations would ensure participation in the planning process and representation at the catchment authority level; for example through an appropriate local representative structure, such as the Local Government Areas.

We suggest that, as part of the planning review process, pilot local water management areas are established within sub-catchments to allow for a review of the institutional process of representation at the State and basin level.

Catchment Management Plan for integrated natural resource management of Komadugu Yobe Basin



Project and Programme Review

As part of the planning process the rehabilitation, completion and extension of development projects within the catchment require that all projects are reviewed within an integrated approach to catchment and water management. This implies that all competing uses within the catchment competing water uses are recognised and prioritised with consideration to their most equitable and efficient water use while also being protective of the environment.

Priority investment in the catchment should therefore be given to those projects which fulfil the concepts of efficiency, equity and environmentally sound use. Priorities give should be based on such factors as sector development policies; the temporal and spatial variability of water resources, as a reflection of the integrity of the resources; The nature of current and anticipated demands; and the managerial capacity (including financial resources) required to carry out the project and programme functions competently and efficiently.

The project and programme review procedure should reflect this integrated approach to prioritising investment.

To summarise the implications for the project review in the planning process there is growing recognition that:

- All project and programme development should fulfil the concepts outlined in the anticipated National Water Resources Management strategy and the envisaged catchment Management Plan. Projects that fulfil such criteria should be given priority for development.
- Apart for the technical and financial viability of the scheme or project, the key condition for sustainable development impact from a particular investment project is its **implementability**. This requires that the institutional demands of the project are matched to local institutional capacity, and that stakeholders are genuinely **committed** to the project through participation and local **ownership**. The conventional project identification/preparation approach of the past has militated against these requirements being met.
- Economic efficiency and fiscal sustainability demand that Operation and Maintenance costs and at least part of the capital costs of irrigation schemes should be recovered from the users. This often requires institutional reorientation of irrigation bureaucracies, the formation of users' groups or WUAs, and an even greater need for participation and local ownership.
- Adverse social and environmental impacts are significant contributors to project failures. Despite past mistakes, governments, financing institutions, planners and implementers continue to pay only lip service to the need for impact assessment. The consensus is **that social and environmental impact assessment is as essential and important as economic tool as economic analysis in planning successful projects and programmes**.
- In some cases the planning process may become as important an end as the ultimate project plan, since it should be the means of building local commitment and capacity.

Catchment Management Plan for integrated natural resource management of Komadugu Yobe Basin

Project and Programme Appraisals

This study is somewhat pioneering in its attempt to prioritise a development programme within an integrated catchment framework, whilst simultaneously developing the guiding principles and framework necessary to define and refine the process.

As part of this review procedure detailed project appraisals have been carried out on:

- **Kano River Irrigation Project (Phase 1) (Report Reference R3/2/3), and**
- **Tiga and Ruwan Kanya Reservoirs (Report Reference R3/3/5 and R3/3/6).**

The appraisals were accompanied by dam safety reviews of **Challawa Gorge, Tiga and Ruwan Kanya Reservoirs** in that they affect the integrity of the water supply downstream (Report References R4/2/9 R4/2/5 and R4/2/6 respectively).

The reviews were followed by assessments of the sustainable irrigation management within the catchment, with a summary report (Report Reference no R5/1), taking cognisance of management issues throughout Nigeria, and individual annex reports on:

- **Kano River Irrigation Project Phase 1**
- **Watari Irrigation Project, and**
- **Hadejia Valley Irrigation Project Phase 1**

The detailed recommendations can be found in these individual reports. However in terms of the overall planning process the following recommendations are made:

Kano River Irrigation Project Phase 1

The economic analysis suggests that reinvestment in KRIP 1, to restore the irrigable area to its original 13 286 ha would be profitable at the level of costs and benefits assumed. However, while the projected benefits can be regarded as realistically attainable it remains to be confirmed whether or not the Authority's estimates are sufficiently accurate for an investment decision to be made. It is recommended that a decision on whether or not to proceed with completion of the balance of the command area in KRIP 1 should be left until (a) the availability of irrigation water is confirmed and (b) the existing command area is successfully operated and maintained under the type of new management suggested below.

The analyses and experience to date on this and other similar investments in Nigeria suggest however that there would be little point in re-investing in the project without addressing the fundamental problems that have led to its present condition. These mainly revolve around financing the O&M costs. There is a need to consider structural change in attempt to provide farmers with a reliable service, in return for which they should be expected to meet a large proportion of the full O&M costs. One suggestion for consideration is **Participatory Joint Management**, under which the project authority would retain responsibility for O&M of the dams and main/branch canals, and the farmers, through a strengthened, properly constituted and legally established federated water users' associations (WUAs), would be given responsibility for the rest. The project authority would become an autonomous service provider and the users would be expected to meet the full cost of the service. As stakeholders, the users should be represented on the board of the project authority. Project

Catchment Management Plan
for integrated natural resource management of
Komadugu Yobe Basin



authority staffing should be reviewed, with participation from the WUA, and non-essential staff should be re-deployed.

Rehabilitation should be carried out within the context of a long-term perspective, within the framework of the project management arrangements suggested above, and planned with the full participation and consent of the client users. Government must expect to provide finance both for rehabilitation and for O&M in the short term - but the latter at an adequate level to avoid a continuation of the rehabilitation-decline-rehabilitation cycle - and on a sliding scale with gradual transfer of financial responsibility to the users.

It is recommended that the findings of the dam safety reviews of Tiga and Ruwan Kanya reservoirs are implemented immediately in that they affect the safety of the reservoirs and the integrity of the water supply.

Tiga Reservoir

In terms of the overall planning process the following recommendations are made concerning the operation and maintenance of Tiga Reservoir:

- The future operational and storage requirements for Tiga reservoir should be considered within the context of an Integrated Catchment Management Plan for the Hadejia Jama'are-Komadugu-Yobe Basin prior to implementing any remedial or other works designed to significantly increase the current storage capacity.
- The dam represents a high hazard in terms of the consequences of failure; extreme damage and considerable loss of life could be expected. The cost benefit ratio of undertaking the rehabilitation works is likely to be high.
- The mechanisms for providing adequate long term maintenance funding needs to be addressed to avoid continuing the cycle of build, decline rehabilitation. Either government must allocate adequate resources from central funds or the users must pay sufficient water charges to cover these costs although collection could be difficult. Provision will have to be made by government if the latter option is adopted to fund dams such as Tiga where the full revenue stream cannot be generated because the schemes that they were intended to supply have not been fully developed.
- Dam safety legislation in Nigeria is currently inadequate a needs to be reviewed in line with International guidelines.

Annex IV: The Development of Guiding Principles

The Process

The set of principles presented here are based on the guiding principles set out in the Dublin Conference Statement and reaffirmed during the UNCED in Rio de Janeiro in 1992.

Specifically the development of these guiding principles has followed the participatory approach, and described in the following section. The principles are consistent with the provision of Nigeria's Water Resources Act, W2, of 2004.

The following fundamental principles were proposed for public review and discourse in various consultation documents. The process began with the distribution in November 1998 of the consultation draft 'Strategic Framework, Principles and Objectives' for public comment to over one hundred key individuals, institutions, funding agencies and NGOs.

All previous comments and revisions received were documented in this and presented for further consultation and review. These principles would need to be formally adopted by all Nigerians.

They have a 'softer' status than for example any resulting legislation. By definition, they should assist in the integration, implementation and application of policy; providing guidelines on the interpretation of law. However, they do not create substantive obligations that are actionable in their own right but are intended to inform and guide the decision making process.

The Guiding Principles

These Guiding Principles were developed and guided by the concept of sustainability outlined in the Strategic Framework document (*Reproduced Report Reference no R2/1*) and which can best be summarised under the following strategies:

- ✓ **demand-driven and community-based development;**
- ✓ **basic services as a human right; 'some for all' rather than 'all for some';**
- ✓ **equitable regional allocation of development resources;**
- ✓ **water has economic value;**
- ✓ **the user and polluter pay principles;**
- ✓ **integrated development and catchment management; and**
- ✓ **environmental integrity.**