Factor of Multipurpose Development	Consequences other than Economic Development Objective
- Water source development:	- Conservation of minimum flow in the river
- Irrigation development:	- Social improvement in the community
- Flood mitigation:	- Social welfare improvement in the protected area

Because of this aspect, all the benefits and effects of a multipurpose dam cannot be precisely quantified in monetary terms specifically for cost allocation purposes. Therefore, cost allocation should ideally be based on not only cost-benefit consideration but also on social, environmental, and sometimes political considerations. However, its quantitative assessment is difficult in most cases.

A practical approach is that the government will consider affording soft loans to those sectors needing such a special consideration and/or having a low economic return.

The government should encourage all water use sectors to participate in multipurpose development projects with a view to achieving a higher economic efficiency in the development.

When a multipurpose project is formulated, an important consideration to be given is that the project should benefit the population of the immediate vicinity; for example, in form of having their own water supply with acceptable quality, fishing rights without having to get tedious licences and possibly access to water for limited irrigation. In this way the local community will see it as their project and it will improve the local environment.

4.10.3 Planning of storage reservoir/dam scheme

Storage dam scheme is one of effective measures for augmenting the water exploitation, which is particularly important in a dry weather country like Kenya. Although it may not always be a correct solution, the development agency(ies) should consider to exploit the dam scheme at its maximum development potential since the potential of the damsite can only be utilized by a dam initially constructed thereat. Hence, selection of the optimum size of the dam development is quite important. This is particularly emphasized for the Athi, Tana, and Lake Victoria basins where the demands for water uses would continuously be increasing in future.

There would be two chances of examining the optimum exploitation of a dam scheme;

(a) One is when an agency plans and optimizes the development scale of a dam plan

(b) The other is when the WAB approves the application of water permit and construction of the relevant structures

In (a) above, an ideal approach is that the plan would be referred at this stage to the relevant basin development authority (e.g. TARDA, LBDA, KVDA) who is the multipurpose development planning/co-ordination agency and may have an opinion of the need of multipurpose development approach.

At the process of (b), MOWD (as river administrator) jointly with WAB will check the appropriateness of the proposed dam plan at a standpoint to examine whether the plan may require other consideration from river conservation and management aspects (e.g. flood control, minimum discharge, conservation of water quality/riverine environment). Hearing of opinion from the basin authorities may be required again at this stage. For this purpose, MOWD should call for consultation between the ministries/agencies/authorities concerned to reach the most optimal development solution.

4.10.4 Coordination between ministries/agencies

Under the present institutional set-up, most of the multi-objective development projects will come out from the studies of the river basin development authorities. This is the ideal case. In some cases, the proposal may be raised from studies of other agencies such as KPC, NIB, and NWCPC. In both cases, proper coordination will be required among the agencies concerned.

A tentative proposal herein is that the proposed multipurpose project will be discussed and coordinated for decision of joint implementation at a special committee organized on ad-hoc basis. The committee will be organized at the request of the agency who first proposed the project. MOWD will act as the leading agency for the coordination at the committee since MOWD is, in coordination with the WAB, the overseer of the country's water resources and hence in a position to coordinate the allocation of water sources for various development.

P5. WATER RESOURCES AND USE MANAGEMENT

5.1 Surface Water Management

5.1.1 Hydrological data management

(1) Hydrological observatory work

MOWD is currently operating some 900 water level gauging stations, of which about 330 stations are rated. A major problem is the limited availability of financial resources and some stations have deteriorated or are not working properly. Under this situation, a practical approach would be to reduce the number of stations which should be selected strategically through assessment of the relative importance of each station (see Sectoral Report B for detail of this issue).

Nevertheless, unique aspects prevailing in Kenya are that there is a wide variation of hydrological characteristics among river basins and moreover water abstraction is made mainly in tributaries and springs in upper watershed areas. These factors require hydrological observations at as many as possible places.

Hence, the reduction in the number of stations should be a temporal measure and ultimately the number of observatory stations be increased with the increase of budgetary resources.

(2) Processing and storage of data

The processing of data and interpretation of the results are carried out centrally by the Surface Water Section of MOWD headquarters. This system is appropriate to apply for some time span, provided that de-centralization of a part of the work (e.g. digitization and/or input of the field records) will be considered in future.

There are two important aspects needing future improvement:

(a) Data collected from field contains many missing or inaccurate data

(b) some of the data recorded by other agencies (e.g. LBDA, KPC/KPLC) is not stored in MOWD's data base.

The item (b) above could be achieved by MOWD's leadership of requesting the coordination from other agencies. Improvement of (a) is discussed below.

(3) Training of field hydrologists

The accuracy of collected hydrological data depends much on the skill and motivation of hydrologists posted to provincial/district offices. It is important that

the field hydrologists be fully aware of how their work fits into the upgrading of data quality and of the implications of missing or inaccurate data.

It is recommended to organize annual seminar involving some element of training and the presentation of the end results of each regional hydrologists.

(4) Dissemination of hydrological information

The Surface Water Section of MOWD would be responsible to disseminate hydrological data to other Divisions/Sections within the Ministry and also to other government agencies and private firms. It is recommended to establish a publication program so that hydrological information should be more readily available to users.

The data could be produced using the existing data processing system (Wang computer) or a new system (Vax station/Macintosh) established under this NWMP Study. The publications will be both on regular basis in the form of a hydrological yearbook and on ad-hoc basis responding to a request from other agencies/firms. Some charges may be imposed for publication of data to cover the expenditures of data retrieval, printing and other costs, like the case of issuing the water permit. The income shall be used for improving the functions of data processing systems and data publication services.

5.1.2 Water abstraction permit

(1) Water permit data

The Water Act stipulates that utilization of surface and ground water can only proceed upon receipt of a water abstraction permit from the Water Apportionment Board (WAB). Surface water abstraction is permitted for limited periods: currently 10 years (formerly 25 years) for domestic and industrial use, 5 years for irrigation use, and 2 years for construction use. When the permitted period expires, it can usually be renewed. Water permit is often transferred from one holder to another. Groundwater abstraction permits are issued without a time limitation. Improving measures will be required with regard to (i) strict regulation for the permit holders' obligation of submitting the applications for the renewal and transfer and also (ii) a new provision describing the time limitation of groundwater permits.

Up to the present, more than 25,000 proposals have been submitted. Almost all the documents relating to abstraction permits are filed and stored in the office of the WAB in Nairobi. From such documents, Register Book, District Files, and River Basin Files are made. The Register Book is the first step in keeping the records and should be complete. However, the existing Register Book already has much missing data. Consequently, the accurate number of water permits currently effective can not be known. Currently effective permits may number around 15,000. This Study has attempted to look into this issue, but found it almost

impossible to exercise a complete updating of the permit data with the inputs allowed for the Study. The updating will require a thorough review of existing data including the original application forms with field works for confirmation on the sites. The work will be of several years to be carried out jointly by WAB and MOWD.

The Computer Service Centre of MOWD maintains a database of the abstraction permits using the existing Wang system. This database was designed within the constraints of the hardware capacity. Due to this constraint, much important information, such as irrigation areas and kind of crops, were excluded. But, this can be improved by introducing of a new database (Vax Station) and restructuring the input data.

Further, data input is based on the minutes of the Apportionment Board meeting, which sometimes contain inaccurate information, mistyping, etc. The data input should be based on original application forms and their amendments as made by WAB.

(2) Actual water use

Most water abstraction is made by private individuals, who construct small structures and/or install pumps in river channels. When water abstraction permits are granted, the installation of measuring devices is required as a condition of the permit, but private water users often fail to install them. In the case of groundwater abstraction as well, installation of measuring devices is requested, but boreholes having measuring devices are few. It is recommended to exercise more strict enforcements on this issue including cancellation of the permit and prosecution in the court, which are allowed under the present law.

Applicants often tend to minimize their requirement of water in order to make it easy to obtain permit, but once the application is approved, they abstract as much water as they require. Also, there seems to be many cases of water abstraction without a permit. One of the jobs of water bailiffs is to patrol and check the water utilization, and if illegal abstraction (abstraction over or without permission) is found, they have to take necessary countermeasures. But, insufficient numbers of water bailiffs and transportation (vehicles and fuel) makes it practically impossible to frequently check the field conditions. This issue is discussed in Sub-section 5.1.3 below.

The process of obtaining an abstraction permit is long and time consuming. This may be one of the reasons that water abstraction without a permit tends to occur. In this respect, there may be a shortcut method in approving the permit for the cases of application of a small quantity and/or temporal use, particularly in relatively rich runoff rivers and high groundwater resources areas.

At present, actual water use conditions are unknown and illegal water abstraction cannot be checked. This situation causes serious problems in water resources

development and management. Without knowing the actual condition, development planning is risky and water management is difficult. In some basins in high potential areas, it is reported that the abstraction volume permitted by WAB appears to have already exceeded the available natural flow. This calls for the need for specific survey of present water use and runoff yield in those particular basins.

(3) Need for upgrading the water permit data

The problems discussed above are not new. The 1973 WHO study (Ref. P.2) pointed out similar issues, and many consultants have faced the same problems. The reasons why it has not been solved are shortages of funds and experts. In addition, water use monitoring and management does not produce immediate and direct benefits, and consequently, administrators have had a low interest in these issues.

However, as water demand for domestic, industrial, irrigation and other uses grows, the water use problem will become an increasingly serious issue. When it becomes serious, it will be too late to solve the problem, because it takes time to establish monitoring program and organization and time to accumulate reliable data.

In this context, the following are deemed to be required urgently:

(a) Renovation of filing system of water abstraction permit

(b) Installation of a terminal of the MOWD database system for water abstraction permit within the Water Apportionment Board and direct input of data from the application form

(c) Water use survey firstly for several critical river basin and ultimately to cover all basins (checking of all the abstractions and measuring actual intake amount over several seasons): these surveys should include both surface and groundwater

(d) Working out naturalized river flow based on the actual abstraction by river basin

(e) Establish the maximum permissible amount for surface and groundwater use by area.

The works for (c) to (e) above will require a lot of expertise inputs. It is worth proposing the above studies as one of the donor assistance programmes.

(4) Procedure for issue of water permit

The present procedures (see Sub-section 2.3.2) appears to be acceptable provided that the routine works should be carried out properly. Here, the duties of Water

Bailiffs are quite important since they are responsible for the field evaluation of applications and the inspection of completed works including the judgement on fulfillment of the conditions given for the permits to be issued. The Water Bailiff should be an experienced hydrologist or water resources engineer who can judge and evaluate the adequacy of data and parameters proposed in applications.

Currently, the Water Bailiff's evaluation of the available discharge is based on one day's discharge measurement in some cases. This is not adequate. He should be kept informed of basic hydrological parameters at key gauges in the area (information to be provided by the Hydrological Section of MOWD) and, in addition, he should accumulate his own discharge measurement data as many as possible in collaboration with hydrologists. Hearing from local people will provide valuable information. The elevation of available discharges should be based on those multifarious information sources.

It is proposed that WAB will have a system of charging the fees for water permits to cover the operation costs incurred directly for issuance of the permits.

(5) Contribution by MOWD

Water Apportionment Board shall continue to have their present functions. An idea, solely from technical viewpoint, is that MOWD would take over the functions, since it has stronger technical capabilities. However, this will not be ideal in view of the context that the water permit issue should better be handled by an independent organization representing the opinions of other water agencies (NB: MOWD is one of the largest water users).

On the other hand, WAB has virtually no technical staff. MOWD should be more involved in the aspect of water permit data management; not only in database management but also in upgrading data qualities. The works recommended in (3) above would be MOWD's task.

5.1.3 Water use monitoring and control

As mentioned in Sub-section 5.1.2 (2) above, improper uses of water exist at many places, including over-abstraction, misuse, and other illegal abstractions. Hence, the monitoring and control thereto are important tasks assigned to MOWD. Though its implementation in a complete form is quite difficult, an attempt to solve this issue should be pursued.

(1) Encouragement of Water Bailiffs' activities

Successful achievement of water use monitoring and control will depend largely on the capability and volition of Water Bailiff posted to provincial and district offices. Their main duty is the surveillance of water uses under the implications of the Water Act. It is important that their interpretation of the Water Act should be adequate and consistent. Training of Water Bailiffs should be continued through annual

seminars dealing with education on the Water Act, case studies of approval and surveillance of water permits including legal aspects, and exchange of information on issues experienced in various regions. More training of environmental issues should also be given in view of increasing importance of the issue.

It is physically difficult to increase the number of highly qualified Water Bailiffs. Each Water Bailiff would be responsible for on-the-job-training of his technical assistants (Assistant Water Bailiffs and Water Guards). It is also worthy of consideration to organize an appropriate course at KEWI for the Water Bailiff Assistants so as to improve further in this performance. Providing an adequate transportation facility should be given priority.

(2) Measurement and reporting of water uses

A water permit is approved in most cases with a condition that the water user shall install controlling/measuring devices. However, this condition may often be regarded by water users to be a non-compulsory order due mainly to the absence of follow-up surveillance by Water Bailiffs. Due to the lack of measuring devices, actual abstraction of waters has not been known.

Section 21 of the Water Act allows WAB to require a water permit holder to keep a record of water abstractions (see Sub-section 2.3.3 (5)). However, water users also do not consider this a compulsory order.

It is recommended that MOWD establishes and issues, under the name of the WAB, a special regulation for the compulsory installation of measurement devices and also the reporting of water abstraction record by water users. Since it is almost impractical to apply this to all water users, the order would be given only to the major water users (to be specified by WAB) who are supposed to be using the water at a rate more than 5% of the dry season discharge in the river stretch concerned (NB: The 5% should be reduced stepwise in future). The measuring devices and recording method will be subject to the Water Bailiff's periodical inspection.

(3) Strengthening the imposition of penalties

Present laws allows the imposition of penalties to offences in water use (see Sub-section 2.5.4). It would be important to exercise the strict enforcement of the penalties as and when the Water Bailiff identifies any vicious illegal water uses. In any cases, the issue of a warning letter should precede actual imposition of the penalty, say 3 to 6 months, to allow the water user to take remedial measures. The amount of fines may be increased to a certain level enough to call for the water users' attention. The cancellation of water permit may be the strongest way of penalizing the users.

5.1.4 River maintenance discharge

Rule 86 of the Water (General) Rules provides for compensation water. However, it appears not to be a mandatory requirement. This should be revised such that all surface water abstraction schemes are to consider the compensation water to be released for the downstream water uses. This is particularly important in case of schemes involving water transfer to another river basin/sub-basin and also storage reservoir in which a large variation of seasonal water release is planned (e.g. no release in the dry season).

Release of the compensation water should consider the river maintenance discharge in the downstream reaches. The river maintenance discharge defined here is the minimum flow required for preserving the river for various water uses (in terms of both discharge and water level) and water quality conservation. This Study tentatively assumed it to be not less than the recorded minimum daily discharge (see Sectoral Report B - Hydrology), but essentially it should be assessed for each of the selected key stations in each river. The assessment shall be made under river basin studies and/or each project studies carried out henceforward.

Water abstraction permits shall be approved for the available water in excess of the river maintenance discharge.

5.1.5 Need for flow augmentation measures

As economic activities expand, the need for water use will increase and accordingly the application of water permits may increase further. On the other hand, available natural runoff is limited and hence there is a physical limit of issuing permits in terms of water quantity. A basic principle is that water permit applicants (especially major water users, both public and private) should exploit their water sources (eg. storage reservoir) in the case of rivers where the dry season flow is already critical.

Water permit application from small communities and/or groups of people should not be restricted indiscriminately. Notwithstanding WAB's effort for controlling water use and preserving the river maintenance discharges, there may arise such cases that the downstream water users experience water shortage. In such cases, MOWD will have to plan the construction of dams/reservoirs for augmentation of flows in the downstream reaches, either as a scheme specific to this purpose or as a part of a multipurpose scheme, if it is demanded by and a benefit to the public (e.g. peoples' dependence on river, livestock watering). The concept of a flow augmentation dam is discussed in Sectoral Report H - Dam Development Plan.

5.2 Groundwater Management

5.2.1 Water permit for groundwater development

The Water Act states that a water permit is required for groundwater development of an area which is situated within 92m (100 yards) of any body of surface water or within 805m (a

half mile) of another existing borehole (see Sub-section 2.3.2). For boreholes not falling in this category, the authority for development is required.

This Study proposes that all boreholes and wells should be subject to the acquisition of water permit. All data and information on groundwater development and use should be kept in record of and under control by the Water Apportionment Board on an uniform basis covering all boreholes/wells. The only exception would be for shallow hand-dug wells (say, less than 10m in depth) excavated on private lands.

The Water Act requires that drilling contractors should submit to WAB within 30 days a complete drilling completion record when they did the works. This regulation should be strictly enforced without fail since the record is a very important information for the groundwater management.

5.2.2 Defective wells

According to the present provision in the Water Act (Sections 58-65), the "defective wells" deals only with the ingress of salt water. The provisions shall also apply to all polluted water (eg. fluoride) as far as it is not suitable for human domestic uses, particularly in urban areas. Nevertheless, there would be exceptional cases where the boreholes/wells would be kept in use for livestock and/or animal watering.

5.2.3 Monitoring of water use

As for surface water (see Sub-section 5.1.3), monitoring of water use is also necessary for groundwater. Water use can be recorded in the form of pumping operation hours and number of days in operation together with information on type and capacity of pumps. Major water users may be required to install adequate types of measurement devices such as flow meter or triangle weir.

It may be almost impractical and unnecessary to require water use recording of all borehole/wells. The obligation may be limited to major water users (public water undertakers and major enterprises undertaking a bulk abstraction) which are to be designated by WAB.

Water level should also be measured at least twice a year if the borehole owner has a water level meter. When issuing water permit, there should be a condition that every borehole have an air-line to facilitate water level measurement.

5.2.4 Groundwater data management

Borehole completion records currently filed in the Groundwater Section of MOWD will be the basic data for future groundwater resources management. The database of the records should be managed properly and the quality upgraded further. The following are important items of data management needing careful attention:

(a) Borehole completion record

- uniformity of data registration (through guidance and lectures to borehole drilling contractors)
- careful check of the data by the Groundwater Section, including re-confirmation and/or exclusion of unlikely data
- check of errors during the data input (this should also be made for existing data in the database)

(b) Water quality data

- uniformity of data registration in collaboration with the Water Quality and Pollution Control Section
- careful check of the quality of data (exclusion of unlikely data)
- elimination of the data input miss, including the check of existing data

(c) Pumping test

- standardization of test method (step-drawdown test/constant pumping test/recovery test) which would be designated in the work specification to drilling contractors
- careful check of the data and analysis results

5.2.5 *Groundwater resources assessment*

In the long run, attempts shall be made to assess the country's groundwater resources on a detail basis covering the following:

(a) Groundwater balance analysis for each region through computer simulation models, incorporating the parameters of abstraction rate, precipitation, evaporation, and water level hydrograph.

(b) Accumulation and evaluation of water quality data to establish practical water quality guidelines applicable to each region.

A practical approach to (a) above would be to handle it in regional water resources studies such as the river basin study and the District water resources study as proposed in the Action Plan (see Main Report Vol.2).

With regard to groundwater quality guidelines described in (b), accumulation of actual water quality data is essential. Noteworthy aspects are that the water quality

data of groundwater are available only for 15% of all the boreholes in the country and that most of the boreholes have not been observed and monitored since the completion. Particularly, the data in semi-arid and arid areas are still scarce, while the water quality there is suspected to be not always good. This situation should be rectified by more intensive monitoring of boreholes for public water supply, observation and exploratory, which are equivalent to about 24% of all boreholes in the country, at a regular interval, for example twice a year, each in the dry and rainy season. Groundwater quality monitoring is indispensable to make clear the various conditions of water quality and to define specific levels of drinking water standards, especially for the small-community water supply.

The internationally recognized and authorized guidelines for drinking water quality are those recommended by the World Health Organization (1985) and these guidelines have been adopted by many countries including Kenya. These guidelines should be recognized as means to an ultimate goal. It will be appropriate to establish the intermediate guidelines more practically applicable to each region, taking into account the variety of geographical, socio-economic, dietary, and industrial conditions. In fact, poor water is often better than no water.

Water laboratories for water quality analysis are necessary at the district level because water samples should be analyzed as soon as possible after sampling of the water. The laboratory could also be used for water pollution control purpose.

5.2.6 Proper pumping tests

Pumping tests should be conducted to determine the performance characteristics of a well and the hydrogeological parameters of the aquifer.

The first purpose of the tests is to have information as to the production capacity of the completed well and/or provide information needed for the determination of pumping capacity to be installed for a new well. The data can be obtained from step-drawdown tests, in which the well is pumped at successively greater discharges for relatively short periods.

The second purpose of the tests is to provide drawdown and recovery tests' data, from which the principal parameters of the aquifer, transmissivity and storage coefficient, can be calculated. This type of test is called an aquifer test. The aquifer test consists of pumping a well at a constant rate (constant-pumping test) and recording the drawdown in the pumping well and in nearby observation wells observed at specific times. The test is also called a constant-pumping test.

5.2.7 Monitoring wells network

Observation wells for monitoring groundwater would be indispensable to make clear mechanisms of recharge to groundwater from precipitation or of drawdown due to

over-pumping and movement of groundwater and contaminants. The data obtained from regular monitoring should be stored into the database for groundwater management.

The purpose of monitoring wells is to (1) determine the static water levels or potentiometric surfaces of all aquifers, (2) permit access for the collection of water samples to detect contaminants, (3) monitor the movement of groundwater and contaminants, and (4) calculate and estimate groundwater abstraction rates.

There are 66 observation boreholes in the country, mainly in the Nairobi conservation area according to the borehole database. Observation records have seldom been obtained except for the Nairobi conservation area. Even in the Nairobi conservation area, observations have not been continued due to financial constraints, lack of transport, lack of suitable equipment, lack of provision for servicing and maintenance of the equipment, shortage of staff with adequate levels of training, and lack of understanding of boreholes' owners.

5.2.8 Installations of airlines and abstraction meters

It should be made mandatory for future boreholes to equip airline and groundwater abstraction meters to monitor rest water levels and evaluate groundwater abstraction rates.

5.2.9 Equipment for groundwater surveys, development and monitoring

Each district should have groundwater exploration equipment such as terrameters or resistivity meters, water level instrument such as dippers, portable water quality meters such as PH meters and electric conductivity meters, and simple surveying equipment such as altimeters and compass.

5.3 Water Pollution Control

5.3.1 Agencies to be responsible

According to the provision of Section 158 of the Water Act, water pollution control for both surface water and groundwater is managed by the Ministry of Water Development. In the Ministry, water pollution issues are handled through the coordination of the Water Apportion Board, the Provincial/District Water Engineer Offices and the Water Quality and Pollution Control Section in the Water Resources Division.

The Public Health Act prescribes water quality control of water supply in Section 129 and 130. The implementation and enforcement of the Public Health Act and its subsidiary legislation (eg. the Drainage and Latrine Rules) are practically undertaken by local authorities (municipal, urban, and area councils). The local authorities are empowered to control the purity of water supplies, both by water undertakers and traditional supplies, to prevent pollution by wastes and to control the construction/operation of drainage works and sewers. In addition to the health inspectors appointed by local authorities, the Director of Medical Services, the Ministry of Health, also appoints health inspectors in certain districts.

Thus, the leading agency should remain to be MOWD, wherein the leadership would be held by the Water Quality and Pollution Control Section.

5.3.2 Water quality monitoring programme

(1) Present condition

Surface water :

Any water pollution control should be preceded by water quality observations. The Water Quality and Pollution Control Section of the MOWD is responsible for the implementation of a nationwide water quality monitoring program. This monitoring network covers all major rivers, lakes and aquifers (springs) and incorporates 120 sampling points (see Fig. P5.1). These are located at hydrological gauging stations on the rivers to allow mass loads to be estimated.

The network is comprised of two basic types of stations;

(i) "reference stations" are sited in the upper catchment of the major rivers and designed to provide baseline data on natural water quality.

(ii) "Impact stations" are sited near to known point sources of pollution and are specifically for pollution control purpose. Similar sampling stations are located further downstream of such point sources to assess the self-cleaning capacity of the river.

The program calls for each station to be sampled four times a year in January - February; April - May; June - July; and October - November. Additional samples are collected and analyzed on an irregular basis as the need arises.

In practice, however, the water quality monitoring program described above falls far short of the desired level of surveillance. The main reasons are;

(a) Financial constraints
(b) Lack of transport
(c) Lack of suitable equipment and maintenance services thereof
(d) Shortage of skilled staff, especially at the District level

Removal of these constrains is the first step towards the successful achievement of the country's water quality monitoring programme.

Groundwater

Of the nearly 10,000 boreholes in the country, only 11% have some water quality data logged on the MOWD database. Most of the data represents those tested at

time of initial drilling, but no regular testing has been undertaken for most of the boreholes since then. The scarcity of existing data makes it quite difficult to meaningfully assess the groundwater water quality of the country.

(2) Approaches to the immediate improvement of the program

On one hand, the program is obliged to assume that some extent of resource constraint would continue for a certain period. Under this circumstance, the following improving approaches are proposed:

(a) Re-evaluation of monitoring method to conform with budgetary constraints

The number of stations (presently 120 stations) and the range of parameters monitored should be re-evaluated and reduced to conform with budget constraints. It is not recommended that reducing the frequency of sampling is used to lower the monitoring cost. Water quality exhibits considerable seasonal variation especially in rivers and streams, and this variation would be missed by infrequent sampling.

(b) Scrutinization of the data

Existing data contains erroneous data; in some cases unlikely or impossible values. As a general principle, it is more worthwhile having good reliable data from a lesser number of water sources than unreliable data from many sources. Further, the data should be well scrutinized before entry into the database. This improvement could be achieved without significant increase to operation costs.

(c) *Collection and collation of additional data*

Other than data logged on the MOWD database, considerable additional volumes of water quality data exist in published documents, consultants reports, aid organization studies, university thesis, and NGO documents. It is recommended that a concerted effort is made by MOWD to collect and collate this material and to enter it on the database and to update the information at regular intervals. This effort could also be achieved at a moderate cost by the effort of the Water Quality and Pollution control Section of MOWD.

(d) Groundwater quality monitoring

A noteworthy aspect is, as noted above, that the water quality data of groundwater is available only for 11% of the boreholes in the country. This situation should be rectified by more intensive monitoring at a regular intervals, say 2 times a year, each in the dry and rainy seasons. This will cause some cost burden to MOWD and other relevant agencies for monitoring government owned and other public boreholes/wells. The monitoring of

private boreholes may be left as the owners obligation by setting forth a relevant regulation.

(3) Approaches to the long-term improvement

Although it is a fact that water quality monitoring programs are relatively expensive to run in terms of both capital and recurrent costs, the benefit derived from protection of the nation's water resources outweigh these costs. On the condition that the program must be operated on a continuous long term basis, the program should be reinforced with increase in financial, equipment, and manpower resources up to a level high enough to cover operation costs for 120 surface water stations and public boreholes/wells, say within the coming 10 years.

It is worth proposing a grant aid survey covering the following as an initial step to the accumulation of country-wide data:

- Surface water quality sampling at all reference/impact stations
- Groundwater quality sampling at selected public boreholes/wells

The results could be the baseline data for future control and be useful for detection of erroneous data contained in the existing data.

5.3.3 Water pollution control

(1) Standards for effluent quality and receiving waters quality

Effluent discharge standards have been formulated and are enforced by the Pollution Control Unit of MOWD (Omwenga 1990). The standards include a generalized effluent quality standard and some specific standards for industrial sources (e.g. paper mill, sugar factory). It is recommended to establish more specific standards for discharges from other types of industrial sources. The establishment of standards for bacteriological quality of treated effluents is also necessary. For reference, general standards for effluent quality used in Japan are given in Appendix P.2.

There should also be standards for control of the quality of the receiving waters (river, lake). An example of the standards used in Japan is also shown in Appendix P.2. Some recommendations on approach to the preparation of the standards is described in Section 10.2 of Sectoral Report N.

(2) Enforcement of Water Pollution Control

In overall terms, waters in Kenya have not been polluted yet so much as compared with some industrialized countries. Nevertheless, local and intermittent pollution incidents have already been arising and doubtless will become more frequent in the future as the population and economic growth continue. What is essential now is

firm action by the regulating authorities to contain the present level of pollution and prevent further problems from arising. By establishing good management and administrative practices, the threat of pollution development in the future can be mitigated and the mistakes made in industrialized countries of the world can be avoided. Without doubt, where pollution control is concerned, prevention is far better and more economical than finding a cure.

Legal provisions for control have been clearly set forth in the Water Act, the Public health Act and the related Rules. What is needed now is positive enforcement of the regulations by relevant authorities.

The Water Act sets forth clauses for the breaches of legal provisions related to the use of water resources. These should be applied to water pollution. Relatively heavy fines may be imposed to vicious cases. Along with this concept, a lot of new provisions on water pollution control are prescribed in the comments on the Draft Amendments of the Water Act. The Fines and/or imprisonment for offenses for water pollution are proposed, but, on the other hand, it is difficult to practically control water pollution only with them. The most effective penalty is to order the shutdown or restriction of operations of productions/works which are causing the water pollution. It is recommended to include this regulation in the Amendments. The cancellation of water abstraction permit will also be an effective measure, in case the pollutant producer uses its own water abstraction source.

In addition to strengthening legal control, the following approaches would also be necessary to achieve successful management of water pollution control.

(a) Formation of national consensus by a new law or an amendment of the Water Act with support of press campaign.

(b) Cooperation and coordination between Chemists and Water Bailiffs in Provincial/District Water Engineer Offices in terms of exchanging the data and information relevant to water quality and pollution control.

(c) Step-wise improvement of water quality of effluent from factories by negotiation between MOWD and the enterprises without applying a strict effluent standard from the beginning.

(d) Concentration of investment and control for water pollution in the priority areas, such as Nairobi, Nakuru, and Kisumu. Especially, the effluent into reservoir or river course being used for water supply should be controlled severely. Nairobi Dam was already abandoned due to the contamination of domestic effluent around the reservoir.

(3) Power for remedial measures

Water (General) Rules (Rule 48) empowers the Water Apportionment Board to require the submission of a plan, detailed specification, and process description of works to purify the effluent. However, this power is limited to the case of pollution associated with a water abstraction.

This provision should be extended to cover all cases of pollution, irrespective of whether the pollution is associated with a water permit or not. Also, there should be an explicit provision that WAB has the power to order remedial work. MOWD shall assist WAB in undertaking the technical issues.

(4) Effluent from factories

A primary principle is that effluent from each factory should be treated at its own treatment works before release from the factory. For instance, MOWD Embu noted a case of possible fear that the tanning factories like Limuru Bata and Thika Tanners produce highly polluted effluents with chromium levels very high. When these effluents are discharged into the public sewerage works, they interfere with normal treatment by killing the micro organisms. Referring to this case, MOWD Embu concludes that the industries should be forced to have their own special sewerage treatment works and should then be monitored very closely.

5.4 Shared Water Resources (International Rivers)

5.4.1 Helsinki rules

The 52nd Conference of the International Law Association (ILA) held in Helsinki in August 1966 resolved the articles on the use of waters of international rivers, which is known as "the Helsinki Rules on the Use of Waters of International Rivers". The Rules are the product of the efforts by "the Committee on International Rivers" over a period of 12 years. The Rules set forth various definitions and guidelines which would be useful for reflecting in an international agreement with regards to the use of waters of international rivers.

The Helsinki Rules consist of 6 chapters, of which Chapters 1 and 2 describe the general principles and rules and from Chapter 3 onward set forth specific provisions related to pollution, navigation, timber floating, and the settlement of disputes. The main articles of Chapter 1 and Chapter 2 are reproduced in Appendix P.3 attached hereto.

The basic principle of the Helsinki Rules appears in Article IV, which says that "each basin State is entitled, within its territory, to a reasonable and equitable share in the beneficial uses of the waters of an international drainage basin".

5.4.2 International drainage basin in Kenya

Article II of the Helsinki Rules designates that "an international drainage basin is a geographical area extending over two or more States determined by the watershed limits of the system of waters, including surface and underground waters, flowing into a common terminus".

Kenya is surrounded by five neighbouring countries; Tanzania, Uganda, Sudan, Ethiopia and Somalia with border lines intersecting many river drainage basins. Accordingly, many parts of the Kenya's land are classified into "international drainage basin".

This study listed 18 international drainage basins relevant to Kenya as shown in Table P5.1 (List) and Figure P5.2 (Location Map). It is noted that the delineation of basin boundaries herein is based on the concept of surface water drainage basin.

The number of sub-basins categorized into international drainage basin amounts to 114 in total.

In preparing the List, the following was noted:

(a) Lake Victoria is a headwater of the Nile river. Hence, 13 river basins pouring into the Lake are regarded as international drainage basins, though they are all (11 basins) or almost all (Sio and Kuja) within Kenya's territory. Two other rivers; Mara and Grumeti, also debouches finally into Lake Victoria.

(b) Tsavo river basin (Sub-basin 3G) has at its headwater a small catchment on the Mt. Kilimanjaro slopes in Tanzania and hence is regarded as an international drainage basin. Strictly speaking, the whole Athi river basin (Drainage Area 3) to which the Tsavo sub-basin belongs may be deemed to be the international drainage basin. However, on Figure P5.1, only the Tsavo sub-basin is indicated as an international drainage basin in view of a small fraction of drainage area in Tanzania.

5.4.3 Technical aspects envisaged for each basin

(1) Malaba (5 sub-basins: 1AA to 1AE):

Malaba river originates in Mt. Elgon, flows down along the Kenya-Uganda border and then goes into Uganda.

A primary activity for this river is to commence hydrological observation jointly with Uganda. At present, the river has no mechanical water abstraction on the Kenyan side. Uganda is taking some water (quantity not known) for water supply to Tororo town at a point some downstream from Malaba town. Although no large water abstraction scheme is proposed at present, there may be a possibility of water abstraction for irrigation and/or water supply to the riverine towns/villages (incl. Malaba town) in future.

(2) Lake Victoria (13 river basins or 58 sub-basins: 1B-1K):

These 13 river basins are situated within Kenyan territory (except for very small fractions of Sio and Kuja rivers) and hence have virtually no direct relevance to water uses in adjacent countries; Tanzania and Uganda.

Lake Victoria has its outlet at Jinja (Uganda) from which the water goes into the Victoria Nile river. The catchment area of Lake Victoria at Jinja is some 262,000 km^2 (Lake surface area: 68,000 km^2) and average runoff is said to be 1,100 m^3/s, to which the rivers discharging from Kenya (including Mara and Pololet) share 34,000 km^2 (13%) in catchment (see Table P5.1) and 134.5 m^3/s (32%) in average runoff (see Table P5.2).

In view of not a small share of the Kenya's rivers to the total runoff of the whole Lake Victoria basin, it may be said that the water uses in these 13 basins will have some impacts to the water resources of the whole Lake Victoria basin. In the light of the Helsinki Rules, due consideration should be paid when proposing schemes involving bulk water transfer to another basin, in particular in case of direct abstraction of the Lake Victoria water.

(3) Mara (5 sub-basins: 1L):

This river originates in Kenya and flows into Tanzania. Most of river flows owes to the Kenya's catchment. A specific aspect is that the river acts as a water artery for watering to animals in two world-wide known tourism areas: Masai Mara National Reserve (Kenya) and Serengeti National Park (Tanzania). Any changes in the river flow regime should be subject to a detailed study on dependence of animals on the river.

In case of the undertaking of bulk water transfer scheme(s) involving the reduction in the river flow, it would be appropriate to have a pre-agreement with Tanzania in line with the context of the Helsinki Rules.

(4) Grumeti in Tanzania (a part of sub-basin 1LB-3):

The catchment in Kenya territory shares only a minor fraction of the total basin and plays little importance in terms of water yield. Moreover, the catchment is situated in an arid zone and no active water use is foreseen. These suggest that no conflict in water use is likely.

(5) Lake Natron (5 sub-basins: 2KA-2KC, 2H and a part of 1LA-3):

The catchments of this lake basin are mostly in semi-arid and arid areas. The only perennial river in the basin is the Ewaso Ngiro South river. Since the inflow from the Ewaso Ngiro governs the hydrological regime of Lake Natron, any major water

transfer from the Ewaso Ngiro would be subject to a detailed environmental study of the Lake Natron. The conservation of natural environment of the lake is important for Kenya in view that the lake is a habitat area of Flamingoes who travel to other lakes in Kenya.

(6) Lake Amboseli (1 sub-basin: 3N):

Lake Amboseli is a seasonal lake collecting water in the rainy season. Almost all the water impounding area falls in the territory of Kenya. The lake offers a valuable water point for wildlife in the Amboseli National Park and hence the present hydrological environment should be preserved.

Of particular importance to be noted is that Mt. Kilimanjaro acts as a perennial water source for the mountain's foot area in Kenya. If any water abstraction and/or transfer scheme is proposed in the Tanzanian territory (either surface or groundwater), it will affect the water yield environment in the Amboseli National Park area.

(7) Tsavo (1 sub-basin: 3G):

This sub-basin originates from Mt. Kilimanjaro in Tanzania territory. Although the catchment in Tanzania is small, it is virtually the perennial water yielding source for the sub-basin. Particularly, many springs including the Oloitokitok spring owe to this water source. In this respect, the conservation of this catchment area on Tanzania side is quite important for Kenya.

(8) Lake Jipe/Lake Chala (1 sub-basin: a part of 3J):

Most of the dry season water originates in the Kilimanjaro headwater in Tanzania, then flows down through the Lumi river of Kenya, and finally pours into the Lake Jipe which is shared by Kenya and Tanzania. Kenya can use water resources in the Lumi river and several springs (including Njoro spring). At the same time, Kenya is responsible, jointly with Tanzania, for conservation of hydrological environment of the Lake, since most of the lake inflow is yielded from or through the Kenya's land, though some come from the North Rare Mountains in Tanzania.

In case any scheme involving bulk water abstraction directly from the Lake Jipe is proposed (e.g. water supply to coastal areas), it should be subject to prior agreement with Tanzania in the light of the Helsinki Rules.

A similar agreement is also required for the use of the Lake Chala water. The lake water seems to discharge out at several small springs at the foot of the Lake Chala hills. Any further abstraction of the lake water would be subject to a detailed water balance analysis of the Lake.

(9) Mzukune (1 sub-basin: a part of 3J):

This basin lies in arid area and no important surface water source exists. In this respect, this basin is deemed to have a little importance as an international drainage basin. The area belongs to Tsavo West National Park on Kenya side and Mkomazi Game Reserve on Tanzania side, where groundwater use in the form of water holes and/or boreholes/wells may be active in future. However, no conflict is likely in the groundwater use.

(10) Umba (1 sub-basin: a part of 3K):

Water in this river is yielded from a Tanzania catchment and received by Kenya at the downstream most reach. Although there is no notable water uses in the Kenyan river reaches at present, the reach will be subject to degradation of the river environment if any bulk water abstraction is made in the Tanzanian reach. It is recommended to continue water level/discharge measurements. The records would provide valuable information for reaching a mutual agreement for water use of this river.

(11) Tarach/Lotikipi Plain (1 sub-basin: 2J):

This basin covers the borders of Kenya, Sudan, and Ethiopia with the majority of catchment falling in Kenya, a very small fraction in Ethiopia, and the rest in Sudan. The basin is located in an arid area, with no major water use. Occurrence of future conflicts in water use between the countries is unlikely.

(12) Lake Turkana (9 sub-basins: 2A, 2B & 2C):

This basin commands a very vast area of arid lands in Kenya and Ethiopia. Of particular importance in this basin is to conserve the hydrological environments of Lake Turkana. This aspect is remarked in detail in Sectoral Report N - Environmental Conservation.

Almost the entire part of Lake Turkana is within Kenyan territory and hence the conservation of the lake environment would chiefly benefit Kenya. A particular aspect to be noted here is that the majority of the Lake inflow comes from the Omo Wenz river in Ethiopia. It is reported that a major dam project is under implementation on the Omo Wenz. The reduction of inflow from the Omo Wenz, if it occurs due to the dam scheme, will significantly influence Lake Turkana. It is most preferable to have opportunities of discussing with Ethiopia and exchanging information regarding development activities in the Lake Turkana basin.

(13) Lake Chew Bahir in Ethiopia (1 sub-basin: a part of 2AA):

Kenya occupies only a part of this basin. The area is dry and no major water use is foreseen. The basin is deemed to have less importance as an international drainage basin.

(14) Chalbi Desert (1 sub-basin: 5J):

The whole basin is entirely in an arid area, and no major water use is anticipated except at Marsabit area. No conflict with Ethiopia is likely to occur.

(15) Lach Dera (23 sub-basins: most part of Drainage Area 5):

This basin covers almost all parts of Drainage Area 5 except Sub-basins 5J, 5H and 5GB. The only perennial river is the Ewaso Ngiro in the reaches upstream of Sub-basin 5ED (see Fig. P5.1). Five rivers flow into Somalia. They are all seasonal rivers/lagas conveying waters only in flood periods. In this context, it can be said that water development activities in the upstream areas (Kenya land) would not have much impact to the water use in the downstream area (Somalia). Groundwater is presumably flowing out into Somalia, but the extent is not known.

Northern border area (Moyale-Sololo area) is certainly receiving groundwater yielded from Mega Escarpment in Ethiopia. It is unlikely that the abstraction of this groundwater will constitute any conflicts with Ethiopia.

(16) Juba/Daua (2 sub-basins: 5H & 5GB):

Most part of the catchment area of this river basin belongs to Ethiopia in the upper reach and Somalia in the lower reach. The Kenya's catchment shares only a small fraction even at the point upstream of Mandera. It is a fact that most of the water in the river reach on the Kenya-Ethiopia border comes from the Ethiopian catchment, but the Kenyan people would be entitled to use the water in the light of the Helsinki Rules.

Although the quantity of water use on the Kenyan side will not be much for the foreseeable future, it would be more favourable to show and discuss with Ethiopia water abstraction plans, especially in case of bulk water abstraction using machines.

(17) Lac Genaneca/Lac Sare (1 sub-basin: 4JA):

Sub-basin 4JA forms the upper part of this basin. The basin is situated in dry area where no major water development is anticipated. No conflict in water use with Somalia is likely to occur.

(18) Lac Buscbusc/Lac Garebey (1 sub-basin: 4JB):

The situation of this basin is just similar to the case of (17) Lac Genaneca/Lac Sare above. No major conflict is foreseen.

As indicated in Figure P5.1, the majority of Kenyan catchments are classified into the international drainage basin. If the whole of Athi river basin (3A to 3H) is deemed to fall in this category (in view of a part of catchment of sub-basin 3G falling in Tanzania), the basins classified as Kenya's inner-land basin are limited to only the Tana river basin (Drainage Area 4) and other 19 sub-basins in the central part of Rift Valley.

5.4.4 Coordination with neighbouring countries

(1) Present situation:

Kenya has so far had no major issues relating to water uses in the internationally rivers classified rivers.

(a) Kenya has not been involved in any treaties with other countries. Kenya's basic policy is to maintain its sovereignty in undertaking water development and use. It is noted that a few of the Nile basin states show interest to discuss the water use of Nile river with other basin states..

(b) There have been no noteworthy conflicts in water use with other countries nor requests/inquiries from other countries as to the water uses.

(c) There is no system of exchanging information with other countries with regard to water development plans in the international drainage basins.

(2) International drainage basins accorded relative importance

Among 18 international basins listed in preceding Section 5.4.3, the following 8 basins are regard to have relative importance:

No.	International Basin	River in Kenya	Action Recommended (see also (3) below)
(1)	Malaba	Malaba	– Hydrological measurement
(2)	Lake Victoria	13 river basins	– Agreement of lake water use in case of bulk water transfer
(3)	Mara	Mara	– Hydrological assessment on aspects of wildlife conservation
(5)	Lake Natron	Ewaso Ngiro South	– Lake Natron environmental study
(8)	Lake Jipe	Lumi	– Lake Jipe environmental study
(10)	Umba	Umba	– Hydrological measurement
(12)	Lake Turkana	Lake Turkana	– Lake Turkana environmental study
(16)	Juba	Daua	– Hydrological measurement

(3) Actions recommended

(a) Exchange of information with neighbouring countries:

Although the need is not so acute, it is recommended to mobilize a gradual approach to this issue.

- With Uganda : – Water use in Malaba river
- With Tanzania : – Coordination of water uses and conservation of wildlife, natural lakes and watersheds, covering all relevant basins
- With Ethiopia : – Conservation of the Lake Turkana environment

(b) Hydrological observation:

Hydrological information is essential information needed for discussing any issues on international rivers. Immediate requirements are;

- Malaba river : jointly with Uganda
- Mara river : by Kenya near the border
- Umba river : by Kenya near the border

- Omo river : by Ethiopia at a downstream reach nearer as possible to the Lake Turkana

- Daua river : jointly with Ethiopia

(4) Environmental assessment study

An important factor relevant to proposing water abstraction plans is the conservation of natural environments of some specific areas. Environmental assessment studies are recommended for the following areas chiefly to determine the quantity of water abstraction permissible in each basin:

(a) Mara river : conservation of wildlife in both Kenya and Tanzania

(b) Lake Natron : conservation of water quality and ecology in the lake

(c) Lake Jipe : conservation of water quality and estimate of abstractable water quantity

(d) Lake Turkana : conservation of water quality

The study should preferably be carried out jointly with relevant neighbouring countries (Tanzania and Ethiopia) at some future time when sufficient hydrological information has been accumulated.

5.5 Water Charges

5.5.1 General criteria for water charging

The mode and extent of cost recovery in water resources development and use projects vary a lot in different countries. They range from zero recovery to full cost recovery including the recovery of interest cost. In between, partial cost recoveries are widely in practice in accordance with different criteria and socio-political considerations particular to each country.

As indicated in the outcomes of this Study, water resource development in Kenya will require an accelerated and large amount of investment to keep up with rapid socio-economic development. To meet this requirement, not only effective investment but also efficient recovery of public expenditures should be pursued.

This Study envisages two general criteria for formulating the water charge policy, which are already recognized by GOK.

The first is a leading criterion that the beneficiaries are required to share, according to the benefits they receive, the entire cost of the public facilities including construction, operation and maintenance costs if the beneficiaries are identifiable and are confined to certain

sections of the community. This cost should in principal not be covered by tax revenue collected from general tax payers who include non-beneficiaries, but should be recovered from the beneficiaries themselves as a separate charge. This criterion is based on the free market economy principle and the principle of equity, which encourages the economic efficiency and optimum allocation of national resources.

The second criterion is that the government grant should be provided only if it is necessary in order (i) to encourage the beneficiaries' participation in development or (ii) to provide social amenities from the standpoint of subsidizing low income people.

5.5.2 Charging policy for domestic/industrial water supply

It is apparent that the benefit of public water supply systems is only provided to those who are served by the systems. All cost of water should in principle be collected from that section of population benefited by the systems rather than depending on tax revenue.

Nevertheless, rapid expansion in water supply facilities will have to be undertaken henceforward and will be continued for some time span, during which the self-paying operation may not be practicable in view of increasing burden to water undertakers/people for repayment of heavy loans and interests. In such a case, it may be necessary to consider providing a grant to partly finance the public water supply projects. However, this should be regarded as an intermediate measure to be abolished over the long term.

With regard to rural water supply schemes, the central government's grant would have to be continued for the time being in view of low level income in the rural areas. The government grant should be distributed on an equitable basis for the whole country area in terms of served population ratio and/or health/sanitation improvement aspects.

Effort should be made to encourage sound financial management in public water supply projects. Water tariff should be reviewed regularly and revised as necessary. Until the time when self-paying operation is established at each water supply system, it is desirable to apply a common water tariff, probably each for urban and rural schemes, throughout each District with the exceptions of such areas that specifically higher rates should be applied for control of the overall quantity of water consumptions (e.g. Nairobi and Mombasa requiring extensive water transfer, Nakuru requiring regional environmental conservation).

One of the objectives of public water supply is to provide essential amenities for general social well-being. Water tariff should be so designed to impose a low water charge rate for the minimum consumption to meet basic needs. To encourage water saving, on the other hand, a progressive water charge rate should be introduced. This concept is already discussed in many reports and documents (e.g. Ref. P.8 and Ref.P.9).

In case of self-help schemes, settlement schemes, and some of rural water supply schemes which aim to meet the basic needs, the beneficiaries may be required only to meet the cost of operation and maintenance of the project.

5.5.3 Charging policy for sewerage works

Public sewerage system benefits mainly the direct users of the facilities. Non-users living in the area may only be benefited by the improved public health environment attributed to the sewerage works. Similar to the case of public water supply works, the charging system in sewerage projects should be based on self-paying principle and accounted for separately. Sewerage charge in the form of a surcharge to the water supply charge should be implemented in accordance with this principle. The determination of charge rates will have to take into account the capacity of the beneficiaries to pay, which should, however, not be assessed too much on the low side.

House assessment revenue will be another revenue source of sewerage account for supplementing the revenue accruing the sewerage charge in the event that such a charge alone cannot fully recover the costs. House assessment revenue accrues from the assessment rate imposed on the whole area regardless of whether it is entirely served by the sewerage system. Allocating a certain portion of the revenue to the sewerage account is presumed acceptable on the basis that the public sewerage system is ultimately to be extended to serve the whole area for reason of public health improvement and for administrative efficiency.

In the development of new housing and/or industrial estates, the developers should either construct the necessary sewerage system at their expense or bear the cost of extending the existing facilities to serve the newly developed area.

To encourage the development of sewerage systems in municipalities, the government should continue to extend the assistance of financing in terms of loans to local authorities. For areas where sewerage development is urgently needed from viewpoint of public health improvement and river water pollution abatement, the government may consider a measure of extending a soft loan to the local authorities concerned, which would be applied for a limited time span in the short term future.

5.5.4 Charging policy for irrigation and agricultural drainage

Cost recovery in respect of irrigation and agricultural drainage projects is minimal in most countries. In a number of projects in Kenya, no attempt has been made to recover even the operation and maintenance cost. Although it is a fact that irrigation and agricultural drainage projects benefit solely the farmers in the areas concerned, no full cost recovery is recommended for the time being in view of low income level of the farmers in most cases.

An appropriate solution would be to charge rates high enough to recover the operation and maintenance cost taking into consideration the farmers' real income. A part of the rates chargeable may be offset by direct participation in operation and maintenance by the farmers.

5.5.5 Charging policy for flood mitigation and urban drainage works

(1) Flood mitigation works

No flood mitigation charge is imposed in most other countries. This is chiefly due to a specific difficulty of quantifying the entire monetary benefits and defining precisely the beneficiaries of flood mitigation projects.

It is not recommended, in view of this practical difficulty, to introduce a system of flood mitigation charges. The government should continue to finance flood mitigation projects, but excepting the cases in private lands where the land owner is responsible for the remedial measures (Water Act: Section 13).

(2) Urban drainage works

Urban drainage system is a network of main, secondary, and tertiary drains, primarily for the purpose of collecting and conveying drainage water from discrete areas in the town. No clear relationship can be established between individual beneficiaries and the portion of the drainage facilities serving them. However, it would be logical to presume that an urban drainage system in the aggregate serves all the people in the town concerned. Hence, the cost of main, secondary, and tertiary drains should be financed from tax revenue of local authorities. The cost of infrastructure drains in discrete areas should be borne by those individuals who directly benefit from them.

5.6 Compensation for Adverse Effects

The implementation of water resources development projects involves in some cases adverse effects such as the submergence of agricultural lands and houses by a storage reservoir. The parties and individuals affected by such adverse effects should be equitably compensated and the cost for compensation and/or remedial measure be included as a part of the project cost.

All adverse effects cannot be quantified in monetary terms. Monetary compensation may not be appropriate in all cases. In some cases, it may be desirable to make compensation in goods and services; for example, in equivalent land, housing and/or job opportunities. This is particularly important for rural people where different tribes live in confined areas.

5.7 Watershed Protection

(1) Protection of Catchment Area

According to the provision of Section 14 in the Water Act, the Minister for Water Development can designate any part of catchment area where special measures are necessary for the protection of water resources.

Important areas for protection are forest areas, particularly, indigenous forest lands. In fact, there are in most cases many springs around the forest lands, which indicates the forest forms natural water reservoirs. This Study had attempted to summarize an inventory of springs, but found that the locational information was available only for some 200 springs. They are shown in Figure P5.3, together with the locations of major forest lands appearing on 1:250,000 maps.

The following is recommended:

(a) Preparation of spring lists covering the whole country, which include;

- Review and upgrading of spring lists currently filed in MOWD
- Identification of the locations of all springs

The work can be handled by District Water Offices which are acquainted with the local information.

(b) Identification of forest lands which are functioning as the source of springs. This could be done jointly by MOWD head office and local offices. The information will also be available from the Forest Master Plan Study currently in progress by the Ministry of Environment and Natural Resources (MOENR).

(c) Designation of protection areas based on the findings in (a) and (b) above. In principle, all the relevant forests may be listed as the protection area.

The responsible agency for the control of catchment protection will be MOWD in collaboration with MOENR. In implementation aspect, a possible approach may be to assign the River Basin Authorities as implementing agency, but on specific project basis (entrustment from MOWD or MOENR). In view of the important role of MOWD in this activity, MOWD should be provided with sufficient financial resources.

(2) Preservation of Soil

According to the provision of Part IV in the Agriculture Act, the Minister for Agriculture executes the conservation of the soil on any land with the Central Agriculture Board. For this purpose, he makes rules and controls for the following matters:

(a) The breaking or clearing of land for the purposes of cultivation
(b) The grazing or watering of livestock
(c) The firing, clearing or destruction of vegetation including stubble

The functions presently assigned to MOA should remain active in view of importance of soil conservation work so as the intensification of land uses expands in future.

Soil erosion causes not only devastation of agricultural lands in agricultural production aspects but also brings about excessive yield of sediments in the river courses. It is foreseen that more positive works for sediment control in the river courses would become necessary. The works may include the constructions of sand arresting dams (Sabo dams), sand pockets, and river training works. The works will be the responsibility of MOWD, possibly handled by the River Engineering Division to be newly established (see Sub-section 7.2.1).

(3) Nature Reserves of Forest

According to the provision of Section 6 in the Forest Act, the Minister for Environment and Natural Resources may declare a forest area or a Central Forest or any part to be a nature reserve for the purpose of preserving the natural amenities. The Chief Conservation controls the deeds related watershed such as cutting, grazing, removal of forest or disturbance of the flora.

This regulation may be undertaken separately from the catchment protection stated in (1) above. It is presumed that all the nature reserve forests should fall in the protected catchments, but conversely some of the protected catchments may not be forest reserve areas.

In this regard, MOWD and MOENR should exchange information and exercise mutually coordinated regulations from both aspects of water resources conservation and natural amenity conservation.

(4) Permanent Presidential Commission for Soil Conservation and Afforestation

The Commission coordinates the conservation of soil, water and forest resources in the arid and semi-arid areas of Kenya, and forms a basis for a more planned development and protection of agricultural resources in these areas.

Coordination functions of the Commission should continue to be active, since many more conflicting issues between development activities and conservation requirements would be arising in future.

P6. FINANCIAL ASPECTS

6.1 Basic Structure of Public Finance

The autonomous bodies dealing with public finance are classified into two major groups, the central government and the local governments comprising 116 authorities as of November 1990. The central government is the largest body among the public financing sectors in Kenya. In terms of annual expenditure, the central government dealt in the fairly large amount of K£3.1 billion in the fiscal year 1990/91. Due to an increase in demand for more public services, expenditure by the central government has continued to increase at a faster rate than the growth in revenue, as shown in Table P6.1. On the other hand, the local governments have dealt in only 6% to 8% of the total expenditure of the central government for the past five fiscal years, despite the total amount of the all local authorities (refer to Table P6.2).

The current revenue of the central government increased by 77% between 1986/87 and 1990/91. This increase is mainly due to the introduction of Value Added Tax (VAT) which was set up as a part of indirect taxes instead of sale taxes in 1990. The fiscal revenue is broadly divided into three items: direct taxes, indirect taxes and other revenues and incomes, as shown in Table P6.1. Of the total domestic revenue of K£2,459 million in 1990/91, indirect taxes accounted for K£1,387 million or 56%, the largest share among the three revenue items. It consists of import duties and excise duties as well as VAT.

Besides the current revenue, external grants have been one of the most important revenue in the national public finance. It accounted for K£426 million or 17% of the domestic revenue of K£2,459 million in 1990/91, as seen in the table. This external revenue is mainly utilized for the development expenditure of the central government.

In spite of that, the overall deficit of the central government reached K£443 million in 1990/91. Thus, it has been financed by loans through both external and internal financial sectors constantly, as seen in the table. The increase of the external loans brought about a high level of debt-service ratio which was said to be 33.4% in 1989. Thus, commitment of multi-lateral loans is changing to rely on IDA instead of on IBRD since 1987. In addition, raising funds for public finance in the financial market has weakened liquidity for private financial demand. As a result, it appears to cause a crowding-out phenomenon in the financial market.

In Kenya, the estimation of current budget started from the beginning of the previous fiscal year on the basis of the circular dispatched by the Ministry of Finance (MOF). Through the appropriation of the parliament after two negotiations between MOF and other Ministries, the current budget is applied into use from the beginning of the current fiscal year. This budget calendar is illustrated in Figure P6.1

6.2 Disbursement of Government Funds

The budget of the central government is commonly composed of both recurrent and development estimates. Due to an increase of completion of on-going projects and an increased demand for more public services, the recurrent budget has continued to increase at a higher rate than the development budget. The recurrent expenditure increased about 4.8 times between 1979/80 and 1989/90, but the development expenditure was about 2.5 times during the same period, as shown in Table P6.3.

From the point of view of government services, major shares in the total expenditure are accounted for by education, defense, agriculture and health, as seen in Table P6.4. Expenditure for physical infrastructure services were as follows in 1990/91: (1) Electricity, gas and water supply, accounted for K£89 million or 2.2% of the total expenditure; (2) Road, K£113 million or 2.8%; and (3) Transport and communications, K£41 million or 1.0%. The total expenditure of these three services accounted for K£243 million or 6.1% of the entire expenditure. It fluctuated between 5.2% in 1987/88 and 6.7% in 1988/89 of the entire expenditure for the recent five fiscal years.

For the sake of promotion of water resources development projects, it is imperative to make the development budget increase to a satisfactory amount. Table P6.5 shows the development expenditures approved by the parliament for the late five fiscal years. In 1990/91, the top five ministries regarding the amount of development expenditures were; (1) Ministry of energy (MOE), with the amount of K£146 million, (2) Ministry of Public Works (MOPW), K£114 million, (3) Office of the President (OP), K£85 million, (4) Ministry of Education (MOEd), K£76 million and (5) Ministry of Water Development (MOWD), K£75 million. Thus, MOWD is given a big amount of the public finance, and is considered to provide one of the most essential public facilities for the people.

Yet, the government has introduced the expenditure ceilings system to improve the financial deficits on the occasion of the forward budget exercises as mentioned in Treasury Circular No.6 (Ref.P.23). The system corresponds to the public investment program, and forces to select effective and urgent projects among on-going and newly proposed projects within the expenditure ceilings for the time being. This policy is considered not to suppress the capital investment but to allocate more funds to the priority services and projects and to utilize available budgetary resources more efficiently.

6.3 Grants and Loans

Foreign assistance (official development assistance: ODA) to Kenya constantly increases and reached K£542 million (equivalent about US$500 million) on a gross basis in 1989/90, although the amount in 1990/91 went down to K£515 million (about US$430 million). There were 37 ODA donors to Kenya in 1990/91, which were broken down to 18 multi-lateral organizations and 19 bi-lateral countries. In ODA, the ratio between loan and grant was about 3:4 in 1990/91 and this ratio has not changed drastically in recent years, as seen in Table P6.6. The top five donors in 1990/91 were (1) France, (2) European

Development Fund (EDF/EEC), (3) Japan, (4) IDA and (5) West Germany in order of the total gross amount of both loans and grants.

Regarding grants, the largest donor was EDF/EEC among all donors to Kenya. It accounted for K£60.6 million or 21% of the total grants in 1990/91. Of bi-lateral donors, the countries which granted a sum of more than K£20 million in the same fiscal year were the following six countries: (1) West Germany, (2) Finland, (3) Japan, (4) United Kingdom and (5) United States of America (USA). The total amount of these six countries was K£139 million or about a half of the total grants.

In the fields of loans, the largest donor was France in terms of gross amount in 1990/91. It accounted for K£71 million or 31% of the total loan amount. Succeedingly, IDA and Japan were the top donors, which accounted for K£58 million (25%) and K£36 million (16%) in the same fiscal year, respectively.

Total outstanding external debt of the central government aggregated to K£3,419 million as at June 30, 1990. The largest creditor was the World Bank, of which the total amount was K£1,018 by IBRD and K£493 million by IDA. In bi-lateral donors, West Germany used to be the largest creditor until 1988, but after debt write-off by the German government in 1989 Japan became the largest creditor for the government of Kenya. The outstanding debt from Japan amounted to K£428 million at the end of the fiscal year 1989/90. At present, the government of Kenya is trying to reduce the external debt through the debt management strategy. Finally, the government has an end in view of decreasing the debt-service ratio from 33.4% in 1989 to 25% by 1993.

6.4 Financing of Water Related Undertakings

Table P6.7 shows annual budget allocation for projects and program related to water development during the fiscal year 1981/82 to 1989/90 and during forward budget for 1990/91 to 1992/93. MOWD, the leading Ministry, accounted for K£75 million or 33.4% of the total budget for water development in 1989/90. Its share has decreased in recent years, as seen in the table. However, in the forward budget, its share seems to recover to 44.3% by 1992/93. The table also shows the accumulated total amount deflated by a price index (civil engineering index: Ref.P.24) at 1991 constant prices. According to this accumulation, MOWD accounted for 41.5% of the total budget allocation for development for the above period.

Incidentally, the Ministries related to water development are: MOA, which has jurisdiction over irrigation development; MOLG, over water supply and sewerage schemes by local authorities; MOE, over hydro-power development and KVDA; and MORD, over regional development by TARDA, LBDA, Ewaso Nyiro North Development Authority and Ewaso Nyiro South Development Authority.

The total budget for water development by the above Ministries aggregated to K£225 million in 1989/90, accounted for 22.4% of the total development estimates of the central government. Its share slightly increased during the last ten years, as seen in the table. In

spite of that, the share of MOWD has decrease from 10.1% to 7.5% of the total development estimates, though it will be on the increase in the forward budget as mentioned before.

The budget for NWCPC started from the fiscal year 1989/90. In the first fiscal year, it accounted for K£45.9 million or 61% of the total budget of MOWD. Even afterwards it occupied around 40-50% of the total budget. Thus, as far as the budget allocation is concerned, NWCPC bears an outstanding burden regarding water development in both urban and rural areas of the country. NWCPC is expected to support itself on its own water supply accounting system in the near future. For the time being, however, it seems to be difficult for NWCPC to do so, because most of water supply schemes can not recover even their own O/M costs with their water charges yet.

Besides the central government, local authorities are managing the water and sewerage undertakings mainly in urban areas. They are of course under jurisdiction of MOLG. Their total budget for water management and development projects was tabulated in Table P6.2. Through their management of water related undertakings, they are getting service charges which are internalized into the current revenue and incomes of the local authorities. Although their service charges are one of the most useful for current revenue of the local authorities as sales of goods and services as shown in the table, their service charges do not always recover their full costs, i.e., not only O/M costs but also depreciation of water supply and sewerage facilities.

Table P6.8 shows the external funding for projects related to water development in the fiscal year 1990/91. In terms of the total amount, the largest contributor for the water projects was France from among 37 donors, accounting for K£53.2 million or 37% of the total external funding, as shown in the table. The largest project by France was "Turkwell Gorge Project" promoted by KVDA, which contributed K£50 million by loan and which accounted for 94% of the total French funding. The second largest donor was Japan, accounted for K£31.8 million or 22% of the total. Its financing assistance was distributed among Ministries as follows: K£15.3 million for 4 Projects to MOWD; K£2.0 million for 1 projects to MOLG; K£6.8 million for 2 projects to MORD; and K£7.6 million for 3 projects to MOE. Major donors for water related projects, financed more than K£2 million, were West Germany, Norway, Finland, Italy, EDF/EEC, Canada, Sweden and Netherlands.

Besides the public sectors, the non-governmental organizations (NGOs) are promoting their water supply projects as described in Sub-section 4.4.1.(6). None of the NGOs are said to spend more than a few million shillings per annum on water projects. Among them, CARE is said to be the largest non-religious NGO. CARE's annual budget in 1991 fiscal year was approximately US$300 thousand (K£7.6 million), of which US$190 thousand was spent for water projects. Their funds were procured through Canada, United Kingdom, Norway and Japan as donation for CARE. At present time, CARE employs 18 water and sanitation staffs on three-year contract bases.

6.5 Constraints in Financial Aspects

Owing to the alteration of taxation system, the current revenue of the central government has increased since the introduction of VAT. However, the overall deficit of the government is still large as mentioned in the Section 6.1. Thus, the government introduces the expenditure ceilings system and restricts the expenditure for the new projects, unless the projects have extremely high economic efficiency. Although it is not clear how long this investment program will continues, the ceilings system might be considered to continue for the time being.

In addition, the government tries to improve the crowding-out conditions by reducing excessive treasury bonds and to revitalize the financial market for private financial demands. Thus, the government has to push its fiscal restraint to improve the fiscal situation and to reduce domestic borrowing at present.

Because of the high debt-service ratio in Kenya, it seems to be sensitive for the government of Kenya to increase external debt for project implementation. This will put the country in an awkward position to expect more external loans.

Foreign grants are another important financial source for development in Kenya. Since the Gulf Crisis and social disorder in Eastern Europe and the Soviet Union, however, the world economy seems to grow at moderate rate after several years of reasonable expansion. Thus, the international economic situation is not always favourable for increasing more financial grants for Kenya. In this international scene, however, several leading donor countries are expected to remain strong in economic growth and to support the developing countries continuously in the future.

Excluding a few water works, most water supply and sewerage undertakers can not run their own business on the basis of self-supporting accounts. Although the undertakers are still young and have little experience on management of water business, NWCPC and MOLG are expected to lead them to support themselves by their own accounting in full cost recovering conditions. In that case, NWCPC and MOLG as well as MOWD could bring about new water projects without any financial difficulty. Moreover, so long as the water business succeeds in management, the undertakers could multiply their supply services to their surrounding areas. This would be desirable for water related undertakings.

6.6 Other Issues relevant to Financial Aspect

6.6.1 Cost sharing policy in water supply

MOWD will embark on a cost sharing in water supplies. Although this is a great task which should overpass many constraints and social factors, a gradual move should be made since it is ultimately to be achieved.

At present, a greater portion of the water supply cost is disbursed from the government recurrent expenditures. The first step is to make clear for each water supply system what

portion the government is subsidizing against the total cost. This will be disseminated to the beneficiaries for their understanding to move into a gradual reduction of the subsidization.

6.6.2 Accounting system for water supply and sewerage works

The Study attempted to receive information from local authorities as to the financial situation of existing water supply and sewerage works. However, it found that most of the local authorities did not maintain enough explanatory data to assess whether their water and sewerage schemes were financially viable.

This situation should be improved by introducing a proper accounting system, firstly for major urban supplies operated by municipalities and ultimately for all schemes. This will also be applied to the schemes currently operated by MOWD and NWCPC.

The accounting should preferably be standardized. A very preliminary proposal is;

- Classification of schemes into a few to several types in line with the policy of cost sharing applied to respective schemes
- For each type classified, standardization of the rules of accounting and the method of cost accounting
- Standardization of rules of water charge setting

It is recommended that MOWD, NWCPC, and MOLG jointly seek the best approach to establishing these standardizations.

6.6.3 Prioritization of implementation schemes

It is a fact that the water supply sector has a major constraint in its implementation; that is the limited budgetary resources. However, a great demand is raised from people for early supply of water. This tends in some cases to embark on the implementation of schemes more than the budgetary capacity.

Although this is quite hard to the responsible implementors, a practical approach is to reduce the number of implementation schemes within the constraint of budgetary resources actually available, so that the scheme could be completed at a economical implementation speed. For example, five cyclings of the implementation of 10 schemes for a two-year period in one cycle would be more cost effective than the implementation of 50 schemes over 10 years.

P7. RECOMMENDATIONS ON OTHER ISSUES

7.1 Legal Aspects

The Water Act was originally established in 1951 and revised once in 1972. Since then, the situations surrounding water development and use have changed a lot. MOWD has recognized various deficiencies, contradictions and/or constraints in implementing the Act in actual undertakings of water development. MOWD has already launched a revision of the Act inviting comments from all divisions/sections/regional offices and also from other water-related agencies. The draft version of the Revised Water Act had been discussed with the Attorney General Chamber and is at Cabinet level as of May 1992.

The Water Act is the principal law for water development and use in Kenya. The revision of the Act should be made to harmonize with other laws related to water. The revision work is a great task requiring many inputs. It is almost beyond the capability of this Study to look into every details of the necessary revisions.

Sub-sections hereunder describe only major issues noted by the Study relevant to the formulation of the master plan.

7.1.1 Defunct Water Resources Authority and Regional Water Committee

As is already discussed in MOWD, the name of the Water Resources Authority will be excluded from the configuration of the present laws. Two aspects which should appear in the revised Water Act are;

(a) Cease of the functions of Water Resources Authority
(b) Assignment of the similar functions to MOWD or otherwise to a special body to be established under the umbrella of MOWD.

Likewise, the Regional Water Committee should also be defunct legally. The functions appear now to have been transferred to the District Water Board (see Section 3.3).

7.1.2 Tana and Athi Rivers Development Authority

According to the provision of the Tana and Athi Rivers Development Act, this Authority was established to advise on the institution and co-ordination of development projects in the basins. But, practically the Authority is acting as an implementation agency and, in fact, it has already constructed Masinga Dam and Kiambere Dam.

To execute existing function and further integrated water management, the Act should be amended so that the Authority is empowered to exercise not only planning but also construction, operation and maintenance, like the Kerio Valley Development Authority and the Lake Basin Development Authority.

In the Tana and Athi river basins, there may arise many conflicts in water use in the future in view of large water demands there, wherein the attainment of integrated water development and use would be essential. In this regard, the role of the Authority would be increasingly important as a multi-sector development agency.

7.1.3 The Water (Water Undertakers) Rules

The Rules, made under Section 182 of the Water Act, apply to the gazetted water undertakers. It is proposed that the principles of the Rules should apply to non-gazetted water undertakers as well.

Many of the rules, as well as some provisions of the Water Act, are not applied to local authority water undertakers. It is proposed that the same rules do apply to all water undertakers.

7.1.4 The Lakes and River Act

This Act mainly provides regulations for dredging and use of steam vessels on certain lakes and rivers. The Act is administered by the Ministry of Transport and Communications.

In view of increasing need for the protection and management of river courses (and possibly lakes), relevant regulations may be added to this Act. In this case, MOWD will be closely related to the Act. The provisions shall be consistent with those in the Water Act.

7.1.5 The Local Government Regulations

Power to undertake sewerage, drainage and water supply works is given to municipal councils, urban councils and area councils in Part XI of the Regulations. The water supply provisions include the power to supply water, establish and maintain waterworks, and make bye-laws. Every local authority, whether a water undertaker or not, can compel the provision of a proper and sufficient water supply.

To make more clear the relation between the local authority' power in this Regulation and the Water Act, it is desirable to have a provision that every local authority undertaking water supply is to be a water undertaker to be appointed under the Water Act.

7.1.6 Establishment of environmental assessment and management guidelines

There are no established comprehensive environmental guidelines in Kenya, other than a guideline included in the Environmental Management Report (NES, 1978). Since environmental conservation is an increasingly important issue in the future, the preparation of comprehensive guidelines will be a prerequisite requirement. The guidelines shall cover both the principle rules of environmental impact assessment and environmental management plans.

In preparing the guidelines, the following will be usable as reference literatures;

(a) Guidelines for Integrated Regional Economic cum Environmental Development Planning, Asian Development Bank, 1988

(b) The World Bank Operational Manual, Operational Directive 4.00, Environmental Policy, World Bank, 1989

(c) Environmental Planning and Management and the Project Cycle, Asian Development Bank, 1988

(d) Environmental Guidelines for Selected Infrastructure Projects, Asian Development Bank, 1988, each covering water supply, irrigation, hydropower, and industrial development, forestry development, sewerage and excreta disposal, etc.

The guidelines should of course suit the conditions prevailing in Kenya and cover the items particular to Kenya. Hence, the preparation of the guidelines will be a great task possibly needing several years or more. National Environmental Secretariat (NES) is the agency capable of handling this issue.

The guidelines, once formulated, would act as a leading law with regard to the management of the environment. Another importance is that there is need to harmonize the various legislations with specific interest to water resources. There may arise strong needs to strengthen the existing laws at appropriate levels.

7.1.7 Implementation of laws

(1) Existing problems

There are many acts, rules, regulations and by-laws with regard to water supply, sewerage, and water pollution, and so there is a multiplicity of agencies involved in their implementation and enforcement. Further, much of the administration seems to be handled by the central administrations and in many cases prosecutions must be by the Attorney General.

A study in 1973 (Ref. 2) reported that most of the problems encountered arise from a low level of implementation and enforcement of the law, rather than any serious deficiencies in the legal provisions. The report stated the reasons for this low level of enforcement might be summarized as follows:-

(i) The division of responsibilities among many agencies, with little coordination. At best this makes for procedural difficulties, and at worst leads to lack of interest.

(ii) The number of laws involved which may be difficult to understand and correlate, particularly by the subordinate officials concerned.

(iii) The demise of the Water Resources Authority and the Regional Water Committees. (NB: But, this is now not valid since the functions have been taken over by MOWD).

(iv) Lack of experience of enforcement procedures by officials and lack of case law.

(v) Staff shortages.

(vi) *Inability to take Water Act prosecutions to subordinate courts quickly.*

(vii) An absence of what can best be described as the "philosophy of enforcement", particularly at senior levels. This is to some extent reflected by the comparatively junior grade of the official responsible for enforcement.

(2) Decentralization of implementation responsibilities

As one of measures for tackling the existing problems, this Study proposes that, in principle, the practical responsibilities for the implementation and enforcement would be entrusted to the district offices of each Ministry or local authority, and they would handled the exercises (presumably, most issues by the offices of water bailiff and local authority). In case any issues requiring the coordination among sectors should arise, they would be reported to and coordinated by the District Water Board which has been recently established (see Section 3.3). This decentralization of responsibilities will call for the level-up of spirits of the officials towards the positive solution of the issues occurring in their districts and thus improve the efficiency of the exercises.

The District Water Board may be assigned as a body to receive the first arise of any appeals and disputes with regards to water related issues. Only issues not solved at the technical levels of the District Water Board, Catchment Board, and finally at Water Apportionment Board may be referred to the subordinate courts in the districts.

(3) Training of the officials

The officials in charge of the implementation and enforcement shall have sound knowledge with regard to the implication of the laws (not only the text of law but also the reasons for it), the extent and limit of their powers and also the effective procedures leading to a successful prosecution or dispute settlement. In this context, training in legal aspects is very important for the officials involved in these issues (e.g. water bailiffs, health inspectors, provincial/district water engineers). The training program in the form of annual seminars should be established in each ministry/agency as is proposed for of water bailiffs (see Sub-section 5.1.3).

It is proposed that a senior officer (presumably an experienced water engineer or bailiff) be assigned as a chief legal training officer within MOWD or WAB, who would be in charge of the training of officials concerned with legal implementation issues. WAB may have a few lawyers to exercise the training as well as to handle the legal issues which would actually arise.

(4) Public relations campaign

On implementation aspects, some educative efforts should be attempted to make the public aware the implication of laws together with the importance of water resources. The public will be explained through appropriate measures of public campaign that enforcement of laws is not only for national interest but also for the benefits of people including himself and his neighbors.

The measures of public relations campaign will include (Ref. P.2):

(a) Articles in the press and magazines
(b) Preparation and distribution of simple illustrated booklet on water law
(c) Talks by appropriate officials to societies, luncheon clubs, schools and the like
(d) Tactful and well-informed officials visiting offenders and explaining relevant law and reasons for it
(e) Newspapers etc. reporting on prosecutions

(5) Wider use of existing powers

There may be many provisions needing changes to improve the institutional efficiencies and/or to facilitate the implementation/enforcement of legal provisions. It is beyond the capacity of this Study to go into every details of those issues. Nevertheless, it seems that many changes and/or improvement could be made under existing laws. For example, Section 125 of the Water Act allows the Minister to permit or order the combination of undertakings, which could be used for minor or major organizational changes (Ref. P.2). There are many other cases of wide powers allowed in existing laws, which are unused fully. A practical approach would, therefore, first be the wider use of existing powers allowed in existing laws, and then the changes of provisions as identified through accumulation of experiences in implementation and enforcement.

(6) Absence of case law

A previous study (Ref. P.2) stated that one of the by-product of the law level of enforcement is the absence of case law. This is agreeable. However, it will take a long period to accumulate cases of appeals and disputes, since not many cases will arise which would be tested in the courts. A practical approach may be to accumulate the cases of appeals and disputes in the records of the Water

Apportionment Board, which could be usable materials for training of water bailiffs and other officials concerned.

To make the public aware the implication and actual application of laws, a few of the case laws may be to publish in Kenya Gazette or on newspapers which are more circulated and read than the Gazette.

7.2 Institutional Aspects

7.2.1 Establishment of new Divisions/Sections in MOWD

As is shown in Figure P3.1 the present organizational set-up of MOWD is primarily on a functional basis. This seems to be appropriate. To strengthen further the functional capabilities in certain field, this Study proposes the establishment of the following new Divisions/Sections:

(1) Water Apportionment Division

Presently, the Water Apportionment Section is supporting the activities of the Water Apportionment Board. As was described in Sub-section 5.1.1, the responsibilities of the Water Apportionment Board will become increasingly more important so as the water uses and conflicts will possibly increase in the future. Accordingly, the duties assigned to MOWD's Water Apportionment Section will also increase and hence the section should be reinforced further with more staff to be assigned. The Study assumes it more efficient to reinforce MOWD's capacities rather than to assign technical functions to the Water Apportionment Board.

The new Division will have the following two Sections:

(a) Water Apportionment Section

- Management of water abstraction permit data
- Technical advice to the Water Apportionment Board on issuing water abstraction permits
- Updating of data relevant to permissible abstraction rate in each river, receiving collaborations from Surface Water Section in hydrological aspects\

(b) Water Use Monitoring Section

- Processing of water use monitoring data forwarded from Water Bailiffs
- Recording of any illegal water abstractions and uses

- Technical supports to Water Bailiffs including their training

The Water Apportionment Board will remain to handle inter-agency coordination/decision issues as is presently functioning.

(2) River Engineering Division

The administration and management of rivers and associated facilities will be an important assignment to MOWD. It is proposed that the Division will consists of the following three Sections:

(a) River Administration Section

- Management of river ledgers indicating the river statistical data, associated facilities, low and high flow statistics

- Inspection and patrol of rivers and facilities to identify any potential problems

- Technical advice to the Water Apportionment Board with regards to approval of any construction works on the rivers

- Land use control in river area associated with future river improvement works and flood plain conservations

(b) River Engineering Section

- Systematic recording and filing of flood records including hourly rainfall and water stage data on occasions of flood in the rivers where flood is a prominent problem

- Planing, design and implementation of river improvement works including flood mitigation projects and the establishment of flood forecasting/river improvement works including warning systems

- Establishment of a flood fighting system on a regional basis for the rivers with dykes

(c) Urban Drainage Section

- Overall planing and prioritization of drainage schemes in municipalities/ urban centres

- Technical advices to municipalities/urban centres with regard to their proposed urban drainage works

(3) Sewerage Division

Sewerage works will also be an increasingly important task for MOWD in the future. At present, the duties related to the sewerage works are distributed to several Divisions.

Unlike the water supply undertakings, MOWD is not the direct undertaker of sewerage works. The works are the responsibility of municipalities/urban centers. This Study assumes that this implementation system should remain unchanged in the future. The MOWD will act as the overall planner and administrator in this sewerage work field.

With a view to achieving closer relation with municipalities/urban centers and simplifying the flow of communications, an idea is to establish a unified Division handling all aspects of sewerage works within MOWD. The division will be divided into the following three Sections, each of which would have a minimum number of specialized personnel:

(a) Sewerage Planning Section
(b) Sewerage Design and Construction Section
(c) Sewerage Operation and Maintenance Section

(4) Research Institute under Research Division

The present Research Division is responsible for formulation of water research policies and objectives, coordination of research activities in water resources and waste water engineering, liaison with other national and international research and development organizations related to water research. These functions will be maintained and expanded as the most important duties of the Research Division.

A programme worthy of proposing is that the Division will have a Research Institute equipped with physical research facilities such as hydrological experiments, hydraulic model test facilities, water laboratory, soil/concrete laboratory and other equipment for research of new water technologies. However, this will require a large amount of budget and hence is regarded as a long span programme.

7.2.2 Expansion of Kenya Water Institute (KEWI)

(1) Background of KEWI

The Kenya Water Institute was started as a small Training Unit within the Hydraulics Branch of the Ministry of Works in 1960. In 1970 it became a Training Section within Operation and Maintenance Branch of Water Department in the Ministry of Agriculture. However, when the Ministry of Water Development was

created in 1974, the Training Section became the Water Staff Training School and later developed into the present Kenya Water Institute (KEWI) in 1985.

(2) Role of KEWI

The main role of the Kenya Water Institute is to train sub-professional manpower for the entire Water and Sanitation Sectors. In addition, it provides orientation courses for various professionals joining the Ministry of Water Development. It therefore serves the Ministry of Water Development, Local Authorities, the recently established National Water Conservation and Pipeline Corporation (NWCPC) and other organizations operating water supply and sewerage schemes in Kenya.

The Kenya Water Institute is the only institution in the country training exclusively for the Water Sector and therefore plays a very important role of human resources development for the entire Water Sector.

(3) Training Programmes

The Kenya Water Institute offers both Diploma and Certificate courses as detailed below.

i) Diploma courses (3 years duration) in Water Technology in the following options:

- Water supply
- Environmental Technology
- Groundwater and
- Surface Water

ii) Certificate courses (2 years duration) in Water Technology in the following options:

- Water Supply
- Waste Water
- Groundwater
- Surface Water

iii) Operation courses in

- Sewerage
- Water Supply

The operators courses consist of three stages, Basic, Intermediate, and Final. Each stage is of three months duration. However, the three stages are conducted in three consecutive years.

iv) Induction courses for newly recruited professionals joining the Ministry of Water Development.

v) In-service courses for various cadres.

(4) Needs of expansion of KEWI

KEWI will have an increasingly important role, since the development of water and sanitation sectors will apparently need more skilled personnel.

- Increase in number of water supply and sewerage systems as the service area expands to cover a larger population

- Gradual transfer of the systems to local authorities (see Sub-section 4.5.7)

These require the training of operation and maintenance crews.

KEWI has at the moment a capacity of training some 300 students. However, this will not meet the future increasing demand. Although the long-term expansion plan should be based on a more detailed forecast, the number of students will presumably have to be doubled within several years. The expansion of KEWI will need the additions of equipment (e.g. laboratory equipment, computers), building spaces and number of tutors. In view of the nature of proposed development, a grant assistance as has been given by IDA shall be provided.