b) 資料を分析し、信頼性の薄いものは切り捨てる

c) 資料のない地域では周辺の資料から類推するための解析モデルを作成する

d) 主要な観測所において、必要があれば現地観測を行うことにより、低水、高水の検証を行う

(2) 地形図

a) 既存の地図を利用する

b) 地域的な計画においては、1／100,000、1／250,000、1／1,000,000の小縮尺の地図を利用し、施設計画にあたっては、1／50,000の地図を利用する

(3) 地下水資料

a) 全国にわたって既存資料をできるだけ多く収集する

b) 信頼性の薄いものは切り捨てる

c) 必要に応じて代表的な井戸において、揚水試験を行い検証する

d) リモートセンシングの結果と既存資料により、水理地質図を作成するが、1／250,000の地図程度を目安とする

ただし、さらに程度を上げられる地域についてはこの限りではない

6－2 調査項目及び内容

6－2－1 調査の概要

(1) 調査の全体像及び調査のフローチャート

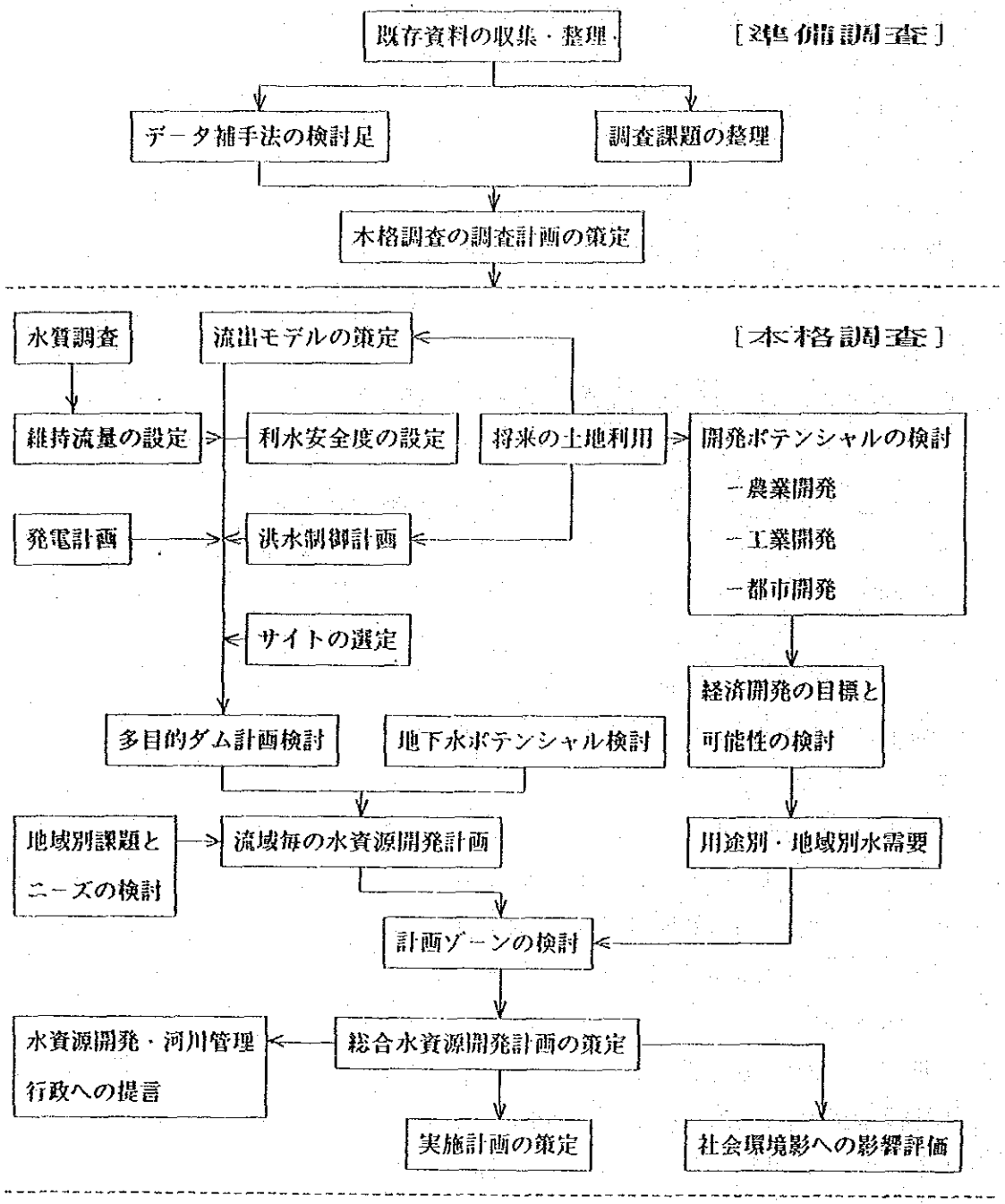
本調査は、準備調査及び本格調査で構成され、24カ月で実施される。調査対象地域はケニア国の全地域とするが、調査の重点は土地利用の不可能な乾燥地域を除く地域に置くべきである。本調査の概略的な調査のフローチャートを図－6.1に示す。

(2) ＜準備調査＞

準備調査では、既存資料の収集、調査課題の整理及び本格調査計画の立案等の作業が6カ月にわたって実施される。既存資料の収集については、水資源開発計画の作成に関連するできるだけ広範囲の分野にわたり、既存資料を取りまとめたものとする。既往の水資源開発計画として、『NATIONAL MASTER WATER PLAN, Sep., 1980, TAMS』がある。この計画の基礎資料として、231地点の月雨量及び400地点の流量資料が使われている。同計画立案後既に10年が経過しているので、本調査では、その後の追加水文資料を加えて検討すべきである。

(3) ＜本格調査＞

本格調査では、各種の調査・解析を行い、全国総合水資源開発計画を立案することとなるが、次のようなことを特に注意すべきである。



図－6.1　調査のフローチャート

a　地下水調査

半乾燥地域や地方集落での飲料・家畜用水は地下水に依存する割合が大きい。また、現況においても各地で地下水が利用されている。このため、水資源開発として、地下水開発は重要な役割を果たす。水資源としての地下水賦存量の推定方法として、本調査の地下水調査では、①既存の地質図及び井戸データの分析　②揚水試験　③井戸水位測定　④リモートセンシング（人工衛星写像分析）　⑤水文地質調査等を行い、水理地質図を作成し、地下水賦存量を推定するものとする。井戸データの補完に利用するため、50本程度の揚水試験と200本程度の井戸水位測定を行う。8,000地点の既存井戸データ（地点、地下水位、揚水量が記述されている）の整理・解析が地下水賦存量の推定で重要な役割を担うこととなる。

b　リモートセンシング

半乾燥地域が広大に広がり、人口が急増している調査対象地域の地域特性を把握するため、リモートセンシングにより、①植生特性　②土地乾燥状況　③土地利用状況等を調べる。ただし、乾燥地域については、必要に応じ対象とする。調査のフローチャートは図－6.2のとおりである。

c　水利用と水開発に関する法律・制度・組織

ケニア国の行政組織は一般に若く、組織の改廃がよく行われている。水資源開発に直接関連するものでも、昨年（1988年10月1日）、『THE NATIONAL WATER CONSERVATION AND PIPELINE CORPORATION』が設立されるなど、日本と相当に異なっている。また、水法は整備されているようであるが、その運用及び実行については、疑問点もある。したがって、現状の法律・制度・組織の運用実態を調べ、本調査で立案する水資源開発計画の実行に際しての問題点等を調べる必要がある。

6－2－2　準備調査

(1)　国内事前調査

調査団が現地に出発する前に、調査の基本方針の把握及び現地調査の円滑を図るため、日本において次のような準備作業を行う。

①　調査業務内容の把握と基本資料の整理、検討

②　調査計画の立案

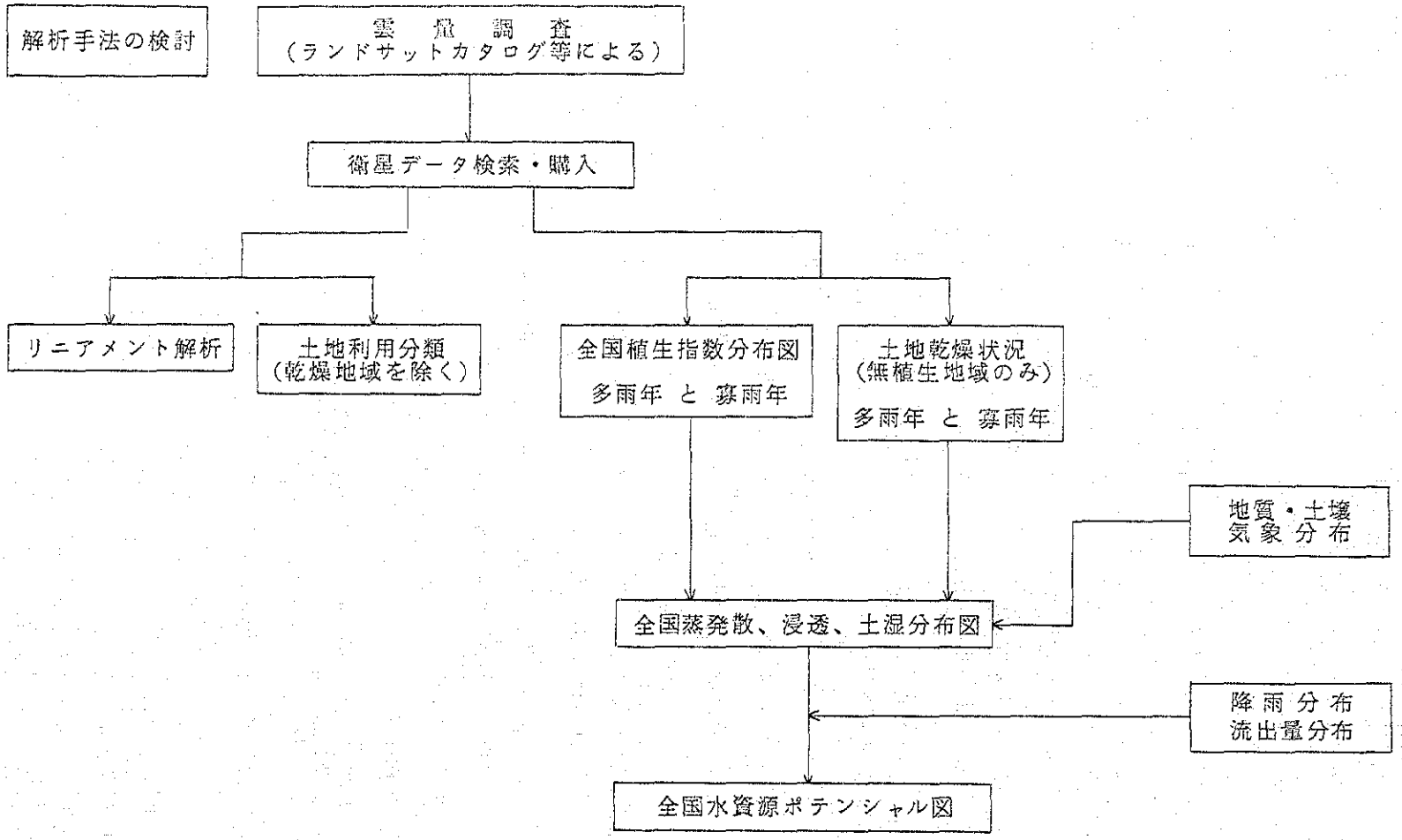
③　購送資機材の準備

(2)　既存資料の収集

水資源開発計画の立案に関連して、既存資料・情報を収集する。収集すべき資料・情報としては、次のような資料が考えられる。

①　社会・経済：土地利用、都市計画、開発計画、人口・資産・生産額、行政区分等

図－6.2　リモートセンジグのフローチャート



② 地形・地質：地形図、地質図、空中写真等

③ 気象・水文：雨量、河川流量、蒸発量、気温等

④ 地下水：水理地質図、既存井戸データ

⑤ 水利用：農業用水、水力発電、生活用水、工業用水、河川航行等

⑥ 洪水対策及び洪水被害

⑦ 水質及び自然環境

⑧ 既存の水資源開発調査

⑨ 水資源開発に関連する法律・政策・制度・組織

⑩ その他

(3) 収集資料の解析

本格調査の問題点抽出及び調査計画立案の観点で収集した資料・情報を解析する。

(4) 調査計画の立案

収集資料・情報の解析結果に基づいて、本格調査段階の調査計画を立案する。この際、次のようなことに留意する。

① 本格調査段階で実施する調査の主要課題及び調査項目を吟味して選定する

② 既存の観測水文データを評価し、修正・補完の方法を示す

③ 調査方針、調査手法の詳細及び調査工程等を明瞭に示す

(5) 報告書

準備調査の成果をプログレスレポート(1)にとりまとめ、ケニア側に報告する。

6－2－3 本格調査

本格調査は、①水資源開発調査 ②需要量計画 ③地域別開発計画の策定 ④法規と組織のレビュー ⑤全国水資源開発マスタープランの策定等の作業で構成される。

(1) 水資源開発調査

水資源開発調査では、①表流水調査 ②地下水調査 ③水資源開発基準検討 ④基本事項の検討 ⑤開発地点調査 ⑥開発計画調査 ⑦多目的ダム計画 ⑧流域別開発計画案の策定等の作業を行い、水資源賦存量を調べ、地域別開発計画案を策定する。

〔1〕 表流水調査

既存の観測雨量及び流量データに基づき、水系別基準点ごとの流況及び洪水特性を明らかにする。観測流量データの不足及び流量の確率評価のため、適切な流出モデルの作成が必要である。なお、本項に関連して、コンピュータを利用した水文データベースシステムを確立するとともに、既存の水文データは入力を行う。また、主要水文観測所については現地調査を行い、必要に応じて修復ないしは新設する。

〔2〕 地下水調査

既存の水理地質資料、井戸台帳及び本調査で実施する揚水試験、井戸水位測定、リモートセンシングならびに水文地質調査等の結果に基づいて水理地質図（1／250,000程度）を作成し、地域ごとの地下水賦存量を把握する。

揚水試験は調査対象地域の中で50井戸程度を選定し、帯水層の水理地質特性を明らかにする。また、200カ所程度の井戸を選定し、季節変動を含めて井戸の水位を測定する。なお、本項に関連して、コンピュータを利用した井戸データベースシステムを確立するとともに、既存の井戸データは入力を行う。

リモートセンシングでは、過去のランドサット写像を入手し、経年的及び季節的な表層土壌の乾燥状態を把握する。

〔3〕 水資源開発基準検討

水資源開発に関連する次の基準等について検討し、その考え方を明らかにする。

① 水資源開発プロジェクトの利水安全度

② 河川の流水の正常な機能を維持するために必要な流量

③ 水資源開発のための計画・設計基準

〔4〕 基本事項の検討

次のような分野について、水資源開発の必要性及び問題点を明らかにする。

- 農用地の開発（かんがい、開墾、牧畜等）
- 都市開発
- 工業開発
- 森林開発及び保全管理
- 廃棄物及び下水処理
- 河川状況
- 環境保全と対策
- 漁業開発
- 貯水池、取水堰、防潮施設
- 水力発電開発
- 高速道路開発

〔5〕 開発地点調査

ダム／貯水池及び取水堰等による水資源の開発地点を選定する。開発地点の選定にあたっては、中期計画（2000年までを目標にする）及び長期計画（2010年までを目標にする）に区分して選定する。

〔6〕 開発計画調査

次の事項に関する開発ポテンシャルを調べ、開発概案を作成する。

① 洪水防御

- 洪水流量－氾濫・浸水区域－洪水被害の関係
- 既設の洪水防御施設
- 総合的な洪水制御計画の立案及び事業費の概算

② 電源開発

- 全国の水力発電供給計画及び電力需要の状況
- 選定されたダムサイトでの水力発電計画の立案及び事業費の概算

③ 農業開発

- 既存の農業地域、主な作物、かんがい方法等の把握
- 既設の農業開発計画についての調査
- 土地／水／作物条件を考慮した農業開発ポテンシャルの検討
- 現状及び将来の牧畜開発

④ 工業開発

- 工業開発の現状
- 既存の工業開発計画についての調査
- 水資源開発と関連した有望な工業開発地域の提案
- 工業による水質汚染および産業廃棄物等環境問題の抽出

⑤ 都市・地域開発

- 既存の都市、市場及び市街化地域の調査
- 都市計画及び地域開発計画についての調査

⑥ 水質管理

- 主要河川での水質測定（一般水質、浮遊土砂、塩分）及び評価
- 汚染防止のための管理（水質基準）と対策についての検討
- 特に水質汚染のひどい地区の水質改善対策に係る予備調査

〔7〕 多目的ダム計画

選定されたダムサイトについて、水利用及び貯水池運用計画（生活用水、工業用水、水力発電、洪水調節、かんがい、維持流量等）を検討して、多目的ダム計画を立案する。

〔8〕 流域別開発計画案の検討

検討された水資源開発案について、開発される水資源の量・質、開発費用、社会的なインパクト及びその他事項を総合的に検討し、地域別の合理的な開発計画案を検討する。なお、開発計画は、表流水開発ポテンシャルと地下水開発ポテンシャルを考慮して

最適な配分を検討する。

(2) 需要量計画

需要量計画では、水資源の開発地点・規模等を特定するために、①社会経済の現状の把握 ②現状の水需要と水利用の把握 ③計画年の社会経済条件の整理 ④計画年の水需要の設定等の作業を行い、地域別・セクター別の水需要を調査する。水需要の地区及び量の調査にあたっては、中期計画（2000年までを目標にする）及び長期計画（2100年を目標にする）に区分する。

〔1〕 社会経済の現状の把握

公表された社会経済統計及び各セクターの所有するデータを整理して、現況の社会経済及び農業経済を調査する。

〔2〕 現状の水需要と水利用の把握

各セクターの所有するデータを整理して、セクター別の水需要と水利用の実状を調査する。

〔3〕 計画年の社会経済条件の整理

水資源開発の計画年としては、中期計画：2000年及び長期計画：2100年となる。これら計画年における次のような社会経済条件を整理する。

① 人口及びその他社会経済指標
② かんがい及び農業開発状況
③ セクター別、地域別の産業開発状況
④ 都市・地域開発のフレーム
⑤ その他：漁業、レクレーション、舟運、汚濁防止、環境保全等

〔4〕 計画年の水需要の設定

次のような項目に関する水需要量を明らかにし、地域別計画年の水需要量を設定する。

① 生活用水
② 工業用水
③ かんがい用水
④ 水力発電
⑤ その他：漁業、レクレーション、舟運、汚濁防止、環境保全等

(3) 地域開発計画の策定

前述の水資源開発調査及び需要量計画の成果に基づき、①水開発と水利用のゾーニング ②水需要と水供給 ③総合水資源開発計画の立案 ④社会環境評価等の作業を行い、地域別の最適水資源開発計画を策定する。

〔1〕 水開発と水利用のゾーニング

水開発と水利用の観点から、水資源開発地域（水開発）と経済開発地域（水利用）のゾーニングをする。

〔2〕 水需要と水供給の設定

セクターごとの水需要を集計して地域別の水需要量を設定し、水資源開発施設で供給すべき水質及び水量を設定する。

〔3〕 地域別水資源開発計画の立案

設定された供給量に従って、次のような作業を行い、地域別の水資源開発計画を立案する。

① セクター別の水利用の調整及び流域変更ならびに導水等も考慮した開発計画の立案

② 事業費の概算

③ 水開発単価の算定及びその評価

〔4〕 社会環境評価

立案された水資源開発計画の社会環境に与える影響を評価し、必要に応じて環境保全対策を検討する。

(4) 法規と組織のレビュー

水資源の利用及び開発に関連するケニア国の法規と組織を、次のような項目について検討し、問題点を抽出し、その改善を提案する。

① 法体系及び組織機構

- 水に関する法令及び規制
- 関連機関の組織と人員
- 慣行と運用実態

② 河川管理

- 河川の分類
- 河川管理者と管理方式
- 河川関連工事の実施体制

③ 水資源の開発と管理

- 計画及び管理における組織の機能と調整機構
- 水利用の調整
- 水保全・管理政策

(5) 全国水資源開発マスターアクションプランの策定

前項の地域別水資源開発計画の中から、緊急に実施すべき水資源開発プロジェクトを選

定する。併せて、開発プログラム及び水資源管理政策を明らかにし、緊急水資源開発プロジェクトの実施に際しての組織・法制に関する勧告を行う。

(6) 報告書

本格調査の進捗に応じて、次のような報告書を作成し、ケニア側に提出説明する。

① インセプションレポート(1)(2)

② プログレスレポート(1)(2)

③ インテリムレポート

④ ドラフトファイナルレポート

⑤ ファイナルレポート

6－3 要員計画

調査団を構成する専門分野は次のとおり。

1. 総括
2. 水資源開発計画
3. 地下水開発計画
4. 水文調査
5. 水文調査（データベース）
6. 水文調査（井戸調査）
7. リモートセンシング
8. 水文地質
9. ダム計画
10. ダム地質
11. 測量
12. 河川計画（洪水対策含む）
13. 電源開発
14. 農業開発
15. 環境／水質
16. 組織・法制度
17. 社会・経済

6－4 調査工程

本件調査の全体所要月数は約24カ月とし、

第1段階：準備段階（6カ月）

第２段階：本格調査（ 18 カ月 ）

の２段階に分け実施するものとし、その調査工程は概ね図－ 6.3 のとおり。

6－5　調査用資機材

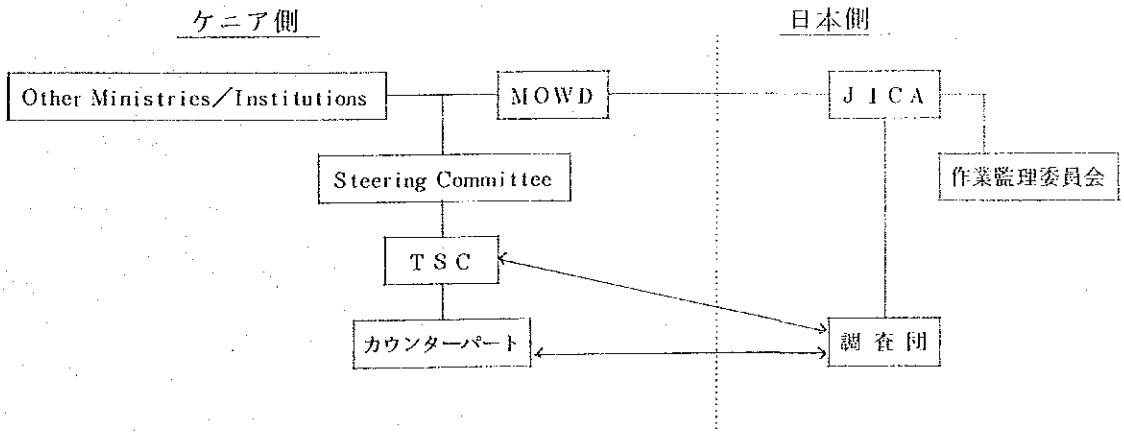
本格調査に必要な機材として、ケニア側からリストアップのうえ要望越しているが、少なくとも次のものの購送は、調査をスムースかつ合理的に進められ、ならびに調査精度の向上が期待される。

1. 車輌（四輪駆動車）　4～6台
2. マイクロコンピュータ（水文・気象、地下水データ等をもとにデータベースの作成及び分析）　2～3台
3. ワードプロセッサー（現地での作業が長期にわたり、データ整理、報告書作成用として必要）　2～3台
4. 複写器（データ、資料のコピー及び報告書作成）　2～3台
5. 水文・気象観測用機器（地下水井戸観測含む）　1式
6. 水質分析　1式
7. 地質調査用機器　1式
8. 測量用機器　1式
9. 製図板等事務用機器　1式

6－6　調査実施体制

本件調査のケニア側実施機関は水資源開発省（Ministry of Water Development）であり、同省下の水資源開発公団（National Water Conservation & Pipeline Corporation）の全面的な協力参加及びその他関連省庁、政府機関で構成する Steering Committee 及び Technical Sub-Committee をもって実施される。

本件調査の実施体制は次のとおりである。



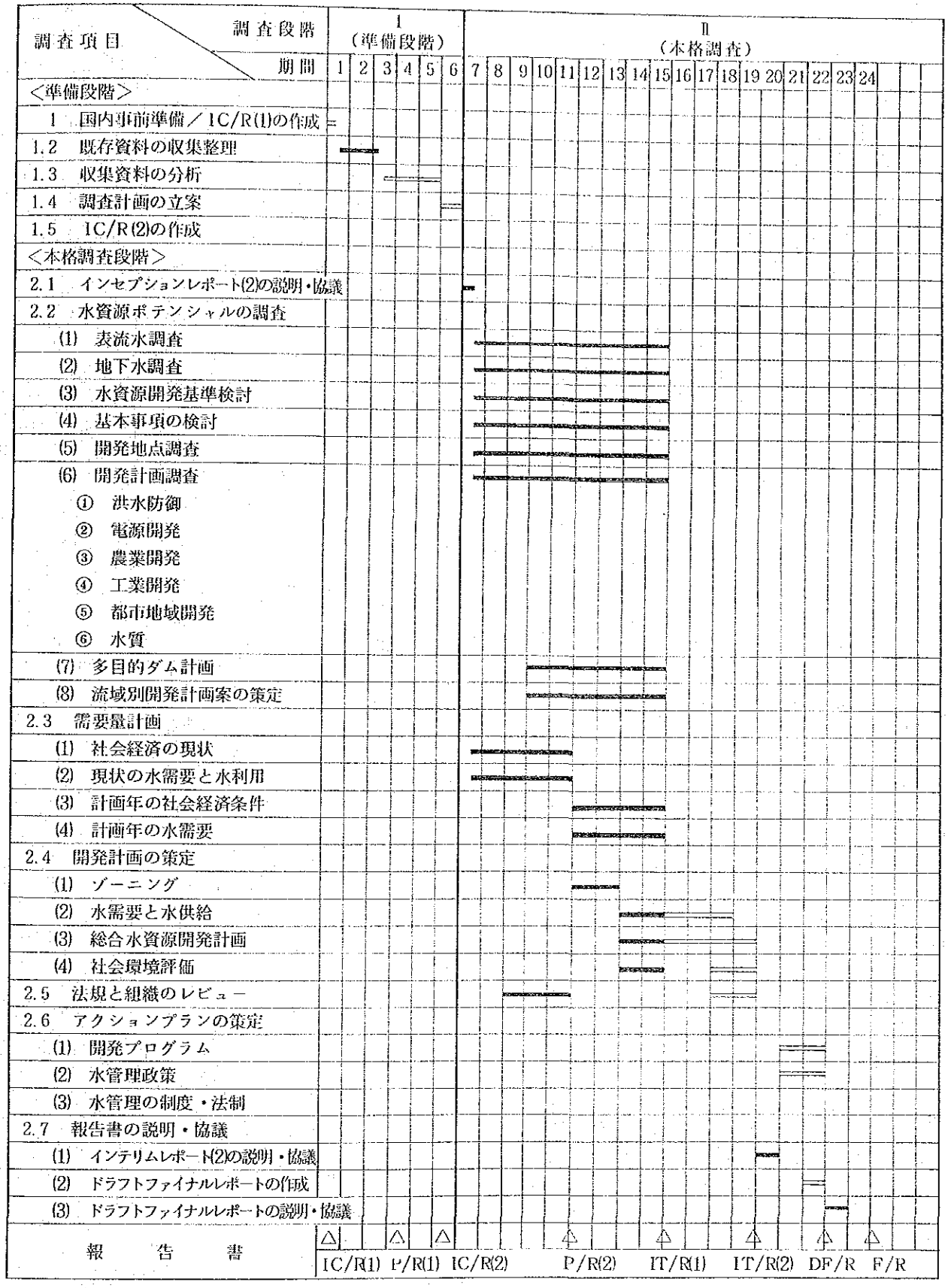
6－7　調査実施にあたっての留意点

(1)　ケニア国の水資源開発に係る関係省庁、政府関係機関は多岐にわたるもので、Steering Committee及びTechnical Sub-Committeeを通じて十分な意志疎通及び協議・調整を図ること。

(2)　本件マスタープランの具体的プロジェクトの実施のカギを握る援助国、国際機関に対して情報の収集のみならず、意見交換も行い、良好な関係を保つこと。

(3)　同国一部地域で発生している水質問題等環境への配慮も計画に組み入れること。

図－6.3　ケニア国全国水資源開発計画調査工程(案)



附　属　資　料

1. ケニア政府からの要請内容（T／R）
2. Scope of Work（S/W）
3. Minutes of Meeting（M/M）
4. 調査用機材リスト（1989年９月25日付ケニア側文書写し）
5. 面会者リスト
6. 質問状及び調査結果
7. 収集資料リスト
8. ケニアに対する技術協力案件（水資源開発関連）の実績
9. 価格調査結果（揚水試験費用概算）
10. The State Corporation Act（The National Water Conservation and Pipeline Corporation Order, 1988）　1988年６月24日付ケニア政府官報
11. ケニア国地形図索引（1/250,000、1/100,000、1/50,000）
12. ケニア国地質図索引
13. ケニア国における水資源開発プロジェクト（援助案件）リスト

4. 調査用機材リスト（1989年９月25日付ケニア側文書写し）

1．ケニア政府からの要請内容

REPUBLIC OF KENYA

TERMS OF REFERENCE

FOR

NATIONAL WATER MASTER PLAN

JANUARY 1989

MINISTRY OF WATER DEVELOPMENT

REPUBLIC OF KENYA

TERMS OF REFERENCE
FOR
NATIONAL WATER MASTER PLAN

I. INTRODUCTION

Successful and well balanced physical and economic development of the country depends to a large extent on comprehensive advance planning of various development sectors. Among them, water resources are one of the most important components to be carefully planned in view of limited availability in total quantitative terms and locational/seasonal maldistribution of the resources.

If future development continues to rely on adohoc planning and implementation, it will certainly create a deplorable situation of water resources environment in the long run and cause enormous difficulties in water use/supply in particular in dry areas of the country. On the other hand, industrialization and urbanization are expanding elsewhere in the country, but paying little attention to overall and long range water resources environment. Within no long period, most of rivers existing today will be no more than open, clean and sightly. Drought and water pollution may annihilate the lives of fish and wildlife. Any water supply works would require costly long pipelines and intricate purification works.

A particular aspect is that the country of Kenya is located in arid climate zone and hence water resources are prominently valuable natural resources. Notwithstanding the government effort for water exploitation projects, the availability of clean and plentiful water is increasingly becoming a limiting factor to further development of the country. Neither large scale modernization, agricultural development, industrial development nor urbanization can be undertaken unless firm supplies of water of good quality are ensured over a long term. These foreseeable constraints and difficulties suggest the strong necessity of establishing a long term water exploitation and management plan covering comprehensively the whole country.

A separate aspect is that the responsibility for development and management of water resources has been fragmented among several

ministries and authorities, each having a separate interest for water use. This tends to encourage different water resources activities taking place in isolation, leading to competition in water use and duplication of functions. The Government desires to minimize this kind of situation in future.

These situations require a comprehensive integrated approach to nation-wide water resources planning, development, conservation and management to ensure a greater efficiency in future water use and also in use of other resources such as financial and man-power resources required for the development and management activities.

It is proposed to carry out this study under a technical assistance program of Japan International Cooperation Agency (JICA) of the Government of Japan.

II. PREVIOUS STUDIES

Ministry of Water Development carried out earlier a study leading to the preparation of National Master Water Plan (TAMS, September 1980). This study intended to deal with possible water related projects in the country and impact of these projects to the country's development.

The study was however hampered by the lack of adequate data for most of the projects and had to focus on a limited number of projects. The report has thus been used by the Ministry and other agencies concerned with water development to implement individual schemes with little attention to overall water resource situation in the country.

It has now been realized that this piecemeal approach may no more be reasonable and economical in future. As water demand continues to increase, it would be of a vital importance to maximize the benefit of available water resources and to attain the most efficient water use and management in the long term, both quantitatively and qualitatively and also both time wise and areal distribution wise. Almost ten (10) years have passed since the preparation of the previous water master plan, during which the development needs have changed significantly. It is now the time to review and re-formulate the development framework of nation's water resources.

V. SCOPE OF WORKS

The study shall include all works to meet the objectives described in the foregoing Chapter III and shall comprise the following two (2) phases:

Phase I : Review of available information and preparation of study program

Phase II : Main work for National Water Master Plan

Problems involved in the entire subjects of national water resources may be too complicate and difficult to permit an early definition of the methodology of the study. The study therefore contemplates to carry out firstly Phase I activity comprising a review of available information followed by the preparation of a study program during the first 4-month period. Afterward, the main part of the study comprising comprehensive assessment, planning, development, conservation and management and other aspects of the nation's water resources would be undertaken as Phase II activity during a duration of 20 months.

Phase I Review of Available Information and Preparation of Study Programme

1. Collection and Review of existing data/information

The Study Team shall at first collect and review all existing data and information relevant to the study, which would be available from the government agencies concerned and other publications and literatures. The data collection and review will cover;

1.1 Meteorology and hydrology, mainly availability of records

1.2 Topography, chiefly availability of topographic maps

1.3 Geology, including general geological maps, geological data of possible dam sites, reservoirs, irrigable areas and others

1.4 Groundwater, including hydrogeological maps and other literatures

1.5 Water use and water right in fields of domestic, industrial, irrigation, power, etc.

1.6 Water quality, covering general aspects, salinity effects and water pollution

1.7 Ecology and environmental aspects, including fish, wild life, vegitation, recreation, etc.

1.8 Irrigation and agriculture including livestock

1.9 Flood mitigation and drainage, including flood damage records

1.10 Hydropower

1.11 Domestic and industrial water supply

1.12 Navigation in rivers

1.13 Watershed conservation and management

1.14 Socio-economy, including population, demography, regional products, settlement programme, specific socio-cultural problem, etc.

1.15 Urban and regional development planning

1.16 Land use, covering existing and projected agriculture, forestry, fishery, industry, etc.

1.17 Existing water resources development studies and river basin studies.

1.18 Laws, regulations, policies and customary practices related to water use and development

1.19 Present institutions, organizations, administrations and their functions related to water development and management

2. Preparation of Study Programme for Phase II Work

Based on findings of data availability, water resources configuration and any specific problems noticed, the Study Team shall prepare a study program for subsequent Phase II work.

2.1 Identification of important topics and subjects to be included in the study

2.2 Recommendation of improvement of existing data and collection of additional data needed for Phase II study

2.3 Preparation of approach, methodology and detailed work programme for Phase II study.

2.4 Preparation of Inception Report (Phase I report).

3. Discussion of Subsequent Study Program

On the basis of Interim Report, discussions will be held among JICA; Study Team and Kenyan Government to finalize the detailed work program of subsequent study. Notwithstanding, the basic concept of the study will remain unchanged from the intended in these Terms of Reference.

Phase II Main Work for the National Water Mester Plan

Work items to be covered by Phase II study are given below. These may be subject to further refinement based on findings from Phase I study.

4. Study on Potential Water Resources

The study shall evaluate the nation's water resources and their development potential in the following aspects:

4.1 Study of natural river discharges
- Meteorological characteristics of river basins
- Runoff yield and characteristics
- Flood discharges

4.2 Water resources development criteria and standards
- Risk level criteria used for water resources development projects
- Minimum low flow criteria ensuring the natural river environment
- Standards for water resources development planning and design

4.3 Review and identification of problems and needs for water resources development, covering the areas of;
- Land use policies and practices

- Agricultural land development (irrigation schemes, land reclamation schemes, livestocks, etc.)
- Urban development
- Industrial development
- Forest development and management
- Waste disposal
- River conditions
- Environmental conservation
- Aqua/marine cultural development
- Reservoir, diversion weir and tidal barrage development
- Hydropower development
- Highway development

4.4 Possible water resources exploitation sites (dam, weir, estuary barrage, etc.)

- Schemes up to year 2000 (mid term plan) - To conduct reconnaissance and desk study for assessment of site conditions, plans, social/environmental impact, cost estimate, etc.
- Schemes beyond year 2000 (long term plan) - To conduct desk study for preparation of preliminarily proposed plans.

4.5 Flood control

- Assessment of inundation area and flood damage in relation to flood discharges
- Existing flood protection facilities
- Preparation of comprehensive flood control plans over the country with cost estimate

4.6 Hydroelectric potential

- National hydropower supply programme and power demand
- Possible hydropower generation at water resources dam sites, with cost estimate

4.7 Irrigation and agricultural development

- Survey of existing agricultural areas, crops and methods
- Study of available agricultural development plans
- Identification of agricultural development potential in view of land classification, potential water resources, desirable crop types, soil classification and reclamation potentiality
- Study of present and future livestock breeding

4.8 Industrial development

- Survey of existing industries
- Study of available industrial development potential
- Recommendations on sites for different industries in consideration of available water resources
- Identification of problems of water pollution by industry and industrial wastes disposal,

4.9 Urban Centres

- Survey of existing cities, market centres, and potential urban areas
- Study of available town planning schemes and development plans

4.10 Groundwater resources

- Deliniation of potential areas
- Safe yield in major potential areas
- Quality of water
- Cost estimate

4.11 Water quality

- Supplemental field measurements and evaluation of water quality, sediment transport and salinity in major rivers.
- Water quality to be maintained and measures to be taken against pollution.

- Preliminary economic study of enhancement of water quality in the most critical areas.

4.12 Formulation of multipurpose dam development plans

- Coordination of water use, allocation of reservoir capacity for water supply, power, flood control, irrigation, maintenance of minimum low flow, etc.
- Plan formulation of multipurpose dam development

4.13. Formulation of rational water resources development programme by basin

- Coordination and arrangement of water resources development between surface water and groundwater, taking water quality, quantity, cost, social impact and other factors into consideration.

6. Water Demand Projection

In parallel with the estimate of water resources potential in Section 4 above, the study shall examine water demands for mid term and long term, towards year 2000 and 2010, respectively. The study shall look into and identify;

5.1 Present socio-economy and agro-economy

5.2 Present water demand and water use

5.3 Projection of economic development target and potentiality in 2000/2010

- Population and other socio-economic indices
- Irrigation and agricultural development
- Industrial development in each sector in each zone
- Urban and regional development framework
- Other water related factors, including fishery, aqua-marine culture, recreation, navigation, pollution abatement, ecosystem conservation, etc.

5.4 Water demand and requirement in each zone in 2000/2010

- Domestic and irrigation water supply
- Irrigation
- Hydropower generation
- Other water requirement, such as natural reserves, recreation, fishery/aqua-marine culture, eco-system, navigation, pollution control, riverine populations and their dependence on rivers.

6. Optimum Water Development and Use by Zone

The study shall then formulate national water resources development programme towards year 2010. The plan formulation will be prepared for each economic development zone appropriately classified in consideration of the country's development programme and water resources distribution. The study in this stage shall cover;

6.1 Zoning for water development and use

- Economic development zone
- Water resources development zone
- Study on the allocation of water for all uses

6.2 Demand and supply in quantity and quality

6.3 Comprehensive water resources development programme

- Planning of water resources development to meet the demands and needs with attention to the following:
  (a) Coordinative use of water among sectoral developments
  (b) Ways and means to increase water resource distribution per capita in dry districts, including planning of possible interbasin water transfer
- Estimation of investment costs required for the water resources development plans including comparison with alternative plans as appropriate,

- Evaluation of water costs for specific projects as required and appropriate

6.4 Socio-environmental aspect

- Evaluation of socio-environmental impact resulting from water resources development projects and environmental protection measures required to mitigate or minimize adverse environmental effects.

6.5 Strategies and policies for the water management

7. Review of Laws and Institutions

The study will review the existing water-related laws and institutions to identify any problems or constraints and propose the improving measures. The proposals would be of a recommendation level for reference to the government future consideration. The review will look into the following:

7.1 Legislation organization and institutional relationship

- Laws and regulations related to water
- Institutions and staffing of the agencies concerned
- Practices and customs

7.2 River administration

- Classification of rivers
- Administrator and administration of rivers
- Execution of river works

7.3 Administration of water resources development and management

- Organizational function and coordination in planning and implementation of water resources development
- Coordination in water use
- Water resources conservation and management policy

8. Final Outputs

As the final outcomes of the study, the following shall be presented in the Final Report:

(1) Results and conclusion of the studies in Sections 4, 5, 6 and 7 above, and

(2) Master Action Plan indicating specifically the implementation programme and policy to be achieved in the subsequent follow-up period

The Master Plan will contain all factual data compiled for and employed in the planning, the results of all surveys, studies and analysis, design criteria and standards adopted in the study, the outline of the proposed projects, and also recommendations on follow-up observatory/monitoring programmes, further studies as well as legal and organization aspects.

After its completion and approval by the Government, the Master Plan will become a basic document of water resources development policy of the Government. It will serve as a guide for all water resources development works and as basic data for the planning of any development projects.

Transfer of Knowledge

Throughout the course of the study, transfer of knowledge shall be pursued to the Government personnel and counterpart personnel by the foreign experts of respective fields. This transfer of knowledge and training will be carried out at the stage of field works, in the office studies and at the foreign experts home office.

For successful achievement of this programme, the study shall be carried out in close collaboration on day-to-day contact basis between the foreign study team and the Kenyan Government working forces.

VI. REPORT

(1) Inception Report (Phase I Report)

The Study Team shall prepare and submit to the Government of Kenya 30 copies of Inception Report within three (3) months after the starting date.

(2) Progress Reports

The Study Team shall prepare and submit to the Government of Kenya 30 copies each of Progress Reports No. 1 and No. 2 within eight (8) and twelve (12) months after the starting date, respectively.

(3) Interim Report

The Study Team shall prepare and submit to the Government of Kenya 50 copies of Interim Report within sixteen (16) months after the starting date. The Government of Kenya will provide the Study Team with its comments within 45 days after receipt of the Interim Report.

(4) Draft Final Report

The Study Team shall prepare and submit to the Government of Kenya 50 copies of Draft Final Report approximately within three (3) months after receipt of the comments on the Interim Report. The Government of Kenya will provide the Study Team with its final comments within 30 days after receipt of the Draft Final Report.

(5) Final Report

The Study Team shall prepare and submit to the Government of Kenya 100 copies of Final Report within two (2) months after receipt of the comments on the Draft Final Report.

VII. UNDERTAKING BY THE GOVERNMENT OF KENYA

For the smooth execution of the study the Government of Kenya will provide the following undertakings:

(1) Exempting the Study Team from taxes and duties for equipment and materials and personnel effects brought into Kenya for purposes of this study.

(2) Assigning counterpart personnel to the Study Team during the study period.

(3) Providing all available data, information and existing reports required for the study.

(4) Making arrangements for accommodations and field office required for the study, when necessary and where the Government facilities are available.

(5) Permission for taking maps and survey data, including selected contact prints of aerographs out of Kenya to Japan by the Study Team, subject to approval of the Government of Kenya.

(6) Providing any other available facilities which may be required for the execution of the study.

(7) Forming a Steering Committee under the auspices of the Ministry of Water Development for the overall management of the study.

(8) Forming a Technical Sub-Committee responsible for the day-to-day management of the study, maintaining close liaison with the Study Team on all matters.

(9) Assisting the Study Team in visiting relevant government agencies, in determining special problem areas and in carrying out field works.

VIII. UNDERTAKING BY THE GOVERNMENT OF JAPAN

The Government of Japan will provide;

(1) Sending the Japanese Study Team to conduct the study.

(2) Bearing the necessary expenses for the study including supplemental field investigation works required for the study.

(3) Accommodating Kenyan Counterparts of this study for training in Japan.

(4) Transferring the knowledge to Kenyan counterparts during the period of the study.

(5) Bringing in some of the necessary equipment for the efficient conduct of the study.

Supplemental Note to Terms of Reference

DETAILED SCOPE OF PHASE I STUDY

It is apparent that the preparation of a master plan for water resources development is a complex undertaking involving comprehensive surveys and studies of most areas of the physical features and the economic and social life of the country.

To ensure that the master plan is prepared in the most thorough and efficient manner, the work has to be outlined and planned in advance. To this end, it is necessary that the first phase of the study would consist of collection of data/information and programming of subsequent main study, which is defined as phase I study in the Terms of Reference.

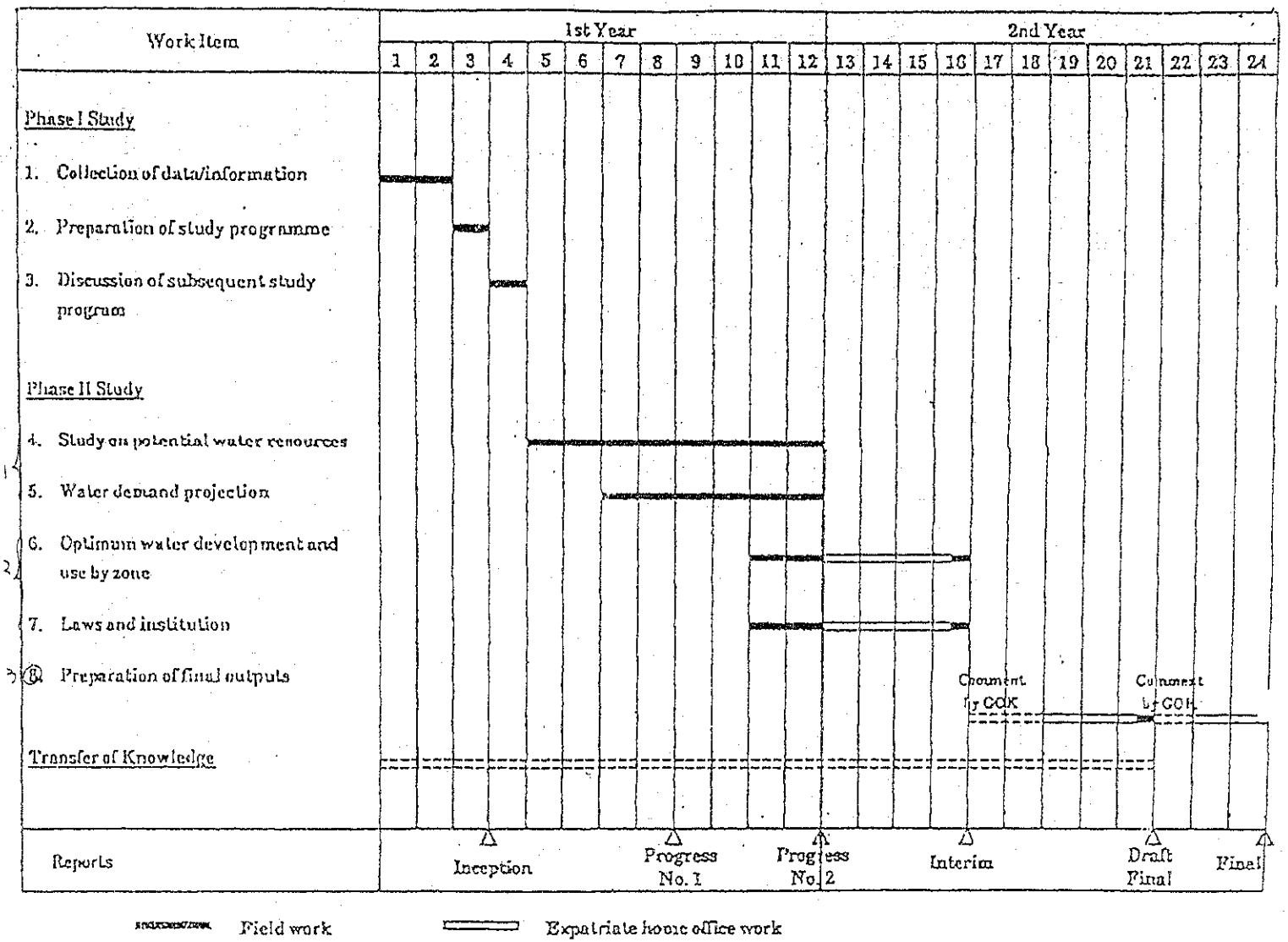
1. Scope and Organization of Phase I Study

The Phase I study will consist of a compilation and study of all available records, documents and written information and of field trips throughout the country as may be necessary.

All available pertinent records and documents will be gathered from the Government agencies, publications and other literatures. The material sought after will include;

- maps of various sorts; e.g. geography, geology, soils, land use, road and transportation facilities, botanical distribution and others,
- climatological and meteohydrological tables/diagrams on rainfall, runoff, temperature, humidity, evaporation and winds,
- agricultural data on land use, crops' cultivation and irrigation practices, etc.,
- reports and surveys on water resources, industry, agriculture, etc.,
- demographical data including population censuses for past years,

STUDY SCHEDULE



- existing development plans and schemes for agriculture, industry, power, transportation, etc. as well as town planning schemes, and

- any other available information which may have a bearing in the master plan study.

Activities during this phase will also include meetings with and briefings by representatives of the Government ministries and agencies concerned with water resources development and water use and consumption to get their point of view and ideas.

After all the data and information have been obtained and studied, the Study Team will undertake a series of field trips. The aim of field trips will be to acquaint the Team with the study areas to be covered, to inspect available water resources, to establish contact with the local authorities and the Ministry's representatives in various districts and localities and to obtain additional data and first hand information in the field.

The last phase of Phase I study will consist of the preparation of an Inception Report for the study.

2. Inception Report

(1) Descriptions in Inception Report

The report shall cover;

a) Information and Data:

In which all the information and data obtained by the Study Team will be summarized. Also, additional data required for the master plan will be listed in detail.

b) Definition of Major Problems:

In which the major problems of water resources development and conservation encountered by the Study Team in the fields of domestic water supply, agriculture, industry, hydropower, flood control and drainage, waste disposal, etc. will be listed. The list will serve as a guide for the master plan, in which the problems

will be analyzed and evaluated and possible engineering solutions for them suggested if appropriate.

c) Programme for Master Plan:

In which the detailed approach and methodology of master plan will be accurately defined; and a plan of organization of the work including the sequence of operation and time-tables set out. The programme of the master plan will also be accompanied by a logical flow diagramme.

(2) Submission and Approval

The Inception Report will be submitted to the National Water Conservation and Pipeline Corporation and Ministry of Water Development for review of the proposed outline of the National Water Master Plan. Then detailed scope of the Master Plan Study will be discussed for finalization between the Government of Kenya (GOK) and Japan International Cooperation Agency (JICA).

Phase I Study is proposed to take four (4) months including the discussion between GOK and JICA.

2. Scope of Work (S/W)

2. Scope of Work (S/W)

SCOPE OF WORK
FOR
THE STUDY
ON
THE NATIONAL WATER MASTER PLAN
IN
THE REPUBLIC OF KENYA

AGREED UPON BETWEEN
MINISTRY OF WATER DEVELOPMENT OF
THE REPUBLIC OF KENYA
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

NAIROBI, September 8, 1989

Mr. S.K. MBOYA
PERMANENT SECRETARY
MINISTRY OF WATER DEVELOPMENT

MR. HIROAKI TAMAMITSU
PRELIMINARY
STUDY TEAM LEADER
JAPAN INTERNATIONAL
COOPERATION AGENCY

MR. S.C. MBINDYO
PERMANENT SECRETARY
OFFICE OF VICE-PRESIDENT AND
MINISTRY OF FINANCE

I. INTRODUCTION

In response to the request of the Government of the Republic of Kenya (hereinafter referred to as "GOK"), the Government of Japan decided to conduct the Study on National Water Master Plan in the Republic of Kenya (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

The Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programmes of the Government of Japan, will undertake the Study, in cooperation with the authorities concerned in Kenya

The Ministry of Water Development of Kenya (hereinafter referred to as "MOWD") shall act as counterpart agency to the JICA Study Team(hereinafter referred to as "Study Team") and also as coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

The present document sets forth the scope of work with regard to the Study.

II. OBJECTIVE OF THE STUDY

1 The objective of the Study is to formulate national water resources development programme towards 2010 as a target year.

III. SCOPE OF THE STUDY

1. Study Area

The study area will cover the whole area of the Republic of Kenya.

2. Study Framework

The Study comprises of the following two (2) phases.

Phase 1: Review of Available Information and Preparation of Study Programme.

This phase will include a review and analysis of existing studies, data and information relevant to the Study, and conduct the first field survey. The results and findings of review and analysis mentioned above shall lead to the

formulation of study programme for subsequent Phase II work.

Phase II: Main Work for the National Water Master Plan:

Based upon the results of the main part of the Study comprising of comprehensive assessment, planning, development, watershed conservation and management and other aspects of the nation's water resources, national water resources development programme towards year 2010 will be formulated.

3. Study Items

3-1 Phase I: Review of Available Information and Preparation of Study Programme

3-1-1 Collection and Review of Existing Data and Information

1) Meteorology and hydrology, mainly availability of records
2) Topography, including aerial photography
3) Geology, including general geological maps, geological data of possible dam sites, reservoirs, irrigable areas and others.
4) Groundwater, including hydrogeological maps and other literature
5) Water use and water rights in fields of domestic, industrial, irrigation, power, etc.
6) Water quality, covering general aspects, salinity effects and water pollution
7) Ecology and environmental aspects, including fish, wild life, vegetation, recreation etc.
8) Irrigation and agriculture including livestock
9) Flood mitigation and drainage, including flood damage records
10) Hydropower
11) Domestic and industrial water supply
12) Navigation in rivers
13) Watershed conservation and management
14) Socio-economy, including population, demography, regional products, settlement programme, specific socio-cultural factor, etc.
15) Urban and regional development planning
16) Land use, covering existing and planned projects in agriculture, forestry, fishery, industry, etc.
17) Existing water resources development studies and river basin studies
18) Laws, regulations, policies and customary practices related to water use and development

19) Present institutions, organizations, adminstrations, and their functions related to water development and management

3-1-2 Preparation of Study Programme for Phase II Work

(1) Identification of important topics and subjects to be included in the Study
(2) Recommendations of improvements of existing data and collection of additional data needed for Phase II study

3-2 PhaseII: Main Work for the National Water Master Plan

3-2-1 Study on Potential Water Resources

The study shall evaluate the nation's water resources and their development potential in the following aspects:

(1) **Study of natural river discharges**
   (a) Meteorological and hydrological characteristics of river basins
   (b) Run-Off yield and characteristics
   (c) Flood discharges

(2) **Groundwater resources**
   (a) Delineation of potential areas
   (b) Safe yield in major potential areas
   (c) Quality of water
   (d) Preparation of hydrogeological maps

(3) **Water resources development criteria and standards**
   (a) Risk level criteria used for water resources development projects
   (b) Minimum low flow criteria ensuring the natural river environment
   (c) Standards for water resources development planning and design

(4) **Review and identification of problems and needs for water resources development, covering the areas of**
   (a) Land use policies and practices
   (b) Agricultural land development (irrigation schemes, land reclamation schemes, ranch development schemes etc.)
   (c) Urban development
   (d) Industrial development
   (e) Forest development and Management
   (f) Waste disposal
   (g) River conditions
   (h) Environmental conservation and protection
   (i) Aqua-marine cultural development
   (j) Reservoir, diversion weir and tidal barrage

development
(k) Hydropower development
(l) Highway development

(5) **Possible water resources exploitation sites (dam, weir, estuary barrage, etc.)**
(a) Schemes up to year 2000 (mid - term plan) - to conduct reconnaissance and desk study for assessment of site conditions, plans, social/environmental impact, cost estimate, etc.

(b) Schemes up to year 2010 (long -term plan) - to conduct desk study for preparation of preliminarily proposed plans.

(6) **Flood control**
(a) Assessment of inundation areas and flood damage in relation to flood discharges
(b) Existing flood protection facilities
(c) Preparation of comprehensive flood control plans over the country with cost estimates.

(7) **Hydroelectric potential**
(a) National hydropower supply programme and power demand
(b) Possible hydropower generation at dam sites, with cost estimates.

(8) **Irrigation and agricultural development**
(a) Survey of existing agricultural areas, crops and methods
(b) Study of available agricultural development plans
(c) Identification of agricultural development potential water resources, desirable crop types, soil classification and reclamation potentiality
(d) Study of present and future livestock development.

(9) **Industrial development**
(a) Survey of existing industries
(b) Study of available industrial development potential
(c) Recommendations on sites for different industries in consideration of available water resources
(d) Identification of problems of water pollution by industry and industrial waste disposal.

10) **Urban Centres**
(a) Survey of existing cities, market centres, and potential urban areas
(b) Study of town planning schemes and development plans.

11) **Water quality**
(a) Supplemental field measurements and evaluation of

water quality, sediment transport and salinity in major rivers
(b) Water quality to be maintained and measures to be taken against pollution
(c) Preliminary economic study of enhancement of water quality in the most critical areas

12) **Formulation of multipurpose dam development plans**
(a) Coordination of water use, allocation of reservoir capacity for water supply, power flood control, irrigation, maintenance of minimum low flow, etc.
(b) Plan formulation of multipurpose dam development.

13) **Formulation of national water resources development programme by basin**
Coordination and arrangement of water resources development between surface water and groundwater, taking water quality, quantity, cost, social impact and other factors into consideration.

3-2-2 Water Demand Projection

(1) Present socio- economy and agro-economy
(2) Present water demand and water use
(3) Projection of economic development targets and potentiality in 2000/2010
(a) Population and other socio-economic indices
(b) Irrigation and agricultural development
(c) Industrial sectoral development
(d) Urban and regional development framework
(e) Other water related factors, including fishery, aqua-marine culture, recreation, navigation, pollution abatement, ecosystem conservation etc.
(4) Water demand requirement in 2000/2010
(a) Domestic and industrial water demand
(b) Irrigation
(c) Hydropower generation
(d) Other water requirements such as natural reserves, recreation, fishery/aqua-marine culture, eco-system, navigation, pollution control, riverine populations and their dependence on rivers.

3-2-3 Optimum Water Development and Use by Zone

(1) Zoning for water development and use
(a) Economic development zones
(b) Water resources development zones
(c) Study on the allocation of water for all uses
(2) Demand and supply in quantity and quality
(3) Comprehensive water resources development

programme
(a) Planning of water resources development to meet the demands and needs with attention to the followings:
- Coordinative use of wate amocng sectoral developments
- Ways and means to increase water resource distribution per capita in dry districts, including planning of possible interbasin water transfer

(b) Estimation of investiment costs required for the water resources development plans including comparison with alternative plans as appropriate

(c) Evaluation of water costs for specific projects as required and appropriate

(4) Socio-environmental aspect

(a) Evaluation of socio-environmental impact resulting from water resources development projects and environmental protection measures required to mitigate or minimize adverse enviromental effects

3-2-4 **Review of Laws and Institutions**

(1) Legislation organization and institutional relationship
(a) Laws and regulations related to water
(b) Institutions and staffing of the agencies concerned
(c) Practices and customs

(2) River administration
(a) Classification of rivers
(b) Administrator and administration of rivers
(c) Execution of river works

(3) Administration of water resources development and management
(a) Organizational function and coordination in planning and management
(b) Coordination in water use
(c) Water resources conservation and management policy.

3-2-5 **Formulation of National Water Master Action Plan**

(1) Water development programme
(2) Strategies and policies for the water management
(3) Institutional and legislative recommendations

IV. SCHEDULE

The Study, in principle, shall be carried out in accordance with the tentative schedule shown in the attached Annex 1. The Schedule is tentative and subject to be modified when both parties agree upon any necessity that will arise during the course of the Study.

V. ORGANIZATION

The executive agency for the National Water Master Plan will be MOWD in collaboration with National Water Conservation and Pipeline Corporation. In view that the Study will cover a wide range of subjects handles by other water-related agencies, MOWD will establish a Steering Committee constisting of other water related institutions for overall management of the study.

A Technical Sub-committee (hereafter referred to as "TSC") comprising the staff of MOWD and the other concerned agencies will also be formed as an organization responsible for day-to-day management of the Study. The Study Team will maintain close liaison and contact with TSC on all matters. The TSC will despatch to the Study a project coordinator and appropriate number of counterpart personnel, to assist the Study Team in arranging for access to available data, in determing special problem areas, and in conducting field survey and study activities.

VI. REPORTS

JICA will prepare and submit the following in English to GOK:

(1) **Inception Report (Phase 1 Report)**
Fifty (50) copies of Inception Report within six (6) months after the starting date.

(2) **Progress Reports**
Fifty (50) copies each of Progress Reports No.1 and No. 2 within four (4) and eleven (11) months after the starting date respectively.

(3) **Interim Report**
Fifty (50) copies of Interim Report within (16) months after starting date. The Government of Kenya will provide the Study Team with its comments within forty five (45) days after receipt of the Interim Report.

(4) **Draft Final Report**
Fifty (50) copies of Draft Final Report approximately

within five(5) months after receipt of the comments on the Interim Report. The Government of Kenya will provide the Study Team with its final comments within thirty (30) days after receipt of the Draft Final Report.

(5) **Final Report**
Hundred (100) copies of Final Report within two (2) months after receipt of the comments on the Draft Final Report.

VII. UNDERTAKINGS OF THE GOVERNMENT OF KENYA

1. To facilitate smooth conduct of the Study, the Government of Kenya shall take the following necessary measures:

   (1) to secure the safety of the Study Team;
   (2) to permit the members of the Study Team to enter, leave and sojourn in Kenya for the duration of their assignment therein, and exempt them from alien registration requirements and consular fees;
   (3) to exempt the Study Team from taxes, duties, and other charges on equipment, vehicles, machinery and other materials brought into Kenya for the implementation of the study;
   (4) to exempt the members of the Study Team from income tax and other charges imposed on or in connection with any emoluments or allowance paid to the members of the Study Team for their services in connection with implementation of the study;
   (5) to provide necessary facilities to the Study Team for remittance as well as utilization of funds introduced into Kenya from Japan in connection with the implementation of the Study Team;
   (6) to provide medical services as needed. Its expenses will be chargeable on the members of the Study Team;
   (7) to secure permission for the Study Team to take all data and documents (including photographs) related to the Study out of the Kenya to Japan;
   (8) to secure permission for entry into private properties and/ or restricted areas for the conduct of the Study;

2. GOK shall bear claims, if any arises against the members of the Study team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arises from gross negligence or wilful misconduct on the part of the members of the Study team.

3 MOWD shall, at its own expense, provide the Study Team with the following in cooperation with other relevant organizations:

(1) Available data and information related to the Study;
(2) Necessary number of counterparts including a project coordinator throughout the Study period;
(3) Suitable office space with necessary normal office equipment and clerical services;
(4) Credentials or indentification cards;
(5) Permission to use walkie-talkie for execution of the field surveys.

VIII. UNDERTAKINGS OF JICA

For the implementation of the Study, JICA shall take the following measures:

(1) to despatch, at its own expense, study team to Kenya;
(2) to pursue technology transfer to Kenya counterparts personnel in the course of the Study;
(3) to provide equipment and machinery for the implementation of the Study, which will remain the property of JICA, unless otherwise agreed upon.

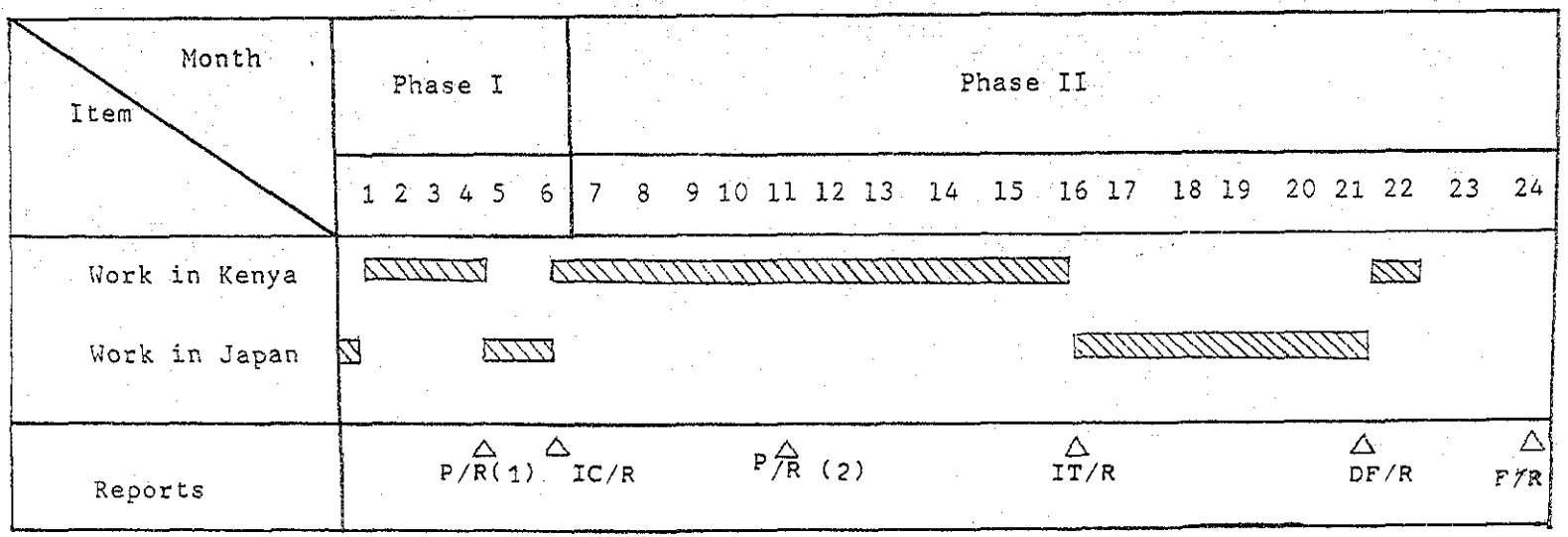
IX. CONSULTATION

JICA and MOWD shall consult with each other in respect of any matter that may arise from or in connection with the Study.

H.T.

ANNEX 1

TENTATIVE STUDY SCHEDULE



Remarks

IC/R : Inception Report

P/R : Progress Report

IT/R : Interim Report

DF/R : Draft Final Report

F/R : Final Report

3. Minutes of Meeting (M/M)

3. Minutes of Meeting (M/M)

MINUTES OF MEETING
ON
SCOPE OF WORK
FOR
THE STUDY ON THE NATIONAL WATER MASTER PLAN
IN
THE REPUBLIC OF KENYA

AGREED UPON BETWEEN
MINISTRY OF WATER DEVELOPMENT,
THE REPUBLIC OF KENYA
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

NAIROBI, Sept. 8, 1989

MR. S.M. MBOVA
PERMANENT SECRETARY
MINISTRY OF WATER DEVELOPMENT

MR. HIROAKI TAMAMITSU
LEADER OF THE PRELIMINARY
STUDY TEAM
JAPAN INTERNATIONAL
COOPERATION AGENCY

The preliminary Study team (hereinafter referred to as "The Team") headed by MR. H. TAMAMITSU visited the Republic of Kenya from 28th August to 10th September, 1989 for the purpose of discussions and exchange of views on the Scope of Work for the Study on the National Water Master Plan in the Republic of Kenya.

The Team had a series of discussions with the officials of the Ministry of Water Development, (hereinafter referred to as "MOWD") and the National Water Conservation & Pipeline Corporation as well as relevant officials of other water-related agencies, and also carried out field reconnaissance.

The list of members from both sides is attached herewith.

Through those discussions, both sides agreed on the Scope of Work.

The main items of mutual understanding in addition to the Scope of Work are as follows:

1. National Water Master Plan

   Since water is one of the most important basic resources for successful and well balanced physical and economic development of Kenya, MOWD and other water-related institutions recognized the National Water Master Plan as necessary and valuable.

2. Organization

   For smooth and effective implementation of the Study, both the

Steering and Technical Sub-committee will be established with function and composition as shown in Annex 1.

Officials of the Embassy of Japan in Kenya and representatives designated by JICA will participate as observers of the above committees.

Both sides confirmed full participation and cooperation to the Study from water-related institutions.

3. Study Schedule

Kenya side requested the Team to commence the Study as soon as possible. It was recommended that greater part of the Study be done in Kenya.

4. Study Equipment

Kenya side strongly requested the team to donate equipment, machinery and other materials shown in Annex 2, after the completion of the Study.

5. Counterpart

The team requested MOWD to assign to the JICA Study Team the appropriate counterpart personnel such as project coordinator, hydrologist, geologist, civil engineer, dam engineer, physical planner, industrial planner, sewerage engineer , irrigation, agriculturist, economist, environmentalist and support staff such as typists, drivers.

6. Counterpart Training

Kenya side requested to transfer technology to the counterpart by both through on-the-job training in the course of the Study and technical training in Japan.

The team agreed to convey the above request to JICA for consideration.

7. Technical Seminar

Taking the importance of the Study into consideration, the Kenya side requested the team to hold a technical seminar related to water resources development towards the end of the Study.

THE LIST OF MEMBERS FROM BOTH KENYA AND JAPAN

KENYAN SIDE

1. MINISTRY OF WATER DEVELOPMENT (MOWD)

a) MR. S.M. MBOVA	Permanent Secretary
b) MR. E.K. MWONGERA	Director of Water Development
c) MR. J.S. NYAMATO	Deputy Secretary
d) MR. S. NCHOGU	Head of Planning and Design
e) MR. E.B.I.N. RWERIA	Principal Economist
f) MR. J.B. OSORO	Public Relations Officer
g) MR. M. IDE	JICA Expert

2. NATIONAL WATER CONSERVATION AND PIPELINE CORPORATION (NWCPC)

a) MR. M.M. MAHAMUD	Chief Development Service Manager
b) MR. A.M. MAKOKHA	Chief Operation Manager
c) MR. E.M. MWAI	Chief Geologist
d) MR. K. WATHOBIO	Planning and Design

3. MINISTRY OF FINANCE

a) MRS. D.K. MUSAU	Assistant Secretary

JAPANESE SIDE

1. JICA PRELIMINARY STUDY TEAM

a) MR. HIROAKI TAMAMITSU	Leader Vice President Japan International Cooperation Agency (JICA) HDQ
b) MR. KENSUKE WATADO	Water Resources Development Planning Senior Engineer River Bureau Ministry of Construction
c) MR. MIKIO TAKASIMA	Cooperation Planning Ministry of Foreign Affairs
d) MR. TOSHIYUKI AOYAMA	River Planning Hydraulic Engineer Minister's Office Ministry of Construction
e) MR. JUNICHI YOSHITANI	Hydrology Research Engineer River Dept Public Works Research Institute Ministry of Construction
f) MR. MITSURU SUEMORI	Coordinator JICA HDQ, TOKYO
g) MR. YOSHIO NAKAGAWA	Groundwater Development Groundwater Development Expert Hydroengineering Dept Yachiyo Engineering Co., Ltd

2. THE EMBASSY OF JAPAN

a) MR. NOBUYUKI HORIE	First Secretary

3. JICA, KENYA OFFICE

a) MR. KENJI KUMAGISHI	Resident Representative
b) MR. MASAYOSHI JURO	Assistant Resident Representative

ANNEX 1

COMPOSTION AND FUNCTIONS OF STEERING COMMITTEE AND TECHNICAL SUB-COMMITTEE

A STEERING COMMITTEE

The following ministries and institutions will constitute the Steering Committee for the National Water Master Plan:

- Ministry of Water Development
- National Water Conservation and Pipeline Coorporation
- Ministry of Energy
- Ministry of Regional Development
- Ministry of Agriculture
- Ministry of Livestock Development
- Tana and Athi River Development Authority
- Kerio Valley Development Authority
- Lake Basin Development Authority
- National Irrigation Board
- National Environment Secretariat
- Permanent Presidential Commission on Soil and Water Conservation.

The functions of the Steering Committee will be:

(i) To provide development policy guidance,
(ii) To receive explanation of study outputs from the JICA Study Team through the technical sub-committee on major issued of the Study,
(iii) Comment and advise on the direction of the Study from the aspect of the Government's general development policy,
(iv) Approve the Final Report at the end of the Study.

B TECHNICAL SUB-COMMITTEE

Members of the Technical Sub-Committee (hereafter referred to as "TSC") will be drawn from among members of the Steering Committee. The total number of members of this committee should be as few as possible and its maximum number should be less than half the total number of the Steering Committee. Members of the TSC will be drawn from the main agencies represented in the Steering Committee.

The functions of the Technical Sub-Committee will be:

(i) To provide day-to-day management of the Study through discussions with the Study Team as and when required,

(ii) Discussing study directions and outputs on regular basis as well as at the occassions of issues of major Study outputs,
(iii) Advising the Study Team on important issues to be incorporated in the Study,
(iv) Briefing and informing the Steering Committee of the progress and outputs of the Study so that a unified study approach can be maintained between the Steering Committee and the Study Team.
(v) Dispatching to the Study Team, a Project Coordinator (who will be the Chief Counterpart Officer) and appropriate number of counterpart personnel.
(vi) To prepare for technical seminar(s) on the Study.

ANNEX 2

EQUIPMENT, MACHINERY, VEHICLES AND OTHER MATERIAL NECESSARY FOR THE STUDY REQUESTED BY MOWD

1.	VEHICLE (4WD STATION WAGON TYPE)	6
2.	MICRO COMPUTER SET WITH SOFTWARE (including one set of potable desk-top type personal computer)	3
3.	DEDICATED WORD PROCESSOR (with necessary assessories, spare parts and software)	3
4.	COPY MACHINE (with sorting, enlargement/ reduction, and necessary spare parts)	2
5.	WATER QUALITY ANALYSIS KIT	3
6.	WATER LEVEL, CURRENT METER	20
7.	DRAFTER (for map drawing)	5
8.	SCIENTIFIC POCKET CALCULATOR	15
9.	OTHER SURVEY EQUIPMENT	To be listed later

4. 調査用機材リスト（1989年９月25日付ケニア側文書写し）

4. 調査用機材リスト（1989年9月25日付ケニア側文書写し）

REPUBLIC OF KENYA

MINISTRY OF WATER DEVELOPMENT

Telegrams: "WATER", Nairobi
Telephone: Nairobi 723103—12
If calling or telephoning ask for

When replying please quote
Ref. No. MWD/WS/14/57/(48)
and date

THE PERMANENT SECRETARY
MAJI HOUSE
NGONG ROAD
P.O. Box 49720
NAIROBI, KENYA
25TH September, 19 89

Mr. Mitsuru Suemori,
Second Development Study Division
Social Development Study Department
Japan International Cooperation Agency
P. O. Box No. 216, 48th Floor
Shimjuku Mitsui Bldg.
1-1, Nishi-Shinjuku 2- chome
SHINJUKU-KU, TOKYO, 163 JAPAN

Dear Mr. Suemori,

EQUIPMENT REQUIRED FOR PREPARATION OF WATER MASTER/PLAN

Reference is made to Annex 2 of the Minutes of the Meeting on Scope of Work for the Study of the National Water Master Plan in the Republic of Kenya.

When we prepared the list of equipment required for the preparation of the Water Master Plan, we indicated under item 10 that Survey Equipments was to be listed later. We have now compiled the list of the equipment which is listed here below:

Description	Quantity
- Distomat-Electrical-optical Distance measuring equipment (up to 5 km range, attached to a theodolite together with all accompanying auxillaries)	2
- Theodolite one second reading with tripods	4
- Automatic levels	10
- Prismatic Compass	10
- Levelling Staves (5m)	20
- 100m Steel Chains	20

- Survey Umbrellas	20
- Ranging Rods (3m)	30
- Universal Tripods	5
- 30m Tapes	10
- Pantographs	3
- Terrameter SAS 300B + Accessories	2
- Seismic Refraction Unit	1
- Electromagnetic Unit (3M-34)	2
- Petrographic Microscope	2
- Stereoscope (table)	21
- Geological Hammer	10
- Sledge Hammer	12
- Altimeter	35
- Conductivity Meter	10
- pH Meter	20
- Measuring Tape (30m)	20
- Sediment Samplers	25
- Automatic Water Level Recorder	30
- Gauge Plates	20
- Gauge Plates - 0.0 - 1.5m	200
" - 1.5 - 3.0m	200
" - 3.0 - 4.5m	100
- Potable Water Pumps (Head 10m-20m)	35
- Stop Watches	40
- Rain Guages (Automatic)	100
- Survey Automatic Level	35
- Rubber Dingy	35
- Bridge Crane (Complete)	35
- Portable Cable Way (complete	35
- Planimetre	40

We have included a big quantity of certain items such as gauge plates and rain guages. We consider availability of these items to be crucial for timely completion of the study and hope you will consider supplying all of them.

Although we included requirements for three (3) Word Processors, you will agree with me that the Study Team will definately require efficient typewriters. I suggest that you include 3 typewriters which should also be able to be used as printers for computers and wordprocessors.

We look forward to the arrival of the Study Team at the end of the year. We are on our part making the necessary preparation of the study.

(E.B.I.N. RWERIA)
FOR: PERMANENT SECRETARY

5. 面会者リスト

5. 面会者リスト

1. MINISTRY OF WATER DEVELOPMENT (MOWD)

a) MR. S.M. MBOVA	Permanent Secretary
b) MR. E.K. MWONGERA	Director of Water Development
c) MR. J.S. NYAMATO	Deputy Secretary
d) MR. S. NCHOGU	Head of Planning and Design
e) MR. E.B.I.N. RWERIA	Principal Economist
f) MR. J.B. OSORO	Public Relations Officer
g) MR. F.O. DONDE	Mombasa Provincial Water Engineer
h) MR. C.W. OCHIENG	(Tiwi Geologist, Mombasa)
i) MR. L.K. BIWOTT	Project Manager Kwale Water Supply and Sanitation Project
j) MR.C. NDEGWA GITAHI	Deputy District Water Engineer (Marsabit)

2. NATIONAL WATER CONSERVATION AND PIPELINE CORPORATION (NWCPC)

a) MR. M.M. MAHAMUD	Chief Development Service Manager
b) MR. A.M. MAKOKHA	Chief Operation Manager
c) MR. E.M. MWAI	Chief Geologist
d) MR. K. WATHOBIO	Planning and Design
e) MR. P.K. KAPSONDOY	Regional Manager (Mombasa)

MINISTRY OF FINANCE (TREASURY)

1. MR. G.M. MITINE
   Director of External Resources/
   Deputy Secretary

2. MR. C.I. SHAKABA
   Desk Officer/
   Senior Assistant Secretary

3. MRS. D.K. MUSAU
   Asst. Desk Officer/
   Asstistant Secretary

4. MR. J.M. NYANUMBA
   Asst. Desk Officer/
   Assistant Secretary

MINSTRY OF REGIONAL DEVELOPMENT

1.	MR. D.R. MBOYA	Permanent Secretary
2.	MR. W. NJOROGE	Deputy Secretary

MINISTRY OF ENERGY

1.	MR. C.N. MUTITU	Permanent Secretary

NATIONAL IRRIGATION BOARD (NIB)

1.	MR. J.P.K. MBANDI	General Manager

KENYA INDUSTRIAL ESTATE (K.I.E.)

1.	MR R. ARUCHIO	Chief Engineer
2.	MR. H.T. ODHIAMBO	Divisional Manager (Projects)

MARSABIT DISTRICT COMMISSION

1.	MR. OTINDO	Deputy Commissioner

TANA RIVER DEVELOPMENT AUTHORITY (TARDA)

NAME	POSITION/ORGANISATION
Mr. Colin Read	Kiambere Project - Team Leader
Mr. A.M. Marimi	TARDA - OPC/PA
Mr. D.F.M. Kallari	TARDA - DM
Mr. O.K. Bobotti	TARDA (Tana System) - Hydrologist
Mr. W.M. Kariuki	TARDA (Athi System) - Water Resources & Environment Manager

LAKE BASIN DEVELOPMENT AUTHORITY (LBDA)

NAME	POSITION
Mr. S. Machoka	Deputy Managing Director (T.S.)
Mr. R. Adhiambo	Deputy Managing Director (A.F.)
Mr. L.M. Nyongesa	Hydrologist
Dr. Onyango Ogembo	Water Resources Engineer
Mr. D.K. Mshila	Regional Planner
Mr. Fred Odera	Hydrogeologist

KERIO VALLEY DEVELOPMENT AUTHORITY (KVDA)

Mr, S.K. TUVEI	Managing Director

在ケニア日本大使館

a）熊　谷　直　博　　特命全権大使
b）加　来　至　誠　　公使
c）堀　江　信　之　　一等書記官

海外経済協力基金ナイロビ事務所

a）石　黒　雅　一　　首席駐在員

金属鉱業事業団ナイロビ事務所

a）山　本　泰　久　　首席駐在員

JICAケニア事務所

a）熊　岸　健　治　　所長
b）高　畑　恒　雄　　次長
c）十　郎　正　義　　所員

6. 質問状及び調査結果

6. 質問状及び調査結果

資料の収集状況

A1 General Matters

1/15

Items	Availability Conf.	Availability Obt.	Source	Remarks
A1-1 Census & Statistic Data in Past 10 Years Incl.: a) Population by Province or District, Age, Sex, Race Religion etc. b) Occupational Breakdown of Population c) Number of Household d) Production in Agriculture (Incl. livestock), Industry Mining, Trade Service etc. by Province or District e) Gross National Product (GNP) f) Balance of International Payment g) Amount of Import/Export h) Consumer Price Index i) Whole Sale Price Index j) Exchange Rate		○	The Government printer	Economic Survey 1989 Statistical Abstract 1988
A1-2 Population Density Map		○	Central Bureau of Statistics	
A1-3 Administrative District Division Map		○	Survey of Kenya	
A1-4 Long Term National Develpment Plan		○	The Gorernment Printer	Economic Management for Renewed Growth (Settionae Paper No. 1986)
A1-5 Five Year National Develpment Plan		○	– ditto –	
A1-6 Current Five Year Sectorial Development Plan				
A1-7 Current Five Year Reagional Development Plan				
A1-8 Other Related Data				

ITEMS	Availability Conf.	Availability Obt.	Source	Remarks
A2-1 Topographical Maps Scale / Covering Area 1/50,000 ケニア国南側 2/3 1/100,000 ケニア国北側 1/3 1/250,000 ケニア国全土	○		Survey of Kenya	
A2-2 Aerophotograph Scale / Covering Area 〃 1/80,000 〃 〃 ケニア国全土 〃 1/10,000	○		– ditto –	
A2-3 Geological Data a) Geological Map Scale / Covering Area 1/125,000 ケニア国全土	○		Mines and Geopical Department	
b) Geological Sudy Reports				Geological Map の解説書
A2-4 Land Use Map		○	Kenya Rangeland Ecological Monitoring Unit. (KREMU)	
A2-5 Soil Classification Map	○		Ministry of Water Development (MOWD)	
A2-6 Meteological Data a) Location Map of Observation Station		○	Kenya Meteorological Department	Climetological Statistics for Kenya 1984 Table-A1 の形成とは異なる。
b) List of Station in Form "Table-A1"		○		
c) Data of Several Typical Stations Regarding: – Temperature – Relative Humidity – Evaporation etc.		○		

Items	Availability Conf.	Availability Obt.	Source	Remarks
A2-7 Rainfall Data				
a) Location Map of Observation Station		○	Kenya Meteorological Dept.	
b) List of Station in Form "Table-A2		○	– ditto –	
c) Isohyetal Map - Annual mean - Seasonal - Maximum Year - Minimum Year	○		Kenya Atlas	
d) Monthly Data of Several Typical Stations		○	Kenya Meteorological Dept.	
e) Study Report on Rainfall in Kenya		○	– ditto –	
A2-8 Runoff Data				
a) Locaiton May of Observation Station		○	Hydrology Section, MOWD	
b) List of Staiton in Form "Table-A3	○		– ditto –	
c) Runoff Data of Each River System incl. - Annual Runoff Volume - Probale Peak Discharge	○		– ditto –	
A2-9 Data Bank System on Meteological & Hydrological Data	○		Computer Serrice Section, Meteorological Dept. – ditto –, MOWD	
A2-10 Data on Main Earthquake		○		
a) Location Map of Earthquake				
b) List of Main Earthquake in Form "Table-A4"				
c) Design Criteria for Earthquake				
A2-11 Other Related Data				

Items	Availability Conf.	Availability Obt.	Source	Remarks
A3-1 River a) Map of Catchment Area and Tributaries b) Profile and Typical Cross Section c) Characteristics of Main River in Form "Table-A5"		○	Hydrology Section, MOWD	
A3-2 Runoff Data in Form "Table-A6"		○	– ditto –	Table ~ A6 と形成は異なる。
A3-3 Dam a) Location Map of Dam incl. Existing, Under Construction and Planning b) List of Dam in Form "Table-A7"		○	Water Conservation Section, MOWD	
A3-4 Present Water Consumption and Future Demand in 2000/2010 by Sector and Area in Form "Table-A8"				
A3-5 Potential Water Resources and Their Amount				
A3-6 Water Right a) Location Map of Permitted Water Right b) Registration Form of Water Right c) List of Registered Water Right in Form "Table-A9"	○	○	Computer Section, MOWD – ditto –	
A3-7 Conception on Risk Level of Minimum Low Flow Ensuring Natural River Environment				
A3-8 Previous Study Reports on Water Demand & Supply		○		
A3-9 Other Related Data				

Items	Availability Conf.	Availability Obt.	Source	Remarks
A4-1 Hydrogeological and Aquifer Data				
a) Hydrogeological Map and Profile		○	Groundwater Research Section, MOWD	
b) Isopiezometric Contour Map		○	– ditto –	
c) TDS(Total Desolved Solid in ppm) Map		○	– ditto –	
d) EC(Electric Conductivity in Micro-mhos/cm) Map				
e) Transmissivity Coefficient Map				
f) Specific Capacity(in lit./sec/m) Map				
A4-2 Well Data				
a) Location Map of Existing Well	○	○	– ditto –	
b) List of Typical Well by Area in Form "Table-A10"		○	– ditto –	
A4-3 Location and Yield of Main Well Field and Spring		○	– ditto –	
A4-4 Present Usage and Future Demand in 2000/2010 of Groundwater by Sector & Area in Form "Table-A11"				
A4-5 Example of Groundwater Development Cost				
A4-6 Previous Study Report on Hydrogeology and Groundwater Development		○	– ditto –	Sectorial Study and National Pvogramming for Community and Water Polution Contral, Report No.7 Groundwater Pesources in Kenya, WHO
A4-7 Data Bank System for Groundwater Development	○		Cemputer Service Centor, MOWD	
A4-8 Other Related Data				

Items	Availability Conf.	Availability Obt.	Source	Remarks
A5-1 Urban and Rural Water Supply System incl. existing, under construction and planning				
a) Location of Water Supply System	○		Operation Section, MOWD	
b) List of Water Supply System in Form "Table-A11"	○		– ditto –	
A5-2 Five Year Urban and Rural Water Development Plan by Area				
A5-3 Previous Study Reports on Urban and Rural Water Development		○		
A5-4 Other Related Data				

A6 Irrigation

Items	Availability Conf.	Availability Obt.	Source	Remarks
A6-1 Present and Future(2000/2010) Situation of Aguriculture by Area in Form "Table-A12"	○		Agriculture Engineermp Div. Ministry of Agriculture	Programe, Objective and Stra Cegy
A6-2 Present and Future(2000/2010) Irrigation Area				
a) Location Map of Irrigation Area	○		– ditto –	
b) List of Irrigation Area in Form "Table-A13"		○	– ditto –	
A6-3 Five Year Agriculture Development Plan by Area				
A6-4 Previous Study Reports on Agriculture Development Plan		○		
A6-5 Other Related Data				

Items	Availability Conf.	Availability Obt.	Source	Remarks
A7-1 National Electric power Development Plan				
A7-2 National Hydro-power Supply Program				
A7-3 Present and Future Demand a) Average Demand b) Peak Demand				
A7-4 Existing and Future Generation System a) Hydroelectric b) Fuel Thermal c) Geothermal				
A7-5 Existing and Future Transmission System				
A7-6 Standard Cost of Electric Supply a) Power Station b) Transmission				
A7-7 Standard Electric Charges				
A7-8 Institutional System of Electric Supply				
A7-9 Data Bank System for Electric Power Development				
A7-10 Previous Study Report on Electric Power Development				
A7-11 Other Related Data				

Items	Availability Conf.	Availability Obt.	Source	Remarks
A8-1 Organization & Budget for Flood Control a) National Level b) Regional Level				
A8-2 Technical Standard for Flood Control Plan and Design				
A8-3 Past Flood Disasters by Each River System a) Inundation Area b) Damaged Item & Quantity c) Flood Rainfall & Discharge				
A8-4 Existing Flood Control Works by Each River System incl. Maps and Technical Documents a) National Project b) Regional Project				
A8-5 Future Flood Control Plan by Each River System incl. Maps and Technical Documents a) National Project b) Regional Project				
A8-6 Previous Study Report on Flood Control		○	Irvigation Section, MOWD	
A8-7 Other Related Data				

Items	Availability Conf.	Availability Obt.	Source	Remarks
A9-1 Present Industry a) Location Maps b) Production Items & Quantities				
A9-2 Future Industry Plan				
A9-3 Present & Future Water Demand for Industrial Use				
A9-4 Standard Charges of Industrial Water				
A9-5 Previous Study Report on Water Use for Industry				
A9-6 Other Related Data				

A10 Ecology and Environment

Items	Availability Conf.	Availability Obt.	Source	Remarks
A10-1 Present Ecological and Environment Problems and Counter-measures Relating to Water Resources Development such as a) Water Pollution b) Fish & Wild Life c) Vegetation d) Serious Epidemic Disease f) Over-extraction of Ground Water		○	Water Polution Control Section, MOWD	
A10-2 National Standard for Environment				
A10-3 Location Maps of National Park and Game Reserve				
A10-4 National Forestry Plan				
A10-5 Previous Study Report on Water Resources Development		○	Water Polution Control Section	Water Chemistry of the Upper Athi River, 1975
A10-6 Other Related Data				

Items	Availability Conf.	Availability Obt.	Source	Remarks
A11-1 Organization of Government				
A11-2 Organization of Water Resources & Water Supply		○	MOWD	
A11-3 Current Law, Regulation and Local Rule Relating to Water Resources Development		○	The Gorernment Printer	Water Acts
A11-4 National Budget in Past 5 Years		○		
A11-5 National and Local Road Maps a) Present Network b) Future Plan		○	Survey of Kenya	
A11-6 List of Governmental and Commercial Company Dealing with a) Drilling b) Survey c) Geophysics d) Soil Mechanics e) Engineering & Consulting		○	MOWD	Drieeing Co. & Consultants
A11-7 Current Wages of Laberours				
A11-8 Current Cost of Material such as Cement, Steel, Fuel etc.				
A11-9 Other Related Data				

Table-A1 List of Meteological Observation Station

Location No.	Name	Observation Period							Remarks
		Rainfall	Temporature	Humidity	Evaporation	Wind	Sunshine	Others	

Table-A2 List of Rainfall Observation Station

Location No.	Name	Type	Observation Period	Available Data			Remarks
		Gauge or Recorder		Daily	Hourly	Others	

Table-A3 List of Runoff Observation Station

Location No.	Name	Type	Observation Period	Available Data				Remarks
		Gauge or Recorder		Water Level		Discharge		
				Daily	Peak	Daily	Peak	

Table-A4 List of Main Earthquake

Location No.	Name	Time of Occurance	Location of Focus	Magunitude	Description of Damage	Remarks

Table-A5 Caracteristics of Main River

Location No.	Name	Catchment Area	Length of Main Stream	Width of Typical Section	Average Gradient	Remarks

Table-A6 Runoff of Main River

Name	Catchment Area (km2)	Mean Annual Runoff (mcm)	Maximum Discharge (m3/s)	Minimum Discharge (m3/s)	Annual Flow Duration (m3/s)				Sediment Runoff (t/year)	Remarks
					95 days	185 days	275 days	355 days		

*

* Daily discharges of 95 days in ayear more than this figure.

Table-A7 List of Dam

No. Name	Year Of Completion	Location		Type	Height (m)	Crest Length (m)	Valume of Dam (103m3)	Gross Capacity of Reservoir (103m3)	Effective Capacity of Reservoir (103m3)
		River	Nearest City						

*

Continued

Purpose of Dam	Catchment Area (km2)	Reservoir Area (km2)	Owner by	Engineering by	Coinstructed by	Remarks

**

* TE: Earthdam PG: Granity dan
GR: Rockfill dam VA: Arch dam

** I: Irrigation S: Water Supply
H: Hydroelectric R: Recreation
C: Flood Control

Table-A8 Present Water Consumption and Future Demand of Surface Water

Consumption of Demand	Area Province or District	Sector of Water Use							
		Municipality			Irrigation	Industry	Hydropower	Mining	Total
		Urban	Rural	Total					

Table-A9 List of Registered Water Right

No.	Name of Owner	Private or Official	River	Location	Purpose	Allowable Intake Rate (m3/set)	Allowable Intake Amount (mcm)	Effective Period	Remarks

Table-A10 List of Typical Well

Location No.	Elev.	Date of Completion	Type of Bore Hole	Total Depth (m)	Hole Dia. (mm)	Type of Casing	Type of Screen	Water Level (m)	Main Aquifer (m)	Production Discharge (l/sec)	Transmissivity (m2/sec)

Continued

Specific Capacity (l/sec/m)	Water Quality		Other Chemical Test Result	Lithology	Remarks
	TDS ppm	EC (m.mhos/cm)			

Table-A11 List of Urban and Rural Water Supply System

Location No.	Name	Distrit	River	Intake Structure	Dimension of Water Way	Treated or not	Intake Rate (m3/sec)	Unit Consumption (lit./person)	Annual Consumption (mcm)	Cost of Unit Water (ksh/m3)	Remarks

Table-A12 Present and Future(2000/2010) Situation of Aggriculture by Area

Kind of Crop	Cultivated Area (ha)	Production Amount (t)	Unit Yield (t/ha)	Unit Price (ksh/t)	Unit Water Consump-tion	Number of Livestock and Unit price(ksh/head)					Remarks
						Cattle	Sheep	Goat	Chiken	Others	

Table-A13 Present and Future(2000/2010) Irrigation Area

Location No.	Name	Year of Completion	Irrigation Area (ha)	Intake Structure	Irrigation Channel	Intake Rate (m3/sec)	Annual Consumption (mcm)	Project Cost(103ksh)

7. 収集資料リスト

7. 資料収集リスト

A－1 General

番号	資料の名称	ページ数	収集先名称又は発行機関
①	The 1977 Catalogue of Government Publications	86	The Government Printer
②	Economic Management for Renewed Growth (Settional Paper No. 11986)	117	〃
③	Economic Survey 1986	190	General Bureau of Statistics Ministry of Planning and National Development
④	Kenya, Provinces and District Map	1	Survey of Kenya
⑤	Population Distribution, 2 Sheets	1	Central Bureau of Statistics
⑥	Projected Population and Density	3	〃
⑦	Economic Survey 1989	157	〃
⑧	Statistical Abstract 1988	275	〃
⑨	Arid and Semi-Arid Lands Development in Kenya	128	Government of Kenya
⑩	Athi River Basin Pre-Investment Study Annex－12～21	≒ 300	Tana River Development Authority
⑪	Athi Basin Forward Plan 1986－1996	41	Tana and Athi River Development Authority
⑫	Tana and Athi Rivers Development Authority Forward Planning (1986－1996)	85	〃
⑬	Development Plan 1989－1993	262	The Government Printer
⑭	National Water Master Plan (Vol. I－V)		Ministry of Water Development (TAMS 米国コンサル)
⑮	Computer Inventory		MOWD
⑯	Development Estimates for the Year 1985/86 (抜すい)		Government of Kenya
⑰	〃 1989/90 (抜すい)		〃
⑱	Estimates of Recarrent Expenditure 1989/90 (抜すい)		〃

A－2 Basic Technical Data

番号	資　料　の　名　称	ページ数	収集先名称又は発行機関
①	Catalogue of Maps	40	Survey of Kenya
②	Road Map of East Africa	1	Text Book Center Limited
③	City of Nairobi, Map and Guide	1	Survey of Kenya
④	Climatorogical Statistics for Kenya 1984	87	Kenya Meteorological Department
⑤	Reliability of Rainfall in East Africa	13	〃
⑥	The Interpolation of Rainfall in the Nairobi Area	16	〃
⑦	The Distribution of Actual Evaporation/Evapo-transpiration Over East Africa	29	〃
⑧	The Persistence of the Monthly Rainfall Over East Africa	26	〃
⑨	A Note on the Onset of the Rains in East Africa	18	〃
⑩	Towords the Forcasting of Hailstorms in the Kericho Area	23	〃
⑪	Rainfall Intensity-Duration Frequency Data for Stations in East Africa	30	〃
⑫	The Maximum Possible Rainfall in East Africa	17	East African Metological Dept.
⑬	E.A.M.D List of Meteorological Publications 1972	14	〃
⑭	Example of Computer Out-put of Run-off Data		Computer Service Section, MOWD
⑮	〃 of Gauge Heights		〃
⑯	List of Run off Observation Station		〃
⑰	Land Use Map	1	Kenya Rangeland Ecological Montoring Unit, Minstry of Environment and Natural Resources
⑱	Land Use Mapping of Kenya Using Remote Sensing Techniques	33	〃

番号	資　料　の　名　称	ページ数	収集先名称又は発行機関
⑲	Lake Victoria Drainage Basin	1	MOWD
⑳	Rift Valley Drainage Area	1	〃
㉑	Athi River Basin Hydrometric Scheme	1	〃
㉒	Tana River Basin Regular Gauging Station	1	〃
㉓	List of Publications, Kenya Soil Survey	27	Kenya Soil Survey
㉔	Study on Earthquake	172	Nairobi University
㉕	Field Investigation Report, Greater Nakuru Water Supply Project Eastern Division Stage I, Seismicity		
㉖	Annual Summary of Discharge		Hydrology Section, MOWD

A－3 Surface Water

番号	資料の名称	ページ数	収集先名称又は発行機関
①	Application for Advertisement of Water Right	1	MOWD, Computer Services Section
②	Register of Dams in Kenya	1	Water Conservation Section MOWD
③	Application for Adverdisement of Water Permit	1	Computer Service Section, MOWD
④	Example of Computer Output of Water Permits		〃

A－4　Ground Water

番号	資　料　の　名　称	ページ数	収集先名称又は発行機関
①	Geological Map of Northern Kenya	1	Grondwater Research Section, MOWD
②	Geological Map of Kenya, South of Equator	1	〃
③	Borehole Location Map, North of Equator	1	〃
④	〃　South of Equator	1	〃
⑤	Piezomeric Surtace Map of Kenya, North of Epuator	1	〃
⑥	〃　South of Equator	1	〃
⑦	Borehole Yield Map for Kenya Above Equator	1	〃
⑧	〃　South Kenya	1	〃
⑨	Altitudes of Bore-Holes Northern Kenya	1	〃
⑩	Groundwater Quality of Kenya	19	〃
⑪	Report No.7, Groundwater Resouress in Kenya, March 1973	53	World Helth Organization
	Seotorial Study and National Programming for Community and Rural Water Supply, Sewerage and Polution Control including Groundwater Quality Map, 2 Sheets		
⑫	Example of Computer Output of Borehole Data		Computer Service Section, MOWD
⑬	List of Typical Well	5	Geology Section, MOWD
⑭	Borehole Comletion Record (Form)		MOWD

A－5 Urban and Rural Water

番号	資料の名称	ページ数	収集先名称又は発行機関
①	Operational Water Schemes by District		National Water Conservation and Pipeline Corporation
②	Project Programme	5	〃
③	Example of Output for Operation and Maintenance Statistics	1	Operation Section, MOWD
④	Water Resources Assessment Study in Laikipia District	1	NWCP, C
⑤	Water Resources Assessment Study in Baringo District	1	〃
⑥	Water－a Sector Policy Paper－ Jar/1989		Netherlands Development Organization
⑦	Water Resources Assessment & Planning Project －Development of the WRAP Programme, 1981－1988－		〃
⑧	Kenya Rural Water Supply Development Project in Western Province－ Report of the Mission 4－5/1988 Appraisal Mission		Finnish International
⑨	Kenya－Finland, Western Water Supply Progamme Work Plan, 1981		〃

A－6 Irrigation ／A－7 Electric Power

番号	資料の名称	ページ数	収集先名称又は発行機関
①	List of All Schemes and Project		Minstry of Agriculture
②	Present Irrigation Area by Crop	4	〃
③	Water Requirements for Irrigation in Kenya	97	Irrigation Section, MOWD
④	Evapotranspiration in Kenya	90	〃
⑤	Study on Options and Investment Priorities in Irrigation Development 4/1987		NIB
①	Kenya National Power Development Plan		
	Executive Summary 6/1987 Main Report		
②	National Energy Policy 4/1984		Ministry of Energy and Regional Development

A－8 Flood Control

番号	資　料　の　名　称	ページ数	収集先名称又は発行機関
①	Pre-Investment study for Water Management and Development of Nyando and Nzoia River Basins, Nzoia River Basin Pre-Development Report	83	Irrigation Section, MOWD

A-10 Ecology and Environment

番号	資料の名称	ページ数	収集先名称又は発行機関
①	Location Map of Observation of Water Quality	1	Water Polution Control Section, MOWD
②	Example of Observation Data of Water Quality	1	〃
③	Standard of Water Quality	1	〃
④	The Water Chemistry of the Upper Athi River 1975	本文のみ5	〃

A-11 Others

番号	資　料　の　名　称	ページ数	収集先名称又は発行機関
①	Licenced Borehole Contractors in Kenya	1	NWCPC
②	Name of Consultants	1	〃
③	The Water Act, Chapter 372		Government Printer
④	Wages for Labourers	1	NWCPC
⑤	Insteel Limited Price List No.101/89	5	〃
⑥	The Geology and Mineral Resources of Kenya 1969		Geological Survey of Kenya Ministry of Natural Resources

8. ケニアに対する技術協力案件（水資源開発関連）の実績

8. ケニアに対する技術協力案件（水資源開発関連）の実績

1. ソンドウ川水力発電開発計画調査（M/P、F/S）	12/1985
2. モンバナ地区給水増強計画調査（F/S）	9/1981
3. ムウェア地区かんがい開発計画（F/S）	3/1988
4. タベタ・ルミ給水計画基本計画（B/D）	12/1987
5. マグワグワ水力発電開発計画事前調査	8/1989
6. カノー平野かんがい開発計画予備調査	8/1989
7. ケニア国 Kajiado－Narok 地下水開発計画（B/D）	3/1982

9. 価格調査結果（揚水試験費用概算）

9. 価格調査結果

〔参考〕 揚水試験費用概算

1. 前提条件

① 単価はMOWのDrilling Sectionによるが、ごく概算であり、条件を定めて見積もりをとるほうがよい。MOWではリグの損料は計上していないので、民間会社に頼むと、その分高くなる。

② 揚水試験井戸の本数は50本、3パーティで行う。

③ 井戸1本当りの所要日数

ポンプその他据付 1日、 撤去 1日、 井戸間移動 1日

揚水3段階 水位回復

試験時間＝井戸洗い（6 hr）＋マルチステージテスト（6 hr ＋ 4 hr）

揚水 回復

＋シングルステージ（72 hr ＋ 24 hr）≒ 112 hr ÷ 24 hr ≒ 5日

＝合計 8日

④ 揚水試験所要時間

50本 × 8日 ÷ 3パーティ ÷ 25日 ＝ 5.3カ月 ≒ 6カ月

2. 見積金額

①	準備及び大移動	1式	＝ 700,000 ksh
②	揚水試験	112 hr/本 × 50本 × 320 ksh	＝ 1,792,000
③	ポンプ据付・撤去	2日 × 7 hr × 50本 × 800 ksh	＝ 560.000
④	井戸間移動	1日 × 7 hr × 50本 × 400 ksh	＝ 140,000
⑤	検層	1式	＝ 750,000
⑥	水質分析	1式	＝ 200.000
			4,142,000 ksh
			≒ 29,000,000円

10. The State Corporation Act (The National Water Conservation and Pipeline Corporation Order, 1988)　1988年6月24日付ケニア政府官報

Kenya Gazette Supplement No. 35 *24th June, 1988*

(Legislative Supplement No. 28)

CORRIGENDA

Legal Notice No. 254 of 1988, on page 479—

Delete the figure "35" appearing in the main heading and in paragraph 1 and *insert* "38";

Legal Notice No. 255 of 1988, on page 498—

Delete the figure "36" appearing in the main heading and in paragraph 1 and *insert* "39";

Legal Notice No. 256 of 1988, on page 499—

Delete the figure "37" appearing in the main heading and in paragraph 1 and *insert* "40";

Legal Notice No. 257 of 1988, on page 500—

Delete the figure "38" appearing in the main heading and in paragraph 1 and *insert* "41";

Legal Notice No. 258 of 1988, on page 500—

Delete the figure "39" appearing in the main heading and in paragraph 1 and *insert* "42";

Legal Notice No. 259 of 1988, on page 501—

Delete the figure "40" appearing in the main heading and in paragraph 1 and *insert* "43";

Legal Notice No. 260 of 1988, on page 501—

Delete the figure "41" appearing in the main heading and in paragraph 1 and *insert* "44".

LEGAL NOTICE No. 270

THE STATE CORPORATIONS ACT

(*Cap.* 446)

IN EXERCISE of the powers conferred by section 3 (1) of the State Corporations Act, I, Daniel Toroitich arap Moi, President and Commander-in-Chief of the Armed Forces of the Republic of Kenya, make the following Order:—

THE NATIONAL WATER CONSERVATION AND PIPELINE CORPORATION ORDER, 1988

Citation.

1. This Order may be cited as the National Water Conservation and Pipeline Corporation Order, 1988.

Establishment of the Corporation.

2. There is hereby established a state corporation to be known as the National Water Conservation and Pipeline Corporation (hereinafter called "the Corporation") which shall be a body corporate in accordance with section 3 of the Act and which shall perform and exercise the duties, functions and powers specified in the Act and in this Order.

Board of the Corporation.

3. There shall be a Board of the Corporation which shall, subject to section 6 (4) of the Act, consist of—

(*a*) a non-executive chairman appointed by the President;

(*b*) the chief executive;

(*c*) the Permanent Secretary to the Ministry for the time being responsible for water development;

(*d*) the Permanent Secretary to the Treasury;

(*e*) the Director-Chief Engineer for Water Development;

(*f*) not more than six other members not being employees of the Corporation, of whom not more than two shall be public officers, appointed by the Minister.

Headquarters.

4. The headquarters of the Corporation shall be in Nairobi.

Functions of the Corporation.

5. (1) The Corporation shall, under the general direction of the Minister for the time being responsible for water development, manage and develop the water projects specified in the Schedule, details of which are available at the offices of the chief executive of the Corporation and the Permanent Secretary to the parent Ministry.

(2) The Minister may by notice in the Gazette amend the Schedule

(3) The Corporation shall in connection with the water projects specified in the Schedule—

(*a*) supply water in bulk to such water undertakers as the Minister may, after consultation with the Board, by notice in the Gazette, designate;

(*b*) supply water, in bulk or otherwise, to such persons or class of persons as the Minister may, after consultation with the Board, by notice in the Gazette, designate;

(*c*) do all such things as may be necessary or advantageous for the management and development of the water projects and for securing an adequate supply of water;

(*d*) apply for and obtain all such licences, permits and other authorities required under any written law or as may be desirable.

(4) The Corporation shall assist the Government in the formulation and execution of a national water development policy.

Charges for water.

6. (1) The Board shall, in consultation with the Minister and subject to subparagraph (2), determine the prices to be charged by the Corporation for water supplied by it and the methods of charge for water; and the prices to be charged and the methods of charge for water supplied by the Corporation in bulk shall be published in the Gazette.

(2) The Corporation may determine separate prices or methods for any particular person or class of persons or for any particular area.

Fund and banking accounts.

7. (1) The Corporation shall establish a "National Water Conservation and Pipeline Fund" in to which all moneys received by the Corporation shall be paid and out of which all payments made by the Corporation shall be made.

(2) The Corporation shall open a banking account or banking accounts for the Fund.

(3) The Corporation may invest any surplus funds in the manner approved by the Minister and may lend those funds for water development purposes.

Protection from personal liability.

8. No matter or any thing done by a member of the Board or any officer, employee or agent of the Corporation shall, if the matter or thing is done bona fide for executing the functions, powers and duties of the Corporation render the member, officer, employee or agent or any person acting by his directions, personally liable to any action claim or demand whatsoever.

Liability of the Corporation for damages.

9. The provisions of this Order shall not relieve the Corporation of the liability to pay compensation or damages to any person or any injury to him, his property or any of his interests caused by the exercise or any power conferred by this Order or by the failure, whether wholly or partially, for any works.

Delegation by the Corporation.

10. The Corporation may, by resolution, either generally or in any particular case, delegate to any committee of the Corporation, or to any member, officer, employee or agent of the Corporation the exercise of any of the powers or the performance of any of the functions or duties the Corporation is authorized by this Order to exercise or perform.

SCHEDULE OF WATER PROJECTS

1. The Nul-Turesh Pipeline and Water Supply.
2. The National Dam Construction Project.
3. The Greater Nakuru Water Project (East and West).
4. The Second Mzima Pipeline.
5. The Great Rift Water Project.
6. The Tana/Lamu Water Project.
7. The Sabaki Water Project.

Made on the 16th June, 1988.

D. T. ARAP MOI,
President.

LEGAL NOTICE NO. 41

THE EXCHANGE CONTROL ACT

(*Cap.* 113)

IN EXERCISE of the powers conferred by section 2 (1) of the Exchange Control Act, the Minister for Finance makes the following Order:—

THE EXCHANGE CONTROL (AUTHORIZED DEALERS) (AMENDMENT) ORDER, 1989

1. This Order may be cited as the Exchange Control (Authorized Dealers) (Amendment) Order, 1989.

Sub. Leg.

2. The Schedule to the Exchange Control (Authorized Dealers) Order is amended by inserting in alphabetical sequence the following new entry—

Trust Bank Limited.

Made on the 16th January, 1989.

GEORGE SAITOTI,
Minister for Finance.

LEGAL NOTICE NO. 42

THE STATE CORPORATIONS ACT

(*Cap.* 446)

THE NATIONAL WATER CONSERVATION AND PIPELINE CORPORATION ORDER, 1988

(*L.N.* 270 *of* 1988)

AMENDMENT OF SCHEDULE

IN EXERCISE of the powers conferred by paragraph 5 (2) of the National Water Conservation and Pipeline Corporation Order, 1988, the Minister for Water Development amends the Schedule to the Order by inserting the following water projects—

8. Kapsabet Water Project.
9. Ndia Water Project.
10. Othaya Water Project.
11. Embu Water Project.
12. Bungoma Water Project.
13. Kakamega Water Project.

AMENDMENT OF SCHEDULE—(*Contd.*)

14. Shitoli Water Project.
15. Kandara Water Project.
16. Kahuti Water Project.
17. Litein Water Project.
18. Chebang'ang Water Project.
19. Nyakach Water Project.
20. Kisii Water Project.
21. Maseno–Kombewa Water Project.
22. Mathira Water Project.
23. Aguthi Water Project.
24. Marmanet Water Project.
25. Kiambu Water Project.
26. Oloitokitok Water Project.
27. Marere Pipeline Water Project.
28. Tiwi Water Project.
29. Kabarnet Water Project.
30. Siaya Water Project.
31. Kiambaa Water Project.
32. Taveta Lumi Water Project.
33. Kiambere Water Project.
34. Soin Water Project.
35. Itare/Chemosit Dam Project.
36. Inter-Basin Water Transfer Nzoia/Kerio Project.
37. Endo/Perkerra Water Project.
38. Kipsigak Water Project.
39. Kurgung Water Project.
40. Chemususu Dam Project.
41. Malewa Dam Project.
42. Kirandich Dam Project.

Dated the 8th January, 1989.

W. N. AYAH,
Minister for Water Development.

LEGAL NOTICE NO. 43

THE WATER ACT

(*Cap.* 372)

TRANSFER OF WATER UNDERTAKINGS

IN EXERCISE of the powers conferred by section 125 (1) (*b*) of the Water Act, the Minister for Water Development, after consultation with the Water Resources Authority, authorizes the following water undertakings, hitherto operated by the Director of the Water Development, to be transferred to the Managing Director, National Water Conservation and Pipeline Corporation with effect from the 1st July, 1989—

1. Kapsabet.
2. Ndia.
3. Othaya.
4. Embu.
5. Bungoma.
6. Kakamega.
7. Shitoli.
8. Kandara.
9. Kahuti.
10. Litein.
11. Chebang'ang.
12. Nyakach.
13. Kisii.
14. Maseno-Kombewa.
15. Mathira.
16. Aguthi.
17. Marmanet.
18. Kiambu.
19. Oloitokitok.
20. Greater Nakuru (West)
21. Sabaki.
22. Marere.
23. Tiwi.
24. Mzima.
25. Kabarnet Town.
26. Siaya Town.

Dated the 8th January, 1989.

W. N. AYAH,
Minister for Water Development.

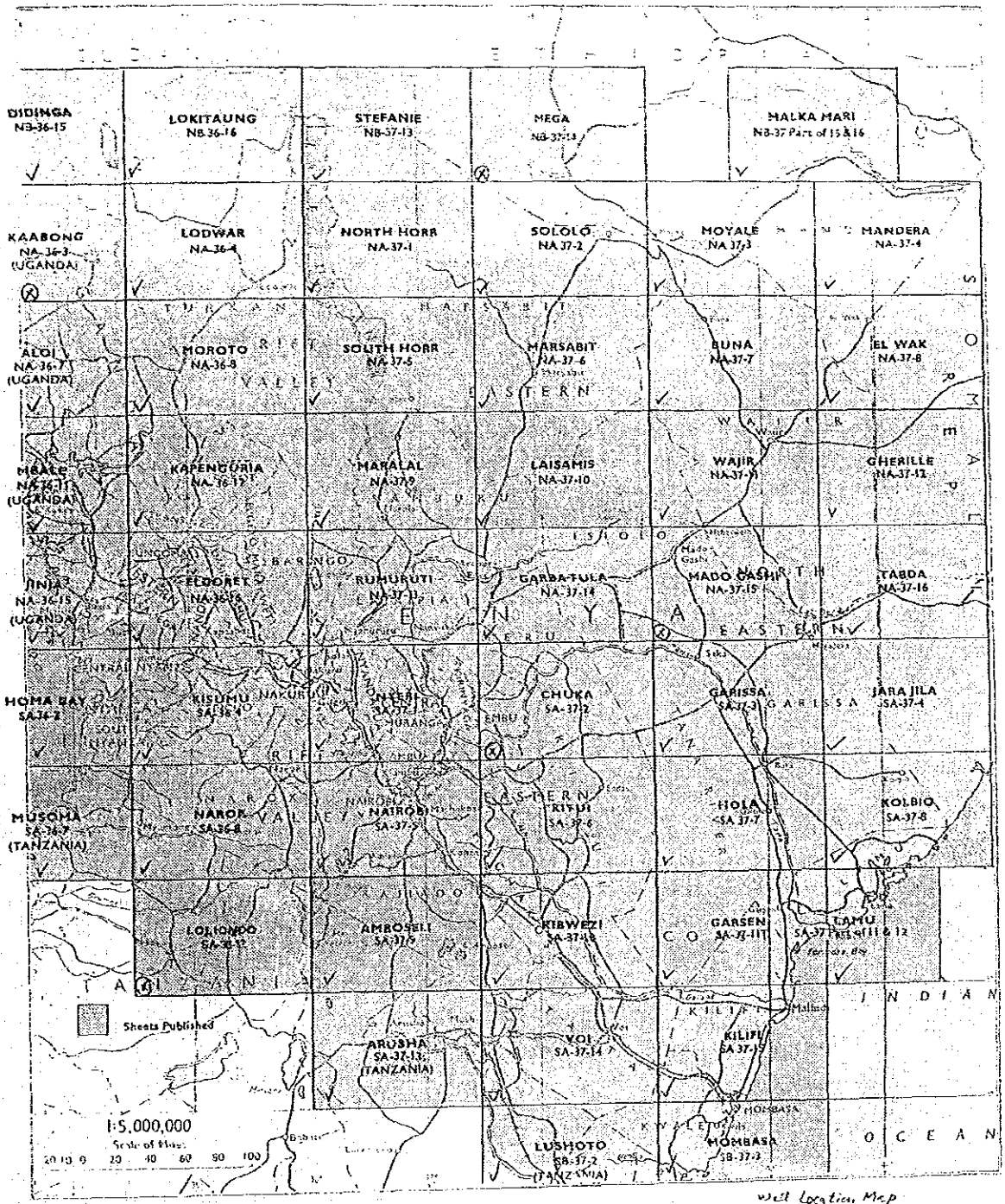
PRINTED AND PUBLISHED BY THE GOVERNMENT PRINTER, NAIROBI

11. ケニア国地形図索引（1/250,000、1/100,000、1/50,000）

11. ケニア国地形図索引

11.－1

1:250,000 TOPOGRAPHICAL MAPS (Y503) DIAGRAM 3

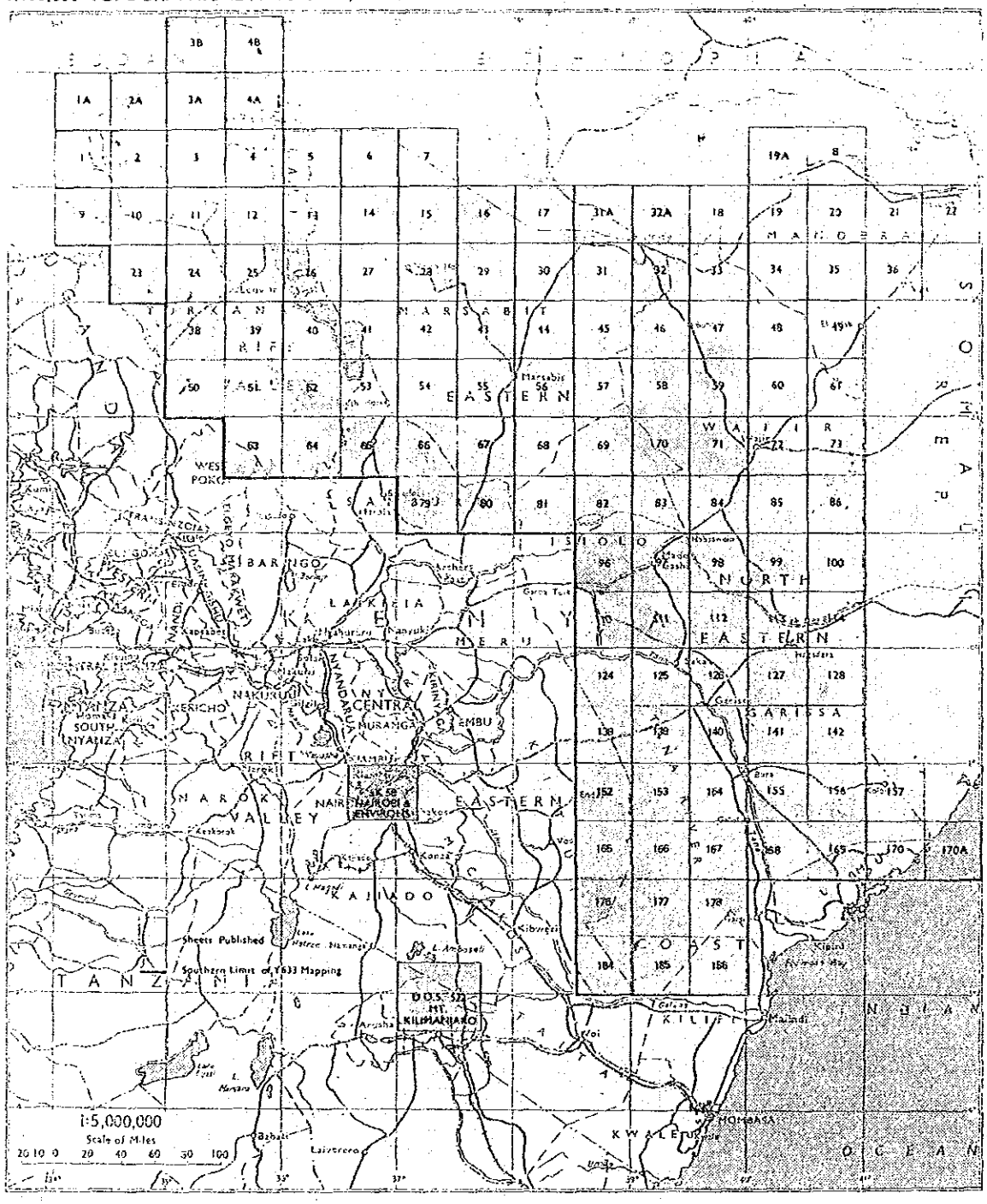


Well Location Map

No. 18 No.22 No. 43.44

No18, No22, No43, No44 など

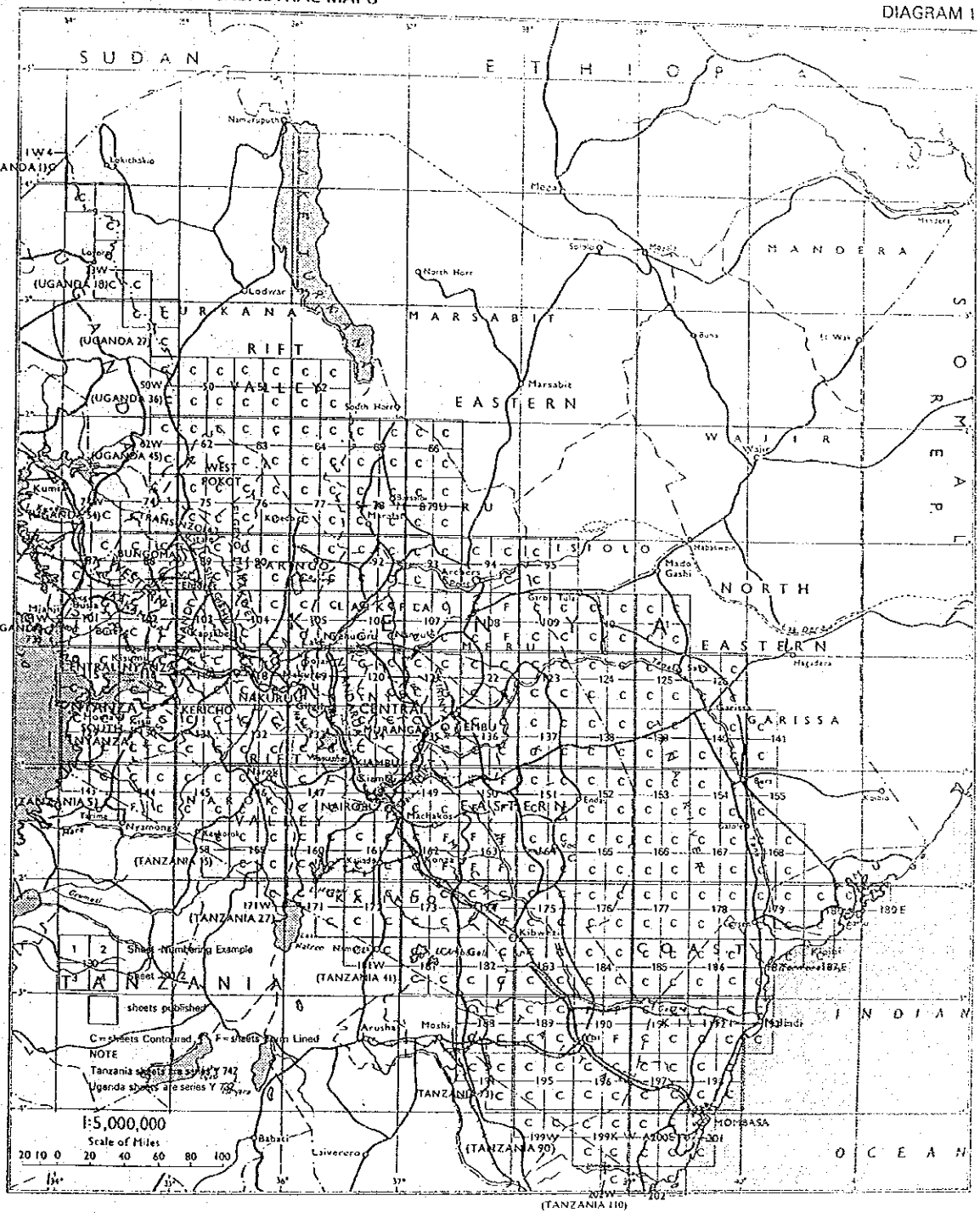
1:100,000 TOPOGRAPHICAL MAPS Y 633, SK 58 AND D.O.S. 522 DIAGRAM 2



11.－3

1:50,000(SK49) TOPO－CADASTRAL MAPS

DIAGRAM 1



出典：Catalogue of Maps
(Survey of Kenya, March/1985)

12. ケニア国地質図索引

12. ケニア国地質図索引