REPUBLIC OF SUDAN

MINISTRY OF IRRIGATION AND WATER RESOURCES

SUMMARY OF THE

COUNTRY STRATEGY ON INTEGRATED WATER RESOURCES MANAGEMENT

FEBRUARY 2007

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ACRONYMS

ACOW	Arab Council on Water
AMCOW	African Ministers Council on Water
BCM	Billion Cubic Meter
CIDA	Canadian International Development Agency
COM	Council of Ministers of Water Affairs of the Nile Basin
CPA	Comprehensive Peace Process
EIA	Environmental Impact Assessment
EMC	Earth Moving Corporation
ESTAC	Ethiopian-Sudanese Technical Advisory Committee
FAO	Food and Agricultural Organization of the United Nations
FEDDAN	4200 Square meters.
FOP	Field Outlet Pipe
GWWD	Ground Water and Wadis Directorate
Hafir	Small reservoir constructed in rural areas for drinking water for humans and animals
HCENR	Higher Council for Environment and Natural Resources
HRS	Hydraulic Research Station
HYDROMET	Hydro-Meteorological Survey of the Equatorial Lakes
IAEA	International Atomic Energy Agency
IAHR	International Association of Hydraulic Research
IAHS	International Association of Hydraulic Sciences
ICID	International Commission on Irrigation and Drainage
ICOLD	International Commission on Large Dams
IOD	Irrigation Operation Directorate
IWC	Irrigation Works Corporation
IWRA	International Water Resources Association
IWRM	Integrated Water Resources Management
MCM	Million Cubic Meter
MDG	Millennium Development Goals
MIWR	Ministry of Irrigation and Water Resources
NBI	Nile Basin Initiative
NCS	National Comprehensive Strategy
NCWR	National Council for Water Resources
NGOs	Non-Governmental Organizations
NWC	National Water Corporation
NWD	Nile Water Directorate
PJTC	Permanent Joint Technical Commission for Nile Waters
PSP	Private Sector Participation
SIDA	Sweden International Development Agency
SNWP	Sudan National Water Policy
SPU	Strategic Planning Unit
SVP	Shared Vision Programs
TECCONILE	Technical Cooperation Committee for the Promotion of the Development and Environmental protection of the Nile Basin
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
TWRO	Technical Water Resources Organ
Wadi	Non-Nilotic Stream
WB	World Bank
WHO	Word Health Organization
WMO	World Meteorological Organization
WUA	Water Users Association
WWC	World Water Council

VISION

“ASSURED OUR WATER RESOURCES IS MANAGED FOR SUSTAINABLE SOCIOECONOMIC DEVELOPMENT, POVERTY ALLEVIATION AND PEACE”

Justification

a. Background:

Water is life. Its use and development underpins the social and economic fabric of the society in Sudan. The Government of National Unity is committed to undergo reforms, update the national water policy and improving the management and protection of water resources to ensure that water is available for equitable allocation for all the demands in the country including water for domestic and public use, agriculture, energy, navigation, livestock, industry, tourism and the many other uses of water. The reforms include the globally accepted principles of decentralization, participation, subsidiarity and sustainability of the water resources.

There is no existing one single legal document that governs the development, management and utilization of water resources in Sudan. However, there are different existing water related legislations which can be regrouped into two parts based on the time of their approval:

Prior to 1992: the policies and legislations of irrigation and hydropower were under the Ministry of Irrigation and Water Resources, MIWR whereas the drinking water was under the Ministry of Engergy. However, the first water policies in Sudan were formulated during the colonial era 1913, to allow construction of Sennar dam and the Gezira irrigation schemes. The Nile water policies and plans were then formulated during the period 1952-1956. These policies governed establishment of new irrigation schemes i.e. Managil and operation and maintenance of the other irrigated schemes and dams and soil surveys. The water policies were also updated following the 1959 Nile Waters Agreement, and Nile Valley Plans were formulated, culminated in the establishment of Roseires and Elgirba dams, extension of Managil, Sugar projects in Elgirba and Elgunaid and pump irrigation schemes. The Nile Valley Plans were later updated in the late seventies. The Master Plan of the Nile Waters was prepared in 1978/1979 concentrating on the economic use of water.

Post 1992: The MIWR embraced all the sub-sectors, namely policy making and legislations, planning, and coordination of all the water resources. Consequently, the drinking water became the responsibility of the MIWR.

Bearing in mind experiences, limitations and lessons learnt from the implementation of the 1992 Water Policy, and taking into consideration future aspirations of the people and the realities of the world around, the MIWR in 1999, decided to review, integrate and update the existing 1992 Water Policy with support from the FAO and the UNDP which resulted in the preparation of the 2000 year water policy draft.

b. The Need for Policy Updating:

The National Water Policy draft of 2000 is a single policy document which had to be improved based on the new country developments.

Other issues that support the importance of carrying out a major review in the available and draft water policies are:

- Balance between supply and demand and efficient use for irrigation water in agriculture.
- More utilization for irrigation from groundwater and solving the problem of drawdown and deterioration.
- Striking a balance between agricultural uses and hydropower.
- Increase the water use, particularly rain-fed to match with the available vast land areas.
- High rate of growth dictates excessive investment programs in the water sector.
- The need to enhance regulation and coordination between the different users and avoid fragmentation of Government responsibilities and institutions in the States as dictated by the CPA.
- Mitigating the environmental pollution hazard.
- The formulation of regulation Acts to establish the appropriate enforcement mechanism for the management and development of water resources and the Environment Protection Ordinance of 2000.
- Enhancing capacity in water resources management and development in the States and GOS.
- The introduction of stakeholders in the Gezira scheme (WUAs)

The following integrated Water Policy of 2007 has been developed based on the Transitional Constitution of Sudan, water policies of 1977, 1992 and 2000, macroeconomic and social policies and development strategies. The formulation of the Water Policy of 2007 is also based on sound water assessments, established effective regulatory framework and capacity for enforcement of approved legislations and to promote the role of women, moves toward market-oriented solutions and creates incentives for the sustainable use of water resources.

1. INTRODUCTION AND SITUATION ANALYSIS

1.1 Water Resources Availability

General

Sudan, the largest country in Africa, covers an area of about 2.5 million km^2 between latitudes 3° N and 23° N and longitudes 21° 45″ E and 38° 30″ E. It borders nine countries and shares surface and groundwater with 12 countries. It has a population of about 26 millions (1993 Census) with an annual increase of 2.8%. More than half that population lives on just 15% of the land along the river Nile. The rest of the population lives in areas away from the Nile.

The country is traversed lengthwise by the Nile enclosing the central clay plains with Red Sea hills on the east and Jebel Marra in the west. Many parts are traversed by scattered seasonal flashy streams while in the South East plains; sheet runoff flow to the main rivers is dominant during the rainy season.

Water resources in Sudan comprise three main categories, the surface water which contains rainfall and Wadis (seasonal non-Nilotic streams) waters, and the Nile system; groundwater and the unconventional water. The Sudan shares the Nile with nine countries, the Wadis waters with three countries and ground water with three countries.

Surface water

a. Rainfall

Rainfall in Sudan is generally characterized by its variability and it varies according to four distinct zones, namely:

i. The desert zone north of latitude 17° with annual rainfall of less than 75 mm (comprising roughly 36% of Sudan's land area);
ii. The semi desert zone north of latitude 15° with annual rainfall of 75 mm to 300 mm, occurs during 2-3 months and dry during the rest of the year (roughly 20% of the land area);
iii. The Low Rainfall Savannah zone lying between latitudes 9° and 15° with annual rainfall of 300 mm – 900 mm (roughly 24% of land area), and
iv. The southern part south of latitude 9° that comprises the equatorial forests, high rainfall savannah, flood plains and swamps where the average annual rainfall exceeds 900 mm, concentrated in 4-5 months (roughly 20% of land area).

b. The Nile System

The Nile Basin is shared by ten riparian countries, namely: Burundi, D. R. of Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda. Sixty three

percent of the Nile Basin falls within Sudan and more than seventy percent of the area of Sudan lies within the Nile Basin. The hydrology of the Nile and its tributaries is summarized in Table 1.

Table 1. Supplies from the Nile and its tributaries

Tributary	Total Annual Average Supply (bcm)	Flow Characteristics
Blue Nile	50.7	Average daily peak discharge falls from 535 mcm/day in August to only 11 mcm/day in April
Rahad	1.09	Flow from July to November
Dinder	3.0	Flow from June to November
White Nile	27.8 (at Malakal)	Daily flow falls from 114 mcm/day in November to 54 mcm/day in April
Bahr El Gazal	14	Only 0.5 bcm reaches Malakal (swamps)
Bahr El Jebel	26 at Mongalla	Only 14.0 bcm reaches Malakal (swamps)
Sobat	13.3 reaches Malakal	Losses in Baro and Machar reach 8 bcm. Flows range from 8 mcm/day in April to 66 mcm/day in November
Atbara	12 (7 from Setit and 5 from Atbara branch)	Low regulated flows from February to June
Main Nile	84 (at Aswan)	Average daily peak flow of 690 mcm/day (August-Sept.) and a low flow of 74 mcm/day (April-May)

The average annual flow of the Nile recorded at Aswan in southern Egypt, 84 bcm, is shared by Egypt (55.5 bcm) and Sudan (18.5 bcm) according to the 1959 Nile Water's Agreement between the two countries, 10 bcm are estimated to evaporate from the Aswan High Dam reservoir, built according to the above agreement. The Agreement also established the rights of the other riparian countries for the utilization of the Nile Waters.

c. Wadis Waters

Gash and Baraka are the largest Wadis, each with an annual average flow ranging from 200 to 800 mcm, which occurs between July and Sept. These Wadis originate from Eritrea and terminate in the continental deltas of Gash, Toker and Red Sea. Wadi Azum and Wadi Hawar are the largest Wadis in western Sudan, with an estimated annual runoff of 500 to 750 mcm, respectively. The combined total annual runoff of all the Wadis in Sudan is estimated to vary from 5 to 7 bcm.

Groundwater

Groundwater investigations and development in Sudan are still embryonic. Given the size, complexity and cost of groundwater investigations, information on availability of groundwater resources in the country as a whole is sketchy. Renewable groundwater

estimates are within 4 bcm. Groundwater is found in Nubian Sandstones, Umm Ruwaba Formation and alluvial deposits. Basement Complex Formations, despite their impermeability nature, may also contain groundwater in fractured or weathered zones.

Unconventional Water Sources

The quantity of this type of water is insignificant and its use is still very limited and at an early stage i.e. desalination in Port Sudan and sewage treatment in some parts of Khartoum. But in future there is a good potential for the development of these alternative sources of water in desalination, recycling and water reuse.

The current annual amount of water available to Sudan from national and international sources is about 30 bcm (Table 2).

Table 2. Summary of the available water to Sudan.

Water Resources	Quantity (bcm)	Constraints
Sudan present share from the Nile Waters Agreement (at central Sudan)	20.5	Seasonal pattern coupled with limited storage vessels. Expected to be shared with riparians.
Wadis Waters	5 to 7	Highly variable, short duration flows which are difficult to monitor or harvest. Some are shared with neighbors.
Renewable Groundwater	4.0	Deep water entailing high cost of pumping. Remote areas of weak infrastructure.
Present Total	30.0	
Expected from reclamation of swamps	6.0	Capital investment needed with considerable social and environmental cost
Total	35.5 to 37	

1.2 Present and Future Usage of Water

Irrigated agriculture is by far the major user of water in Sudan. The main crops grown are cotton, sorghum, groundnuts and wheat. It consumes more than 90% of the water. Human and animal consumption are estimated at 5% and 1% is estimated for the industrial and other uses. The developed agricultural schemes cover a net cultivable area of 4.4 million Feddans (1.85 m ha) of which more than 3.2 million Feddans (1.35 m ha) were cultivated in the agricultural season 2005/2006, expected to rise to 5.5 million fed. (2.31 m ha) in the near future. The total water used by these schemes plus evaporation from the existing reservoirs is estimated at 14.5 bcm (measured at Aswan). The estimates were based on the present performance and cropping pattern, irrigation water requirements and the high conveyance efficiencies in the Sudan's clay plains. A recent

study by the Ministry of Agriculture and Forests in collaboration with the Ministry of Irrigation and Water Resources for a 25 years Strategy (2002-2027) projected the irrigation needs to be about 42.5 bcm by the year 2027, human and animal usage and other domestic and industrial needs to be about 10.1 bcm (Table 3). If the evaporation from the reservoirs of the proposed hydropower development projects is added (6.6 bcm), the total demand would be 59.2 bcm.

Table 3. Water Demand Projection to 2027 (bcm)

Year	Irrigation	Domestic Supply	Animals & Others	Total
2010	27.1	1.1	3.9	32.1
2020	32.6	1.9	5.1	39.6
2025	40.3	2.5	5.3	48.0
2027	42.5	2.8	7.3	52.6

1.3 Institutional and Legal Framework

Institutional Framework:

The responsibility of water resources monitoring, assessment, development and management in Sudan was not under one institution. The major part was under the responsibility of the Ministry of Irrigation and Hydroelectric Power now the Ministry of Irrigation and Water Resources (MIWR). The Ministry of Irrigation and Hydroelectric Power was entrusted for management of water resources in Sudan including monitoring, assessment, planning, development of the Nile Water Resources and the major Wadis of Gash, Baraka and Jebel Marra, for irrigation, hydropower and partly drinking water. The monitoring, assessment, development and management of the small Wadis in central clay plains of Sudan for drinking water and also the monitoring and development of ground water for drinking was the responsibility of the Rural Water Corporation which used to be part of the Ministry of Agriculture for sometime and the Ministry of Energy for the other. There was national water resources policy for each of the above water sectors separately. Sewage and sanitation is only up to now limited to Khartoum town and is under the municipality as it is the case with most countries of the world. Measurement of evaporation was and is still the responsibility of the Meteorological Department which is part of the Aviation as in many countries in the world. There was coordination between the Meteorological Department and the other agencies involved in the use of water resources. There is perfect degree of coordination between the Ministry of Irrigation and Water Resources, the Ministry of Agriculture and Forestry, the Ministry of Electricity and the Ministry of Industry, through the high committee of utilization and optimization of the Blue Nile waters.

Realizing these drawbacks, the Government started in the last decade some major steps for rectifying the situation. One of these major steps is bringing down the responsibility of all the water resources, surface (Nile and Wadis) and ground water resources, under the umbrella of the Ministry of Irrigation and Water Resources (MIWR). Another major step is the formulation of the National Council for Water Resources (NCWR) with the objective of formulating common water resources policies and coordinating the activities

of all water sector agencies and stakeholders. The NCWR has the Technical Water Resources Organ (TWRO) as its executing arm. These can be considered as significant steps towards the integration of activities in this important sector.

The Ministry of Irrigation and Water Resources (MIWR)

All water affairs are now under one umbrella – the Ministry of Irrigation and Water Resources (MIWR). The Council of Ministers Resolution no. 34 on September 2005, after the CPA, defines the powers of the national focal point for water resources, the Ministry of Irrigation and Water Resources (MIWR). Its main functions are:

Administrative Functions

a. Assessment of the water resources by compiling information and data for analysis and evaluation.
b. Formulation of policies for the use of water resources and review and update such policies according to new developments.
c. Preparation of new water resources development projects, evaluation of the -*+ 41+engineering designs prepared by non governmental agencies and issuing of technical approval and supervision for implementation.
d. Conducting hydraulic research, as well as systems analysis, flood control and sedimentation studies.
e. Assessment, formulation and development of national plan for irrigation.
f. Operation and maintenance of dams.
g. Development of irrigation systems and operation and maintenance of large irrigation schemes.
h. Development of regional and international cooperation in the various aspects of water resources and irrigation development activities.
i. Development of training activities for the different skills in irrigation and water resources management.

Organizational Structure under the Undersecretary

a. Planning;
b. Water Resources,
    i. Nile Waters
    ii. Groundwater and Wadis
c. Projects;
d. Irrigation Operations;
e. Dams and Nile Control;
f. Mechanical & Electrical Affairs;
g. Financial and Administrative Affairs;
h. Hydraulic Research Station (HRS).
i. Data and Information Center.

The National Corporate units that deal with the macro planning are directly under the supervision of the Minister. These are:

- The National Council for Water Resources (NCWR),
- The Technical Water Resources Organ (TWRO) and
- The National Water Corporation (NWC).
- The Strategic Planning Unit

Other companies under the direct supervision of the Minister are:

i. Irrigation Works and Earth-Moving Authority,
ii. National Company for Manufacturing of Water Service Equipment,

Units formed to preside over execution of the major development projects include:

i. Kenana and Rahad Executive Corporation,
ii. Jonglei Canal Executive Authority.

Legal Framework:

There is no existing one single legal document that governs the development, management and utilization of water resources in Sudan. However, there are different existing water related legislations which can be regrouped into two parts based on the time of their approval:

Prior to 1992 the policies and legislations used to appear in each sub-sector (irrigation, hydropower, domestic, etc…) as these sub-sectors were under different institutions. The major part of water resources policy, strategies, plans, development and management used to be the responsibility of the Ministry of Irrigation and Hydropower (now Ministry of Irrigation and Water Resources). However, the first water policies in Sudan were formulated during the colonial era 1917, to allow construction of Sennar dam and the Gezira irrigation schemes. The Nile water policies and plans were then formulated during the period 1952-1956. These policies governed establishment of new irrigation schemes i.e. Managil and operation and maintenance of the other irrigated schemes and dams and soil surveys. The water policies were also updated following the 1959 Nile Waters Agreement, and Nile Valley Plans were formulated, culminated in the establishment of Roseires and Elgirba dams, extension of Managil, Sugar projects in Elgirba and Elgunaid and pump irrigation schemes. The Nile Valley Plans were later updated in the late seventies.

In 1992 a comprehensive review of policies and legislations has taken place, under which the MIWR embraced most of the sub-sectors, namely policy making and legislations, planning, and coordination of all the water resources. Consequently, the drinking water became the responsibility of the MIWR. This section provides a brief overview of these developments:

1.4 International Water Issues

During the colonial era several protocols were concluded with respect to shared Nile Water resources to the effect that the upstream countries should not construct works on the upstream tributaries which may affect their flows to the downstream riparian states without prior agreements between both sides. The first agreement was the 1891 Rome Agreement between Britain and Italy with respect to river Atbara. There was also the May 1902 Agreement between Ethiopia and Britain with respect to the Blue Nile, Lake Tana and the Sobat; and the 1906 Protocol between Britain, France and Italy pertaining to their interests in Ethiopia. With respect to the Equatorial tributaries there was the 1906 Agreement regarding the Semiliki and Isango rivers between the Congo Free State and Britain and Egypt, and the 1934 Kagera River Agreement between the United Kingdom and Belgium, which stipulated that the upstream countries under the British and Belgium rule should not construct works on the Nile tributaries nor on the Lakes without the prior consent of Sudan and Egypt.

Later after the independence of Sudan, in 1956, an agreement was concluded between Sudan and Egypt in 1959 (repealed the 1929 Agreement). In 1967 the White Nile Basin countries agreed to implement the Project of the Equatorial Lake Hyrometeorological survey (HYDROMET). The Project was initiated by Sudan, Egypt, Uganda, Tanzania, and Kenya and was joined later by Zaire (D.R. of Congo), Rwanda, and Burundi with Ethiopia as an observer member. The HYROMET Project was intended to study the Water Balance of the Equatorial lakes, develop a mathematical hydrological model to assist in the planning of water conservation and development and to provide the ground work for inter-governmental cooperation in the storage, regulation and use of the Nile Waters. The HYDROMET Project Technical Committee was the first institutional arrangement consisting (either as a full member or as observer) representatives of all the Governments of Nile riparian countries.

The HYDROMET Project continued from 1967 to 1992 when the participating countries realized that there was a need to redefine the Project to make it more robust to future challenges and to extend the geographical area of cooperation to cover the whole Nile Basin, and consequently agreed to convert the Project to Technical Cooperation Committee for the Promotion of the Development and Environmental Protection of the Nile Basin (TECCONILE).

The objectives of the TECCONILE was to assist the participating countries in the development, conservation and use of the Nile Basin water resources in a sustainable manner through basin-wide cooperation, determine the equitable entitlement of each riparian country to the use of Nile waters, assist participating member states in developing national water master plans and their integration into a Nile Basin Development Action Plan and help them to develop their infrastructure, capacity building and techniques required for the management of the Nile Basin water resources and enhance regional cooperation and environmental protection.

In 1997, the COM agreed that TECCONILE needs to be further strengthened and broadened in scope and accordingly the Nile Basin Initiative (NBI) was initiated in Dar es Salaam (Tanzania) in February 1999.

The NBI was launched as a regional congregation with which the Nile Basin countries should cooperate for sustainable development and management of the Nile Basin. The NBI first phase is a transitional institution mechanism that includes all riparian countries and provides an agreed basin-wide framework to fight poverty and promote economic development in the region. The NBI also provides a process to facilitate substantial investment in the Nile Basin to realize regional socio-economic development, and represents a real commitment by the Nile riparian countries to foster cooperation and sustainable development of the Nile River for the benefit of all riparian countries.

It is worth noting that since 1992, Sudan formed a joint technical committee with Ethiopia (ESTAC) to foster cooperation particularly with respect to agreeing on concepts for the equitable use of the Nile Waters, exchange of data, watershed studies and joint water resources studies. Also an agreement was concluded with Egypt and Libya for the hydro geological studies of the Nubian Sandstone aquifer shared by Sudan, Libya, Egypt and Chad.

1.5 Water Policy Objectives and Principles

Goal of Water Resources Policy

To lay the foundation for a rational and efficient framework to sustain the water needs of national economic development, poverty alleviation, peace, environmental protection and social well-being of the people through sustainable water resources management.

General Water Resources Policy Objectives:

- Recognize water as scarce vulnerable resource with high social and economic value which has to be equitably, economically, efficiently managed, used, sustained and developed for the benefit of the people, on strategic planning basis with long term visions.

- Provision and equitable distribution of water for the different States and users in the country based on comprehensive and integrated plans and optimum allocation principles that incorporate efficiency of use, equity of access, and sustainability of the resource.

- Promotion of national unity through the reasonable and balanced utilization of water resources and the entire natural resources.

- Establishment of a financing mechanism for the funding of the water resources management functions.

- Human resources development and capacity building to meet the professional and technical skills needs of the country in water resources management.

- Increase investment in essential water resources infrastructure.

- Promote demand management, conservation and protection of water resources and the overall aquatic environment in a sustainable basis in conjunction with essential infrastructure development.

- Promote environmentally sustainable water resources development and management.

- Promote the participation and engagement of the private sector and other stakeholders in service delivery to improve efficiency and effectiveness and enhance sustainability of the services including water resources management.

- Recognize the linkages between water resources management and the economy and ensure food security, water security, control immigration and water related conflicts, poverty alleviation, and security and attain settlement and peace.

- Secure and maintain the country rights in the shared water resources and promote water as an element for fostering strategic relations and integration.

Fundamental Principles of Water Resources Management Policy:

a. Water is a natural endowment commonly owned by all the peoples of Sudan.
b. Every Sudanese shall have access to sufficient water of acceptable quality for basic human needs should be the highest priority in the development of water resources.
c. Water resources development shall be underpinned on rural-centered, decentralized management, participatory approach as well as integrated framework.
d. Ensure the integration of water resources development and utilization with Sudan's overall socioeconomic development framework and guided by those socioeconomic development objectives at the federal and states levels of government.
e. Promotion of the participation of all stakeholders, user communities; particularly women's participation in the relevant aspects of water resources management.
f. Development of water resources must be demand driven and management should be undertaken at the lowest possible level.
g. Development and management of water resources, and the operation and maintenance of water services must be economically sustainable through the recovery of costs from those who benefit.
h. Enhance the integrated and comprehensive management of water resources that avoids fragmented approach.
i. The national government is the custodian of all trans-boundary water in the country for the equitable benefit of all in the public interest, in coordination with the States.
j. Monitoring of water resources is essential for the proper development, management and protection of water resources.
k. The development of water resources should be friendly to the environment and the ecology in order to ensure sustainable utilization of water resources for present and future generations.
l. Provision of water should depend on the sovereignty of the country to utilize and develop its natural resources and protect it from natural disasters e.g. desertification, droughts, erosion, etc…
m. Institutional arrangements at federal and state levels should be clear, integrated, accessible, efficient and transparent whilst avoiding duplication of functions and responsibilities.
n. Water and water related issues are an integral part of the wider economy and have direct effects on many other sectors which require inter-departmental and inter-sectoral communication coordination, synergy and cooperation.
o. To avoid conflict of interests in water development and use. Priority should be given to the use of water for the basic needs, e.g. drinking water and sanitation, areas of water shortage with tensions and violent clashes among communities over water, rural development, poverty alleviation,

food security, environment protection, efficient use, rights of other countries in shared waters according to existing agreements and protocols.

p. Water allocation must be governed with efficient and economic use, technical and economic viability, environment protection, sustainability, etc.

2. WATER RESOURCES MANAGEMENT

2.1 Water Resources Assessment

Policy Track:

Set up mechanisms for continuous assessment of resources through all the stages of data collection, storage, analysis, dissemination and monitoring of water resources data and information, using modern and efficient technology. This will include strengthening of the institutional capacity of the various responsible agencies. Full databases should be established to capture and monitor a wide range of hydrological and hydro-geological and related information at all the water resources management levels. This will be essential for sustainable water resources management, development and protection.

Strategies

Accurate, timely and efficient water resources data and information collection, storage, analysis, dissemination and monitoring for sustainable water resources management and planning is necessary to develop and strengthen a water resources assessment and monitoring system that is based on the subsidiary system with appropriate data and information dissemination system.

Plans and Activities

- Carryout an inventory of existing data assessment and monitoring system
- Determine upgrading and modernization requirements of system
- Expand and rehabilitate water resources monitoring systems (e.g. hydro-meteorological, stream gauges and flows, groundwater, and water quality)
- Upgrade the technology in data collection processing (Geographical information Systems, Remote Sensing, Groundwater Survey Equipment, Global Positions Systems, and Email.)
- Establish and maintain an up-to-date database at the National, State and Local levels.
- Continue the dissemination of the daily Nile water gauge and discharge information and initiate similar regular annual/seasonal publication of other key water resources data and information for public consumption (i.e. water quality)
- Put in place coordination mechanism to ensure access and linkage to database.
- Establish inter-linked data bases with institutions that have relevant data in IWRM
- Establish onsite data collection systems e.g. in dams and subdivisions the national irrigation schemes.
- Establish the human capacity to support the new developments.

2.2 Surface Water

Policy Track:

i. **Foster conjunctive use of surface and groundwater as an efficient and sustainable water resources development and management option to augment the high cost of pumping groundwater from deep levels.**

ii. **Recognize that surface water development, utilization, protection and conservation go hand in hand and ensure that irrigation and drainage, hydraulic structures, watershed management and related activities are integrated and addressed in unison.**
iii. **Surface water planning and development must be integrated with land use management at all levels.**
iv. **Management of surface water shall insure social equity, economic efficiency, system reliability and sustainability norms.**
v. **A reliable data base and information system is a pre-requisite for sound assessment, planning, management and development of surface water resources.**
vi. **The operation and maintenance of surface water systems should be based on cost recovery – the user pays principle.**
vii. **The storage capacity in rivers, Wadis and rainwater harvesting vessels has to be increased to meet the increasing demand of water.**
viii. **Optimum, reasonable and equitable use of surface water should be promoted through cooperation between and within the States in national and local waters.**
ix. **The Government has a regulatory function to ensure that the appropriate standards of service quality, sustainability and environment friendliness are met by the water suppliers and users.**

2.3 Groundwater

Policy Track:

i. **Groundwater resources are an indivisible part of the hydrological system, the national water balance and the natural resources base.**
ii. **Groundwater resources are a national property, the equitable use of which is common to all subject to national authority and control.**
iii. **Proper planning assessment, development and management of water resources cannot be achieved without strengthening the information base at the national and the states level.**
iv. **Present and future water users have a right of access to clean and unpolluted groundwater resources and un-degraded environment.**
v. **Groundwater is to be recognized as having a social and economic value; its value is based on the cost of the development, operation and maintenance of groundwater resources.**
vi. **Groundwater abstraction, particularly from alluvial and shallow aquifers, shall be based on recharge and safe yield concept.**
vii. **Sustainability of groundwater development, investment and supply services shall be planned for and considered as part of development and management policy of the water resources systems.**

2.4 Unconventional and Marine Water Resources

Policy Track:

i. **Research planning and development of unconventional and marine water resources will be undertaken in order to utilize marine and unconventional alternative water resources for the Sudan.**
ii. **Regulations to cover marine water use, protection, tourism, recreation fishing etc. are needed to control marine water resources and coastal areas.**

Generic Strategies on Water Resources Management

This strategy supports the implementation of the National Water Policy and provides a framework for undertaking the following plans and activities:

- Implementing the National Policy on Water Resources Management and Development and Water Resources Act of 1995, Irrigation and Drainage Act of 1990 to strengthen water resources Management.
- Developing a decentralized institutional setup for managing water resources.
- Strengthening the hydrologic, hydro geologic, climatic, and water quality information networks and water resources assessment capacities.
- Strengthening groundwater management.
- Use of nuclear isotopes in the studies of the Nubian sandstone aquifer and dam safety.
- Controlling pollution of surface and groundwater.
- Examining the complexity of water availability and water demand in relation to changing land use patterns.
- Strengthening capacity for integrating environmental quality objectives in WRM.
- Providing enabling environment, for empowerment of user groups and stakeholder participation.
- Providing basis for analysis necessary for equitable water distribution to the States and stakeholders.
- Improvement of criteria and selection of residential areas and physical developments to avoid natural water ways, flood basins, Wadis and fertile areas.
- Prepare strategies and plans based on the concept of Integrated Water Resources Management.
- Enhance cooperation between the States in transboundary waters.
- Full and efficient utilization and development of surface and groundwater resources.
- Building of dams on the Nile and Wadis.
- Addressing the problem of sedimentation in dams' reservoirs and other irrigation structures.
- Enlargement of existing reservoirs through heightening and construction of new dams.

- Eliminating thirst and develop safe water supply networks all over the country; targeting to avail water for human and animal life.
- Developing the water equipment manufacturing industry to supply water pumps, drilling equipment, pipes, reservoirs and spare parts.
- Developing economic criteria for the utilization of water in such a manner as to maintain a balance between the cost on one hand and the economic and social return on the other.

2.5 Environmental Protection and Conservation

Policy Track:

The overall po1icy is to ensure environmentally sustainable development. The policy is geared towards the integrating and strengthening of environmental values and considerations into water resources planning, management and development and increasing awareness on their impact on human health, development and other natural resources. Focus will primarily be concentrated on clarifying, improving, and streamlining the institutions and processes responsible for the integration of environmental aspects in overall water resources management.

Strategies

In order to attain environmentally sustainable water resources management by maintaining reserve flow levels in reservoirs and rivers at all times in order to protect bio-diversity, sensitive environments and species with important eco- and socio-economic functions such as wet-lands, watersheds, ecosystems, riverine environments etc.:

- Strengthen water conservation measures to enhance water availability for environmental sustainable bio-diversity and socio-economic activities.
- Restoration of degraded strategic environments.
- Ensure implementation of the measures detailed elsewhere in the strategy related to abstraction licensing, borehole drilling control, levies etc to address the over-exploitation of surface and ground-water resources, water quality control, EIA and demand management.

Plans and Activities

- Prepare environmental management, protection and implementation plans to protect ecosystems, fight pollution, weeds, and the hyacinth, control of sedimentation in the tributaries, reservoirs, canals, inlets, and the hazards related to water.
- Carry out survey and map critical water bodies for environment conservation.
- Determine abstraction limits and quality standards.
- Enforce Environmental Act of 2001.
- Identify and restore degraded strategic environments.

2.6 Water Quality and Pollution Control

Policy Track:

i. **The formulation of standards and guidelines for the disposal of undesirable elements in water should be supported by effective enforcement.**
ii. **The Higher National Council for Environment and Natural Resources**

(HNCENR) and the States' Councils have to be strengthened to achieve effective monitoring.

iii. **Water abstraction and disposal licenses should be constantly reviewed and effluent discharge levies introduced as instruments for pollution control. The level of the levy will be set to cover the cost of treatment required for individual effluent discharges in line with the 'Polluter-Pays' principle.**

iv. **Recognize relationship between the water quality and water use. Good quality water should be reserved for drinking and some other uses.**

v. **The amount of water injected for petroleum extraction is becoming extremely huge and poses a hazard to the inhabitants of the oil drilling areas. The control, management and use of this type of industrial water are important to mitigate its environmental impacts.**

Strategies

To ensure effective national water quality and pollution control for sustainable water resources management:

- Establish effective water quality and effluent discharge standards and guidelines and enforcement system for water quality and pollution control.
- Strengthen the capacity to monitor and enforce water quality and waste water discharge standards.
- Ensure implementation of related activities of classifying water bodies according to quality
- Awareness creation of the effects of pollution.

Plans and Activities

- Carryout studies on the extent and effect of pollution
- Prepare standards and guidelines for effluent discharge.
- Develop, implement and monitor water quality and pollution control management plans
- Develop guidelines and enforce EIA on proposed projects and land use changes.
- Strengthen the National Water Testing Laboratory (MIWR) and its States branches for efficient water testing.
- Establish laboratory linkages and accreditation mechanisms for the analytical laboratories
- Involve the participation of stakeholders and private sector in pollution control.
- Cross check implementation of related activities of classifying water bodies according to quality and awareness creation
- Establish capacity for management of water extracted with oil to ensure clean environment

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2.7 Disaster Management – Floods, Droughts and Erosion

Policy Track:

i. **A national Disaster Management Policy will be developed to ensure that the country is less vulnerable to disasters.**

ii. A policy of investment in water resources management infrastructure, including increasing storage of water and cooperation with upstream countries to offset the effects climate variability should be pursued.

Strategies

To ensure effective flood, drought, desertification and erosion management through sustainable water resource management resulting in reduced vulnerability to climate variability and water related natural disasters:

a. Flood and Erosion Disasters

Strategies on Prevention and Mitigation:

- Formulate policies on settlement in flood prone areas
- Improve watershed conservation and protection so as to retard surface run-off.
- Develop infrastructure design parameters and regulations to ensure that structures can sustain flooding at the design return periods
- Develop flood control infrastructure.
- Put in place appropriate land use management practices that protect erosion prone areas.
- Create awareness on vulnerable areas.
- Review design criteria in erosion prone areas.

Strategies on Preparedness:

- Enhance data recording and information management systems, particularly of extreme events, to enable design for protection against floods.
- Increase public awareness on dangers of settling in flood prone areas.
- Maintain the flood forecasting and early warning systems at the National level, and develop ones at the State and local levels.
- Train and build capacity for appropriate response.
- Determine vulnerable erosion areas so as to plan for their protection.
- Develop funding mechanisms for erosion prone areas.

Strategies on Response, Recovery and Rehabilitation

- Strengthen the institutional and human capacity of the National Civil Force and establish institutional framework for flood management at the States and local levels.
- Develop funding mechanisms.
- Established institutional framework for disaster management.
- Establish a mechanism for erosion management at National, State and Local levels.

b. Drought and Desertification

Strategies on Prevention and Mitigation:

- Undertake watershed management activities so as to improve on soil infiltration and groundwater storage.
- Run a public awareness campaign on water harvesting techniques.
- Put in place an advisory services system for drought prone areas to increase

resistance to drought effects particularly in such factors as borehole drilling for water supplies etc.
- Develop long term strategies for planning and construction of infrastructure to increase the per capita storage of water in arid areas and to ensure food security.

Strategies on Monitoring and Preparedness:

- Advise consumers on the need for water storage for security.
- Provide strategic water reserves.
- Enhance appropriate water use management practices.
- Develop funding mechanism.
- Set up a monitoring and data collection system for indicative data such as water table levels.

Strategies on Response:

- Establish drought and desertification management institutional structures at the National, State and Local levels.
- Develop food and water supply contingency plans to include local authorities, NGOs, international organizations such as the United Nations agencies etc. and the Civil Defense Force if appropriate.

Plans and Activities

- Cross check implementation of related activities elsewhere in the strategy in the area of watershed management, conservation and environment.
- Community sensitization, mobilization and resettlement.
- Identify and map the flood, drought, desertification and erosion prone areas.
- Rehabilitate disaster prevention structures including dykes and dams.
- Maintain, establish and operate early warning systems.
- Determine training needs and train personnel in water disaster management.
- Establish emergency centers e.g. search and rescue.
- Provide essential basic needs.
- Encourage resettlement away from disaster areas.
- Undertake restoration of original waterways.

2.8 Applied Research

Policy Track:

Research will be promoted as a basis for sustainable management of water resources by initiating collaboration with relevant research institutions and where possible other stakeholders. The intention is to establish a National Water Research Institute complemented by other research institutes. Institutional and financial support should be increased; particularly for research programs aimed at the development of improved water resources management based on the water sector needs.

Strategies

To promote applied research and disseminate findings in support of sound water resources management:

- Develop a comprehensive national research program to support sustainable water resource development, management and utilization in the different sectors.

Plans and Activities

- Determine research needs.
- Develop a comprehensive national applied and basic research programs, including research studies on floods, droughts, desertification and erosion control.
- Carryout a study on the capacities of MIWR and Hydraulic Research Station (HRS) and recommend requirements for rationalization and upgrading.
- Upgrade, rationalize and establish a fully functional National Water Training and Research Institute.
- Modernize and update data gathering, processing, analysis, archiving and dissemination of techniques.
- Setup a data base capable of networking with other research institutes.
- Set-up pilots and trials on selected technologies including modern irrigation.
- Continue research in the Nile and tributaries flows, sediment transport, the improvement of irrigation efficiency and design of alluvial channels, calibration of hydraulic structures, Bathometric Surveys for the existing dams and research programs associated with the Agricultural Green Campaign (Nafra).

2.9 Regional Waters and International Issues

Policy Track:

i. **Recognize the rights of all the co-riparians in the use of the Nile and other waters.**
ii. **Maintain the share of Sudan in the regional water resources concluded by mutual agreements; and continue existing bilateral cooperation between Sudan and Egypt (1959 Agreement), and between Sudan and Ethiopia (1991 Protocol).**
iii. **Cooperate on the basis of amicable understanding and good faith, sovereign equality, territorial integrity and mutual benefit.**
iv. **Promote cooperation with countries sharing surface and groundwater with Sudan, particularly within the context of the Nile Basin Initiative (NBI), Lake Shad, Nubian Sandstone Aquifer, Baraka and Gash.**
v. **Develop, conserve and use of shared water resources in an integrated, sustainable and environmentally sound manner through basin wide cooperation for the benefit of all and in recognition of the principle of equitable and reasonable utilization with the commitment of preventing the causing of no harm to other users or resources.**
vi. **Support the endeavor through the different committees and experts from the Nile Basin Countries to agree on a Cooperative Framework acceptable to all considering the reasonable and equitable utilization of the Nile waters without causing significant harm to each other.**
vii. **Sudan calls all co-basin countries to exert joint efforts and to have a unified view towards the best ways of the follow up and implementation of the resolutions of the recent international water forums and earth summits, in particular, the Johannesburg, Kyoto, the Hague and the other ones: UNCED of Brazil, Mar del Plata of Argentina, Dublin, New Delhi, etc.**
viii. **Sudan encourages and promotes cooperation with international and regional organizations, in particular, with the water related organizations**

and agencies such as: WMO, WHO, UNESCO, FAO, UNEP, IAEA, CIDA, SIDA, WB, GTZ, etc. and perform an active role in the ICOLD, ICID, IAHS, IAHR, IWRA, WWC, AMCOW, ACOM etc..

Strategies

To establish collaboration and cooperation mechanisms allowing for shared water wide approaches in management of international water resources to the benefit of all riparians:

- Improve collaborative IWRM by incorporating interests of trans-national stakeholders.
- Enhance the national institutional framework responsible of international waters
- Integrate relevant international conventions and treaties governing the management and administration of international waters into national legislation and policy.

Plans and Activities

- Support the existing forums of cooperation in international waters (i.e. PJTC, NBI, Nubian Sand Stone etc.) and create new forums for collaboration and coordination on other shared water resources management issues.
- Review domestic legislation related to international waters.
- Enhance existing national institution dealing with international waters to coordinate activities related to international waters.
- Sign, ratify and comply with international conventions and treaties as appropriate.
- Harmonize upper reaches projects to serve national and regional needs.
- Achieve environmentally sound management of the catchments areas in a sustainable manner.
- Cooperate within IGAD and other NB countries to study and combat drought and desertification.
- Basin wide human resources development.
- Promote national institutional and legal arrangements in international water resources.
- The establishment of a regional basin-wide data base/information system.
- Protect water quality and aquatic ecosystems in national and international water bodies.
- National and regional efforts to combat aquatic weeds (mainly Hyacinth).
- Conserve wetlands and swamps.

3. WATER UTILIZATION

Overall Objective

In order to meet the present and future demands for water and to promote the country's development; systematic, efficient and sustainable management of water resources, cutting across all sectors and regions, will be the underlying principle of removing availability of water as a constraint to sustainable development.

3.1 Water Supply and Sanitation

Policy Track:

i. **Eradicate thirsty and ensure access to adequate water supply and sanitation as a basic necessity.**
ii. **The achievement of sustainable and financially viable water supply and sanitation services must be the objective of service providers.**
iii. **Recognize that water supply and sanitation services are inseparable and integrate the same at all levels through sustainable and coherent framework.**
iv. **Consider the economic criteria in domestic water supply that balance between the cost and the economic and social return and promote the "User Pays" principle in particular for urban water supply and sanitation services.**
v. **Promote as far as possible, that the development as well as the operation and maintenance of water supply and sanitation systems are carried out at decentralized and appropriate body.**
vi. **Ensure efficient and sustainable management of water supply and sanitation system by avoiding fragmented management on one hand and at the same time by avoiding over-centralization of management.**
vii. **Create conducive situations for the participation of all stakeholders in integrated water supply and sanitation activities and legalize the same.**
viii. **Develop national standards, guidelines and procedures on the different aspects of water supply and sanitation.**
ix. **Work in partnership with all concerned for water supply, drainage and wastewater master plans in major urban areas and prepare water supply and sanitation strategies in rural and other urban centers.**
x. **Ensure that water supply and sanitation financing is based on established set of criteria that incorporate the relevant factors and prioritize them.**
xi. **The plans for providing domestic water should be linked with the development needs of the production and demographic sectors in the States and different regions, in consideration with the desired balanced framework and the huge effort exerted by the urban and rural population to get water.**
xii. **Avoid the health and environmental hazards associated with the domestic water treatment and protect the sources from pollution.**
xiii. **Provide and apply the appropriate technology and promote and support local industries to produce cheap water equipment, and scale-up the use of unconventional energy in water services.**
xiv. **Due to unbalanced distribution and geographic availability of water, it is technically and financially viable to transfer water to some areas away from the source. Hence, inter-basin transfer of drinking and other essential water is vital for satisfying the basic needs for remote areas, in view of the disparity of available water amongst the different regions.**

Strategies

The drinking water supply strategy aims at the provision of water supply for rural and urban population and animals and along the routes of pastoralists and for the settlement of the nomads as well as the prevention of clashes and conflict between pastoralists and farmers. The strategy also aims at supporting the traditional rain-fed agricultural sector, plants and livestock, millennium development goals and poverty alleviation by providing the minimum per capita which is 20 liters/ day/capita in the rural areas and 90/day/capita in the urban areas. The states shall undertake the program of drilling boreholes, dams, hafires whereas the national water corporation undertakes the water projects financed by foreign loans in cooperation with the states and the Ministry of Federal Rule and the Government of South Sudan GOSS.

To ensure that provision is made for the above basic needs and that there is security of water services in terms of both quality and quantity, so as to ensure the maintenance of public health:

- Maintain adequate water resources, through sustainable water resources management, to meet the domestic demands.
- Optimum domestic water use at gate price.
- Provision of suitable techniques for water distribution and supply services.
- Promote manufacturing of domestic water equipment.
- Ensure implementation of activities in earlier sections for development of mechanisms and levies to account for all actual volumetric abstractions, environment, conservation, pollution and watershed management.

Plans and Activities

- Undertake a rapid assessment of the water resources required to meet the domestic needs of humans and animals in key urban and rural locations, and prepare a plan of action to ensure water security for at least basic needs.
- Digging of wells, construction of more haffirs, small dams and reservoirs and maintain and rehabilitate the existing ones, water stations and the equipment in use.
- Installation of pumps for all dug wells.
- Construct water equipment manufacturing plants to produce pumps, drilling equipment, networks and pipelines, reservoirs and spare parts.
- Cross check implementation of activities in earlier sections for development of mechanisms and levies to account for all actual volumetric abstractions, environment, conservation, pollution and watershed management.
- Encouraging national expertise to work in the area of domestic water use.
- Development of researches relevant to domestic water uses efficiency.
- Training, capacity building and increased use of local technical resources to improve cost-efficiency and to reduce dependency on external resources.
- Development and expansion of sanitation services.
- Increased community involvement in planning, execution and management of water supply and sanitation services, promoting cost sharing and self-support.

- Encourage research of improved domestic water sources management, evaluation of existing schemes and identification of cost-effective alternative strategies.
- Continue the ongoing projects:
    a. Drought Combatment Campaign in Darfur Region for drilling 126 boreholes, rehabilitating 142 boreholes, construction of 30 hafirs, 25 dams and rehabilitation of 20 hafirs.
    b. The Crash Program of Eastern Sudan, comprises 100 deep wells, 20 hafirs and 6 dams.
    c. Nyala Water Supply Project, El Daly and Elmazmoom, Elfasher Water Project, Atbara and Eddamar Project, Elgedaref Water Project, Erection of Clarifiers and Filtration Plants and networks in the Rahad, Kordofan, New Halfa, the FAW, Girba, Abeedya, Gebelein, Merowe water supply projects; Water Supply and Sanitation in partnership with UNICEF to increase the clean water and sanitation services by 15% to serve 2 million customers by the end of 2007, comprising 1000 wells with hand pumps and 20,000 latrines; Drilling and Erection of 150 Deep Wells; Rural Water Equipment Project; Red Sea Water Projects including Port Sudan Network, Port Sudan Desalination Plant and Port Sudan Water Project from the Nile; Khartoum New Water Supply Project; Dongola Water Project; The Water Project of Abu Hamad, Elmatama and Eddaba; Wadmedani Water Project; Kosti Water Project; Rabak Water Project; Networks Pipelines; The Training Center; the JAM projects in Western Kordofan State, Western Darfur State, Sennar State, Blue Nile and Kassala States.

3.2 Irrigation, Drainage and Agriculture

Policy Track:

i. **Promote full and meaningful participation of Water Users Associations (WUAs) in all phases of the policies, planning, studies, implementation, operation and maintenance of small, medium and large scale irrigation schemes.**
ii. **Develop the necessary technical guidelines and framework for mechanisms, systems, materials and technologies for improvement of water use efficiency in irrigated agriculture.**
iii. **Develop guidelines, manuals and procedures for the sustainable operation and maintenance of irrigated systems.**
iv. **The licensing of water use must include a rigorous assessment of water resources to be utilized.**
v. **Develop the appropriate cost recovery systems and mechanisms for all irrigation schemes and water pricing must promote equitable and efficient water use.**
vi. **Establish norms and procedures for financial sustainability and viability of irrigation schemes and strengthen the irrigation schemes**

to organize and manage the collection of the water charges through mobilization, encouragement and training of WUAs.

vii. **The use of water in irrigation projects should be monitored and evaluated using appropriate monitoring and evaluation (M&E) systems.**

viii. **Ensure that full integration of irrigation with the overall framework of the country's socio-economic development plans.**

ix. **Support and enhance the private sector in small scale irrigation using pressurized irrigation.**

x. **Minimize and mitigate as much as possible the negative environmental impacts associated with irrigation development.**

xi. **Realign the roles of the private and public sectors to provide services for irrigation and water resources projects to realize sustainable improvements in irrigation benefits.**

xii. **Integrate drainage issues within the domain of water resources management as appropriate.**

xiii. **Establish guidelines and regulations for the development of field and storm drainage on irrigated farms.**

Strategies

To attain food-security, increase real income of farmers, enhance livestock production, increase irrigation production and ability to withstand drought:

- Full utilization of the Sudan's share in the Nile waters according to the 1959 Agreement with Egypt.
- Formulate water resources management plans that will meet the present and future water demand for agricultural sector in a sustainable way.
- Formulate and promote programs to improve irrigation systems, irrigation water use and enhance efficiency.
- Expand irrigation farming to other areas outside of the high potential area.
- Strengthen the agricultural sector institutions capacities for provision of support to small scale farmers for efficiency in water use.

Plans and Activities

- Review the National Water Master Plan data on irrigation demand and prioritize schemes for rehabilitation and implementation with priority given to heightening of Roseires dam and establishing of Setit dam to promote socioeconomic development.
- Implement new dams and continue rehabilitation of the existing ones to achieve horizontal and vertical expansions for crop production.
- Implement new irrigation schemes (i.e. Setit, Rahad phase II, Aweel rice, Benko, the 10th Block in the Rahad, Kenana, regrouping and extension of White Nile schemes, sugar schemes in Melut, Mangalla, White Nile etc., river relief schemes, groundwater schemes at a rate of 25000 Fed./ year) and continue rehabilitation of national irrigation schemes to improve water use and enhance efficiency.
- Utilize the present available renewable groundwater and wadis for agriculture and livestock by using appropriate water harvesting and spreading techniques.
- Provide watering points in nomadic pasturage in arid lands.
- Undertake training of staff categories such as water extension officers in water-

wise irrigation practices.

- Promote investment and encourage the use of modern irrigation systems (sprinkle and trickle) in small scale agriculture.
- Promote participation of farmers through Water Users Associations in the Gezira and the rest of the national irrigation schemes.
- Concentration on gravity irrigation during the flood period by utilizing flood waters.
- Use of pumps to expand in winter crops production along the White Nile and the Main Nile.
- Adopt mitigation and precaution measures to minimize sedimentation in reservoirs and canals.
- Manufacturing of pumps, canals gates and drilling machines locally.
- Continue supervision of Makabrab, Sardiya, Kaboushiya, Gihad, the Basins schemes, the resettlement of wheat, Agricultural Green Campaign (Nafra), kali, Sayal, etc ...in the Nile state; El Sileim Basin, Khiwai, Zawrat, Waha, Osli, Letti schemes, etc) in the Northern state.

3.3 Hydropower

Policy Track:

i. **Ensure that hydropower is and integral part of the multipurpose uses of water and part in the design and operation of multi-purpose dams.**
ii. **Subject hydropower development schemes to strict environmental and stakeholders considerations as well as meeting economic criteria.**
iii. **Ensure that the development sequence of hydropower should be in the priority order of short term, medium term and long term.**
iv. **Thermal backup shall be secured to fill the gap when hydropower generation drops during the flood and recession seasons.**
v. **In order to optimize the use of the water stored for different purposes, dam operation should be coordinated at all levels through appropriate institutional arrangements.**
vi. **Stakeholder participation in management of hydropower must be institutionalized.**
vii. **Involvement of the private sector has to be encouraged in the development of small scale hydropower generation, phased large scale developments and the rehabilitation of existing thermal units.**
viii. **Ensure that all processes of project preparation, including survey, reconnaissance, feasibility studies up to detailed design of medium and large scale hydropower projects shall be the responsibility of the water sector.**
ix. **Cooperate with neighboring countries to establish win-win hydropower projects without causing significant harm to Sudan.**

Strategies

To ensure sustainable use of resources to provide increased hydro power to meet the increased national power demand:

- Formulate hydropower development plans to meet current and future demands in conjunction with other uses, through sustainable water resources management.

Plans and Activities

- Carry out feasibility studies on hydropower potential developments (including low head turbines) in the existing dams (i.e. hydropower extension of Sennar dam), rivers and main canals (i.e. kajbar, Elshiraik, Dal, Bedin) and promote transboundary link with power transmission lines of Ethiopia, and Inga falls transmission line.
- Continue establishment of the ongoing hydropower projects (i.e. Merowi).
- Implement feasible and viable schemes to meet demands.

3.4 Industry

Policy Track:

i. **It is the government's policy to transform Sudan into an industrialized country by the third decade of this century. To realize this goal it is necessary to introduce sustainable water resources management in order to provide water of adequate quality and quantity to meet industrial demand.**
ii. **Industrial development should not be at the expense of the people and the environment.**
iii. **Control and ensure that water bodies are protected from pollution by waste water and other wastes indiscriminately discharged by industries and other institutions.**
iv. **The use of water to transport and dilute waste and to act as a coolant has to be linked with treatment.**
v. **The precautionary principle of pollution control should be adopted with financial penalties for polluters.**

Strategies

To ensure availability of adequate water for industrial development through sustainable water resources management:

- Facilitate availability of water resources for industrial uses through sustainable water resources management.
- Require industries to develop and implement environmental management systems which take into account the impact of industries on the country's water resources.

Plans and Activities

- Encourage industries to develop own water sources in terms abstraction and water quality control permits.
- Develop code of practice for efficient water use and cleaner production technologies

3.5 Navigation

Policy Track:

i. **Enhance and promote the development of navigation to supplement the national economy and to promote passenger as well as cargo transport on sustainable bases and to integrate inland water navigation as part of the overall socio-economic development planning in the country.**
ii. **Subject any proposed development of water resources in water ways in rivers and lakes to detailed assessment of the feasibility for navigation.**

Strategies

- Enhance cooperation with River Transport Authority
- Rehabilitation of the waterways

3.6 Aquatic Resources and Fisheries

Policy Track:

i. **Establish and adopt water resources management measures, quality standards and proper assessment procedures that enhance, promote, preserve and enrich aquatic resources and fisheries.**
ii. **Incorporate aquatic resources and fisheries development in large scale water resources undertakings.**

Strategies

Coordination with animal resources institutions to establish fish farms in rivers, reservoirs and canals.

3.7 Tourism and Recreation

Policy Track:

Encourage inclusion of the development of tourism and recreation resources associated with water in water resources management undertakings.

4. LEGAL AND INSTITUTIONAL FRAMEWORK

4.1 Legislation, Regulation and Enforcement

Policy Track:

i. **Establishment of a comprehensive and enabling legal environment for the proper utilization, development and protection of the country's scarce**

water resources, that allows all citizens to have access for water based on the rules and regulations of the government.

ii. **Enact and implement the Water Resources Act of 1995 and the Irrigation and Drainage Act of 1990, after incorporation of amendments following the powers included in the Transitional Constitution, in harmony with other related policies and legislation, and provide the entire necessary legal framework for penalties commensurate with the violation of legal provisions relating to water resources in order to produce deterrent offset.**

iii. **A legal regime for the rainwater harvesting concept has to be formulated due to the importance and future prospects of rainwater harvesting to cover the expected escalation in irrigation, human and animal water demand.**

Strategies

To produce responsive and effective legislation for management, conservation, control, equitable and sustainable use of Sudan's water resources.

- Enact and implement The Water Resources Act of 1995 and the Irrigation and Drainage Act of 1990 in harmony with other related policies and legislation.

Plans and Activities

- Finalize drafting of regulations related to The Water Resources Act of 1995 and the Irrigation and Drainage Act of 1990.
- Publish, aware and coordinate with stakeholders and water related institutions.
- Finalize ratification of Acts and Regulations enactment.

4.2 Institutional Framework

Policy Track:

The policy of the government with respect to institutional arrangements as regards water resources management is to decentralize water resources management adopting three water resources management levels: National or Federal, State and local levels, and establishing and defining the role of each and how they relate to each other and:

i. **Promote appropriate linkage mechanisms for the coordination of water resources management activities between the Federal and States levels.**
ii. **Foster the participation of user or local communities in water resources management by supporting the establishment of appropriate institutional framework from State's level to the lowest administrative structure and promote decentralized management.**
iii. **Create conducive environment for the enhancement of linkages and partnership between the Federal and States governments on the basis of the constitution for the realization of efficient sustainable and equitable water resources management.**

Strategies

To enhance performance of all actors as provided for in law in the Federal, State and Local water resources management system and ensure a well defined linkages.

- Develop an appropriate and effective institutional framework with clear

responsibilities for actors.
- Set the proper units for meaningful and effective IWRM systems.

Plans and Activities

- Enact the amended Water Resources Act of 1995 and the Irrigation and Drainage Act of 1990 which makes provision for the establishment of the proposed regulations and new institutions.
- Set up the appropriate committees to enact the Acts and Regulations.
- Restructure the functions and activities of the Ministry according with new roles.
- Human resource redeployment and development.

5 CAPACITY BUILDING

5.1 Human Resource

Policy Tracks:

i. **Provide sustainable and objective training on the relevant areas of water resources management as well as develop and implement effective means in order to efficiently utilize and retain trained manpower.**
ii. **Device appropriate strategies for the development and enhancement of local capacity in consultancy and construction through different incentive mechanisms and scale-down on cost of foreign capacity.**
iii. **Provide the necessary capacity building in water resources to the States, with special emphasis to the underdeveloped States, for efficient and equitable water resources management.**
iv. **Build policy review, reform and implementation capacity on sustainable basis.**

Strategies

To ensure efficient and productive workforce who are well trained and motivated and with adequate working environment and financial resources to undertake water resources management:

- Establish the required functions and review existing skills and experience.
- Determine the gaps which exist and design a capacity building program which will fill the gaps.
- Develop and implement a long term program of upgrading and developing skills and experience of all levels of personnel within MIWR.

Plans and Activities

- Carryout staffing norms and job description for the different jobs.
- Carryout a survey on available skills in the MIWR directorates.
- Determine training needs.
- Design the appropriate training programs.

- Promote hydro politics studies.
- Carryout training.
- Establish data bases on available technical manpower in IWRM.
- Reinforcing performance appraisal based on objective assessment.
- Develop a national manpower plan for IWRM.
- Source needed capacity from private sector on short term contracts or consultancy.

5.2 Institutional Capacity

Policy Track:

Promote the development of appropriate institutional structures and support with modern facilities and equipment to enable sustainable water resources management.

Strategies

To support the existing institutions, create appropriate institutions and provide adequate, well maintained, modern facilities and equipment to enable sustainable water resources management:

- Evaluate the institutional structures in the existing water related institutions.
- Establish the necessary institutions.
- Establish the required logistical equipment to perform and take inventory of what is existing.
- Determine the deficit required to be filled and make a program to procure the required equipment.
- Develop and implement a long-term program for maintaining adequate equipment within MIWR.

Plans and Activities

- Support and develop the Training Center and the Data Information Center.
- Determine the equipment requirement.
- Revitalize the existing laboratories.
- Refurbish and install IWRM facilities and equipment.
- Develop comprehensive maintenance packages including preventive, repair and user training instructions.
- Rehabilitation of vehicles and computers
- Provide modern communication tools and equipment.

5.3 Gender Issues

Policy Track:

Promote the full involvement of women in the planning, implementation, decision making and training in water resources as well as empower them to play a leading role in self-reliance initiatives.

Strategies

Undertake affirmative action to ensure that women are represented at all levels in IWRM.

5.4 Stakeholder Involvement

Policy Track:

i. **The water sector policy recognizes the challenge of bringing stakeholders on board in management and provision of water. In order to ensure sustainable water resources management there is a need to apply alternative management options and technologies that are participatory rather than those that are wholly recipient.**
ii. **Ensure the identification of the relevant stakeholder from the outset in any water resource undertakings and create conducive situations for their involvement in the different water resources management activities.**
iii. **Create forums for discussions and consultations amongst the various stakeholders.**
iv. **Support community self-initiatives and direct involvement in water resources management.**

Strategies

To encourage and provide enabling environment for the engagement of nongovernmental stakeholders in water resources management:

- Carry out a survey of all the actors/stakeholders in water resources management and publicize their activities.
- Undertake coordination, sensitization and networking of actors/stakeholders in the sector.
- Develop and implement a program on sustainable water resources management by the actors.

5.5 Private Sector Participation (PSP)

Policy Track:

i. **The water sector policy track recognizes the challenge of bringing private sector on board in management of water resources. A framework is needed to bring about a culture that will promote comprehensive water resources management and development with the private sector and community participation as prime movers.**
ii. **Develop a framework for community-Government-private sector-external support agencies partnership.**

Strategies

To encourage and provide enabling environment for PSP:

- Undertake regulatory, institutional and legal reform to give private sector more incentives to participate fully in areas prior dominated by public sector.
- Establish joint consultative committees consisting of Government and the private sector.
- Include, through nomination, private sector people to Boards.

5.6 NGOs Issues

Policy Track:

Provide a venue for the provision of information, guidelines and directions to external support agencies and NGOs and establish reliable framework for coordinating, guiding and monitoring their activities.

6. COMMUNICATION AND IMPLEMENTATION

6.1 Communication

Policy Track:

The policy track is towards the elevation of the profile of critical water resources management issues through harmonization of policies and enhancement of information flow to ensure public awareness. This will result in sustained national water campaign stakeholders and public participation.

Strategies

To inform public who can effectively participate in sustainable water resources management:

- Launch national water campaign.
- Establish and maintain a continuous communication system in the water sector.

Plans and Activities

- Enhance water awareness at all levels, in particular water users, irrigation workers, and policy decision makers.
- Hold a national water resources conference.
- Provide national water consultative forum for policy harmonization by establishing Water Campaign Committees at national and State levels.
- Develop committee action plans.
- Collect, collate and process WRM information for public consumption.
- Dissemination of WRM information.

6.2 Implementation

Policy Track:

i. **Establish a clear strategy for implementation of water policy and define appropriate means to put it into effect (i.e. regulatory bodies and enforcement agencies)**
ii. **Determine the stages and elements of implementation which need to be considered**
iii. **Define ways to maintain an on going dialogue with a wide range of stakeholders to increase the sense of ownership of the water policy by all stakeholders**

Strategies

- Elevation of water resources management as a key national priority.
- Sensitizing senior government officials and key stakeholders on the challenges and opportunities of WRM.
- Building of consensus and support from government and key stakeholders on the need and urgency of WRM reforms.
- Building of consensus on the implementation of the IWRM strategies.
- Soliciting support for the implementation of the WRM reforms.

Plans and Activities

- Establishment of an Implementation Unit.
- Development of an Implementation Plan.

The plan is expected to include the following details for each policy item:

  - Policy item reference and description,
  - Detailed description of the action to be taken to implement the particular policy item,
  - The priority of the item,
  - A planned date for beginning the implementation action, the duration and the targeted completion date, and a description of phases if implementation is to be phased,
  - An estimate of the cost of implementation, including the initial costs and the expected recurrent costs,
  - How the implementation exercise will be financed? Is it through the Federal budget? State budgets? Or others.
  - Details on the Unit which will be responsible for implementation,
  - The Federal and State government departments and ministries which have a role to play or which will need to be consulted,

- Phasing Implementation.
- Public Awareness.
- Review of Existing Legislation.
- Institutional and Organizational Review.
- Monitoring and Evaluating Implementation.
- Implementation Budget.
- Regulation and Enforcement.
- Ranking of water resources management as a key national priority.
- Raising awareness of senior government officials and key stakeholders on the challenges and opportunities of water resources management.
- Building of consensus and support from government and key stakeholders on the need and urgency of water resources management reforms.
- Improved information management, establishment of a water licensing system and encouragement of efficient water use, as well as transfer of financial responsibilities to the water users.