Flood Control in the Kano Plain

There are 70,000 to 80,000 inhabitants in the habitual inundation areas with an area of about 200 km2 in the Kano Plain. Inundation in the Plain is attributable to flooding of the Nyando, Nyaido, Luando and Kibos Rivers, and normally prolongs for one month at the lower part of the rivers due to backwater effects of Lake Victoria and insufficient drainage systems.

It is reported that the number of inhabitants lose their lives owing to deep stagnant water. The flooding also causes collapse of the houses, and damage/loss to household effects, crops, livestock and public services such as schools, roads, electric and communication facilities. The Provincial Water Office estimates the amount of the flood damage for the 1985 flood to be Kshs. 436 million.

As a countermeasure, the Provincial Water Office has planned the construction of dike with a length of 10 km downstream of the Ahero Bridge, however, due to budget constraints, the works have not been completed upto now.

River bank erosion is also another significant problem in terms of reduction of flow capacity of the channel and agricultural land. The Ahero Pilot scheme is especially affected by the serious and continuous erosion. It is being contemplated to construct short-cut channels at meandering portions of the Nyando River in order to create smooth flow regime.

Watershed Conservation

The flow capacity of the Nyando River is decreasing gradually due to heavy sedimentation which is presumed to be attributable to soil erosion in the catchment area. The existing irrigation canals have been affected by siltation, incurring a large amount of cost for removal of sedimentation every year.

In order to absorb rapid increase in population, deforestation is continuing in the upper part of the catchment area of the Nyando River, causing acceleration of soil erosion.

ii) National/Local government development policy in the sector:

The Nyando River Basin is under-developed due to unfavorable climate and hydrological conditions. Population in the Basin is mainly dependent on agriculture. The limited industry in the Basin is for processing of agricultural products, fish, and livestock. Precipitation is very heavy during rainy season, which results in inundation and damage to crops in the Kano Plain. Back flow from the lake during the rainy season also problems in the Plain, which aggravate flooding and irrigation water use and potable water supply. Increasing pollution has resulted in significant water pollution due to untreated sewerage water mainly from urban centers and industrial wastes, which affect fishery development.

Accordingly, there is a need to improve urban and rural drinking water supply and sanitation to address high incidence of water-borne diseases.

There are several protected forest reserve areas in the upper Nyando River Basin, however, the areas have been degraded, causing poor productivity and damage to infrastructure every year. Therefore, these areas have to be protected by reforestation.

Within the agricultural lands (approximately 2,900 ha; or 11% of the basin area), there are number of irrigation systems. Majority of these area are under paddy, maize, sugarcane, sorghum, pulses, groundnuts and vegetables cultivation. Most of these schemes have been deteriorated over time. Additional lands could be irrigated by extending canal network, provided that water would be available.

On-going activities conducted by the local governments include conservation, management and development of the Nyando River Basin. Kisumu Municipality, which is the center of administration, commercial and industry of the western region of Kenya, is ranked at the fourth largest urban center in Kenya. The municipality including vicinity urban centers has been facing chronological shortage of safe water supply, hampering economic development activities and deteriorating hygienic condition of inhabitants. Therefore, the municipal administration as well as vicinity local governments are keen to augment safe water supply in the urban centers in the Basin.

The Study on the National Water Master Plan (NWMP) was completed in 1992 under technical cooperation by the Japan International Cooperation Agency (JICA). It recommends that a comprehensive water resources development plan be formulated to utilize the precious lands and water resources of the Kano Plain effectively and rationally among the various sectors and urgently realize the flood control of the rivers in the Kano Plain in order to enhance the economic activities and secure the lives of inhabitants. In 1995, Infrastructure Development Institute (IDI) under former Ministry of Construction (MOC), Japan conducted preliminary study and project promotion for the Nyando River Basin Integrated Water Resources Development Project, however, it was not materialized for implementation.

iii) Problems to be solved in the Sector:

In order to address the issues mentioned above, the Project will support the development of the institutional and managerial capacity of the Government. This will stress the collection of water fees, sustainable cost recovery and the implementation and management of water resources infrastructure to ensure the rational integration of strategic water reserves. The Project should provide the basis for development programs in the metropolitan area of Kisumu and in the rural areas which will be aimed at attracting investments through the provision of a reliable quality water supply.

The proposed Integrated Watershed Management Project will add the additional element of integrated basin management, which is necessary for the optimization of the Government's water resources policies.

The Project will coordinate a Task Force for water resources policy using an inter-sectoral approach for the management of water resources for multiple uses in a manner compatible with the tributary and littoral ecosystems. The Project emphasizes decentralized management where efficient and rational decision making along with the active participation of the users in order to ensure user-responsive management of the water resources. The Project will develop and implement institutional mechanisms and will include mechanisms such as incentives, regulations and equitable fees reflecting the social and economic value of water while.

The tariff policy will be strengthened in order to augment the comprehensiveness and effectiveness of charging for bulk water deliveries. This Project will also address a thorough program of rehabilitation and construction of strategic water infrastructure in the Nyando River Basin. Strict selection and feasibility analysis criteria will be applied to these components so as to reduce the risks of political interference when defining the works to be constructed. Comprehensive concurrent environmental surveys and analyses and the dissemination of the basin management information should ensure the consistency of the Project activities with environmental policies and help to improve public awareness regarding conservation of water resources. Water conservation will also be enhanced by increased hydro-meteorological monitoring capability and by the control of the quality and the quantity of water available in the basin.

iv) Outline of the Project/Study

In accordance with the above, the following outline is proposed to be implemented:

Part A : Preparation of Integrated Watershed Management Plan for the Nyando River Basin

1) Review of present conditions in the basin

To review the present condition of the Nyando River Basin in terms of river morphology and integrated water resources management view points.

2) Socio-economic survey

To collect basic socio-economic data in the Project area, and assess the socio-economic condition. Moreover, the survey should include various economic activities in the area, assessment of current development problems, and should recommend an integrated watershed management from socio-economic point of view. Furthermore, economic and social criteria to be used for prioritization of investments should be considered.

3) Hydrologic and hydraulic survey

To collect and review the hydrologic and hydraulic data, such as rainfall, water level and discharge data, and assess the hydrological condition of the River Basins. Surveys will include salinity intrusion survey (24-hour continuous survey including the highest tide predicted within dry-season month). Inventory of existing hydraulic infrastructure should also be conducted.

The data collected and reviewed will be used to develop hydrological models, which will serve as important planning tools in the formulation and future updating of basin plans. The models should describe the main hydrological and hydrogeological features of the study area, including precipitation, evaporation, base-flow, seasonal flow, inflow and outflow at representative control points of the main river and tributaries. Furthermore, an analysis of the flow pattern using the data collected taking into account the flow diversion by the existing irrigation schemes and other users at the confluence of all major streams where significant demands are currently met and the remaining potential could be exploited. Sedimentation study for the basin should also be conducted. Details on the development of annual water balance and flood hydrographs should be provided.

4) Hydro-geological survey

To conduct geological sampling and assess especially the groundwater potentials in the study area.

5) Flood damage survey

To conduct flood damage survey of past floods and assess the magnitude of past flood damages in conjunction with hydrological analysis. After the assessment of the frequency and duration of flood and the extent of flood damage in the study area, options to control flood and mitigate flood damages should be developed using structural or non-structural measures or a combination of both. Flood inundation maps will be developed using the hydrological modeling stated in hydrological survey above. Satellite image and land use maps should be obtained for the flood damage survey also.

6) Irrigation development survey

To conduct existing and potential irrigation area as part of the overall integrated watershed management inputs. Maps of the existing and potential irrigable areas should be drawn out, with scale, form and other specifications should be discussed with the counterparts. The survey should also include recommendation on infrastructures needed to irrigate the potential areas.

7) Water supply and sanitation survey

To conduct demand and supply analysis for domestic and industrial water supply as part of the overall integrated watershed management inputs. The study should verify future water demand based on projections of population and industrial growth; make recommendations on how to meet the demand through the development of surface and groundwater sources under a long-term plan; indicate the urban and rural areas needing water supply for domestic and industrial uses,

including the need, if any, for water and wastewater treatment facilities; and recommend the role to be played by the government and the private sector.

8) Fisheries development survey

To conduct existing and potential development survey as part of the overall integrated watershed management inputs. Furthermore, potential for development of fisheries should be assessed, including review of the present problems, status of development and factors that affect the sub-sector.

9) Watershed Management

To prepare a long-term plan for watershed management in the study area covering the implementation of the concept of multiple use of watersheds, multiple objectives of watershed investments, and community-based watershed management. Critical watersheds should be identified using tools such as satellite imagery and maps.

10) Water Quality Survey

To conduct assessment of the quality of water sources to determine their suitability for irrigation, water supply, and fisheries. Increasing pollution has resulted in significant water pollution due to untreated sewerage water mainly from urban centers and industrial wastes, which affect on fishery development. Accordingly, there is a need to improve urban and rural drinking water supply and sanitation to address high incidence of water-borne diseases. Salinity problem downstream of the Nyando River should also be assessed in view of its limiting effect on the use of water for irrigation and water supply. The plan should recommend measures to control saline intrusion, and propose a program for monitoring of water quality, salinity and sediment at strategic points in the study area.

Furthermore, the study should consider whether solid waste is a source of water sources pollution, in which case, its management should be made integral to the basin master plan.

11) Preliminary design and estimate

To conduct preliminary design of water-related facilities and estimate it's cost.

12) Implementation schedule

To establish integrated watershed management plan and prepare implementation schedule for individual projects within the management plan

13) Institutional Framework for Integrated Watershed Management (IWM)

To conduct i) a review of the current institutional structure, the agencies, both local and national, and their functions with regard to basin-wide water resources development and management; ii) identification of institutional issues related to IWM; and iii) development of a cost-effective program to improve on the institutional framework and resolve the issues identified.