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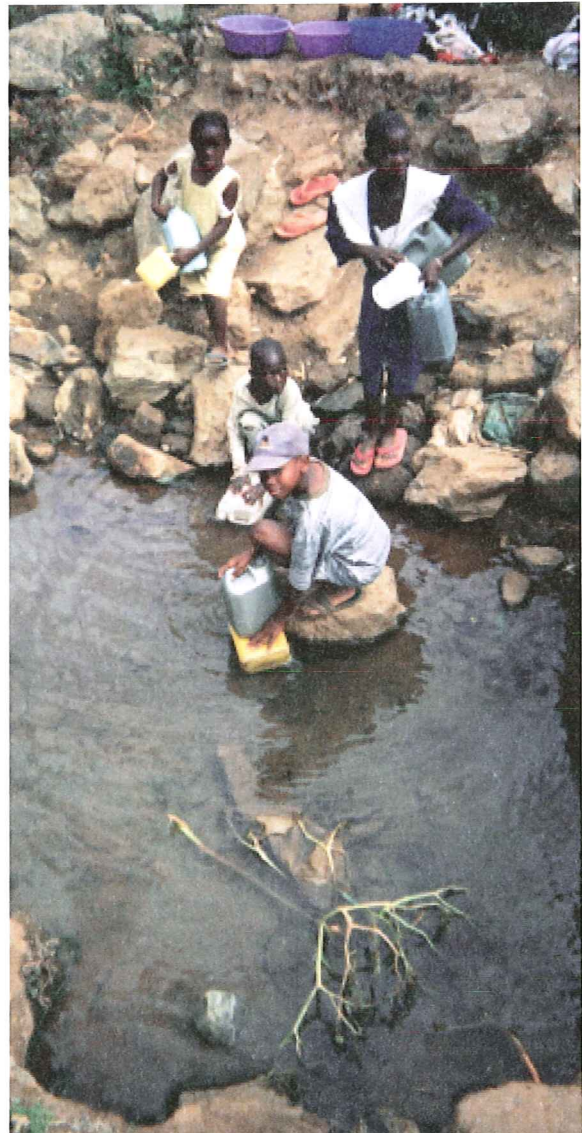
Managing Water for African Cities

Nairobi City

Implementation Plan

Environmental Component

Appraisal Report



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<p>Abstract</p> <p>This is an appraisal of the environmental component of the Nairobi City Implementation Plan under the Habitat guided programme "Managing Water for African Cities". The objective of this appraisal was to ensure the conformity of the plan with the objectives of the Regional Project and Kenya's needs and to explore the availability of domestic resources (human, institutional, and financial) required for efficient project implementation. The appraisal provides input for the revision of the environmental component of the City Plan using the LFA method. The envisaged project interventions include the development of a management strategy for the Ngong river catchment with particular emphasis on the Nairobi Dam, implementation of community-based improvement measures, environmental surveillance systems, public awareness building, and performance monitoring and dissemination of best practice information. This is to demonstrate in practice the potential benefits of catchment-wide and integrated approaches with a view to scaling up best practices in city-wide investment projects.</p>

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Preface

The Cape Town declaration adopted by African Ministers in 1997 recognises that increasing population and rapid urbanisation in Africa pose a serious threat of depletion, pollution and degradation of freshwater supplies, especially in the high-density areas. Since the cities are important driving forces in the political and socio-economic development, special emphasis is needed for the protection and sound management of local water resources and catchment areas, and equitable sharing of water between urban needs. The “Managing Water for African Cities” is implemented and promoted jointly by Habitat and UNEP within the framework of the United Nations Systems-wide Initiative for Africa and is responding directly to the Cape Town Declaration. The aim of the project is to promote integrated urban water resource management and building capacity in key local and regional institutions paying attention to the links between water, urban development and the environment in seven selected cities. These are Abidjan, Accra, Addis Ababa, Dakar, Johannesburg, Lusaka, and Nairobi. These cities have prepared individual City Implementation Plans addressing effective water demand management (WDM) and actions to mitigate the environmental impact of urbanisation on freshwater resources and aquatic systems. The environmental components of these plans are being reviewed with the aim to assist the cities in pursuing the implementation of the city plans.

The undersigned has, in close collaboration with the national co-ordinator Mr. Michael Makuro, the environmental co-ordinator, Mrs. Leah Oyake of NCC, and other concerned Kenyan institutions, reviewed the City Implementation Plan for Nairobi. Dr. Graham Alabaster, Programme Manager and Dr. Anna-Maj Lahdenperä of Habitat Nairobi actively participated in the appraisal. I would like to express my thanks to all people met for their kind support and valuable contributions during the review mission.

The depth of this appraisal is at reconnaissance level, which means that the accuracy and detail are within the limits of a desk study with incomplete verification and fieldwork. The report solely reflects the views of the undersigned, which do not necessarily correspond to either those of neither the Government of Kenya nor those of HABITAT or other institutions mentioned herein.

Oslo, 31 August, 2000

Torbjørn Damhaug

Abbreviations

CBO	Community Based Organisation
DO	District Officer
EC	European Commission
EMIS	Environmental Management Information System
ESA	External Support Agency
ISCC	Informal Settlement Co-ordination Committee
KDO	Kibera District Office
KIP	Kibera Infrastructure Project
KOEE	Kenya Organisation for Environmental Education
KUESP	Kibera Urban Environmental Sanitation Project
LFA	Logical Framework Approach
MENR	Ministry of Environment and Natural Resources
MoLG	Ministry of Local Government
MWAC	Managing Water for African Cities
NCC	Nairobi City Council
NGO	Non Governmental Organisation
NIVA	Norwegian Institute for Water Research
SSA	Sub-Saharan Africa
UNCHS/HABITAT	United Nations Centre for Human Settlements (HABITAT)
UNDP	United Nations Development Programme
UNFIP	United nations Foundation for International Partnership ("Turner Foundation")
WDM	Water Demand Management

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SUMMARY

1. The Government of the Republic of Kenya and UNCHS/HABITAT recently signed a Memorandum of Understanding under the auspices of the project “Managing Water for African Cities”. The report in hand is an appraisal at reconnaissance level of the environmental component of the Nairobi City “Plan of Action”.
2. The review confirmed that the required Kenyan competence and keen interest in implementation of the Plan are in place at operational level. The members of the Co-ordinating Secretariat for the environmental component have been identified and the appointment of them is in progress. Nevertheless, it is essential that that the ToR and mandate of the environmental "task manager" and the key team members will soon be settled and that the implementation process gains momentum.
3. According to the "Plan of Action", the focal point of the environmental component is to address the current pollution problem of the Nairobi Dam and initiate remedies to combat the hyacinth problem at the dam. The appraisal suggests broadening the focus to cover the management of the Ngong River catchment, of which the Nairobi Dam constitute one challenge posing multiple opportunities for recreation, production of biomass, treatment of the river water, and environmental education site.
4. The mission suggests that the main project interventions should be as follows: (i) Development of an action plan for management of the Ngong River; (ii) Implementation strategy for management of the Ngong River; (iii) Establishment of an environmental surveillance and information system; (iv) Implementation of demonstration projects in the Ngong catchment; (v) Initiation of public awareness raising actions; and (vi) Evaluation, performance monitoring and information exchange. The Terms of Reference and budgets for each of these outputs have to be prepared.
5. The implementation plan for the Nairobi City Demonstration Project has great potential to benefit from, and add value to, associated projects with corresponding objectives, such as the Kibera Urban Environmental Sanitation Project, the Community Education and Awareness programme, and the Nairobi River Basin Project.
6. The tentative implementation horizon is four years within a tentative budget of some US\$102,000 for the first year. The final action plan may incur redistribution of the funds among project activities under the current budgetary ceiling. Opportunities for future supplementary funding should be explored.
7. The environmental task team includes (i) Water Resource Management: NCC - Water & Sewage Department and MENR – Department of Water Development; (ii) Urban Development: NCC - Urban Development Dept. and MoLG; and (iii) Environment: NCC – Environment Dept. and MENR. The environmental component task leader is from the NCC – Environment Department.
8. The mission’s findings and recommendations were presented and discussed in the wrap-up meeting with the national co-ordinator, the environmental co-ordinator and the HABITAT team. A Mission Report with major findings and recommendations was submitted on April 14 and is further elaborated in this appraisal report. The environmental sub-committee must, however, further elaborate on the recommendations and project design contribution given in this appraisal report before merging them into the implementation plans of the environmental component.

9. The immediate actions on the Kenyan side would be to continue project mobilisation and inception under the guidance of the Co-ordinating Secretariat and in consultation with HABITAT in order to:
- finalise the Plan of Action using the LFA method;
 - prepare terms of reference for the environmental task leader and other team members;
 - prepare ToR , budget and initiate the rapid assessment, if necessary with the assistance of an external consultant;
 - establish administrative procedures and responsibilities, accounting systems, auditing arrangements, reporting routines, and quality assurance;
 - vitalise their involvement in the WACnet information exchange activity.

1. INTRODUCTION

This report is a summary of findings and recommendations from an appraisal mission to Nairobi, Kenya, from March 27 to April 3, 2000. The time spent in Nairobi was shared between this appraisal and co-operation with HABITAT in outlining a revised regional implementation strategy. The appraisal was undertaken by Torbjørn Damhaug, technical advisor from the Norwegian Institute for Water Research (NIVA) Oslo with the support of Anna-Maj Lahdenperä and Graham Alabaster from HABITAT Nairobi. The mission met with the national co-ordinator and the environmental co-ordinator of Nairobi City Council and other Kenyan institutions involved in the City Implementation Plan. A Mission Report summarising the major findings and conclusions was submitted on April 14. This appraisal report gives some supplementary information and assessments for the revision of the Nairobi City Plan under the auspices of this UNCHS (HABITAT) guided programme.

1.1 Managing Water for African Cities

This review is carried out as part of the “Managing Water for African Cities” (MWAC) programme. The MWAC is implemented and promoted jointly by UNHCS (HABITAT), UNEP and the United Nations Foundation for International Partnerships within the framework of the United Nations Systems-wide Initiative for Africa, and responds directly to the Cape Town Declaration¹ (1997) adopted by African Ministers.

The aim of the MWAC is to promote integrated urban water resource management and building capacity in key local and regional institutions **paying attention to the links between water, urban development and the environment** in seven selected cities. These are Abidjan, Accra, Addis Ababa, Dakar, Johannesburg, Lusaka, and Nairobi. The objectives of the Project are to:

- promote integrated approaches to managing urban water resources;
- improve efficiency of water use in urban areas;
- improve knowledge base of the impact of urbanisation on freshwater resources;
- improve exchange of information and good practices on water resources management for urban areas.

The Project includes the preparation of individual city implementation plans addressing the following inter-connected components:

1. develop an effective water demand management (WDM) strategy for efficient water by the consumers and in African Cities;
2. mitigate the environmental impact of urbanisation on freshwater resources and aquatic systems by:
 - setting up early warning mechanisms for timely detection of “hot spots” where sustainability is likely to be threatened
 - assessment of long-term environmental impacts of large cities on the continent’s water resources.

¹ UNCHS (HABITAT) Partnership in the Water Sector for Cities in Africa. Report on the Cape Town Consultations 8-10 December 1997.

The city implementation plans are explained in the Project Implementation Strategy² and the associated Implementation Strategy for the Environmental Component³ (currently under revision). The MWAC is the first comprehensive initiative to support local and national governments and their partners to effectively cope with the growing urban water crisis and related environmental impacts.

1.2 Appraisal approach

The terms of reference for this external review of the environmental component of the Nairobi City Implementation Plan⁴ call for the following responsibilities of the technical adviser:

- assist in appraising the city implementation plan in the area of environmental assessment/pollution control to ensure broad conformity with the objectives of the Project: “Managing Water for African Cities” and compliance with Kenya’s priorities and needs;
- initially assess the available institutional and human resources capacity required for efficient project implementation.

The depth of this appraisal is at **reconnaissance level**, which means that the accuracy and detail are not determinant in planning of the environmental component, as it is based on a desk study with limited verification in the field. It provides, however, some observations and recommendations as input to the implementation of the environmental component.

The review of the environmental component of the City Plan comprised meetings with NCC and other key institutions. The appraisal mission familiarised itself with essential reports, information systems, and recent initiatives towards improved management of the city's water resources.

The appraisal mission noticed that the environmental component of the City Plan is well designed and the NCC has made substantial progress in preparing for the implementation. Hence, this appraisal report has more the character of proposing certain adjustments of the project plan for the consideration of the Co-ordinating Secretariat.

The mission's findings and recommendations were presented and discussed at the wrap-up session with the city manager and the environmental co-ordinator at the HABITAT office April 4, 2000. The preliminary findings and recommendations were presented in a handout at the meeting as a basis for the discussions. The main findings and recommendations including the inputs from the wrap-up meeting were presented in the Mission Report of April 14 and have been further elaborated in this appraisal report. The recommendations and project design contribution given herein must, however, be carefully examined and revised by the environmental project team and merged into the implementation plans of the environmental component.

² UNCHS (HABITAT) and UNEP: Managing Water for African Cities: Volume 1: Project Implementation Strategy. Expert Group Meeting Cape Town, South Africa, 26-28 April 1999.

³ Managing Water for African Cities: Project Implementation Strategy - Mitigating the Impact of Urbanisation on Freshwater Resources (under revision).

⁴ Managing Water for African Cities: "Draft Plan of Action Water Supply Management and Pollution Control Demonstration Project for the City of Nairobi". Undated.

2. OVERVIEW OF THE ENVIRONMENTAL COMPONENT

2.1 Overall progress of the City Plan

According to the records from the City Managers meeting in The Hague in March 2000 the overall progress and pending plans are briefly as follows:

2.1.1 Progress

- the Memorandum of Understanding recently signed;
- institutional arrangements in place and several meetings held;
- study tour to Johannesburg, Durban and Windhoek;
- pilot areas identified and WDM demonstration projects designed in close consultation with stakeholders;
- awareness campaigns started;
- internet connection established;
- work plan for next period prepared;
- budgets according to UNFIP guidelines submitted;
- funds not fully dispersed.

2.1.2 Plans for the next 6 months

- more momentum to the City Plan;
- appraisal of the environmental component in April–May 2000;
- City Implementation Plan inception workshop and action plan;
- continue public awareness campaign;
- implementation of WDM retrofit interventions;
- implementation of rapid assessment of the environmental component in Ngong river catchment including Nairobi Dam and Kibera settlements;
- complete internet connection;
- contribution to regional initiatives.

2.1.3 Committed actions

Action	Responsibility	Deadline
Appraisal environmental component	UNCHS/NIVA	31.05.00
City Plan inception workshop and action plan	CM	15.06.00
First progress report on Public Awareness	CM	30.06.00
First progress report on WDM component	CM	31.07.00
Rapid assessment Ngong and action plan for the environmental component	CM	15.07.00
Complete internet connection	CM	30.04.00
Participate in testing of the WACnet	CM	15.05.00
Training needs identified and submitted	CM	15.05.00

2.2 Basic Conditions

2.2.1 Key issues

Rapid population growth, urbanisation and industrialisation have put massive pressure on Nairobi's rivers. Untreated industrial effluents, raw sewage and waste from informal human settlements situated in the river catchments have severely deteriorated the water quality posing health hazards, accelerated eutrophication and stress on the aquatic ecosystems. Rivers have been turned into open sewers leading untreated water to streams that serve as water resources for irrigation and other water uses by downstream communities. Some communities are also using untreated sewage on purpose for irrigation. Lack of sanitary systems, arbitrary disposal of refuse pose serious health and environmental problems. The appraisal team's visit to the Ngong River clearly demonstrated the seriousness of the situation. The Nairobi Dam is an example of water resources completely covered by hyacinths since the upheaval in 1997. Fragmented institutional responsibilities and limited law enforcement capacity exacerbate the problems facing the rivers of Nairobi.

2.2.2 City Plan objectives are in agreement with the goals of MWAC and those of Kenya

The project document is basically in keeping with the overall MWAC objective of mitigating the environmental impacts of urbanisation on freshwater resources and on aquatic ecosystems and to improve the health of the communities. The revised objectives of the City Plan are also supporting the Government's goal to reduce the incidence of poverty and improve the well being of underprivileged urban populations by resolving the inadequate sanitation and waste management services in the densely populated areas of Nairobi.

2.2.3 Kenyan commitment and co-ordinated actions under development

The success of the City Plan heavily depends on Kenya's commitment to, and ownership of, the City Implementation Plan. The appraisal mission noted that the Government has realised the magnitude of the problem it faces due to pollution discharges and waste dumping from unregulated settlements alongside the rivers. At policy level, Kenya has enacted sectoral legislation including passing of the Environmental Management and Co-ordination Act. This act sets out to create a national Environmental Management Authority and the establishment of an appropriate legal and institutional framework for improved environmental management. The Environmental Department of the NCC now pursues the preparation of the environmental component of the City Plan in co-operation with relevant partner institutions and stakeholders. The members of the Co-ordinating Secretariat for the environmental component have been identified and the appointment of the members is in progress.

The review noticed that the required Kenyan competence and keen interest for implementation of the Plan is in place at operational level. It is, however, necessary to confirm the availability of sufficient capacity to manage the implementation of the City Plan along with all other projects and regular responsibilities assigned to the NCC. It is essential that the Terms of Reference and mandate of the environmental task manager and the key team members will soon be settled. The need for strengthening of the City Plan management team to effectively implement the environmental component also has to be considered as part of the preparations.

2.2.4 Associated projects and co-operation with external support agencies in place

The NCC has recognised the importance of having close links and co-ordination between the environmental component of the City Plan and related projects to achieve maximum mutual benefits and to avoid duplication of efforts or important aspects being missed out. The environmental component will therefore join forces with ongoing projects in order to create synergies with these projects.

The identified key plans and projects are:

1. The Strategic Development Plan for Nairobi is providing the development vision for the next 20 years. One of the key challenges is reducing the slums and improving the urban environment. The City Plan should take this development plan into consideration.
2. The Kibera Urban Environmental Sanitation Project (WB, DFDI, and AFD) is a community demand oriented project with a strategic approach to improve the sanitation services (pit latrines) and drainage within the communities. The Informal Settlement Co-ordination Committees (ISCC) play a key role in mobilising the inhabitants of the affected settlements and co-ordinating the external assistance. The appraisal team had the impression that the project was less oriented towards catchment level issues than resolving internal sanitary problems in the compounds. Therefore, it is considered a great potential for the City Plan to add value to the urban sanitation project by introducing environmental interventions like intercepting systems to collect residual seepage and wastewater from the Kibera settlements. Although the management of this project did not invite co-operation in the first place, it is worthwhile for the Co-ordinating Secretariat of the environmental component to approach the Preparatory Group of the sanitation project to discuss possibilities for interaction.
3. The environmental component of the City Plan will complement and augment the Nairobi River Basin Project (Government of Kenya, NCC, UNEP, University of Nairobi, African Water Network (AWN) and other NGOs). It is making sound progress towards improved river basin mapping, water quality testing to create thematic maps to illustrate the impact and status of pollutants on the rivers. The results will be processed through the Environmental Management Information System (EMIS). The goal is to prepare a status assessment based on existing information that shows the courses of the rivers, the density of settlements along them, the major land-use and resulting impacts, and threats to the water resources. An exhibition on databases and thematic maps was arranged in Nairobi April 13, 2000, where HABITAT participated.
4. Community Education and Awareness programme set up by Kenya Organisation for Environmental Education (KOE). This programme sets out to produce education materials and manuals for community groups including schools including water quality issues and the impacts of human activities on water resources. This initiative also comprises teacher training and activation of community groups and associations in or around the informal settlements.

Some major financing partners involved in associated projects are: the European Union, the World Bank, UNDP/World Bank Water Supply and Sanitation Group, European Commission (EC), UNCHS/UNEP, and other multi-lateral and bi-lateral development agencies.

2.2.5 Funding of the environmental component and associated projects established

The core funding for the implementation of the environmental component seems secured according to the budget in Table 1. The Kenyan contribution for covering local salaries and inputs amounts to US\$46,000 in addition to UNCHS' contribution of some US\$55,000. Funding of project interventions by associated projects are also partly in place for the Urban Environment Sanitation Project and the Nairobi River Basin Project and other relevant projects. The actual demonstration activities under the City Plan have to be budgeted on the basis of the recommendations of the rapid assessment.

Table 1. Original budget of the environmental component

	Budget US\$		
	NCC/MoLG*)	UNCHS/UNEP	TOTAL
Mobilisation and studies			
Mobilisation	35,000	9,360	44,360
Assessments	1,900	36,800	38,700
Information & Awareness	5,000	4,300	9,300
Contingencies	4,180	5,050	9,230
Total	46,080	55,510	101,590
Demonstration interventions			<i>(to be determined)</i>

*) Calculated from KSh 70 per US\$

2.2.6 Institutional framework

The appraisal mission summarised the institutional arrangements of the execution of the environmental component of the City Plan. The national counterpart institution and signatory to the agreement with UNCHS is the Ministry of Local Government (MoLG) responsible for all political and policy issues and donor co-ordination. The National Steering Committee will consist of major governmental institutions and key stakeholders. The Ministry has also appointed the National Project Co-ordinator for the Nairobi City Plan from the Nairobi City Council (NCC) which is the national executing agency for the City Implementation Plan. This responsibility includes co-ordination of all in-country activities and ensuring participation of key institutions and stakeholders and NGOs within the project area. The NCC Environmental Department plays a key in managing the implementation of the environmental part of City Plan. The members of the Co-ordinating Secretariat for the environmental part have been identified, but the committee had still not constituted itself by the time of the appraisal. Figure 1 shows the institutional framework and main tasks as perceived by the appraisal mission. The four main outputs under the environmental component are described in Chapter 3.

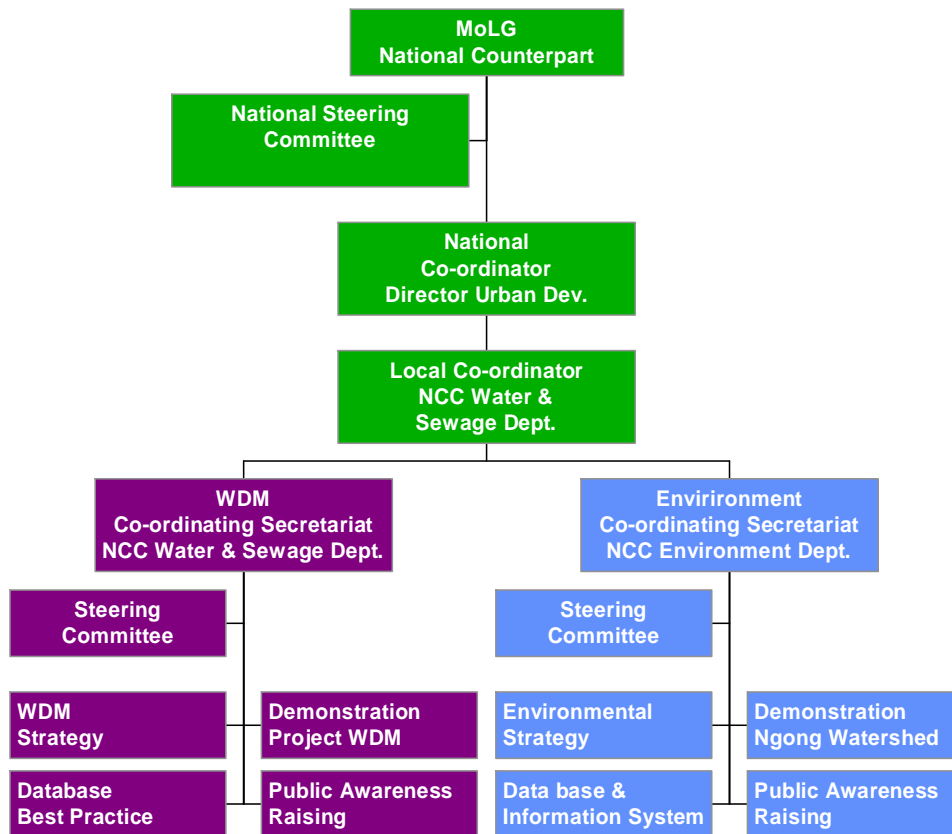


Figure 1. Nairobi City Implementation Plan – Proposed Institutional Framework and Main Outputs

3. ASSESSMENT OF THE ACTION PLAN

3.1 Comments on Project Objectives

The City Plan for Nairobi has a joint “Plan of Action” for the WDM and Environmental components, as it appears in the document "Water Supply Management and Pollution Control Demonstration Project for the City of Nairobi". By and large, the environmental section of the Plan provides a good basis for the planning the implementation of this component of the City Plan, and it is picking up elements from the Logical Framework Approach (LFA). Some observations and suggestions are given in the following sections.

The "Objectives" and the “General and Immediate Objectives” as they appear in section A focus directly on project activities, and to a lesser extent on overarching development objectives and specific objectives of the environmental component. The review mission suggests that the objectives also should include the following:

A-1 General Objectives:

1. *Contribute to sustainable urban development, reduced poverty and improved health and livelihood of the underprivileged groups of inhabitants of Nairobi.*
2. *Contribute improvement of the environmental and ecological condition of the freshwater resources of the city.*

A-2 Immediate objectives:

1. *Improve sanitation and waste management practices in the Ngong River catchment through planning and practical demonstration of environmentally motivated measures.*
2. *Strengthen institutional knowledge and capacity at community, city administration and national levels.*
3. *Enhance public awareness with special emphasis on mobilising the educational system.*
4. *Promote the dissemination and exchange of experience and best practice principles on management of urban water resources at national and regional levels.*

3.2 Outputs

The appraisal recommends including an "Output" section between objectives and implementation strategy sections of the action plan with the following outputs:

1. Develop an implementation strategy for management of the Ngong River;
2. Implement a demonstration project in the Ngong catchment;
3. Make use of a common environmental surveillance and information system;
4. Enhance public environmental awareness and education;
5. Carry out evaluation, performance monitoring and information exchange.

The specific content of each output is further elaborated in the following sections.

3.2.1 Output 1: Implementation strategy for management of the Ngong River

Apply an integrated watershed approach

Although rehabilitation of the Nairobi Dam had been made a focal issue of the environmental component, the review suggests applying a catchment-wide approach for this demonstration project to achieve maximum replication value for other catchments of the city. It is therefore recommended that the water resources monitoring and pollution control strategies in the Ngong River be based on a catchment-wide approach (Figure 2). This approach is necessary in order to analyse and estimate all activities and discharges affecting water quality and quantity of the entire water system, and to develop well justified and prioritised actions. It is assumed that similar approaches will be used in the studies of other tributaries of the Athi River so that the catchment surveillance initiatives add up to a complete river basin monitoring network.

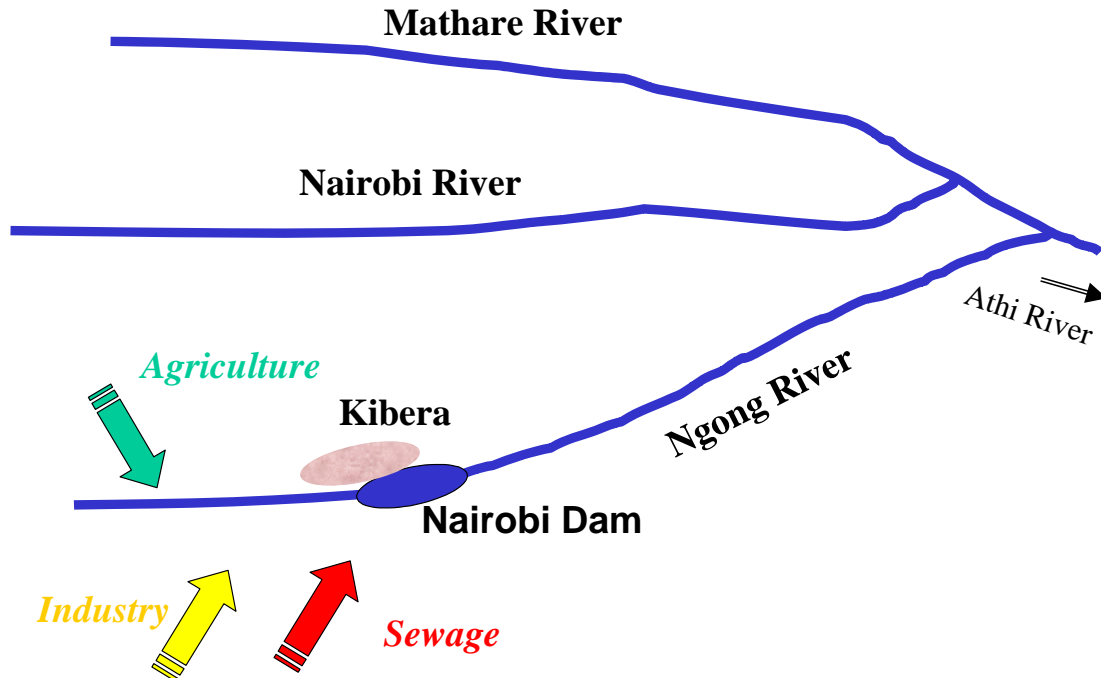


Figure 2. Sketch of Ngong River System and Impacts

Explore possible utilisation of the Nairobi Dam

It is necessary to look at alternative scenarios for repairing or utilising the Nairobi Dam. Alternative functions of the dam may include:

- production plant aquatic plants (hyacinths) including harvesting, processing, and re-use as for instance fuel briquettes;
- the Nairobi Dam as "treatment" system for the lower Ngong River. The overgrown dam is obviously a large biological system that has some cleaning effect for the river water. The overall effects of this "treatment system" should be documented and the possibilities for its optimisation should be evaluated;
- indicator system ("assay") for diagnosing the water quality and environmental conditions of the upper reaches of the Ngong River;
- possible site for environmental education and research activities;
- potential leisure, recreation, and aesthetic value resulting from various degrees of rehabilitation;
- abandoning the dam and reclamation of land.

Investigate sewage management options

As indicated on the photos in Appendix B, the uncontrolled use of raw sewage for irrigation in the Ngong catchment is widespread. Therefore, limited amounts of sewage reaches the municipal treatment plant thus reducing the load on this plant. The unrestrained spreading of raw sewage poses a health risk to the populations in the Ngong River catchment. It seems difficult to prevent people from puncturing the sewer lines. NCC should therefore consider alternative approaches turning this problem into opportunities by allowing the use of sewage for irrigation on the condition that pre-treatment and proper irrigation technology is established. The catchment level consequences of such concept should be further examined in conjunction with the rapid assessment.

Rapid assessment

The review proposes a rapid assessment of the Ngong river catchment being carried out based on available data and information on water quality, flow regimes, ecology, pollution sources, pollution loads, etc. The assessment would include factors of direct relevance to the City Plan, as for example:

- Brief description and characteristics of the catchment and the Athi River basin;
- Sources and impacts of pollution from agriculture, industrial, and domestic sources with special emphasis on the pollution loads from the Kibera and other urban communities with on-site sanitation systems;
- Overview of the water resource monitoring systems and data on hydrology and water quality (chemical, bacteriological, algae, physical);
- Land use and ownership and socio-economic value of a clean dam and river system; public health, welfare and awareness issues;
- Identify project beneficiaries and stakeholders;
- Summary of water users and their requirements;
- Comparison of user requirements with the water quality in the river system;
- Estimate the pollution loads from the Kibera and other urban communities with on-site sanitation systems;
- Assessment of the real and relative impacts of the various influences on the river and the Nairobi Dam;
- Legal and regulatory framework together with the objectives and standards set by NCC, and the implications of the new Environmental Management and Co-ordination Act;
- Examine institutional responsibilities for environmental control and identify gaps and overlaps;
- Look at development scenarios for the water system with reference to the existing Strategic Development plan for Nairobi;
- Outline pollution mitigation measures, cost-effective opportunities for intercepting and discharge of the polluted runoffs from Kibera, regeneration of the Nairobi Dam, local treatment and reuse of piped sewage etc.;

- Prepare action plan for the demonstration project.

The rapid assessment should be planned and carried out in close collaboration with the associated projects identified in section 2.2.4. It will comprise a desk study, verification visits and supplementary water analysis. It will give us an idea about the overall condition of the water resources and the importance of various impacts. The rapid assessment will also make initial predictions of the anticipated effects of various pollution mitigation measures.

3.2.2 Output 2: Environmental surveillance and information

Improved monitoring is an important challenge

Although there is ample information about the city's water resources, a lot of the information is not consistent in terms of common sampling points, analytical methods, sampling frequency (lack of long time series), and in addition the information is scattered between different institutions and databases. Hence, the design of relevant and practical systems for integrated environmental monitoring and information services and related institutional co-operation is an essential challenge facing the environmental component.

Utilise a joint environmental monitoring system

It is logic to build the environmental monitoring strategy around a database and information framework for planning, management and decision support with special attention on water resources. It is suggested that the City Plan be based on an integrated environmental surveillance, information and decision making system. Such system should serve as a management tool for planners and decision-makers, information services for the public and schools, and an expert system for researchers and specialists. It is necessary that the planned enhancement of environmental monitoring systems and water related studies in Nairobi are attached to a common database offering the possibilities for storing, systematisation, retrieval, processing and presentation of aggregated environmental information. The use of a common database to store, process and present environmental-water monitoring data for planning and decision making ensures consistency and quality control of the data. The information products of such system should provide:

- Geographical definition of watershed and watershed hierarchy;
- storing and presentation of watershed information;
- Geographical definition of rivers, dams, and aquifers to be used as objects for storage and presentation of water resource data;
- Creating inventories of discharges, consisting of both point and non-point sources, such as municipal wastewater, industrial effluents and agriculture run-off;
- Data collection, storage and presentation of monitored data on physical, chemical, biological and sedimentological conditions;
- Water quality and quantity modelling, integrated with the database and GIS interface.

Such surveillance and decision making system would allow:

- Increased availability of diversified environmental information and thereby providing a better basis for decisions to be taken by planners and politicians;
- Improved information access to the public and schools, and thereby increasing the awareness on environmental issues and stakeholder involvement in the planning processes;
- Increased possibility for use of holistic environmental data;
- Improved possibilities for long-term planning by using predictive models.

The project should preferably consider using an existing environmental surveillance and information system to cover the requirements of the Ngong River management. The appraisal mission is aware that the Nairobi River Basin Project has an Environmental Management Information System (EMIS) that

also could serve as an information tool of the Ngong River project. Training of personnel will be an important element of the proposed introduction of an environmental monitoring and decision making system. Figure 2 shows an example of the main features of an environmental surveillance and information system.

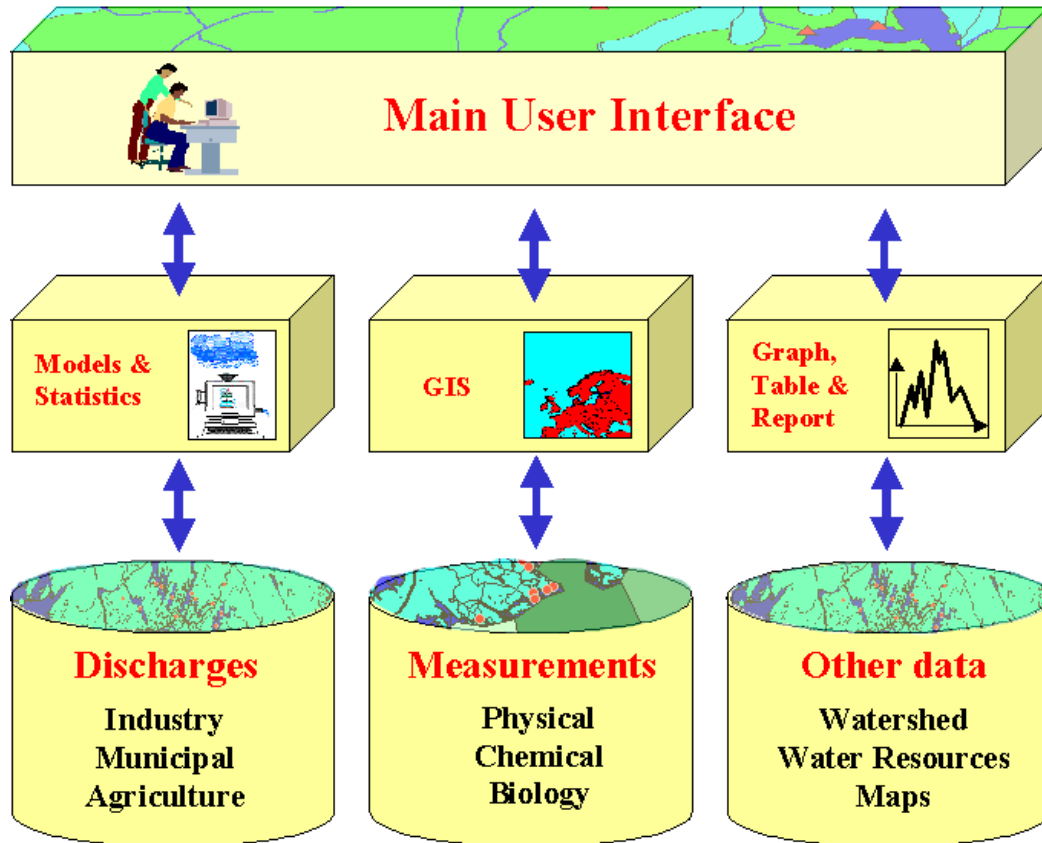


Figure 3. Schematic presentation of an environmental monitoring and information system (Ref.: ENSIS)

3.2.3 Output 3: Implementation of demonstration projects in the Ngong catchment

The implementation of the demonstration activities will be in accordance with the agreed plans and budgets based on the recommendations of the Rapid Assessment. The priority sites for the demonstration activities should be the ones having significant impacts on the water resources, such as the Kibera area. The Output 1 will provide the basis for prioritising pilot activities and social/physical interventions, either in the slum areas of Kibera, among the urban farmers, or direct measures in the Nairobi Dam. Each demonstration project will be designed in close consultation with each concerned community and their representatives. The project should preferably be linked to existing community management organisations in co-operation with pertinent NGOs. The technical design should consider a range of proven technologies paying due attention to willingness and capacity of users and stakeholders to pay for the improvement measures.

The Co-ordinating Secretariat will arrange for professional assistance for procurement, labour contracts, supervision and co-ordination of the site activities according to Kenyan regulations and practice.

3.2.4 Output 4: Public awareness raising

As stated in the Draft Plan of Action, a public awareness campaign will be launched to educate the residents of Nairobi and the personnel of the NCC in better water conservation and pollution control behaviour. This activity will also include consultative workshops, media campaigns, influence on policies and policy makers, linkages with training/learning institutions, and good practice documentation. More details are given in the Draft Plan of Action.

3.2.5 Output 5: Evaluation, performance monitoring and information exchange

The project interventions and their impacts will be monitored and reviewed regularly during the implementation of the environmental component of the City Plan. Monitoring entails checking and control of the achievements of the environmental component compared to the planned inputs, activities and outputs, using the developed indicators. It is recommended to establish a format for monitoring and reporting that will be used throughout the life of the Implementation Plan. The format should be such that inputs, activities and outputs are monitored with reference to the goals and objectives of the Plan and its sub-components. The factors essential for the sustainability of the Nairobi City Implementation Plan comprise (i) policy support measures and local ownership; (ii) institutional aspects; (iii) financial/economic conditions; (iv) technological factors; (v) socio-cultural factors; and (vi) environmental and ecological effects.

A vital project activity will be the continued involvement and substantial contributions by Kenya to the Africa Regional Network of good practice exchange.

3.3 Institutional Arrangement of the Environmental Component

One of the unique attributes of the MWAC initiative is the principle of promoting integrated urban water resource management and building local and national capacity paying attention to the links between water, urban development and the environment in the cities. The proposed institutional responsibilities and task team composition for Nairobi has taken into account these links as shown in Figure 4. Based on input from NCC, the task team will include: (i) WRM: NCC - Water & Sewage Dept. and MENR – Dept. of Water Development; (ii) Urban Development: NCC - Urban Development Department and MoLG; and (iii) Environment: NCC – Environment Dept. and MENR. The environmental component task leader is placed in the NCC – Environment Department.

APPENDICES

Appendix A. People Met

Name	Position	Affiliation
Mr. Kalyan Ray	Chief, R&D Division	HABITAT Building & Infrastr. Technology Section
Mr. Graham Alabaster	Human Settlements Officer	HABITAT R&D Division
Mr. André Dzikus	Human Settlements Officer	HABITAT R&D Division
Mr. Robert Bechtloff	Environmental Consultant	HABITAT R&D Division
Ms. Anna-Maj Lahdenperä	Environmental Consultant	HABITAT R&D Division
Mr. Yima Sen	IT Officer	HABITAT R&D Division
Ms. Yamina Djacta	Co-ordinator	HABITAT Progr. Support Div. Monitoring & Evaluation Unit
Mr. David Smith	Economist	Division of Policy Development and Law, UNEP
Mr. Hassane Bendahmane	Chief Officer	UNEP Habitat Unit
Ms. Sarah Gräslund	Ph.D. candidate	UNEP
Mr. F. J. Mulli (Eng.)	Deputy Director	Ministry of Local Authorities Urban Development
Mr. S. W. Opiyo	Director	Environment Department
Mr. Michael Makuro	MWAC City Manager	NCC
Ms. Leah Oyake	Chemical Engineer	NCC Environment Department
Ms. Mildred Ogendo	Sociologist	NCC Water & Sewage Department
Mr. Benard Komudho	Director	National Environment Secretariat MENR
Mr. Lawrence M. Masyoka	General Manager	Nairobi City Council Water & Sewage Department
Mr. J. P. Kimani	Dep. General Manager	Nairobi City Council Water & Sewage Department
Mr. Manus Coffey	Director Waste Consultant	Manus Coffey Associates Ltd.

Appendix B. Mission Photos



B.1 Informal garbage dump in Kibera settlement



B.2 The Nairobi Dam overgrown with hyacinths



B.3 Agricultural perimeters with informal raw sewage irrigation



B.4 Sewage from broken sewer line near Kibera



B.5 Sewage stream from broken pipeline