JAPAN INTERNATIONAL COOPERATION AGENCY

MINISTRY OF ENERGY
THE REPUBLIC OF KENYA

FEASIBILITY STUDY
ON
MUTONGA/GRAND FALLS HYDROPOWER PROJECT

FINAL REPORT

VOLUME IV
SUPPORTING REPORT (3)
(WORKSHOP PROCEEDINGS)

MARCH 1998

NIPPON KOEI CO., LTD.
PASCO INTERNATIONAL INC.
TOKYO JAPAN

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This Report consists of

Executive Summary

Executive Summary for Environmental Assessment

Volume I Main Report

Volume II Supporting Report (1)
(Engineering Study)

Volume III Supporting Report (2)
(Environmental Assessment)

Volume IV Supporting Report (3)
(Workshop Proceedings)

The cost estimate is based on the price level of June 1997 and the monthly mean exchange rates in June 1997. The monthly mean exchange rates in June 1997 are:

US$ 1.00 = KShs. 54.0 = J. Yen 120

ANNEX A : *Proceedings of Workshop No.1*

ANNEX B : *Proceedings of Workshop No.2*

ANNEX C : *Proceedings of Workshop No.3*

ANNEX D : *Implementation of Workshop No.3 Recommendations by Project Stage*

INTRODUCTION

The Stage 1 study of the Mutonga/Grand Falls Feasibility Study was commenced in February 1994 with the objective of initial environmental assessment and completed by preparing the report on the Initial Environmental Assessment in August 1994. The Workshop No.1 was held in September 13 to 16, 1994 at Embu with the attendance of TARDA, KPLC, JICA, WD, concerned Kenyan Government Organizations, DEC (Embu, Tharaka-Nithi, Tana-River, Mwingi), International Organizations (IUCN, WWF) and JICA Study Team to discuss the results of initial environmental assessment study. The results of discussions in the Workshop No.1 were compiled into the Workshop Proceedings of the Workshop No.1 as ANNEX-A in this Supporting Report (3).

The Stage 2 study started in September 1994 immediately after the completion of the Stage 1 study, with the object to select definitive plan of the Project among the alternatives. The Progress Report (1) concluded and recommended the option of the Low Grand Falls and Mutonga as the optimum development scheme from a technical, economical and environmental viewpoint. The Workshop No.2 was held in ICIPE/Duduville, Nairobi, from 20 to 22 March 1995 with attendance of invited organizations and public applicants. The study results were reported at the Workshop to discuss the results among the attendants. The Workshop Proceedings which reports the results of discussions at the Workshop No.2 is attached as ANNEX-B in this Supporting Report (3).

The Stage 3 study divided into Part 1 and Part 2 was started in June 1995. The Part 1 of the Stage 3 consisting of topographic mapping, geological investigation and transmission line survey for the feasibility design and the study on the optimization of plant scale was carried out from June and September 1995. All study results were presented in the Interim Report and Progress Report (2) submitted in November 1995 and March 1996. The Part 2 of the Stage 3 composed of the preliminary design, construction cost estimate and plan, and the project evaluation was performed from July to September 1997. The Draft Final Report was submitted in October 1997 by incorporating all the results achieved in the study of the Part 2 of the Stage 3. The Workshop No.3 was held in KCCT/Mbagathis (Kenya College of Communications Technology), Nairobi, from 26 to 29 January 1998 with attendance of official invited organizations and public applicants, total 188 participants. The study results of the Stage 3 in the Draft Final Report were presented by the JICA Study Team at the Workshop. Following the explanation of the JICA Study Team and general discussion, three group discussions concerning the engineering study, the upstream environmental assessment and the downstream environmental assessment were carried out by participants. The Workshop Proceedings of the Workshop No.3 compiling

the results of discussions and recommendations of the Workshop is attached as ANNEX-C in this Supporting Report (3).

The recommendations of the Workshop No.3 are categorized into seven stages of implementation consisting of: 1) considered by feasibility study, 2) additional environmental study, 3) detailed design stage, 4) construction stage, 5) infilling period, 6) comprehensive basin study and 7) Kenya Government. As a result, the Implementation of Workshop Recommendations by Project Stage is complied into this Supporting Report (3) as ANNEX-D. Figure D-1 in ANNEX-D presents the allocation of above seven stages for implementation of the recommendations, dividing into stages which are taken into account in the sequence of the project implementation, and in the parallel with the project implementation.

ANNEX - A

PROCEEDINGS OF WORKSHOP NO.1

TANA AND ATHI RIVERS DEVELOPMENT AUTHORITY

MUTONGA/GRANDFALLS HYDRO-POWER PROJECT

INITIAL ENVIRONMENTAL ASSESSMENT WORKSHOP I

13TH - 16TH SEPTEMBER, 1994

EMBU, KENYA

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TANA AND ATHI RIVERS DEVELOPMENT AUTHORITY
MUTONGA/GRANFALLS HYDROPOWER PROJECT
INITIAL ENVIRONMENTAL ASSESSMENT WORKSHOP
EMBU,KENYA - 13TH SEPTEMBER TO 16TH SEPTEMBER, 1994

1. GENERAL INTRODUCTION

1.1. Preamble

The Tana and Athi Rivers Development Authority (TARDA) was established in 1974 through an Act of Parliament (CAP. 443 of the Laws of Kenya) and charged with the responsibility of advising the Government on all matters pertaining to the development of the Tana and Athi river basins, especially utilization of Water Resources.

Essentially the Authority plays the key role of advising, coordinating and implementing projects and programmes which relate directly or indirectly to the utilization of water resources in the two river basins.

Towards this end TARDA has adopted a multi-pronged developmental approach taking into consideration the alternative water uses which include hydro-power development, irrigation, public and industrial water supplies, fisheries and tourism, among others.

The Authority's projects and programmes todate reflect a multipurpose approach as evidenced by the Masinga Dam (Upper Tana Reservoir), Kiambere Hydro-electric project, the Tana Delta Irrigation Project and a host of smaller scale projects scattered within the basins.

The Tana River is the largest indigenous water resource in Kenya with a total catchment basin area of 100,000 km2, or one fifth (1/5) of the country's land area.

The annual rainfall in the upper catchment zone of the river basin is 1,000mm as compared to the whole country's annual average of 621mm. The rainfall intensity and run-off especially during the two seasons calls for effective

regulatory measures in order to augment the benefits of the water resource.

At present five dams have been constructed along the Tana River i.e. at Masinga, Kamburu, Gitaru, Kindaruma and Kiambere, but only a few more suitable dam sites have been identified downstream of Kiambere. These are Mutonga, Grandfalls, Usueni and Kora.

However, the Grandfalls site may be the last ideal location for development because at this point river run-off is highest at an annual average of 156m3, remains almost constant to Garissa, and decreases downstream due to low rainfall and high evaporation rate and seepage into the ground.

Preliminary studies had been done for construction of a dam at Mutonga and/or Grandfalls chiefly for hydro-power production, but techno-economic features for the project have not been determined and neither has sustainability in relation to environmental impacts been examined.

1.2 The Feasibility Study

The current exercise relating to the proposed Mutonga/Grandfalls hydropower project emanated from a request by the Government of Kenya to the Government of Japan for the financing of a feasibility study for Grandfalls hydro-electric project.

Subsequently, a contact survey team from the Japan International Cooperation Agency (JICA) came to Kenya in June 1993 for exploratory discussions with various government agencies and to collect basic data and information which would enable clarification of the Government of Kenya's request to Japan.

As the Goverment agency charged with management and development within the Tana River Basin, TARDA was given the responsibility to coordinate all matters pertaining to the proposed project.

b) Stage 2. which will comprise quantitative assessment of the second workshop for selecting the preferred option and,

c) Stage 3. for the final assessment of the selected option

1.3 Initial Environmental Assessment

In this activity five alternatives have been assumed, i.e.

i) Mutonga only

ii) Low Grandfalls only with option of future raising

iii) Low Grandfalls and Mutonga and,

iv) No development at all.

Assessment carried out between Februay and July 1994 related to the baseline environment in the reservoir area and in the riverine corridor to the sea.

Note should be taken of the fact that in contrast to normal E.I.A. for a dam scheme, two areas are the subject of assessment in this case:-

a) Inundation caused by the creation of the reservoir, and

b) the impacts on the riverine corridor to the sea as a result of changes in the low regime.

The aim of the workshop is therefore to discuss on the one hand all matters pertaining to environmental impacts of the envisaged project, and to steer assessment of the impacts in the succeeding stages.

2. HYDROLOGY BASELINE

This topic was addressed from the view point of the whole river system and on the basis of the reservoir area and riverine corridor.

Three dimensions were adopted in discussing hydrology baseline i.e. an overview of Tana River Hydrology, key features of reservoir areas and the features of the riverine corridor.

2.1. An Overview of Tana River Hydrology

Emphasis here was laid on the need to appreciate the river as a system which is inter-related upstream and downstream through the forces of supply and demand of available water. The river hydrology, morphology, sedimentation and other aspects like water quality were dealt with at length.

The climatic conditions and rainfall were also singled out as major factors in the hydrology of the river.

The hydrology of the river is characterised by 75% of the river flow being generated from 25% of the catchment area. Data for the upper reaches on river flows are available, though with the construction of large dams the river flow cannot be natural. Data on the contribution by ephemeral rivers (laggas) to main flow are poor and cannot be accurately determined.

It is also noted that the flow pattern is biannual which is significant for dam storage and also reliability of supply.

The high grandfalls site corresponds approximately with the maiximum mean annual flow on the Tana of 160m3/sec. which is also similar to Garissa.

In August 1993, a JICA preparatory survey team came to Kenya and concluded an agreement with TARDA for the scope of work pertaining to the feasibility study of what is now called Mutonga/Grandfalls hydro-power project.

The JICA study team in cooperation with TARDA commenced operations relating to the study in February 1994 with activities covering initial environmental assessment, topographic survey and geological investigations.

The study aims at examining the techno-economic feasilibity as well as sustainability taking into account environmental aspects and alternative water uses like hydro-power, irrigation, public and industrial water supplies.

The feasibility study is planned to be carried out in three stages over a two year span - i.e. February 1994 to July 1996, as follows:-

a) Stage 1. comprising initial environmental assessment aimed at initially assessing impacts of the project,

b) Stage 2. which will entail definite plan/pre-feasibility study to select preferred development options among the alternatives identified and,

c) Stage 3. which would be the feasibility study to assess viability of the selected option.

The environmental assessment is also planned to be carried out in three stages:-

a) Stage 1. which entails qualitative assessment of the alternatives accompanied by the first workshop for steering the succeeding studies,

On the other hand the river morphology can be described as follows:-

a) The upper reaches which is characterised by cascading mountainous streams, high rainfall and low evapotranspiration in comparision, to the rainfall,

b) the middle reaches - with wide V-shaped valleys and small meanders and rapids which have been utilized for hydropower generation, and

c) the lower reaches/delta where the river meanders in broad flood plains - 2 - 4 km wide, shifting river channels, ox-bow lakes and swamps.

The observation was made that available records at the Grandfall site on sediment loads are poor. However, the estimated natural sediment yield based on this data at Grandfalls (GF) is 3.21 million m3/year. With the construction of the upstream reservoirs, it is estimated that the current load at GF is 1.02 m3/S and at Garissa is 8.54 million m3/year. The high sediment load at Garissa cannot be adequately explained by the channel scouring and it is not clear whether the sediment comes from scouring of river banks and the channel, or from the laggas.

To overcome the problem of poor data at GF it was proposed that data collection should continue to firm up on information on sediment yield.

Sedimentation is cited as an important aspect in dam construction due to siltation, as well as fertility regeneration downstream,not to mention the river behaviour downstream.

Another aspect that was considered related to water quality while the ground water level which is interrelated with surface water resources was also given due attention.

It was, however, noted that "NIL" entries for some factors in Table F1.7 and Table D1.8 on water analysis at Grandfalls and Garsen respectivley may not reflect the ideal condition and needed re-examination with a view rectifying them. Some of the factors where it was not possible to have nil returns include iron, manganese, aluminium, nitrate, ammonia, total nitrogen, suspended solids and dissolved oxygen.

The issue of the effect of waste water from coffee factories located upstream on the general water quality requires due attention and should be exploited during the feasibility stage.

General water demands upstream was said to be increasing due to multiple uses in agriculture, industry and hydropower generation. This trend is bound to increase in future resulting in lower supply to Grandfalls and also requires close scrutiny.

2.2. Key Features of Reservoir Areas

The dam site is situated in a semi-arid area about 45 km downstream of Kiambere dam. The recorded evaporation is in excess of 1600 mm/year which is significant factor of water losses.

At this stage the river morphology is characterised by a V-shaped valley with breaks in slope and rapids. The flood plain rends to broaden out as the slope reduces.

The stream flow is biannual, and the site coincides with the area of maximum mean annual flow which is approximately 160 m3/S. About 70% of the flow is generated from upstream with 30% coming from the tributaries of Mutonga/Kazita, Ena and Thura rivers.

The floods estimates which have been developed from the existing data indicate that the flood with a 1 in 5 year return period is 1800 m3/S while 1 in 50 years is 3500 m3/S. The mean annual flood is estimated at 1380 m3/S and has a return period of 2 - 3 years approximately. The probable maximum flood which is of interest in design has not been determined.

As previously indicated the data available on sedimentation rates at site is poor. However, considering the mean annual flow (MAF) the sediment load is low and this could be attributed to the trapping of sediment in the upper reservoir.

Basically this site is considered good as a damsite due to the high mean annual flow, the low sediment load and the low risk of damage to life downstream in the event of dam failure.

2.3. Features of Riverine Corridor

The area referred to as the riverine corridor stretches from Grandfalls to the Indian Ocean. It is characterised by river meandering from V-shaped to more pronounced plains downstream of Garissa from where the river channel becomes narrower. Ox-bow lakes and swamps are a common feature of the river downstream of Garsen. River flow is difficult to estimate due to river changes and high deposition of sediments. The delta area subject to extensive and frequent flooding.

The riverine corridor to delta is considered important owing to the primary changes due to modified flow regime and the consequent changes in bio-physical environment.

The hydrological characteristics of the riverine corridor can be summarised as follws:-

i) Grandfalls - Garissa

MAF at Garissa is 165 m3/S

- Flood plain 1.5 - 2 km wide
- 75% of floodplain
- Evapotranspiration and seepage high
- Flood attenuation in peak and volume due to bank overview

ii) Garissa - Garsen

- MAP at Garsen is 110 m3/S while maximum river channel capacity 250 m3/S
- Excessive flood attention due to bank flow
- Notable permanent ox-bow lakes and swamps which receive frequent resupply of water and sediments from Tana river e.g. lake Billisa

iii) Garsen - Delta

- Fan shaped delta
- Saline intrusion
- Slow stagnant water; deposition of fine sediment
- Flow volume significantly less then flood discharge

On the whole the river system is complex and the consequences cannot be assumed to be obvious. Thus, modelling would be a useful tool in order to disegragate different impacts of various development of the river.

Conclusion can, therefore, be drawn that Grandfalls is a good site for a dam and while reasonable information flow is available at Garissa but less so in GF for design, better estimates are needed. Poor information on sediment yield and on impact monitoring from previous development in Tana Basin, is evident.

Discussion Session

During the discussion session the following issues were raised:-

- Water quality
- Flouride levels
- Sediment loads during the wet/rainy season and the

- Question of stability (seismic) due to amount of water held in the dam.

Some of the issues raised could not be addresed in detail during this initial environmental assessment phase but will be considered for more detailed review in the preceeding stages. Of these water quality, flouride levels, sediment loads during the rainy seasons and stability (seismic) and to the amount of water stored need careful analysis.

3. BASELINE ENVIRONMENT OF THE RESERVOIR AREA

The scenario in respect to baseline environment of the reservoir area will be detemined by which one of the four project options is selected for implementation.

The High Grandfalls option is for all practical purposes the most appropriate to draw from since any impacts emanating from its implementation are replicable in the other three cases, though to a lesser extent.

Technically the High Grandfalls is rated as "worst option" as far as environmental impacts are concerned due to its extent. The reservoir area is currently rated at 220 square kilometres covering parts of Tharaka-Nithi, Mwingi and Embu districts.

The area is sparsely populated with adensity of around 50 people per km2 whose typical mainstay is small scale agricultural activity and livestock keeping.

Human settlement into the area is fairly recent and, therefore, socio-economic impacts may not be overly extensive given that average annual income per capital is around Kshs.2,500/-.

Moreover, the "bush-fallow" system of cultivation practised in the area and encroachement into higher ground in search of more productive land has resulted in severe erosion.

Soil degradation is aggravated by absence of adequate ground cover, even along the river banks where only a narrow strip of thicker vegetation exists.

Accessibility to the reservoir area is difficult owing to lack of motorable roads. For this reason the people's mobility is reduced drastically and there is not much contact with the outside world. Neither are there any forms of communication facilities like telephones, while only one bridge exists across the Tana River.

Public facilities which may be affected by the project would include one or two schools since health facilities are provided by mobile clinics run by church organization or Non-Governmental Organizations.

The absence of adequate public health facilites has compounded the problem of endemic diseases like malaria, upper respiratory tract infection and water borne diseases. Sexually, transmitted diseases and even Aids, have also creaped into the region.

The diseases problem is worsened by poor nutrition in the community to the extent that at least 16% of children over three years are stunted.

The land in the reservoir area is mainly Trustland, but at the local operational level is divided along clan lines. Land use is basically subsistence agriculture with millet and sorghum as the main cereals, while legumes include pigeon peas and cow peas.

Bananas are also grown, though not a significant extent, and maize is planted when there is adequate rainfall. The main cash crops are tobacco and cotton.

Rearing of cattle, sheep and goats is a notable activity while donkeys are the main means of transport.

Existing vegetation is the source of building materials and fibres while dik diks, baboons, monkeys and a variety of birds and snakes.are a small common game.

The soils in this area have been studied in detail and although they vary considerably in erodibility, luvisols and lixisols which are the most erodible are widespread.

The risk of erosion is increased by poor vegetation cover and steep slopes and, therefore, soil erosion and sedimentation are likely to have a significant impact on the proposed project.

Detailed surveys of the major vegetation types have not been carried out, but bushland is the predominant vegetation and occurs in areas where human activity is also most evident, i.e. cultivation and over-grazing.

An exhaustive study of the traditional culture and beliefs of the inhabitants of the reservoir area will be looked into at the full IEA stage as it will be important in deciding matters relating to compensation and re-settlement.

It should be noted that a comprehensive re-settlement programme is one of the basic requirements for the funding of any project which may affect the people.

Similarly, matters relating to land tenure and ownership call for critical analysis to ensure that compensation is carried out in a manner satisfactory to all parties.

4. BASELINE - DOWNSTREAM

The down stream refers to the area from Grandfalls site to the Indian Ocean. It is an area with diverse physical, ecological as well as geographical characteristics.

Key features of the downstream area are National Parks and the primate reserve which forms the boundary between the delta and pre-delta area and the Tana Delta area Irrigation Project (TDIP) which is being implemented by TARDA.

This is an area of low population density. The population whose total is estimated at 140,000 people, is concentrated along the towns on the river.

The flooding pattern downstream is closely related to the human settlements which as indicated earlier are concentrated along the town centres. On the river course and small villages also along the river. The areas along the river bank, i.e. five to 10 km either way where the levee system has developed, are used for cultivation while further afield pastoralists rear their cattle.

The dominant ethnic groups from Grandfalls downstream are Merus, Somalis, Ormas, Pokomos and Wardeys, while other small ethnic groups have migranted into the area in search of livelihood. Settlement patterns near the delta area are indiscriminate among the Pokomos, Ormas, and Wardeys. The incomes for the delta people are estimated at between Kshs.4,500 to 5,000/-.

Geologically, the area about 100km downstream of Grandfalls is characterised by basement rock system, with the soil derived from granite rock and are not suitable for agriculture as they are of low fertility.

From Mbala Mbala downstream to the sea, the rock formation is of sediment origin. The soils in this area are complex and are derived from marine rock. However, fluvial soils are found within the same area and these are especially in flood plains are the vertisols (black cotton soil). which have a high clay content.

The vegetation along the corridor is variable and diverse depending on the rainfall which at Grandfalls is estimated at about 400mm and at Kipini at about 1000mm, indicating that the rainfall increases closer to the sea.

The predominat vegetation types are the arid - semi arid types below the Grandfalls site to beyond Garissa while riverine vegetation, terrestrial vegetation and wetlands or acquatic vegetation cover the area below. The salt tolerant vegetatation flourishes closer to the sea.

The corridor has also diversity in terms of flora and fauna. It is reported that there are about 429 bird species out of which 100 are acquatic birds, and various types of fish species like cat fish, tilapia, lung fish etc.

Issues raised during the discussion time related to salinity interphase, biodiversity especially in relation to fisheries resources, biodiversity and the flooding pattern and the relationships between flooding, the mangrove swamps and spawning grounds, off-shore fishing, was also mentioned but dwelt on.

While these issues could not be addressed in full in this initial phase they need to be taken into account during the subsequent phases of the environmental assessment.

5. ENVIRONMENTAL IMPACTS

The highligts of the presentation were in relation to the expected impacts during construction and operation phases both at the reservoir area and the downstream river corridor.

Although the High Grandfalls option could be said to be representative of the whole scenario since any impacts emanating from its construction was replicable in the other alternatives, the present activity was meant as a guideline to a more detailed study which would lead to selection of the last option.

5.1 The Construction and Commissioning Phase

Participants noted that the matter of there being significant change in water quality during the construction stage 1. is derived from the assumption that there would be minimal vegetation decay, but it is evident that plant decay results in an increase in bio-chemical oxygen demands.

In response it was initimated that the amount of estimated bio-degradation would neither have hamfull effects nor major repurcussions on the local or international environment if the necessary control measures were put in place.

However, it was observed that while the problem may not be immediate, it was bound to occur later and could have far reaching effects with serious financial implications when it comes to water treatment for human consumption.

While it is apparent that some of the negative impacts can be mitigated and others are irreversible, there is need for continous collection of data and information needed for monitoring purposes.

The analysis of the construction period for High Grandfalls which spans over nine years raised the issue of the

possibility of reducing the period because the long duration may bring into play other matters whose impacts may not have been taken into consideration.

Reduction of the construction period would require further investigation owing to the cost implication of the project. Moreover, the longer duration may have a positive impact, especially relating to employment.

Another issue which was raised was in respect of physical and chemical changes due to the reduction of the flow regime downstream sssociated with impounding of the reservoir.

It is apparent that this reduction will have significant effects on the eco-system due to increased chemical load and nutrients. On the other hand there would be continuous lowering of the ground water table.

These can however be mitigated by increased discharges from the reservoir through facilities provided during the construction stage.

5.2 The Operation Phase

The absence of clear outlines of the variation of impacts of each of the four proposed options should be addressed so that information pertaining to each of them is available and can easily be evaluated.

In response it was observed that the effects of the dam depended on the reservoir size and its operation and management.

The High Grandfalls option can be assumed to have most significant impacts, but at the same time it has the highest benefits due to its multi-purpose nature which encompasses river regulation aspects, hydro-power generation, irrigation, public and industrial water supplies, fisheries and tourism development.

The regulatory facility at High Grandfalls makes it possible to maintain a constant downstream flow regime as well as ameriorating the effects of flooding.

However, because of the prevalence of conflict between environmental matters and the benefits derived from the project, it is crucial that operating rules be formulated to encompass an environmental cost and variability to allow compensatory release of water downstream when the need arises.

On compensation and resettlement of the people dislocated by the project, it was suggested that a comprehensive study be undertaken inorder to ensure that the traditional way of life of those affected is not dramatically disrupted.

To emphaise the point on dislocation examples were drawn from experiences at Bura and Perkerra irrigation schemes where settlers abandoned site due to incompatible environmental circumstances.

Inorder to facilitate effective management of the project appropriate monitoring and management system need to be put in place so as to gauge the magnitude of aspects which arise later and may have serious environmental impacts - e.g. the crocodile problem in Kindaruma.

6. MITIGATION MEASURES

As a result of the reduced flow regime downstream due to construction and operation of the dam, it is proposed that controlled release of water through facilities provided be a continous activity. This would essentially be beneficial for borehole recharge and maintenance of the ground water table.

One of the management strategies to be considered is the development of release rule curve taking into account the existing circumstances and alternative water demands as well as the variability.

In matters relating to compensation and re-settlement, it was observed that the monetary factor may be of little significance compared to the overall effect of dislocation and a proper plan of action needs to be devised as early as possible.

In the same vein the need to sensitize the people to be affected by implementation of the project was emphasised so as to avoid hostile confrontation.

Incorporation of a buffer zone around the resrvoir as part of the overall project requires critical analysis since several matters pertaining to its management are bound to arise, especially the financial implication. Moreover, the responsibility for rehabilitation of areas laid bare during construction should be addressed as a priority.

7. OBJECTIVES OF THE NEXT STAGE

It was observed that during the next stage a more detailed study of the delta area was to be carried out, but in the light of the fact that TARDA was already in the process of undertaking an environmental impact study coupled with a management plan for the Tana Delta Wetlands, there was need for close coordination of all activities to avoid confusion among local communities.

There is need for improvement of the hydrological model which should incorporate water quality as a major component and in so doing liaise closely with the Department of Water Development.

The accuracy of working documents was re-emphasised especially reference tables which should be clearly tabulated to facilitate decision making especially in the selection of the alternative with the largest net benefits.

It was agreed that both the hydrological and environmental models would be updated and linked up to help determine impacts at various stages.

APPENDIX I.

ISSUES OF CONCERN TO KENYA WILDLIFE SERVICES (K.W.S)

AN OVERVIEW

INTRODUCTION

1.1. Reference is made to the subject. The need to generate power for national needs is fully recognised. The Tana River is closely linked to the socio-economic life style of the people who depend on it and in particular in semi-arid and arid districts of Kitui, Garissa, Tana River and parts of Lamu. It has been described as a lifeline for this area.

1.2 Biodiversity along the Tana River is closely linked to the river dynamics especially the annual flooding and sedimentation phenomena. As a result, biodiversity in various areas is protected through protected areas. These are Meru National Park, Kora National Park, North Kitui National Reserve, Bisinadi National Reserve, Rahole N. Reserve, Arwale N. Reserve, in addition, other closely linked areas, the Tana Delta and Ras Tenewi have been proposed as National Reserves.

The riverine forest, flood plans and ox-bow lakes support a number of wildlife species and are associated with bio-diversity. The Tana River Primate National Reserve is famous both nationaly and internationaly for its riverine habitants, rare monkeys species, the red tana colubus and the tana mangabey. There are numerous studies which have been conducted. These studies linked the flooding of river, sedimentation and biodiversity. Therefore there are issues of concern which need to be addressed in order to ameliorate any negative impacts related to wildlife conservation and other social needs.

2.0 Issues of Concern

There are several issues, which need to be taken into account during the planning/design, construction and operation phases of the project (irrespective of the alternative chosen).

2.1. Impact on Protected Areas

There are several protected areas, which the proposed project will have impacts negative or positive, directly or indirectly. Of particular concern are the impacts on riverine habitants in the Tana River Primate National Reserve and associated biodiversity. The Meru National Park, Kitui North National Reserve and the Kora National Park are closer to the proposed project. The project may have negative impacts on these areas as localised migration of very large harbivores (VHL) e.g. elephants, buffaloes etc. On the other hand, positive impacts such as transport may enhance tourism and revenue generation.

In short, there is need to examine impacts of the proposed project near project area and down stream.

2.2 REDISTRIBUTION/MIGRATION OF WILDLIFE

It is envisaged that the proposed reservoir will redistribute or enhance localise migration of wildlife especially water dependant species. These include hippos, elephants, buffalos etc. This aspect need to be addressed and its associated impact on protected areas.

Migration of aquatic fauna needs to be examined and their breeding patterns. This include the fish especially the eels. May be fish ladders need to be part of the design.

2.3 HUMAN WILDLIFE CONFLICTS

This issue is multidimensions. First, if there is going to be human resettlement or settlements, there is bound to be some conflicts if such settlements are near this water body as wildlife might be attracted to it. Such animals as hippos, crocodiles, elephants etc may be a source of conflicts.

Secondly, linked to wildlife redistribution is migration. The water body may attract more wildlife to the area and be a source of human/wildlife conflict. Populations of hippos, crocodiles or elephants may increase in the environs of the proposed project area due to the dam water.

Therefore, there is need to examine this aspect before IMPOUNDMENT. For example elephants are a major problem in Mwea area.

2.4 TOURISM OPPORTUNITIES

The man made dam may offer some tourism opportunities. These include Hotels, Lodges, Boating, Water Sports, Sport Fishing, Diving and many more. These opportunities may be incorporated in the overall project operation phase. This may be an added advantage given the close proximity of protected areas: Meru N. Park and Kora N. Park.

2.5 WILDLIFE UTILIZATION

Opportunities for wildlife utilization should be explored. These include bird shooting, crocodile farming and ostrich farming etc.

2.6 FLORA UTILIZATION

Dams are known to offer some forest/vegetation products. This aspect need to be examined and recommendations made as they relate to local utilization and commercial exploitation.

2.7 FRESH WATER AND ESTURINE WATER INTERFACE

It has been noted in the Lower Tana in particular, since the construction of the various dams in Upper Catchment, of the extension of the salty (saline) water upstream. An example is at Kalota Brook and the change of fresh water dependent vegetation to mangrove extension and other salt tolerant species.

Linked to this aspect is redistribution of wildlife to areas where fresh water is available. At times this migration is in direct conflict with human and their associated activities (farming and human injury, death). Salinization of borehole in Kipini area is linked to dam building.

2.8 BIODIVERSITY ISSUES AND FLOODING AND SEDIMENTATION

Biodiversity of the region below Grandfalls is closely linked to Tana River Dynamics, in particular annual flooding and sedimentation. These two aspects of sedimentation and flooding are therefore critical issues which need to be incorporated in the design and operation of the proposed dam.

If the flooding or water release from the dam can be timed to coincide with the normal annual floods (May and October - Nov) and yet retain the enough water to meet the objectives of the proposed project, then the issue of biodiversity and river dynamics will have been answered - i.e. availability of floods and silts to sustain the biodiversity as well as human needs.

2.9 MONITORING AND AUDITING MEASURES

The monitoring and auditing aspects need to be incorporated in project operation (at project site and down stream). K.W.S. is ready to cooperate and fully participate in this activities. However certain issues need to be addressed: what is to be monitored by whom, funding, usage of such data etc.

3.0 CONCLUSION

Flooding and sedimentation are key elements in the ecological process of the lower Tana basin. These aspects play a key role in the maintenance of biodiversity as well as socio-economic life of the people of Lower Tana, especially below Grandfalls.

The design plan of the proposed project should be envisaged to accomodate this two aspects. These should coincide with the normal annual flooding to be of any significance. If the design of the proposed dam can accommodate these aspect of flooding and siltation, then many aspects of biodiversity will be maintained as well as social needs.

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A P P E N D I X I I

OBSERVATIONS OF THE DIRECTOR OF WATER DEVELOPMENT

This Ministry was represented by two Technical Experts from the Ministry Headquarters at the Workshop which was held in Embu. In this connection, I wish to draw your attention to a number of issues which Tarda and the Ministry should address ahead of the proposed project as follows:-

(i) That due to lack of adequate data on sediment discharge at the Tana Grand Falls site, Mutonga and Kathita Dams, it may become necessary to do modelling based on data to be gathered as soon as possible.

(ii) That it is necessary to update existing data on Hydrological and Hydraulic Models and that the Ministry can be of assistance in this regard.

(iii) That in view of the anticipated changes in water quality, it is advisable to establish a water quality monitoring programme in which physical, chemical and bacteriological analyses will be carried out for water supplies in Tana River itself.

(iv) That studies should be undertaken to assess the impact of the dam on low and flood flows and water supplies downstream of Grand Falls.

(v) That for sustainable socio-economic development of the area, studies that will address the effect of reduced sediment load and flow on the ecology of Tana River System, including the Tana Delta, should be carried out as a matter of priority.

...../2

(vi) That due to the envisaged water abstraction which will cause changes in the volume of water in the river, it is proposed that some form of modelling should be developed to study the various expected scenarios.

(vii) That due to the expected change in flow frequency, serious flow monitoring should be incorporated in the study through modelling.

(viii) That due to the expected adverse effect on groundwater recharge to the subsurface rock formation in the area resulting from low flows, it is advisable to embark on monitoring of the present water rest levels in boreholes and their yields immediately.

(ix) That due to lack of information on the occasional freak flows contributed by Lagas which are common in the river basin down to its delta, it is important that studies should be carried out to acquire the data particularly during the coming rainy season.

A P P E N D I X I I I

OBSERVATIONS BY IUCN

Further to our inputs at the workshop, I would like to record our main comments, so that they can be incorporated in the overall assessment.

1. Main impacts of the proposed dam

We agree with the observations which were made at the workshop that the main impact will not be the construction on the reservoir itself, but it will be the effects which a dam will have upon the river downstream of the dam.

Our main concern is that we should try and maintain fluctuations in the flow of the river which simulate the natural situation. In this respect, we think that a new dam could have very positive effects on the environment, as it might enable the authority to ameliorate the partial regulation of the river flow which had been created by the operation of Masinga and Kiambere reservoirs.

We are not advocating large, uncontrolled floods every year, but we would like to see a means of releasing sufficient amounts of water from time to time, to create a "proper flood" on the lower floodplain and Tana Delta.

We therefore support the recommendations that the engineering consultants be requested to design a dam which will allow release of water through the turbine tunnel or through an additional sluice gate, well below the spillway.

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2. Operating policy and rules

We are concerned that the authority responsible for the maintenance and operation of the dam may have a different view about the need for downstream floods. We therefore wish to stress the need to have a clear policy agreed before the commissioning of the dam, and have a regular monitoring of the operating rules during the operational life of the dam.

We also want to stress the need for monitoring of the water release, to ascertain whether a release of a slug of water in fact results in recharge of the groundwater and inundation of the floodplain.

3. Link with Tana Delta

We strongly support the comments which the Chair made in his closing speech, regarding the need for collaboration between the hydropower project consultants and the Tana Delta Steering Committee. We hope that TARDA, as the leading agency in both initiatives, will be able to facilitate this collaboration.

4. Silt content and composition

There was a considerable amount of debate about the origin of the sediment in Tana River, and the need for silt release from the reservoir. Our main concern in this respect is that the particles which are particularly important for the delta are suspended sediments and organic matter. We would postulate that this originates from the slopes of Mt. Kenya.

Whilst we do not dispute the fact that erosion will occur below the dams, and in the stream-bed, we are not convinced that this sediment contributes a great deal to the capacity of Tana River to rejuvenate the floodplain and the delta.
Clearly, a lot more study is required in this area.

...../3

5. Mangroves

We know from other delta ecosystems that mangroves play an important role. They provide for a large number of direct benefits to the local people, but are also the breeding grounds for a number of sea fish species. We also know that mangroves require a certain amount of fresh water, and that flooding is necessary for the development of mangrove forests.

We therefore recommend that a study is carried out to determine how often the mangrove stands in Tana delta will be flooded after construction of a new dam, and what this means for the off-shore fishing industry.

In this respect, we wish to draw your attention to the uncertainty of existing topographic information in the delta, and the need for an accurate survey of the levels and micro-contours in the delta.

6. Management of the reservoir buffer zone

The proposed reservoir can be seen as a protected area. Recent debates in Africa about protected area buffer zone management indicate that there is a need to inorporate the people living outside the protected areas, in order to ensure better protection.

We would want to propose that this option is also considered for the management of the reservoir buffer zone.

We were pleased with the discussions at the workshop, and hope that this was only the first step in a long process of public participation and cross-sectoral collaboration.

ANNEX - B

PROCEEDINGS OF WORKSHOP NO.2

Mutonga / Grand Falls Hydropower Project Feasibility Study - Phase 2

Workshop Proceedings

Held at: ICIPE / Duduville

Nairobi

20 - 22 March 1995

Contents

1. INTRODUCTION TO THE WORKSHOP

The Chairman of TARDA, Mr. D.W. Masika, was also the Chairman of the Workshop. Mr. Masika opened the workshop by welcoming the participants and briefly touching on the major issues at hand. The JICA Resident Representative, Mr. N. Yamaura, also welcomed the workshop participants.

As part of the introduction to the workshop, the leader of the JICA Study Team, Mr. K. Sumikawa, gave a summary of the main issues related to the project, a picture of the socio-economic scene, and a briefing on site conditions.

1.1 OPENING SPEECH BY THE WORKSHOP CHAIRMAN AND MANAGEING DIRECTOR OF TARDA, MR. D.W. MASIKA.

"Ladies and Gentlemen,

May I at the outset take this opportunity to welcome you all to this Workshop which is the culmination of the second stage of the feasibility study of possibly the last site for a large dam on river Tana.

In the same vein, I would wish to take a few minutes to briefly outline TARDA's activities and the legal framework under which we operate.

TARDA was created through an Act of Parliament in 1974 and given the mandate to manage water and land resources in the Tana and Athi River Basins.

In order to execute the tasks as described in the enabling Act, the Authority has drawn long range development plans and initiated a number of studies and surveys which are necessary to assess alternative demands on available water and land resources.

The exercise for which we are gathered here today and the deliberations over the next three days hinge around optimum utilization of the waters of river Tana in order to accelerate development.

Hydropower generation has been identified as one of the components of any viable development along the river and five major projects have already been constructed at Kiambere, Kindaruma, Gitaru, Kamburu and Masinga. These projects and two fairly small ones contribute nearly 70% of the nation's power supply, which works out to around 460 megawatts.

In addition, the existing reservoirs have a total holding capacity of over 2..3 billion cubic metres of water which also goes into other uses like irrigation, public water supplies, fisheries and tourism development.

Other suitable dam sites had been identified in the middle reaches of river Tana, but as of now, the ones that call for more attention are Mutonga and Grand falls whose development would have a significant impact on the socio-economic scope both locally and nationally.

Ladies and Gentlemen, during the Initial Environmental Assessment Workshop Stage I held in Embu in September last year, many issues were raised and observations made by participants whose composition cut across a variety of disciplines.

Despite the fact that no specific recommendations were made during the first workshop, comments and observations made have proved invaluable during the implementation of the second phase.

The four possible development scenarios still remain being examined as:-

(i) High Grand Falls only.

(ii) A combination of Low Grand Falls and Mutonga.

(iii) Low Grand Falls with a possibility of raising to High Grand Falls level and

(iv) Mutonga only.

On a lighter note, a fifth scenario also exists in that there may be no development at all !

Today, we are presenting to you the findings of the study team which commenced operations soon after the Embu Workshop. It has not been possible to circulate these reports to all of you due to unavoidable circumstances but we wish to assure you that all materials relating to the proposed project are available in our Library.

This Workshop is not the end of this critical exercise. It actually should be viewed as the beginning and any observation made here or at a later date after perusal of relevant document will be given due consideration.

You, Ladies and Gentlemen, are drawn from a fairly wide spectrum professionally and otherwise, and it is our hope and desire that your contribution will enable us to chart our course for the future in this essential task.

I would not wish to pre-empt your thoughts or observations and would therefore wish to halt at this juncture and leave the floor to the study team.

Once again, thank you very much and welcome."

2. BRIEFING BY THE JICA STUDY TEAM

2.1 WATER RESOURCES SURVEY

Mr. S. Maruyama briefed the workshop on the Water Resources Survey, summarising the information presented in Progress Report 2 of the Feasibility Study. The questions posed and answers given in respect of this issue are included in Annex 1.

2.2 VIDEO PRESENTATION

Mr. N. Hodgson presented a video film containing interviews with local people who will be affected by the construction of any dam/dams. This covered both upstream and downstream issues. No questions were posed at the end of the film.

2.3 ENVIRONMENTAL REVIEW

The video film was followed by a presentation by Mr. N. Hodgson on an Environmental Review of the Reservoir Area, summarising the information presented in Progress Report 2 of the Feasibility Study. No questions were posed to this presentation.

2.4 RESETTLEMENT

Professor D. Obara briefed the workshop on expected resettlement issues, summarising the information presented in Progress Report 2 of the Feasibility Study. The questions posed and the answers given in respect of this issue are included in Annex 1.

2.5 DOWNSTREAM NATURAL ENVIRONMENT

Dr. K. Campbell briefed the workshop on expected changes to the hydrological regime and the major effects expected on the downstream natural environment, summarising the information presented in Progress Report 2 of the Feasibility Study. The questions posed and answers given in respect of this issue are included in Annex 1.

2.6 DOWNSTREAM SOCIO-ECONOMIC ENVIRONMENT

Mr. N. Hodgson briefed the workshop on some expected effects on the downstream socio-economic environment, summarising the information presented in Progress Report 2 of the Feasibility Study. The questions posed and answers given in respect of this issue are included in Annex 1.

2.7 SELECTION OF PREFERRED PLAN

Mr. S. Maruyama briefed the workshop on the criteria used to arrive at a decision in respect of which of the alternative dam construction options provided the optimum results, taking account of economic costs and benefits.

The JICA Study Team recommends the construction of 2 dams, one at Mutonga and one at Grand Falls. The Grand Falls Dam would be sited at the Low Grand Falls Site. The questions posed and answers given in respect of this issue are included in Annex 1.

2.8 PLAN OF OPERATION OF FEASIBILITY STUDY

Mr. K. Sumikawa briefed the workshop on the Plan of Operation of the feasibility study. The questions posed and answers given in respect of this issue are included in Annex 1.

3. PRESENTATIONS

3.1 PRESENTATION BY THE EAST AFRICAN WILDLIFE SOCIETY, EAWS

The East African Wildlife Society, through Mr. N.K. Rotich, presented a paper outlining some initial comments to the Main Report submitted by the JICA Study Team. Mr. Rotich briefed the workshop on these comments, and a copy of the presentation is included in Annex 3 of this report.

3.2 PRESENTATION BY KENYA WILDLIFE SERVICES, KWS

The Kenya Wildlife Services, through Mr. W. Otichielo, presented a paper outlining some initial comments to the Main Report submitted by the JICA Study Team. Mr. Otichielo briefed the workshop on these comments and a copy of the presentation is included in Annex 3 of this report.

3.3 PRESENTATION BY MR. J.J.M. NYAGAH, EGH

Mr. J.J.M. Nyagah, EGH, presented in writing some views on the current topic and a copy of the presentation is included in Annex 3 of this report.

4. WORKSHOP CONCLUSIONS

The following sub-sections summarise the main conclusions arrived at by the individual discussion groups which met on Tuesday 21 March 1995 and Wednesday 22 March

1995. The findings of the individual groups were presented to the workshop by the elected Group Chairmen.

A more detailed presentation of issues discussed in each group is shown in Annex 2 of this report.

4.1 GROUP ON TECHNICAL TOPICS

Chairman, 1st day, Professor Mutiso — *Secretary, 1st day, N. Patel*

Chairman, 2nd day, Eng. J.K. Rutere — *Secretary, 2nd day, Mrs. Fleur Ng'weno*

4.1.1 Artificial Flood Release

Flood release structures will need to be provided in the design.

A Government directive has to be made, on who will have final authority to manage the water release system and ensure that monitoring is done.

Without the artificial flood release structures, the project will have many adverse effects.

4.1.2 Economic Values of Water, Project and Financing

L.G.F. + Mutonga, incorporating flood release structures, is at present the best combination, taking into account that the selection is based on an economic and technical analysis.

For long-term strategies and planning in relation to water value, project value, and financing, it may be necessary to carry out a re-evaluation.

It was felt that the staged development of the lower Grand Falls to final height of the higher Grand Falls as the Target might be very expensive.

4.1.3 Data used for Simulations and Project Design

During the next study, earlier data hydrological will be used where available.

The National Water Master Plan includes projected mass transfers of water from Kathita to Isiolo and from Tana River at Mbalambala to northern parts of Garissa. During this study only water transfers upstream of Grand Falls were considered, and this was only in relation to projected irrigation activities.

4.1.4 Silt Release for the Downstream Ecosystem

For the L.G.F. + Mutonga, a weir in Kathita will need to be built, [*if feasible*], to allow silt-laden water to flow through a diversion without going through the dam.

A system should be put in place to ensure that initial runoff, immediately after rains in the Kathita catchment, is synchronised with artificial floods.

Further studies should be done to establish the actual source of silt before the project is started.

4.1.5 Impoundment Period

Impounding time needs to be recalculated, especially for the H.G.F. which is estimated to take 30 months. Prolonged impounding of the L.G.F. should be studied. [*Ed. note: See comments by JICA Study Team in Annex 4*]

4.1.6 Other Matters

Movement of fish in the river should be taken into account in the design.

Future water needs in the neighbourhood of the dam should be taken into account in the design.

A change of name for the project is necessary to reflect the project's broader objectives, for instance: "Mutonga/Grand Falls Water Resources Development Project", instead of Mutonga/Grand Falls Hydropower Project.

4.2 GROUP ON UPSTREAM NATURAL/SOCIAL ENVIRONMENT

Chairman, Mr. G.N. Kanyi *Secretary, Simon Gatheru*

4.2.1 Buffer Zone

A buffer zone is necessary to protect the reservoir area and the environment around it. The size of this area should be such as to minimise displacement.

4.2.2 Displacement and the Area to which People should be moved

The displaced communities should move to areas nearest to their former homes. It should be ensured that the area they move to can adequately cope with the increased population pressure.

4.2.3 Compensation

Compensation should be land-for-land plus cash to compensate for land lost, for the inconvenience/disturbance caused and to also assist the affected families build new homes and start afresh.

Valuation of land should take the ruling market rates at the time of compensation. Cash compensation should take the market value of the land that can be bought in different areas, and *not* the current land.

Monetary compensation should be given for forest, soil and other natural resources lost, and lost cultural facilities and sacred sites.

The total family as a unit should be involved in the compensation process, to avoid having only one person in the family getting the compensation.

4.2.4 Infrastructure

Existing roads within the affected areas should be improved.

Schools and health centres which have been submerged must be replaced, and the infrastructure within the host/receiving community will also have to be improved.

The location of a good construction site is important, as the buildings can subsequently be used by the local community, e.g. to build a school.

4.2.5 Direct benefits to the affected communities.

Direct benefits to the affected communities, in terms of employment, water and electricity supply among others, will have to be ensured.

4.2.6 Environment

There is need to integrate the local community in environmental protection and conservation.

4.2.7 Funding

It is very important that the total cost of the project is communicated to the affected persons and the public in general. At the same time, issues such as resettlement, compensation, follow-up, management of the buffer zone, training, etc., should all be covered by project funds.

4.2.8 Control

Who is the controlling consultancy or agent within the whole project, and who ensures that recommended studies are undertaken and competently carried out? During the whole workshop, the public has received very little reassurance from TARDA or the government representatives on the issue of control.

4.2.9 Further Studies

There was an expressed need for further studies on issues such as flood release, hydrology of the river, inventory of flora and fauna, and the whole ecosystem both up- and down-stream, land/sea correlation at the delta, siltation and pollution (e.g. from coffee wastes), and the changing conditions of the river.

There was also a felt need that studies being done should also coordinate with other studies within the area by different institutions. There is also a need to coordinate with relevant NGOs.

4.2.10 Integrated Programme

There is a need to view the whole programme as an integrated project, which deals with power supply plus water supply, local development, etc.

4.2.11 Laws related to land and compensation

Laws related to land and compensation need to be reviewed. The project cannot discuss issues related to land as these are very much affected by the land laws of the country.

4.2.12 Evaluation of the Five Options

Evaluation of the five dams is necessary and from where we can learn from past experiences. There is also a need to borrow a leaf from other projects within Africa, like the Aswan Dam in Egypt.

4.3 GROUP ON DOWNSTREAM NATURAL ENVIRONMENT

Chairman, Dr. F.M. Muthuri *Secretary, Mr. Quentin Luke*

4.3.1 Artificial Flooding

The system of releasing floods is questioned, i.e. where is there any known dam with a system of releasing floods? The consequences to the sea-land interface must be clarified.

The consequences of flooding on the river channels are unknown.

It is feared that compensation for loss of belongings etc. would be inadequate.

The quality of water will change due to different sediments, and to an unknown extent.

Communication to the affected communities must be effective.

There is inadequate information on the change in the quality of water due to sediments.

The project must include a monitoring component.

TARDA must co-ordinate with other involved Ministries and organisations.

Baseline studies are a pre-requisite to the design/drawing project phase.

The extent to which the artificial floodwater will affect the change of the flora and fauna of the environment must be determined.

A study of the environmental and sediment issues must be undertaken; the issue should be studied over a period which should cover at least two flood seasons. The studies are anyhow to be seen as a prerequisite of the next phase of the project.

The overall framework is to be formulated by Phase III, taking into account existing, on-going and planned research/management projects.

JICA said the ongoing feasibility studies appeared to go above the budget and time limitations. It was concluded that extending the Feasibility Study is not realistic, but could be put as a suggestion in the proposal.

The JICA study team suggested that a parallel study should be conducted to deal with the issues which would not be able to be included in the coming Phase 3 study.

4.4 GROUP ON DOWNSTREAM SOCIAL ENVIRONMENT

Chairman: Mr. Kiai *Secretary: Ms. Jennifer Mpungu*

4.4.1 Resettlement

Resettlement should be with reference to the community as a whole and not to individuals, providing them with necessary social amenities. Funds for resettlement and other mitigations and interventions should be included as part of the project cost.

4.4.2 Management and Technology

Traditional methods of irrigation have been effective. Phase III of the study should look into these methods and try to adapt and improve on them.

4.4.3 Community Participation and Cultural Issues

The participation of the community in the study of the project should be ensured at the earliest moment. To enhance their participation, information materials should be provided to them in local relevant languages.

4.4.4 Artificial Flooding

Phase III of the study should highlight the following:

- the study should clearly weigh positive against negative effects, as experienced in similar projects, and use the data as a guideline.
- the implications of the artificial flooding on existing lakes, lagas, etc.
- the study should put more emphasis on the area between Garissa and Kipini.
- contingencies should be made to create alternative flooding.

4.4.5 Other Alternatives

There is already pressure downstream due to communities moving in from the north, therefore investigation on impact must be done.

Provision for a power line downstream along with other infrastructure facilities.

4.4.6 Resource Use Conflict

To ease the downstream congestion around limited waterpoints, increased water sources must be developed, preferably supplying potable water.

Findings in Phase II show that the Low Grand Falls + Mutonga is the optimal project. However, the High Grand Falls was still preferred by the group. The alternative projects tend to concentrate on power generation only.

Alternative power sources should be considered.

5. CLOSING OF THE WORKSHOP

5.1 CLOSING MESSAGE FROM CHAIRMAN - D W MASIKA, MD TARDA

The Chairman thanked all the participants for their lively and valuable contributions to the workshop and assured all the participants that issues raised would be recorded and circulated. These will be addressed during the next phase. He also brought up a few issues arising from the workshop:

- All draft reports have been submitted by the JICA study team.
- All discussions held in both the plenary hall and in group discussions have been recorded by the rapporteurs.
- The report concentrated on power requirement aspects and left out other development issues such irrigation, the cost of negative effects of the dam, e.g. on the environment. Therefore more study is required.

- There has been a shortage of materials and little or no data for participants' reference during the workshop. Realistic examples were also not available.

- The compensation issue will have to be seriously addressed.

- Resettlement issue is also important. Future monitoring will have to be an additional component.

- There also appears to be a lack of co-ordination both upstream and downstream and between organisation like KWS, EAWS, NEAP, etc.

- And finally for monitoring purposes, it is suggested that a Steering or Advisory Committee be set up which will incorporate representatives from the affected communities in Embu, Tharaka and Mwingi and NGOs like KWS, EAWS, among others JICA and TARDA. This committee is expected to oversee the progress of the dam, starting from this workshop and future studies.

The Chairman conceded that the issues he had raised (above) were definitely not all the concerns raised or matters discussed during the three days. All matters discussed have been recorded and will be contained in the workshop report.

Finally, the Chairman thanked JICA for organising the workshop, representatives from various NGOs and institutions and the representatives from the affected communities for participating in the workshop, rapporteurs and all participants. He assured participants that reports will be circulated. A number of errors have been found in the study team's draft report which will be corrected before circulation.

5.2 MESSAGE FROM JICA REPRESENTATIVE - NOBUYUKI YAMAURA

The Representative stressed that the success of the programme depends completely on the involvement and commitment of the Government, the society, JICA, TARDA, and everybody else.

The Representative was very appreciative that the workshop objectives had been met, were constructive and diverse opinions were aired, and hoped that JICA would be able to implement. He thanked everybody for taking time to participate in this workshop.

5.3 MESSAGE FROM JICA STUDY TEAM - K. SUMIKAWA

Mr Sumikawa thanked participants for their invaluable contributions during the workshop. The issues raised would be looked into.

He went on to say that, naturally, everybody desires national development (power and water supply, irrigation, etc.). But, uncontrolled economic development may not consider or cater for social costs and may not ensure sustainable development. At the same time, economic feasibility should not be jeopardised by other social factors,

environmental protection, etc. The need to balance the two to ensure sustainable and long term development is therefore very important.

Mr Sumikawa again thanked the workshop participants for their contributions.

ANNEX 1

Questions and Answers Resulting from
Briefing by JICA Study Team

1. WATER RESOURCES SURVEY

Questions to Mr. S. Maruyama.

Question: Were the 5 dams upstream of the proposed site built to satisfy the demand for water, and up to when? Perhaps the 5 dams are not as efficient as they were planned to be, and if not, why?

Answer: The 5 dams cannot meet the demand because the demand is growing.

The Mutonga and Grand Falls can meet demand up to a certain design time. When?

Comment from the floor: Out of the 5 dams only one dam (Masinga) was designed for 'silt-free' water storage for more than a hundred years.

Question: Were detailed water surveys made both upstream and downstream of the proposed site?

Was actual data used, or are the proposals based on assumptions?

Were other sources of water looked into, including those draining into the Tana River?

Answer: Hydrological surveys and observations were done.

Estimations are based on MOWD-data. Additional information will be provided tomorrow.

Question: There is a difference between water user rights provided by the Water Apportionment Board and actual water extraction. Were actual surveys made to get the exact data on actual abstractions?

Figures given on agricultural potential are conflicting with traditional figures, e.g. 90% agricultural potential while traditional figures only quote about 20% of land mass is high to medium potential?

Answer: The answers to these questions will be provided later.

Question: The areas used in the survey for the simulation of power demand were not from the fastest growing municipal towns. Other towns within the basin are recorded to have higher growth rates.

Answer: Will follow later.

Question: The import of power is indicated (on an overhead) as increasing; was the building of the dams not meant to reduce imports?

Answer: Kenya's policy is to secure indigenous energy sources.

Supplementary information from the floor:

The contract between Kenya and Uganda is to supply 30 MW continuously. During peak power demand this is not usually available from Uganda - which has similar peak requirements. Supply from Uganda during the low demand period (after 10 PM) goes above 30 MW, sometimes up to 50 MW.

2. RESETTLEMENT

Questions to Prof. Obara, on Resettlement.

Question: Other archaeological/cultural sites are also affected by the project, rather than the one site mentioned by the presenter (Kinjege).

Answer: Kinjege was just an example. More will be identified.

Question: The professor had told Kenyans not to worry about rivers drying up. However, the speaker felt that this was wrong advice.

Answer: The river would have more water if good management was maintained. The stress was that people should not worry about rivers drying up, but rather on environmental conservation.

Question: It should be part of the project to include local infrastructure development and projects that utilise some of the electricity generated, e.g. agro-processing industries and other primary processing industries. Currently people would only utilise such electricity to a very low degree.

Answer: Agreed

Question: Were previous pre-appraisals done where the opinion of the public was sought, as in this case? It should also be noted that the people who were moved to Olenguruone, who were originally shifted to create space for the expansion of Nairobi, were displaced again later.

Answer: The best area of resettlement is in a familiar cultural environment, i.e. close by where the displaced have relatives.

In the current project, the community to be affected has been involved right from the start.

Previous pre-appraisals were not effective because the comments of the affected communities were not taken into consideration.

Question: Did the local people decide that they needed a reservoir?

Answer: Was not initiated by the local people, but they have played a role in decision-making in terms of issues that may affect their present situation e.g.

resettlement. It was stressed that community participation is a good approach to use when it is a small project e.g. small irrigation scheme. However, where a project is of national importance, it may not necessarily be proposed by the affected community.

Question: Are there other organisations that will be involved in the resettlement issues of this project, or is it TARDA alone?

Answer: No recommendations on organisations to be involved have yet been made.

Chairman's comments:

The Chairman stressed that no project yet exists; this study will come up with a report which will be submitted to the GOK for consideration. He also stressed on the need to review the Compensation Act as it is currently unsatisfactory. How will the community benefit from the project? Will proper health facilities be provided, e.g. to fight water borne diseases, and how will these facilities be financed, by the Treasury, by the Project, or by whom?

3. DOWNSTREAM NATURAL ENVIRONMENT

Questions to Dr. Campbell

Question Are there any existing swamps upstream of the known mangrove swamps, e.g. between Garissa and the Delta? How does the shifting nature of the river fit in with artificial flooding?

Who shall be responsible for the management of the dam, and who will be responsible for the floods, considering there is KPC, KP&LC, TARDA and other players?

Answer: Unaware of any large swamps apart from those in the delta.

The question of management will be considered in the technical group.

Question: Why was the team using base-line figures from Garissa instead of using figures downstream where the laga flows would be included?

Answer: Garissa has the longest existing data which can be relied on. Garissa is also situated at the top of the floodplain, so any flood in Garissa would also flood the lower plains; the floods in Garissa are 500 cumecs. More work will be carried out during the next phase.

Supplementary comment by Prof. Mavuti (UoN):

Where do the sediments come from? Upstream or the lagas? Measurement of laga flow is difficult since equipment may be swept away. The laga sediments are only based on assumptions.

Sediments from lagas downstream of Garissa cannot be measured unless we consider exact land use patterns, which is difficult due to insecurity in the area.

Question: In 1900, sediment was not an issue. Now we talk of the importance of releasing the sediments from upstream.

What is wrong with the encroachment of species in the floodplains, e.g. savannah grasslands taking over from the riverine forest?

Answer: There is a trend over a long period showing that the major source of sediments is where there is lots of rain, high agricultural activities, etc.; good land practice is important. The volume of sediments may not have changed, but sources and composition are likely to be different. A river will always pick up sediments as it flows.

Replacement of riverine species by savannah species is not a good thing, as grazing land is depleted and natural regeneration is not possible where the river no longer floods.

Question: Does the study team have confidence in the simulation model results?

Answer: Yes: It is a simulation model, and data which the team is working on is actual data from the Grand Falls and Garissa (1966 - 1990). The simulations are worked backwards removing the dams to the time of no dams. From the same data, it is estimated that 500 cumecs is needed for any river flooding.

4. DOWNSTREAM SOCIO-ECONOMIC ENVIRONMENT

Questions to Mr. N. Hodgson.

Comment: Declining fish population in Lake Bilisa has occurred due to the change in the river flow at Mnazini, while that at Lake Mlango cannot be recorded due to insecurity.

Comment: Wanted an assurance that a mechanism exists to simulate natural floods.

Request: Whether the study team will propose to have an allocation of funds for unforeseen circumstances for the people downstream. The study team should also recommend other alternatives e.g. to settle people in small scale irrigation schemes like Thanantu Valley.

Question: What are the factors that cause the deterioration of the value of the downstream production systems (as shown on an overhead). Is this not a direct consequence of the 5 dams upstream?

Answer: The changes of the value of the downstream production systems are not a result of the 5 dams, rather it is changes like increased population, cattle, change in river flow, etc.; e.g. the Somalis can no longer move to Somalia due

to the war, or to other areas settled by other communities, e.g. Isiolo. This causes increased pressure on land.

The production systems are collapsing.

5. SELECTION OF PREFERRED PLAN

Questions to Mr. S. Maruyama.

Question: In order to assess the overall economic feasibility of the proposed dams, should the team not also include other economic indicators, e.g. infrastructure development?

Answer: Road development was included in the calculation of economic feasibility.

Question: The team has made forward assumptions on economic impact up to the year 2020. It appears that a number of factors have not been taken into consideration, e.g. the siltation occurring at Masinga Dam, which will affect the water retention capacity of Masinga and ultimately the overall power output?

Answer: Siltation of the proposed dams will not occur within the first 100 years of construction.

Question: Less and less water will be available downstream as time goes by (due to increased take-off upstream of the dams), increasing the gap between water demand and water supply. What interventions are made to prevent this?

Answer: The construction of the proposed dams are intended to meet a specific demand only.

Question: Have you calculated the change that artificial flooding will cause to optimal power generation, i.e. will it change the best dam option?

Answer: The best option (proposed dams) will not make any changes to the level of flooding, and will only cause a limited decrease in optimal power generation, say a few percent only.

Question: Why not just raise the dam walls on the existing dams, say by a metre or whatever, instead of building new dams?

Answer: Only Masinga Dam has a technical possibility of being raised; however, if raised, it would not function properly as it would interfere with the water levels of other dams. The dam walls on the other dams cannot be raised, as they have fixed upstream levels.

Question: The streams flowing into the rivers and dams do not benefit the people optimally, and siltation rates appear to be excessive. Has the team considered impounding the water at its source, and execute water control from there, and increase water impounding in existing dams?

Answer by the Chairman:

TARDA does have impounding programmes for smaller streams, but does not have the required finances.

Question: In the decision-making process, why was it decided that this particular and costly dam was the optimal solution?

Answer: A minimum upstream slope is required to build a dam; due to the slope of the Tana River, the selected point is the optimal point.

Question: In times of drought, the refilling of the dam reservoir will be minimal. Will this not exclude the possibility of releasing water into the river (for environmental reasons), as in these cases power generation will be a priority?

Answer: The 25-year data used, indicates that water can be constantly released into the river.

Question: The basic data on which the water modelling has been done is limited to the 25-year period 1966-1990. Basic data should be applied which has a much longer time span than 25 years.

Answer: It has not been possible to obtain data which goes further back than 1966. In addition, modelling based on data which spans 25 years is considered sufficient for the construction of dams.

6. PLAN OF OPERATION OF FEASIBILITY STUDY

Questions to Mr. K. Sumikawa

Question: How does the proposed dam construction tie-in with the KP&L's plans, both technically and on country-wide energy development?

Answer: The plans tie-in well with KP&L's technical analysis and with the national plans for energy development.

Question: The video shown yesterday (20.3.95) gave the clear impression that the people who will be directly and indirectly affected by the construction of the dams do not support the project. Will their concerns be taken into consideration, not least by the politicians who will ultimately decide?

Answer: The views of those directly and indirectly affected will be given due consideration. TARDA expects to hold a seminar specifically tackling this issue, to which all interested parties and organisations will be invited for open and honest discussions.

Question: As was asked yesterday (20.3.95), why is more electricity required now, is there something wrong with the existing power generating facilities?

Answer by KP&L:

The demand for power is constantly increasing. Due to the usually heavy time-factor involved, planning for power generation is done on a 20-year basis; it is a long-term affair.

Question: People displaced by such activities as the construction of dams have waited for far too long to be compensated for their losses, if ever. Has an assessment been made on the resources to be availed to the people displaced by this project?

Answer: No resource assessment has been made, as no specific project yet exists. However, the team will insist that the World Bank guidelines on this issue are followed, and will do what it can to ensure that previous mistakes and omissions are not repeated.

Comment, by J.J.M. Nyagah, EGH:

There are many untapped sources of water supply and power generation in the region, e.g. Lake Victoria. A study should be made to improve utilisation of these sources.

Question: There has been no mention of any efforts to conserve or improve the utilisation of existing energy resources, and this area should be given due attention. However, the question here is: Is it correctly understood, that the net benefit to Kenya of this undertaking is US$ 75m? Or is this figure solely based on the extra cost of extending the dam wall to ensure sufficient downstream flooding? How about all other environmental costs, have they been factored into the equation? Or?

(There was no direct answer to this question).

Comments, by Prof. Koech, NEAP:

Prof. Koech informed the workshop that he had just come from the site. The people living in and around the area believe that the project is about to start up, and want to know if and how they will be affected. People also want to know if the new dams will be similar to the Masinga Dam, in the sense that some other dams will be built downstream of the proposed project. Finally, the engineers at Masinga recommended that they (or the engineers concerned) should be involved in determining the machinery and equipment to be used.

ANNEX 2

Summary of Group Discussions

SUMMARY OF GROUP DISCUSSIONS

The following sections summarise the main topics discussed by the individual groups during three sessions on Tuesday, 21.03.95 and Wednesday, 22.03.95. The findings of the individual groups were presented by the elected Group Chairmen. The names of the Group Chairmen and Group Secretaries are given.

1. GROUP ON TECHNICAL TOPICS

Chairman, 1st day, Professor Mutiso — *Secretary, 1st day, N. Patel*

Chairman, 2nd day, Eng. J.K. Rutere — *Secretary, 2nd day, Mrs. Fleur Ng'weno*

1.1 ARTIFICIAL FLOOD RELEASE

Flood release structures will need to be provided in the design.

Downstream monitoring will have to ensure that flood release corresponds with water needs downstream.

A Government directive has to be made on who will have final authority to manage the water release system and ensure that monitoring is done.

Without the artificial flood release structures the project will have many adverse effects.

1.2 ECONOMIC VALUES OF WATER, PROJECT AND FINANCING

What is the economic value of a cubic meter of water from Masinga had it gone through the electricity cascade, instead of providing water for irrigation or domestic supply?

For long term strategies and planning in relation to water value (future value taking into account the likely increased need for irrigation as population increases and agricultural land becomes scarce), project value (in its capability to cater for other needs e.g. clean water for Coast region) and financing; it may be necessary to carry out a re-evaluation.

A cost calculation should be done for individual cases of:

1. Low Grand Falls + 5 m for artificial flood creation
2. Low Grand Falls + 5 m for artificial flood creation + Mutonga

3. High Grand Falls

4. Low Grand Falls + possibility of raising it to the High Grand Falls level.

5. Mutonga alone

The Consultant said that the development of the Low Grand Falls, in stages up to the level of the High Grand Falls, would be very expensive.

The Study Team's Terms of Reference state that the team should look into the development of the Low Grand Falls, with the alternative of raising it to the level of the High Grand Falls. This was not done.

Staged development of the Low Grand Falls to the level of the High Grand Falls would also result in a staged investment, and this would definitely change the economics of the project.

L.G.F. + Mutonga, incorporating flood release structures, is at present the best combination, taking into account that the selection is based on an economic and technical analysis. However, stretching the planning period over a longer time, and taking into account that this may be the last opportunity to build a large reservoir on the Tana River, means that this option should be reviewed. The decision on who and when this should be done would have to be made early enough to allow the study team to continue with its schedule of activities.

1.3 DATA USED FOR SIMULATIONS AND PROJECT DESIGN

1966 to 1990 data has been used for project development, data from 1947 to 1990 has been used in other studies and may be available for this project.

Also the major flooding and drought events occurred in the periods between 1947 and 1964, and this period is not included in the data used

During the next study earlier data will be used where available although in the cases of 4f13 and 4f1 gauge stations data exists from 1948 to 1962 and then breaks off to start from 1966 to present.

Tributaries into the Tana River have even older data which could be stretched backwards.

The National Water Master Plan includes projected mass transfers of water from Kathita to Isiolo and from Tana River at Mbalambala to northern parts of Garissa. During this study only water transfers upstream of the Grand Falls were considered, and this was only in relation to projected irrigation activities.

During a further study all projected inter-basin transfers should be taken into account.

1.4 SILT RELEASE FOR DOWNSTREAM ECOSYSTEM

For the L.G.F. + Mutonga case, a weir in Kathita will be built, if it is a feasible plan, to allow silt-laden water to flow through a diversion without going through the dam. This will ensure that the downstream ecosystem continues receiving silt. This will ensure that the replenishment of nutrients in the river basin as in the past.

A system to ensure that initial runoff immediately after rains in the Kathita catchment is synchronised with silt release should be put in place.

Other mechanisms to ensure that silt is released to the river basin ecosystem will be looked into.

Further studies should be done to establish the actual source of silt before any project is started.

1.5 IMPOUNDMENT PERIOD

Impounding time needs to be recalculated, especially for the H.G.F. which is estimated to take 30 months.

The possibility of impounding the L.G.F. during a longer period should be considered, as this would allow more discharge to be released to the downstream systems.

The prolonged impounding of the L.G.F. is technically feasible, though impounding time and discharges depend on safety factor limits, and legal requirements for downstream water compensation (=50m^3).

1.6 OTHER MATTERS

The design should include:

1. A ladder system to allow fish to move up or down the river system.
2. Incorporate water supply take off system(s).

The name of the project should be changed to reflect the project's broader objectives and activities. It was suggested that a name like **Mutonga/Grand Falls Development Project** could be used.

The flow required to create artificial floods at Garissa should be confirmed, as two different figures, 500 m^3/s and 600 m^3/s were used during the presentations by the study team.

2. GROUP ON UPSTREAM NATURAL / SOCIAL ENVIRONMENT

Chairman, Mr. G.N. Kanyi *Secretary, Mr. Simon Gatheru*

2.1 BUFFER ZONE

A buffer zone is necessary to protect the reservoir area and the environment around it.

The size of the area would be decided on by technical persons, BUT the minimum possible should be used as a buffer zone to ensure a minimum number of persons are displaced.

2.2 DISPLACEMENT AND THE AREA TO WHICH PEOPLE SHOULD BE MOVED

a) The first option is where the project can:

- acquire the reservoir area (referred to as Area 1), the buffer zone (Area 2) and the area immediately next to the buffer zone (Area 3)
- re-plan the whole area again, ensuring that an adequate infrastructural system is in place (schools, water, roads, etc.) and sub-divide the land into equal portions, albeit smaller, for both the displaced and host communities
- ensure that all affected persons get a tenancy title like in the Mwea scheme

b) The second option is where:

- land is adjudicated. As has been emphasised even in the draft report, all land around the project area should be adjudicated before the start of the project and title deeds or freehold titles given.
- the project then acquires the land as in a) above, i.e. Areas 1, 2 & 3
- the project re-plans the area as above
- everybody is then given an equal piece of land, albeit smaller, and a title deed (plus cash). This ensures that people have security of the land, cannot easily be taken advantage of and are able to make decisions on their own land.
- At the same time, proper environmental management of the whole zone is to be ensured. This will be done by the local community through a committee, guided by a management plan to be drawn up within the legal framework.

- Rather than looking at the local communities as destroyers of the environment, an education component where people are enlightened on environmental protection and conservation measures should be part of the project.

Conclusions:

- In both options, people will have the choice of staying within an environment they are used to, both culturally and area-wise. The second option referred to above was agreed to be a better option.

- It should be ensured that Area 3 does not get over-crowded. If it is pastoral land, ways of making it more productive should be looked into to enable it to absorb the increased population pressure.

2.3 COMPENSATION

Compensation should ensure that the affected persons are in a better position, or at worst the same conditions as they were in before. If they have received compensation in cash form, they must be able to purchase similar or better land compared to what they had.

Long before the project has started, the implementing agency should have a resettlement plan in place and be ready to finance the cost.

Conclusions:

i) Land-for-Land

- Compensation should be land-for-land and cash to compensate for any land lost, for the inconvenience caused and to also assist the affected families build new homes and start afresh.

- The executing agency should identify areas where people can move to.

ii) Monetary Compensation

- Where cash is given instead of land, the ruling market rates should be used to value the land. That is the market value for the possible land that can be bought and not the current land. (In Tharaka, the only possible area for people to move to will be the highlands like Meru, which is more expensive to purchase)

- Monetary compensation should also be given for:

  ⇒ Forest resources lost, like timber, wild fruits, honey harvest, herbs, indigenous hard and soft woods.

⇒ Soil resources lost, like clay soils, saltlicks, building sand and quarry stones, ballast, iron ore and precious stones.

⇒ Cultural facilities like Igaironi, historical sites (the disposal sites of the Meru/Tharaka people) sacred sites (Kaungumi), Kibuka shrine, graves, separation of relatives, etc.

iii) Women, Children & the Family Unit

- There should be an element where the family unit is protected. It has been noted in the past that compensation is given to one person in the family (in many cases the male, because land is registered in the name of the head of the family, i.e. men) who may go away and leave the rest of the family stranded. The whole family as a unit should be involved in the whole development and compensation process.

iv) County/Municipal Councils

- For the loss of revenue from market places and trade centres, Municipal Councils should get a 'cess fee' from the electricity generated.

2.4 INFRASTRUCTURE

Roads: there are existing roads within the whole area. The project should improve the existing ones rather than embark on the construction of new roads. The decision of where the roads should pass should be made together with the local communities, after comprehensive engineering reports, with various options, have been made.

Other infrastructural development should also be included, e.g. schools and health centres which have been submerged must be replaced, and the host/receiving community's infrastructure (e.g. schools and health centres) will also have to be improved, etc.

Construction Site: The location and construction of a good construction site is important; the buildings can be used by the local community after completion of the works e.g. for a school. Since these people are loosing their land, are being displaced and inconvenienced, the least the project can do is leave behind good and usable structures.

However, this should also take into consideration the technical aspects that go into construction site selection for the actual construction work, and the future requirements like sanitation.

The recommended construction site location should be in Tharaka Location, from where a large number of persons will be displaced.

2.5 BENEFITS TO THE LOCAL COMMUNITY

Employment of the local community, especially during dam construction, should be ensured.

Trade: the local community should be given preference in the supply of locally available materials and food.

Water supplied from the dam to the surrounding areas should be ensured.

Direct electricity supply from the dam to the immediate surrounding areas should be ensured.

Agricultural extension service support should also be included to assist the communities in increasing the productive capacity of the resources e.g. livestock, crops, etc. This takes into consideration that the local community are not fishermen.

2.6 UPSTREAM ENVIRONMENT

There is need to assess what is happening to the environment upstream, e.g. the forests, siltation, persons. Heavy silt is getting into the rivers, accelerated by the high level of human activity.

The National Water Master Plan is looking into the conservation of the catchment area.

Wastes from coffee factories need to be looked into.

Why is there a need for sediments from the higher areas? What was wrong with the clear rivers of the 1900's?

Fisheries topic was not covered well. We need to know about the breeding habits of fish, why the fishing potential first rises then falls, etc. What are the effects of the dam on fish?

Flood Control: there is a need to synchronise the flood release of other dams upstream, synchronise the demand for electricity and the flooding system. What if you release the floods and then there are natural floods from rain? How do we marry the two?

We need to borrow a leaf from other programmes in Africa e.g. Senegal and the Aswan dam in Egypt.

There is also need for more studies on the hydrological cycle of the river upstream, including abstraction of the water by the communities (both legal/recorded and illegal).

Conclusions:

There is need to address an integrated management system for all resources upstream and for waste management.

Need for a study on the effects of other dams on fish and on flood control.

2.7 FUNDING

It is very important that the total cost of the project is communicated to the affected persons and the public in general.

The project costs should in total cover all aspects e.g. technical construction, social and environmental interventions. Issues such as resettlement, compensation, follow-up, management of the buffer zone, training, etc., should all be part and parcel of the project costs, and should be allocated before the project starts. This is considering that in the past, payments have been delayed for prolonged periods due to non-allocation of funds at the outset of the project.

2.8 CONTROL

Who is the controlling consultancy or agent within the whole project? JICA is responsible for a number of feasibility studies. In this workshop still there are a number of studies which we have requested JICA to do. But where is the control group to ensure that these studies are well done or who can come up with alternatives, etc. Where is the check?

During the whole workshop, the public has received very little reassurance from TARDA or the government representatives.

2.9 OTHER ISSUES

LAWS: the current compensation laws and laws touching on land do not adequately compensate affected persons, e.g. for trust land, compensation is only given for any development done (houses, huts, trees, etc.) and not on actual cost of the land.

NGOs can play a large role in the resettlement of the local community. They are usually more in touch with the grassroots community and willing to work anywhere. They should be involved more.

SECURITY: should be ensured, considering that the area will also be opened up to tourists and the public.

ERRORS that have occurred in the past included incomplete data on the area, actual persons to be affected, land required by the involved people, now and for future generations, etc. What will ensure that this does not occur in this project?

ALL recommendations will be passed on to the Commissioner of Lands and the Government.

In Conclusion:

We are talking about people whose lives shall be affected by the project. People should be involved FULLY in the whole development process of the project.

3. GROUP ON DOWNSTREAM NATURAL ENVIRONMENT

Chairman: Dr.F.M. Muthuri *Secretary: Mr. Quentin Luke*

3.1 TOPIC: ARTIFICIAL FLOODING

Main points raised:

Do we believe in the system of releasing floods, and is there any known dam with a system of releasing floods?

In Zambia, the Kafue Gorge and Itezhitezhi dams were given as an example, as was the Manantali dam on the Senegal River. No other examples were currently known despite preliminary literature searches. It was then commented that we are dealing with three different ecosystems regarding the three areas (Tana River, Kafue of Zambia and the Manantali of Senegal).

It was suggested that relevant data on flood dynamics and the consequences of releasing dam water (in various quantities) be provided.

Clarification was sought from the relevant authorities on whether water released will follow the same pattern of flooding, and whether the water is being released from the main river or the laga - will the sediment load be the same.

What quantities of water will be released, putting into consideration that a residual flow must be maintained.

If the water is released and people and/or their belongings are seriously affected, is there any compensation.

What mode of communication is to be used to advise the local people when a flood is intended?

Will the quality of water change due to different sediments, and to what extent?

Suggestions:

It was suggested that more data be provided on the artificial release of floods, and a detailed survey of the topography of the flood area be undertaken.

Communication to the communities via radio was dismissed, and an effective way to communicate should be found.

Provide information as to the quality of water change due to sediments, and have key monitoring sites.

Relevant authorities should fund the monitoring exercise and provide the relevant tools, e.g. rain gauges, and provide training where necessary. The project should include a monitoring component.

TARDA should co-ordinate with other involved Ministries and organisations, i.e. initiate institutional inter-linkages to monitor the project.

Studies should be carried out following recommendations in Phase III, and will be coordinated and funded by the relevant organizations.

The studies should be made a pre-requisite and should be part and parcel of the project.

Detailed biodiversity inventories that will look into the flora and fauna around the riverine corridor need to be undertaken. This should outline the conservation status of the endangered animal and plant species (e.g. the two types of monkeys, and the wild coffee tree used by breeders).

Conclusions:

1. Baseline studies are needed: to be seen as pre-requisites of the detailed design phase of the project. Relevant data on flood dynamics must be provided.

   It was generally recommended that the environmental and baseline studies be included in the project and be funded by the project in order to achieve the necessary linkages with detailed design. The studies are anyhow to be seen as a prerequisite of the next phase of the project (detailed design phase).

   It was said that the environmental and baseline studies should be linked with the project detailed design.

   The study should include salt intrusion [*to the delta*], sea erosion and soil conservation. The studies should also take into account other studies/projects taking place in the delta.

2. Proposed Parallel Study: JICA said that the Feasibility Study was just a proposal for the dams, and within the proposal the team is trying to come up with suggestions from the workshop groups to include in the proposals. JICA

also said the [*required*]environmental and baseline studies appeared to go above the [*existing*] budget and time limitations of the Phase III feasibility studies. It was concluded that extending the Feasibility Study is not realistic, but could be put as a suggestion in the proposal. The best option lay in the parallel environmental and baseline study.

It was suggested that a parallel study should be conducted and incorporated with the detailed design phase, and that unless JICA financed the study, it [*detailed design and dam construction*] was not likely to take off under e.g. the WORLD BANK or TARDA.

As to who would finance the parallel study, a decision was not yet made because JICA did not have the required details as yet.

After the parallel study, then a monitoring system will be established and results based on this will be included in the final design.

3. Water Quality and Sediments: More information on the actual quality of water must be provided. Since sediments affect the quality of water, the consequences of expected sedimentation must be determined.

   The quality of water, quality and source of the sediment, and the magnitude/quantity of the sediments must be determined, taking into account seasonalities and longer-term climatic cycles.

   A study of the environmental and sediment issue must be undertaken; the issue should be studied over a period which should ideally cover at least two flood seasons. It was asked what the sediment issue in the past was i.e. 1940's and 50's, and it was suggested that satellite images be used to confirm the sediment issue in the past and present. [*Editors comment: Satellite imagery from these periods is not available*]

   How do the changes in sedimentation affect the natural environment? JICA said that various organizations will discuss and decide to form a committee which will recommend the findings to the Phase III study team.

   It was asked whether the sedimentation study could be made independently of the Detailed Design. The study team member said it would be advisable if the two issues, (Parallel Study & Detailed Design) were coordinated, because if any are gaps found, they should be included in the Detailed Design.

4. Controlled Flood Release: The artificial flooding system is highly unique, but without information on previous experiences. No one had information to expound on this issue. The relevant Authority must provide relevant information.

   The extent to which the artificial floodwater will affect the change of the flora and fauna of the environment must be determined.

The consequences to the sea-land interface must be clarified, e.g. will the coast-line change, and due to this how will the biodiversity of the interface be affected? [*Editors comment: i.e. with and without controlled flood release*].

5. Monitoring and Management: It is necessary to identify what kind of Monitoring System should be used, and what key monitoring sites and subjects are appropriate.

   The overall framework for baseline and monitoring studies is to be formulated by Phase III, taking into account existing, on-going and planned research/management projects.

   Monitoring the downstream environment should also consider other aspects, i.e. baseline survey, environmental and additional hydrological survey, etc. Then after that the monitoring project would be carried out. Mr. Sumikawa said that all these issues were taken into consideration, but required time and additional funds to be carried out.

6. A consensus was reached and it was concluded that all the issues raised during the group discussion, e.g. artificial flooding, sedimentation, water quality, flooding patterns, seasonality, and inventories, required that relevant studies be performed to furnish required data on the subject.

4. GROUP ON DOWNSTREAM SOCIAL ENVIRONMENT

Chairman: Mr. Kiai *Secretary: Ms. Jennifer Mpungu*

4.1 SUGGESTED TOPICS FOR DISCUSSION

Artificial Flooding

Communities are not sure how these mechanisms work

What alternative measures are in place to mitigate the failure of the releases?

Other Alternatives

Can the study explore the possibilities of developing new population centres i.e. building towns, given that there is scarcity of land for resettlement ?

What implications does this have on the traditions and cultures; is it an option?

What kind of compensation regimes are more feasible?

Resource Use Conflict

Pastoralists -vs- farming; Human habitats -vs- wildlife habitats

Social Institutions

The Pokomo rely on the Tana River; the dam will affect their social and institutional set-up.

Tharaka people consider the Tana River sacred.

The history of irrigation schemes has been disappointing.

How will big mechanised irrigation schemes be organised; will they be commercially oriented, group managed, or managed by a parastatal?

Management and Technology

Pastoralists have diverted water for use in the hinterland, which has implications for river management. What or how is the new development of water release going to be managed?

Even after the implementation of the project, the management and taming of the river should be continued .

Land-Tenure Issues

This is a fundamental issue, which must be looked into.

4.2 GROUP DISCUSSION

4.2.1 Topic 1, Resettlement

Main Points

Downstream there are two different communities, i.e. the Tharaka and the Kamba. Resettlement leading to mixing of the two communities may cause friction between them, and social amenities should be provided individually to the two communities.

From the study on Phase II, individuals affected preferred resettling in the neighbourhood among their own people.

Conclusions:

Resettlement should be with reference to the community as a whole and not to individuals, i.e. any interventions should only focus on the people as a community.

Funds for resettlement, and other mitigation interventions, should be included as part of the project cost to ensure the availability of resources for the resettlement activities.

4.2.2 Topic 2, Management and Technology

Main Points

The downstream fertility level of the soil will be affected, and agricultural methods will thereby have to change.

How is the new water regime going to be managed, and by whom?

What alternative measures will be in place to mitigate the failure or ineffectiveness of the water discharge or release mechanisms?

How will communities participate in the planning and management of the water system?

What kind of technology is most appropriate for the small scale irrigation schemes?

Conclusions:

Traditional methods of irrigation among the community have so far been effective. It is important that Phase III considers these methods and tries to adopt and improve on them, rather than introduce high level technology that the community will not be able to manage.

The study should be funded as an integral cost of the project.

There must be a provision for a power line downstream, along with other infrastructure facilities.

4.2.3 Topic 3, Community Participation and Cultural Issues

Main Points

The community does not understand what the project is trying to achieve, and how their lives will be affected by the project; rumours about the project are widespread.

Is the community involved in the planning and decision-making process?

Conclusions:

The study should incorporate the views of the community as soon as the funding commitment has been secured. The earliest moment should however be sought for community consultation.

Information materials about the project should be produced in the relevant local languages, to give the community a possibility of understanding the project and it's implications.

Radio and other media should be used.

4.2.4 Topic 4, Artificial Flooding

Main points

Artificial flooding will have effects on such things as national crop production. Irrigation schemes are also affected by the flow of water.

Consider supplemental help or compensation to affected communities.

Compare to problems faced in other places where artificial flooding is practised.

Conclusions:

The study team to put more emphasis on gathering information on the positive and negative effects of artificial flooding, and learn from previous experiences how the negative effects can be mitigated.

The exact implications that flooding will have on existing lakes, lagas etc. (Lake Bilisa, ox-bow lakes, lagas) must be registered.

The study should pay more attention to the area between Garissa and Kipini.

What contingencies are being made for artificial flooding?

4.2.5 Topic 5, Other Alternatives

Main points

Previous displacements have settled people downstream. It is likely that more people will settle downstream with this project, as they believe there is more land there.

Conclusion:

A study must be undertaken to investigate the impact on downstream resettlements, considering the increase in population pressure where communities are moving from the north to the river corridor.

4.2.6 Topic 6, Resource Use Conflict

Main points

There is a conflict between pastoralists and sedentary farmers, and human and wildlife habitats. With the natural flooding such conflicts were not a problem, as the water would reach the hinterland where the pastoralists grazed, while the agricultural activities were carried out next to the river. The wildlife as well stayed in the hinterland. The animals only came to the river when it was very dry. With artificial flooding, the pastoralists, wildlife and the sedentary farmers all rely on the water from the river-bed.

Conclusions:

A study to be made to investigate the High Grand Falls against Low Grand Falls + Mutonga, taking into consideration all the other factors, and using socio-economic assessment rather than financial assessment.

Investigate the possibility of supplying water with a potable quality.

Development of water sources should take place downstream, to ease congestion at watering points.

Better infrastructure, industries, food security, roads etc. may increase security in the area. Viewing the project as a Regional Development Project rather than narrowing it down to a power project only.

A study to be made to consider other sources of power, e.g. wind and geothermal power, since hydropower seems to be environmentally and economically expensive.

Whatever development activities are planned downstream should be approached from an integrated point of view, considering that there are other interested parties.