No.

Ministry of Water and Irrigation
Water Resources Management Authority
The Republic of Kenya

OUTLINE DESIGN STUDY REPORT

ON

THE PROGRAMME FOR

COMMUNITY-BASED FLOOD DISASTER

MANAGEMENT TO ADAPT TO CLIMATE CHANGE IN

THE NYANDO RIVER BASIN

IN

THE REPUBLIC OF KENYA

February 2009

JAPAN INTERNATIONAL COOPERATION AGENCY

NIPPON KOEI CO., LTD.

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PREFACE

In response to a request from the Government of the Republic of Kenya, the Government of Japan decided to conduct an outline design study on the programme for community-based flood disaster management to adapt to climate change in the Nyando river basin and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Kenya a study team from October 30 to December 18, 2008.

The team held discussions with the officials concerned of the Government of Kenya, and conducted a field study at the project area. After the team returned to Japan, further studies were made. Then, a mission was sent to Kenya in order to discuss a draft outline design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Kenya for their close cooperation extended to the teams.

February, 2009

Ariyuki MATSUMOTO

Vice President

Japan International Cooperation Agency

February, 2009

LETTER OF TRANSMITTAL

We are pleased to submit to you the outline design study report on the programme for community-based flood disaster management to adapt to climate change in the Nyando river basin in the Republic of Kenya.

This study was conducted by Nippon Koei Co., Ltd., under a contract to JICA, during the period from October, 2008 to February, 2009. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Kenya and formulated the most appropriate outline design for the project under Japan's Programme Grant Aid for Environment and Climate Change.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Masaru TOKURA

Project Manager,

Outline design study team on

the Programme for Community-Based Flood Disaster Management to Adapt to Climate Change in the Nyando River Basin

Nippon Koei Co., Ltd.

SUMMARY

(1) Existing Conditions of the Country

The Republic of Kenya (hereinafter referred to as "Kenya") is located on the east side of the African continent and lies on the equator. Kenya is surrounded by the neighboring countries of Ethiopia, Sudan, Somalia, Tanzania, and Uganda. Kenya has a national land area of approximately 580,000 km^2 and had a population of 36.1 million in 2006. Kenya's climate ranges from the mild tropical climate of the coastal area on the Indian Ocean, the dry climate of the lower inland areas, and to the cool climate of the highlands. Nearly two of thirds of the total land area has a dry or semi-dry climate.

Due to the drought and the damage caused to agriculture and infrastructure by heavy rainfall arising from the El Nino effect, the national economy was strongly depressed in the latter half of 1990s. In addition, security conditions became worse and economic growth became negative in 2000. In the period from 2003 to 2007, the economy recovered and stable growth led to GDP increasing at a rate of 2.9% in 2003 and 7.0% in 2007. Although the economy has experienced positive growth in the recent years, the GDP in 2007 was estimated at only Ksh1,814,200 million (equivalent to USD 24,430 million). This means that GDP per capita is still at the low level of Ksh48,770 (equivalent to USD657). The national economy relies on the agriculture as the main industry, which provides 22.7% of GDP. This is followed by the transportation/communication sector (11.4%) and manufacturing (9.7%). The main farm products consist of coffee, tea, and garden crops. Economic growth in the recent years has been supported by the transportation/communication, retail, and manufacturing sectors. The GDP share by industry is estimated at 23.2% for the primary, 15.7% for the secondary, 49.5% for the tertiary, and 11.6% for others including taxes less subsidies on products.

(2) Background of the Project

In the 9th National Development Plan (2002-2008), the Government of Kenya (hereinafter referred to as "GOK") highlighted the theme "Effective Management for Sustainable Economic Growth and Poverty Reduction". The percentage of people who live below the absolute poverty line is estimated at 53% in Kisumu District and 69% in Nyando District. The absolute poverty rate of both districts covering the Project Area exceeds the national average rate of 50% for Kenya. The Nyando River Basin experiences flooding in the rainy season, which extends from March to May and returns again in November. Flooding affects the main industry of agriculture in both districts and is the main constraint on economic growth. In addition, the flood disaster area is expanding due to climate change. In the areas surrounding Lake Victoria, including the Project Area, the number of rainy days having more than 50mm/day has been increasing. Therefore, a flood management system urgently needs to be established in the Project Area.

Due to the situation described above, JICA carried out the "Study on the Integrated Flood Management for Nyando River Basin" (hereinafter referred to as "the MP Study") as a technical assistance project. The objectives of the MP Study are to: i) Formulate a plan of Integrated Flood Management for the Nyando River Basin; and ii) Develop the flood management capacity of residents through the implementation of Pilot Projects. The field work in Kenya for the MP Study was completed in December, 2008. Twenty-four (24) villages were selected as priority areas, based on the flood disaster map which was

prepared during the MP Study. Measures for flood management in these 24 villages were formulated by the MP Study.

Based on the results of the MP Study, the GOK submitted a request for Programme Grant Aid for Environment and Climate Change ("GAEC") to the Government of Japan for the "Programme for Community-based Flood Disaster Management to Adapt to Climate Change in the Nyando River Basin" (hereinafter referred to as "the Project"). The Project aims to establish a flood management system by implementing structural and non-structural measures for integrated flood management in the 24 villages of the flood prone parts of Nyando District and Kisumu District. Table 1 lists the structural components and Table 2 lists the non-structural components of the Project, as requested by the GOK.

Table 1 Structural Measures of the Project Requested by GOK

Facility	Number of Facilities
Boreholes	11
Evacuation Centers	4
Toilets (10 compartments)	6
Toilets (2 compartments)	3
Storage Facilities	2
Culverts	44
Foot Bridges	7
Weirs	1
Total	**78**

Source: The MP Study

Table 2 Non-structural Measures of the Project Requested by GOK

No.	Component
1	Development of community based flood management organizations.
2	Technical O&M training for structural measures.
3	Community flood management training.
4	Education program for disaster prevention.
5	Radio programs about flood management.
6	Awareness campaign using posters about flood management.

Source: The MP Study

(3) Basic Concept of the Project

In response to the request by the GOK, JICA dispatched the Outline Design Study Team (hereinafter referred to as "the OD Study Team") to conduct the field studies at two times between November 2008 and February 2009. The OD Study Team confirmed the contents of the Project that was requested by the GOK and reviewed the viability of the structural measures. The review considered the following aspects:

1) Consistency with the evacuation places and evacuation routes indicated in the community hazard maps prepared for the MP Study;
2) Land availability for the structural measures without conflicting with existing land arrangements;
3) Impartial provision of the structural measures for each village;
4) Sustainable use by preventing topographic change in the future; and
5) Availability of the structural measures in the initial stages of a flood.

As a result of the review, the structural measures and non-structural measures of the Project were formulated, as shown in Table 3 and Table 4, respectively.

Table 3 Structural Measures of the Project

Type of Structure	Number of Structures
Boreholes	11
Evacuation Centers	4
Toilets (10 compartments)	6
Toilets (2 compartments)	3
Storage Facilities	2
Culverts	44
Foot Bridges	5
Weirs	1
Total	**76**

Source: OD Study Team

Table 4 Non-structural Measures of the Project

No.	Package	Outline
1	Development of community based flood management organizations	
	1.1 Forming and Building the Capacity of Community Based Flood Management Organizations	a) Management and operation training - Community awareness. - Development of bylaws. - Organizational training. - Financial management training. b) Training in writing proposals for fundraising (including preparation of a manual for writing proposals). c) Production and installation of 3 kinds of signboards: - Community hazard maps in each village. - Signboards for evacuation routes in each village. - Signboard at the evacuation center in each village.
	1.2 Technical O&M training for structural measures	a) Both lectures and on-site training in O&M for the series of structures to be constructed by the Project. b) Preparation of O&M manuals.
2	Community flood management training	a) Community Flood Management Training - Training in flood disaster cycles. - Training in first aid. b) Community Flood Management Manual c) Evacuation Drills (The drills will be led by community based flood management organization (CFMO) and utilize the communication network of communities.)
3	Education Program and Public Relation Program	
	3.1 Education program for disaster prevention	a) Targeting 16 primary schools identified within 24 villages. b) Teacher training in disaster prevention and flood management. c) Review and modification of the textbook used to teach pupils. d) Mass printing of the textbook.
	3.2 Radio programs about flood management	a) Long radio programs. b) Short spot programs.
	3.3 Awareness campaign using posters about flood management	a) Posters covering three (3) subjects: i) Storing water, food, and useful goods for evacuation; ii) Awareness when evacuating; and iii) Early warning. b) Distribution of the posters.

Source: OD Study Team
Note: The flood disaster cycle comprises prevention, mitigation, preparedness, response, recovery, and rebuilding.

(4) Construction Schedule and Cost Estimation

The project period was estimated at 23 months, from the signing of the exchange of notes (E/N) to the completion of construction. The estimated period for the main components is as follows:

1) Detailed design, Pre-qualification (PQ), and Tender: 5 months
2) Construction work for the structural measures: 17 months (including completion examination)
3) Implementation of the non-structural measures: 20 months

The implementation cost for the scope of work that is the responsibility of the GOK was estimated at JPY6.7 million.

(5) Project Evaluation and Recommendations

During the Project, the flood management system will be developed within the Project Area comprising 24 villages. The number of direct beneficiaries of the Project is estimated at approximately 20,000 people who live in the 24 villages. In addition, the Project will contribute to improving: i) The public's awareness of flood management; ii) Evacuation safety; and iii) Flood safety in the Nyando River Basin. The O&M system will be developed as part of the non-structural measures of the Project. Community Based Flood Management Organizations (CFMOs) will be developed and trained in financial management, O&M, and the activities required according to the flood disaster cycle. In addition, the following issues taken care of by the GOK must be addressed in order to bring the project effects to the full after the completion of the Project:

(1) Support for the CFMOs by Public Authorities: In the non-structural measures, the CFMOs will be developed and trained in financial and technical management. In cases where the CFMOs are not capable of overcoming any incident, the GOK needs to takes responsibility for financial and technical support of the CFMOs.

(2) Continuation of Education Program and Public Awareness Campaigns: The non-structural measures include education programs for disaster prevention and public awareness campaigns including radio programs and poster distribution. After the Project, the GOK needs to continue these programs. The education programs should be included in the official education curriculum, while the teaching manuals and textbooks should be replicated in other villages. The long and short radio programs should be broadcast periodically. In addition, the posters need to be updated and re-distributed in the future.

(3) Replication of the Project in Other Villages: Based on the experiences of the Project, the GOK needs to make efforts to utilize the local resources and replicate the Project of the structural and non-structural measures in other villages,.

THE OUTLINE DESIGN STUDY
ON
THE PROGRAMME FOR COMMUNITY-BASED FLOOD DISASTER MANAGEMENT TO ADAPT TO CLIMATE CHANGE
IN
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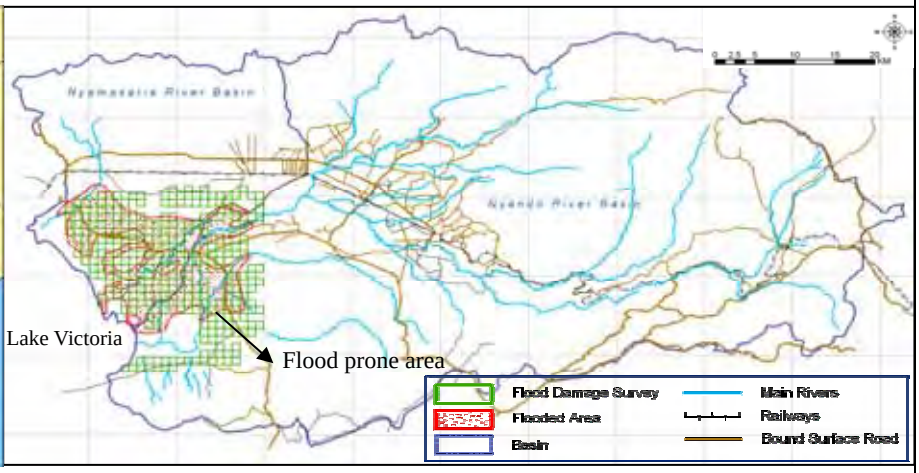
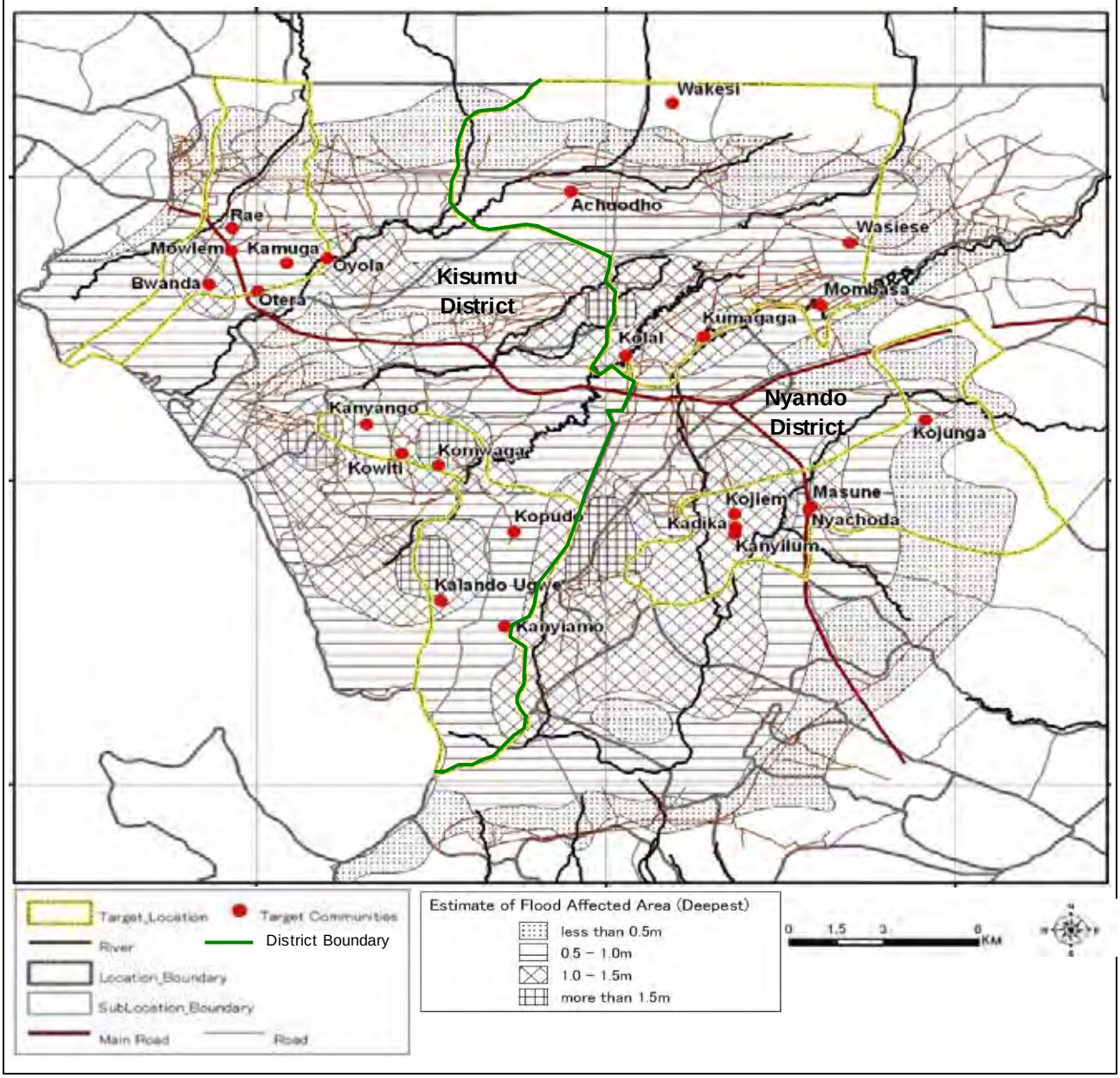
Contents

[Location Map of Kenya]

[Location Map of Nyando River Basin]



[Location Map of 24 Villages]



LOCATION MAP

THE PROGRAMME FOR COMMUNITY-BASED FLOOD DISASTER MANAGEMENT TO ADAPT TO CLIMATE CHANGE IN THE NYANDO RIVER BASIN
- PERSPECTIVE -

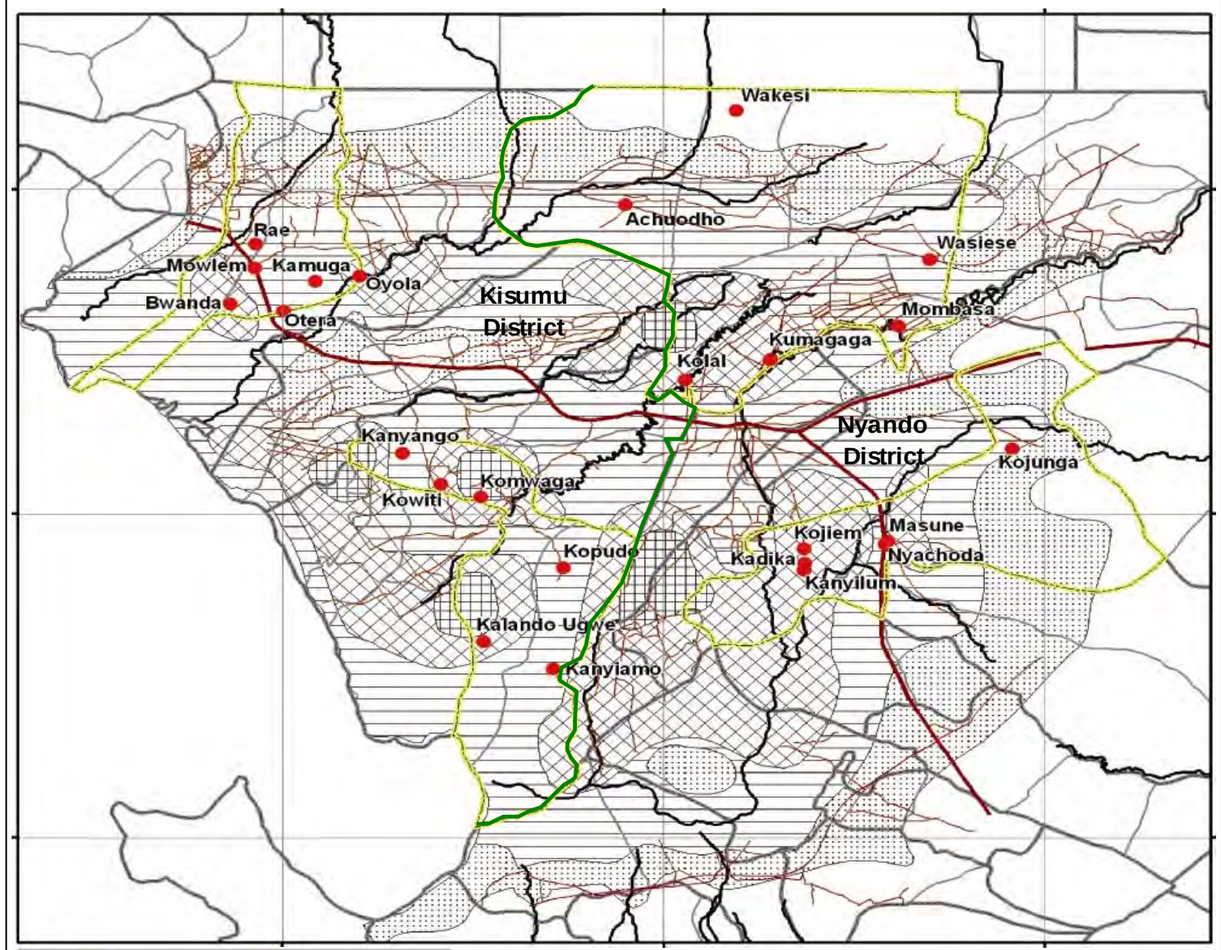
Project Location Map of 24 Villages in Nyando and Ksumu Districts

Flood Condition in the Nyando River Basin

Flood Prone Area at Lower Catchment

Housing Damaged by Flood

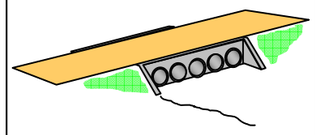
Unpaved Road Affected by Flood



Measures to be Taken in the Project

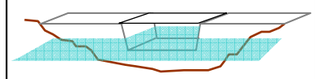
[Structural Measures]

(1) Infrastructure Measures to Prevent Flood Disaster and Provide Evacuation Routes



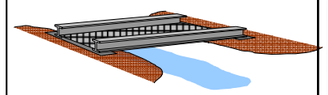
Culvert

(Culvert to provide the evacuation route above its structure.)



Weir

(Weir to provide the water for agriculture and evacuation route above its structure.)



Footbridge

(Footbridge to provide the evacuation route and the safe access for the villages which do not have any access from the outside during the flood.)

(2) Architectural Measures to Provide Evacuation Places

Borehole

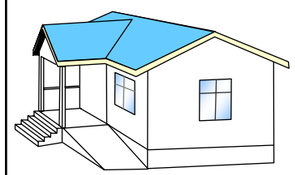
(Boreholes will supply the safe water for the people during the flood.)

Evacuation Centre

(Evacuation center with hall, kitchen, and storage to improve the living envviroment during the flood.)

Toilet

(Toilet to improve the living envviroment during the flood.)



Storage

(Storage to supplement the safe spaces for the evacuees and storages for the relief goods during the flood.)

[Non-Structural Measures]

(1) Forming and Building the Capacity of Community Based Flood Management

Community Sensitization and Training

Community Flood Hazard Map

(2) Community Flood Management Training

Evacuation Drill

Flood Management Training with Manual

(3) Technical O&M Training for Structural Measures

Lecture for O&M Training with O&M Manuals

On-site O&M Training

(4) Education Program for Disaster Prevention

Teacher Training in Flood Management with Teaching

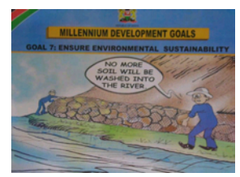
Teaching Pupils with Texbooks

(5) Radio Programs on Flood Management

Long raido programs

Short spots

(6) Awareness Campaign using Poster on Flood Management



Posters (Samples of UNDP and SIDA)

LIST OF TABLES & FIGURES

ABBREVIATIONS

1 Name

(1) Organization

CAAC	Catchment Area Advisory Committee
CBO	Community Based Organization
CFMO	Community-Based Flood Management Organization
DANIDA	Danish International Development Agency
DERC	Disaster Emergency Response and Coordination
DMC	Disaster Management Committee
DOC	National Disaster Operation Center
EU	European Union
GOK	Government of Kenya
GTZ	Deutsche Gesellschaft fur Technische Zusammenarbeit
IMF	International Monetary Fund
KfW	Kreditanstalt für Wiederaufbau
LVSC	Lake Victoria South Catchment Area
MWI	Ministry of Water and Irrigation
NEMA	National Environmental Management Authority
NGO	Non-Governmental Organization
NIB	National Irrigation Board
NWRMS	National Water Resources Management Strategy
R&R	Relief and Rehabilitation Section
SIDA	Swedish International Development Agency
USAID	United States Agency for International Development
WAB	Water Appeal Board
WB	World Bank
WMO	World Meteorological Organization
WRMA	Water Resource Management Authority
WRUA	Water Resource Users Association
WSB	Water Service Board
WSP	Water Service Provider
WSRB	Water Service Regulatory Board
WSTF	Water Service Trust Fund

(2) Others

BS	British Standard
CAP	Community Action Plan
CMS	Catchment Management Strategy
DDP	District Development Plan
EIA	Environmental Impact Assessment

E/N	Exchange of Notes
EPR	Environmental Project Report
ERSWEC	Economic Recovery Strategy for Wealth and Employment Creation
GAEC	Programme Grant Aid for Environment and Climate Change
NDMP	National Disaster Management Policy
NDP	National Development Plan
NPEP	National Poverty Eradication Plan
NWRMS	National Water Resources Management Strategy
PRA	Participatory Rural Appraisal
PRSP	Poverty Reduction Strategy Paper
PVC	Polyvinyl Chloride
RC	Reinforced Concrete
uPVC	Unplasticised Polyvinyl Chloride
VES	Vertical Electrical Soundings
WCQ-LVWMP	Water Quality Component of Lake Victoria Environmental Management Project

2 Unit

Area

cm^2	= Square-centimeters (1.0 cm x 1.0 cm)
m^2	= Square-meters (1.0 m x 1.0 m)
km^2	= Square-kilometers (1.0 km x 1.0 km)
ha.	= Hectares (10,000 m^2)

Volume

cm^3	= Cubic-centimeters (1.0 cm x 1.0 cm x 1.0 cm)
m^3	= Cubic-meters (1.0 m x 1.0 m x 1.0 m)
lit., l	= Liter (1,000 cm^3)

Length

mm	= Millimeters
cm	=Centimeters (= 10 mm)
m	= Meters (= 100 cm)
km	= Kilometers (= 1,000 m)
Inch	= 2.54 cm

Weight

mg	= Milligrams
g	= Grams (= 1,000 mg)
kg	= Kilograms (=1,000 g)
ton	= Metric tonne (=1,000 kg)
N	= Newton (1kgm/s^2)
kN	= Kilo Newton (1,000N)

Currency

US$	= United State Dollars (US$1=JPY105.71)
JPY	= Japanese Yen
Ksh	= Kenyan Shilling (Ksh1=JPY1.480)

Time

sec.	= Seconds
min	= Minutes (60 sec.)
hr.	= Hours (60 min.)
d	= day

Other

%	= Percent

CHAPTER 1

BACKGROUND OF THE PROJECT

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In the 9th National Development Plan (2002-2008), the Government of Kenya (hereinafter referred to as "GOK") highlighted the theme "Effective Management for Sustainable Economic Growth and Poverty Reduction". The percentage of people who live below the absolute poverty line is estimated at 53% in Kisumu District and 69% in Nyando District. The absolute poverty rate of the both districts covering the Project Area exceeds the national average rate of 50% for Kenya. The Nyando River Basin experiences flooding in the rainy season, which extends from March to May and returns again in November. Flooding affects the main industry of agriculture in both districts and is the main constraint on economic growth. In addition, the flood disaster area is expanding due to climate change. In the areas surrounding Lake Victoria, including the Project Area, the number of rainy days having more than 50mm/day has been increasing. Therefore, a flood management system urgently needs to be established in the Project Area.

Due to the situation described above, JICA carried out the "Study on the Integrated Flood Management for Nyando River Basin" (hereinafter referred to as "the MP Study") as a technical assistance project. The objectives of the MP Study are to: i) Formulate a plan of Integrated Flood Management for the Nyando River Basin; and ii) Develop the flood management capacity of residents through the implementation of Pilot Projects. The field work in Kenya for the MP Study was completed in December, 2008. Twenty-four (24) villages were selected as the priority areas, based on the flood disaster map which was prepared during the MP Study.

Based on the results of the MP Study the GOK submitted a request for Programme Grant Aid for Environment and Climate Change ("GAEC") to the Government of Japan for the "Programme for Community-based Flood Disaster Management to Adapt to Climate Change in the Nyando River Basin" (hereinafter referred to as "the Project"). The Project aims to establish a flood management system by implementing the structural and non-structural measures for integrated flood management in the 24 villages of the flood prone parts of Nyando District and Kisumu District.

(1) Components Requested by the Government of Kenya

The components requested by the GOK comprise structural and non-structural measures, which are based on the results of the MP Study. The structural measures aim at constructing: i) Evacuation places by providing an evacuation center, toilets, storage facilities, and a borehole; and ii) Evacuation routes by providing footbridges, culverts, and weirs. A total of 78 facilities were requested for the structural measures. Table 1.1 shows the number of facilities by type of structure. Table 1.2 shows the number of facilities by village.

Table 1.1 Structural Measures of the Project Requested by GOK (by Structure)

Type of Structure	Number of Facilities
Boreholes	11
Evacuation Centers	4
Toilets (10 compartments)	6
Toilets (2 compartments)	3
Storage Facilities	2

Type of Structure	Number of Facilities
Culverts	44
Foot Bridges	7
Weirs	1
Total	**78**

Source: The MP Study

Table 1.2 Structural Measures of the Project Requested by GOK (by Village)

Village	Structural Measures	Description
Rae Kanyaika	Culvert (1)	L=2m, W=3.5m, H=0.7m
	Culvert (2)	L=1m, W=3.5m, H=0.3m
	Culvert (3)	L=1m, W=3.5m, H=0.3m
	Culvert (4)	L=1m, W=3.5m, H=0.3m
	Culvert (5)	L=2m, W=3.5m, H=0.7m
	Culvert (6)	L=2m, W=3.5m, H=0.7m
	Culvert (7)	L=2m, W=3.5m, H=0.7m
Mowlem	Borehole	with hand pump, < 100m
	Toilet	10 compartment type
	Evacuation Center	floor area 210m^2
Bwanda	Culvert (1)	L=12m, W=5m, H=1.5m
	Culvert (2)	L=5m, W=2.5m, H=1.5m
	Culvert (3)	L=1.5m, W=2.5m, H=0.5m
	Culvert (4)	L=3.5m, W=2.5m, H=1.2m
	Culvert (5)	L=13m, W=2.5m, H=1.2m
Otera	Culvert (1)	L=6m, W=3.5m, H=1m
	Culvert (2)	L=8m, W=3.5m, H=2.5m
	Culvert (3)	L=12m, W=2.5m, H=1.5m
	Culvert (4)	L=4m, W=3.5m, H=1m
	Culvert (5)	L=1m, W=2.5m, H=0.6m
Kamuga	Borehole	with hand pump, < 100m
	Toilet	10 compartment type
	Culvert	L=1.2m, W=2.5m, H=0.6m
Oyola	Borehole	with hand pump, < 100m
	Culvert (1)	L=10m, W=5m, H=1.5m
	Culvert (2)	L=10m, W=5m, H=1.5m
	Culvert (3)	L=1.5m, W=8m, H=0.5m
	Culvert (4)	L=2m, W=8m, H=0.8m
	Culvert (5)	L=2m, W=6m, H=1m
	Culvert (6)	L=1.4m, W=5m, H=0.5m
Kanyango	Culvert (1)	L=2m, W=5m, H=0.3m
	Culvert (2)	L=1.2m, W=5m, H=0.3m
	Culvert (3)	L=1.2m, W=5m, H=0.3m
	Weir	W=7.6m, H=1.5m
Komwaga	Evacuation Center	floor area 210m^2
	Toilet	10 compartment type
Kowiti	Culvert	L=8m, W=3.5m, H=1m
	Toilet	10 compartment type
	Storage	floor area 55m^2
Kamget Ugwe	Footbridge	L=8m, W=2m, wood
	Culvert (1)	L=7m, W=3.5m, L=0.3m
	Culvert (2)	L=5m, W=2.5m, H=0.6m
Kopudo	Borehole	with hand pump, < 100m
Kanyiaomo	Culvert (1)	L=5.5m, W=1.5m, H=0.8m
	Culvert (2)	L=8m, W=3.5m, H=1.2m
Kolal	Evacuation Center	floor area 210m^2
	Toilet	2 compartment type
Wasiese	Footbridge	L=30m, W=1.5m, wood
Kamagaga	Footbridge	L=8m, W=1.5m, steel
	Evacuation Center	floor area 210m^2
	Toilet	2 compartment type
Wangaya Mombasa	Culvert (1)	L=1.5m, W=8m, H=0.4m
	Culvert (2)	L=2m, W=9m, H=0.4m
	Culvert (3)	L=2.5m, W=6m, H=0.5m
	Culvert (4)	L=1.5m, W=9.3m, H=0.5m
	Culvert (5)	L=1.5m, W=6.3m, H=0.5m
	Culvert (6)	L=2m, W=5.5m, H=0.5m
	Borehole	with hand pump, < 100m
Achuodho	Borehole	with hand pump, < 100m
	Culvert (1)	L=3m, W=4m, H=0.8m
	Culvert (2)	L=2m, W=4m, H=1m
	Toilet	2 compartment type
Wakesi	Culvert	L=1.3m, W=3.5m, H=0.6m
	Borehole	with hand pump, < 100m
Kojiem	Borehole	with hand pump, < 100m
Kanyilum	Toilet	10 compartment type
	Storage	floor area 55m^2
	Borehole	with hand pump, < 100m
Kadika	Footbridge	L=15m, W=1.5m, steel
	Borehole	with hand pump, < 100m
	Culvert	L=10m, W=2m, H=0.7m
Nyachoda	Culvert (1)	L=10m, W=1.5m, steel
	Culvert (2)	L=5m, W=3m, H=1.2m
	Footbridge	L=10m, W=1.5m, steel
Masune	Borehole	with hand pump, < 100m
	Toilet	10 compartment type
Kojunga	Footbridge (1)	L=12m, W=3.5m, steel
	Footbridge (2)	L=12m, W=3.5m, steel

Source: The MP Study

Note: For culverts, L means the length in the cross-section of river and W means the length in flow direction.

The non-structural measures include the development of and training for Community Based Flood Management Organizations (CFMOs). In addition, the non-structural measures cover public awareness campaigns via education programs and dissemination of information using radio programs and posters. The requested non-structural measures consist of six (6) components, as listed below. A description of each component is given in Table 1.3.

- Development of Community Based Flood Management Organizations;
- Community flood management training;

- Technical O&M training for structural measures;
- Education programs fordisaster prevention;
- Radio programs about flood management; and
- Awareness campaign using posters about flood management

Table 1.3 Non-structural Measures of the Project Requested by GOK

No.	Component	Outline
1	Development of Community Based Flood Management Organizations	a) Management and operation training - Community awareness. - Development of bylaws. - Organizational training. - Financial management training. b) Training in writing proposals for fundraising (including preparation of a manual for writing proposals) c) Production and installation of 3 kinds of signboards - One (1) community hazard map in each village. - Ten (10) signboards for evacuation routes in each village. - One (1) signboard at the evacuation center in each village.
2	Community flood management training	a) Community Flood Management Training - Training in flood disaster cycles. - Training in first aid. b) Community Flood Management Manual. c) Evacuation Drills (The drills will be led by community based flood management organization (CFMO) and utilize the communication network of communities.)
3	Technical O&M training for structural measures	a) Both lectures and on-site training in O&M for the series of structures to be constructed by the Project. b) Preparation of O&M manuals.
4	Education program for disaster prevention	a) Targeting 16 primary schools identified within 24 villages. b) Teacher training in disaster prevention and flood management. c) Review and modification of the textbook used to teach pupils. d) Mass printing of the textbook.
5	Radio programs about flood management	a) Long radio programs. b) Short spot programs.
6	Awareness campaign using posters about flood management	a) Posters covering three (3) subjects: i) Storing water, food, and useful goods for evacuation; ii) Awareness when evacuating; and iii) Early warning. b) Distribution of the posters.

Source: The MP Study
Note: The flood disaster cycle comprises prevention, mitigation, preparedness, response, recovery, and rebuilding.

(2) Natural Conditions

1) Topographic Conditions

The 24 villages in the Project Area are located within the lower part of the Nyando River Basin. The topography here is relatively flat, as the elevation ranges from 1,130m on the periphery of Lake Victoria to 1,200mm in the upper parts streams located in the eastern part of the Project Area. In the outline design study (hereinafter referred to as the "OD Study"), a topographic survey was carried out at the sites nominated for construction of structural measures. The survey covered the planned sites for evacuations centers, toilets, storage facilities, footbridges, culverts, and a weir. For the culverts, a survey was only carried out where the culvert was more than 5m in length. The survey for the evacuation centers, toilets, and storage facilities consisted only of a horizontal survey,

while the survey for the civil structures included both a horizontal survey and cross-section survey. Table 1.4 shows the number of structural measures that were surveyed.

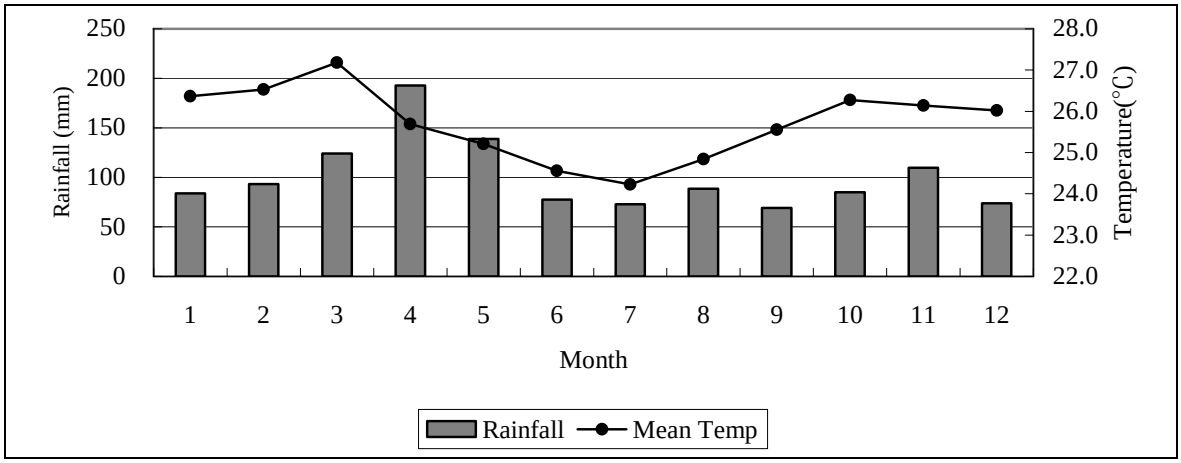
Table 1.4 Number of Places by Type of Structure to be Surveyed

No.	Type of Structure	Locations	Number of Locations
1	Evacuation Centers	Mowlem, Komwaga, Kolal and Kamagaga	4
2	Toilets (10 compartments)	Ofunyu Primary School in Kamuga	5
		Reru primary School in Kowiti	
		Achuodho Primary School in Achuodho	
		Apondo Primary School in Kanyilum	
		Ayweyo Primary School in Masune	
3	Storage Facilities	Reru primary School in Kowiti	2
		Apondo Primary School in Kanyilum	
4	Footbridges	1 location in Kamget Ugwe	7
		1 location in Wasiese	
		1 location in Kamagaga	
		1 location in Kadika	
		1 location in Nyachoda	
		2 locations in Kojunga	
5	Culverts	2 locations in Bwanda	11
		3 locations in Otera	
		2 locations in Oyola	
		1 location in Kowiti	
		1 location in Kamget Ugwe	
		1 location in Kadika	
		1 location in Nyachoda	
6	Weirs	Kanyango	1

Source: OD Study Team

2) Climatic Conditions

The mean annual temperature is 25.4℃ at the Ahero Observatory located in the lower part of the Nyando River Basin. The mean monthly temperature varies from approximately 24.2℃ to 26.5℃. The temperature remains almost constant throughout the year. The average annual rainfall is 1,000mm. The monthly rainfall pattern shows two rainy seasons, namely the long rainy season which extends from March to May, and the short rainy season in November. Figure 1.1 shows the monthly average rainfall and temperature recorded at Ahero Observatory.



Source: Water Quality Component of Lake Victoria Environmental Management Project (WCQ-LVWMP)

Figure 1.1 Rainfall and Temperature Pattern in the Lower Part of Nyando River Basin (Ahero Observatory)

3) Hydrogeological Survey for Boreholes

In the MP Study, the potential ground water resources of the region were assessed by hydrogeological and geophysical surveys, including the sites of eleven (11) boreholes that were requested for the Project. The hydrogeological survey was carried out using Vertical Electrical Soundings (VES). The survey results are shown in Table 1.5. The maximum depth of the aquifer varies from 80m to 130m.

Table 1.5 Estimated Depth of Aquifer for 11 Boreholes

Village	Depth (m)		
	Minimum	Mean	Maximum
Mowlem	40	70	100
Kamuga	50	90	130
Oyola	60	100	130
Kopudo	40	70	100
Wangaya Mombasa	60	80	100
Achuodho	40	60	100
Wakesi	50	80	110
Kojiem	50	80	110
Kanyilum	40	60	80
Kadika	40	70	100
Masune	40	70	100

Source: The MP Study

4) Geological Conditions

Black cotton soil is widely spread over the Project Area. A geotechnical survey was carried out for the Sondu/Miriu Hydropower Project in August, 2005. This survey covered the current Project study area. It was reported that a thick clay stratum was widely spread below surface sand at a depth of 0.4m to 0.8m from the ground surface. The bearing capacity varies from 110 to 180kN/m^2. The available bearing capacity of the soil in the Project Area is considered as ranging from that of hard loam (110kN/m^2) and thick sand (200kN/m^2) according to building standards used in Japan.

(3) Environmental and Social Consideration

1) Environmental Impact Assessment (EIA)

In accordance with Article 58 of Kenya's Environmental Law, an Environmental Impact Assessment (EIA) must be carried out for all development activities. The National Environmental Management Authority (NEMA) examines the EIA report and issues the EIA license based on their examination. An EIA license is mandatory for implementing development activities. Table 1.6 summarizes the EIA procedure.

Table 1.6 Procedure for Environmental Impact Assessment in Kenya

Phase	Necessary Action	Examination by NEMA	Notes
Preparation of Environmental Project Report (EPR)	• The implementation body shall submit an EPR to NEMA. • Potential negative impacts and countermeasures thereof shall be specified in the EPR.	• NEMA shall coordinate with authorities related to the project and examine the EPR. • If the negative impacts are limited and properly taken care of by the countermeasures, NEMA shall issue an EIA license.	• NEMA shall complete the examination of the EPR within 45 days after submission of the EPR.
Preparation of EIA Study Report	• A detailed study shall be carried out of potential negative impacts specified in the EPR. The implementation body shall submit a draft EIA Study Report. • The draft EIA Study Report shall be open to the public. Public hearings for stakeholders who may be affected by the negative impacts shall be held.	• NEMA shall coordinate with authorities, and examine the EIA Study Report. • If there is no problem, NEMA will open the EIA Study Report to the public for 60 days. • The implementing body shall be consulted, based on the comments from the public hearings and the public exhibition of the report. • If there is no controversial matter, NEMA shall issue an EIA license.	

Source: NEMA

In the MP Study, an EPR was prepared for each village and submitted to NEMA in November, 2008. NEMA approved the EPR in February 2009.

Based on the JICA Guidelines for Environmental and Social Considerations, the Project is classified as Category C. The reasons for this are as follows:

i) The structural measures for the Project consist of small-scale facilities. Any negative environmental or social impacts that may result are considered to be very limited.

ii) The structural measures for the Project were selected from the list of facilities proposed in the community action plans (CAPs) that were formulated by the communities. The selection criteria included the following restrictions: i) The facility must not extend to other villages; ii) The facility must not cause any negative impact to neighboring villages; and iii) The availability of land for the facility must already confirmed.

iii) The potential negative impacts of the Project are considered to be limited to the construction stage. During this period, noise, vibration, potential for accidents, and generation of construction wastes will occur. Therefore, the following measures will be implemented to minimize these potential impacts:

- The contractor will hold meetings to explain the work schedule and contents of construction work to the communities.
- The contractor will carry out proper disposal of construction waste.

- The contractor will introduce safety measures to minimize accidents.
- The contractor will arrange the construction schedule so as to minimize the disturbance caused by noise and vibration.

2) Land Acquisition

Community Based Organizations (CBOs) in all 24 villages have already agreed the contents of the structural measures of the Project. Since the land required for the facilities will be donated by the communities, there will not be any conflict of interest resulting from land acquisition.

CHAPTER 2

CONTENTS OF THE PROJECT

CHAPTER 2 CONTENTS OF THE PROJECT

2-1 BASIC CONCEPT OF THE PROJECT

(1) Overall Goal

In the 9th National Development Plan (2002-2008), the GOK highlighted the theme “Effective Management for Sustainable Economic Growth and Poverty Reduction”.

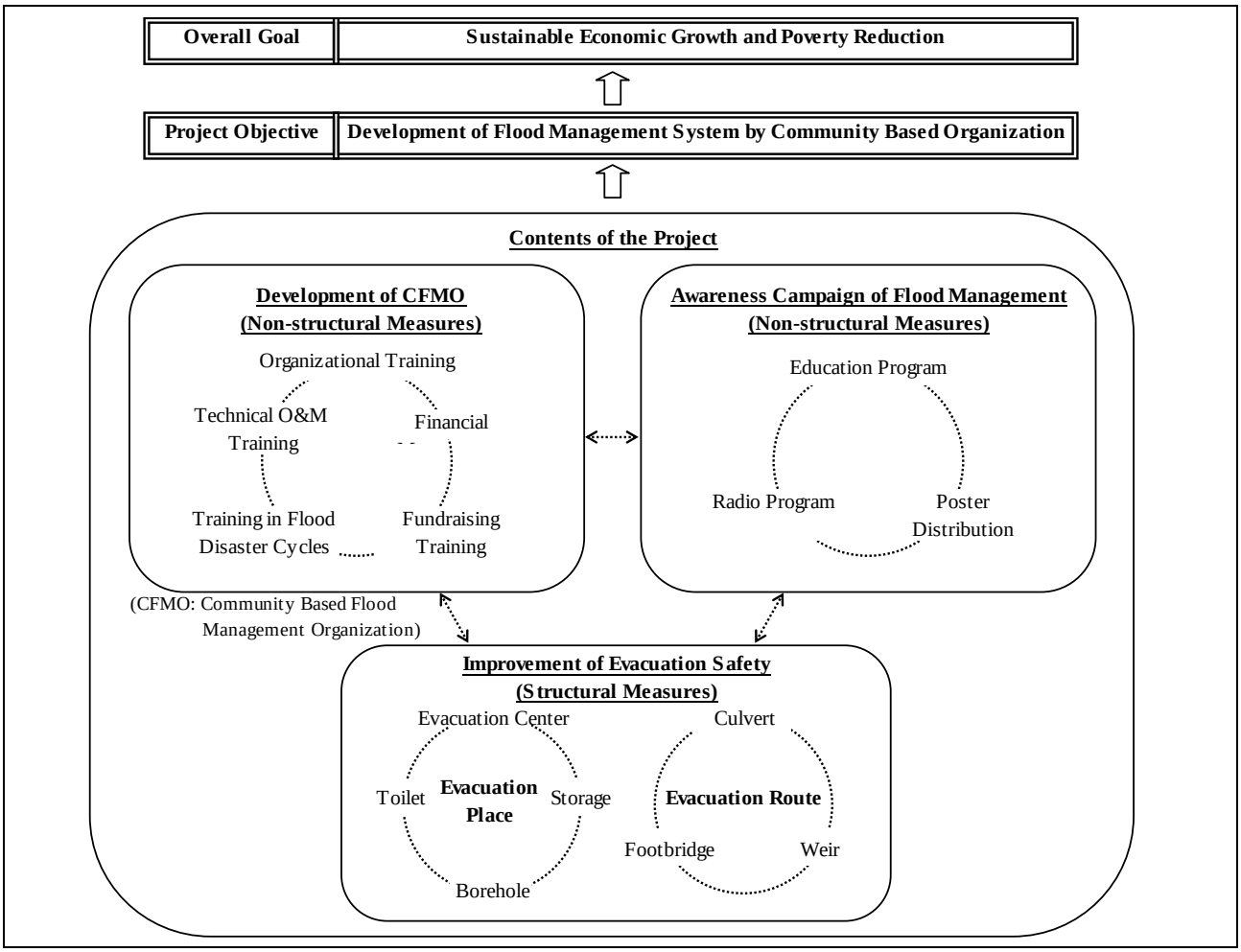
The twenty-four (24) villages covered by the Project Are located in either the Nyando District or Kisumu District. The absolute poverty rate of both districts exceeds the national average rate of 50%. The percentage of people who live below the absolute poverty line is estimated at 53% in Nyando District and 69% in Kisumu District. Flooding occurs in the Nyando River Basin every year and affects the main economic activity of agriculture in both districts. Flood management is considered as the crucial issue for achieving economic growth and reducing poverty.

The MP Study was carried out to improve flood management in the Nyando River Basin. Based on the flood disaster map which was prepared during the MP Study, 24 villages were selected as priority areas which are heavily affected by flooding. According to meteorological data at observatories at Ahero, Kericho, and Tinderet from 1965 to 2004, climatic conditions are changing in the Nyando River Basin. The trend of the average temperature and the number of rainy days (>50mm/day) has generally been increasing. In order to adapt to the effects of further climate change, a flood management system must urgently be established.

The overall goals of the Project are to develop the capacity for the flood management to adapt to the climate change in order to achieve sustainable economic growth and reduce poverty in the Nyando River Basin. The Project objective is to establish community-based flood management systems in the Project Area to allow the goals to be achieved.

(2) Project Description

To achieve the Project objective, the Project will implement both structural and non-structural measures. The structural measures focus on construction of facilities for flood management, while the non-structural measures aim at organizing the community through a series of training programs. Both the structural (facility provision) and non-structural (capacity building) measures must be carried out in order to develop an integrated flood management system. Figure 2.1 below shows the concept of the Project.



Source: OD Study Team

Figure 2.1 Project Concept

The structural measures include two types of facilities. The first type consists of evacuation centers, toilets, storage facilities, and boreholes which will be provided at evacuation places. The second type includes culverts, footbridges, and weirs to provide safe evacuation routes for the evacuees. In total, 76 facilities will be constructed within the 24 villages, as shown in Table 2.1.

Table 2.1 Structural Measures for the Project (by Structure)

Type of Structure	Number of Facilities
Boreholes	11
Evacuation Centers	4
Toilets (10 compartments)	6
Toilets (2 compartments)	3
Storage Facilities	2
Culverts	44
Footbridges	5
Weirs	1
Total	**76**

Source: OD Study Team

The community action plan (CAP) for each 24 village was prepared based on the participatory approach used for communities in the MP Study. The Outline Design Study Team (OD Study Team) carried out field reconnaissance in Kenya during the First Field Study and confirmed the validity of the need for

each of the proposed facilities. Table 2.2 shows the type of facility for each village, based on the field reconnaissance.

Table 2.2 Structural Measures of the Project (by Village)

Village	Facility	Description
Rae Kanyaika	Culvert (1)	L=2m, W=4m, H=0.3m
	Culvert (2)	L=1.2m, W=5m, H=0.3m
	Culvert (3)	L=1.2m, W=2m, H=0.4m
	Culvert (4)	L=1.3m, W=4.5m, H=0.3m
	Culvert (5)	L=2.7m, W=4.5m, H=0.6m
	Culvert (6)	L=1m, W=5m, H=0.3m
	Culvert (7)	L=1.5m, W=5m, H=0.3m
Mowlem	Borehole	with hand pump, max. 100m
	Evacuation Center	Floor area 182m^2
	Toilet	10 compartment type
Bwanda	Culvert (1)	L=12m, W=5m, H=1.2m
	Culvert (2)	L=15m, W=2.5m, H=1.5m
	Culvert (3)	L=1.5m, W=2.5m, H=0.3m
	Culvert (4)	L=2.3m, W=2.5m, H=1.2m
	Culvert (5)	L=12m, W=2.5m, H=1.2m
Otera	Culvert (1)	L=6m, W=4m, H=1m
	Culvert (2)	L=8m, W=4m, H=2.5m
	Culvert (3)	L=12m, W=2.5m, H=1.5m
	Culvert (4)	L=4m, W=3.5m, H=1m
	Culvert (5)	L=1m, W=2.5m, H=0.6m
Kamuga	Borehole	with hand pump, max. 130m
	Toilet	10 compartment type
	Culvert	L=1.2m, W=2.5m, H=0.6m
Oyola	Borehole	with hand pump, max. 130m
	Culvert (1)	L=8.2m, W=5m, H=0.4m
	Culvert (2)	L=8.2m, W=5m, H=0.4m
	Culvert (3)	L=1.5m, W=8m, H=0.5m
	Culvert (4)	L=2m, W=8m, H=0.8m
	Culvert (5)	L=2m, W=6m, H=1m
	Culvert (6)	L=1.4m, W=5m, H=0.5m
Kanyango	Culvert (1)	L=2m, W=5m, H=0.3m
	Culvert (2)	L=1.2m, W=5m, H=0.3m
	Culvert (3)	L=1.2m, W=5m, H=0.3m
	Weir	W=7.6m, H=1.5m
Komwaga	Evacuation Center	Floor area 182m^2
	Toilet	2 compartment type
Kowiti	Toilet	10 compartment type
	Storage Facility	Floor area 41m^2
	Culvert	L=8m, W=3.5m, H=1m

Village	Facility	Description
Kamget	Culvert (1)	L=7m, W=3.5m, H=0.3m
Ugwe	Culvert (2)	L=5m, W=2.5m, H=0.6m
	Culvert (3)	L=30m, W=3.5m, H=1.0m
Kopudo	Borehole	with hand pump, max. 100m
Kanyiaomo	Culvert (1)	L=6m, W=2.5m, H=0.8m
	Culvert (2)	L=8m, W=3.5m, H=1.2m
Kolal	Evacuation Center	floor area 182m^2
	Toilet	2 compartment type
Wasiese	Culvert	L=30m, W=1.5m, H=2.5m
Kamagaga	Evacuation Center	Floor area 182m^2
	Toilet	2 compartment type
	Footbridge	L=8m, W=1.5m, Steel
Wangaya	Borehole	with hand pump, max. 100m
Mombasa	Culvert (1)	L=2.5m, W=6m, H=1m
	Culvert (2)	L=2.5m, W=8m, H=1m
	Culvert (3)	L=2.5m, W=5m, H=1m
	Culvert (4)	L=2.5m, W=5m, H=0.7m
Achuodho	Borehole	with hand pump, max. 100m
	Toilet	10 compartment type
	Culvert (1)	L=2m, W=5m, H=0.8m
	Culvert (2)	L=2.5m, W=5m, H=0.8m
Wakesi	Borehole	with hand pump, max. 110m
	Culvert	L=1.3m, W=3.5m, H=0.6m
Kojiem	Borehole	with hand pump, max. 110m
Kanyilum	Borehole	with hand pump, max. 80m
	Toilet	10 compartment type
	Storage Facility	Floor area 41m^2
Kadika	Borehole	with hand pump, max. 100m
	Culvert	L=10m, W=2m, H=0.7m
	Footbridge	L=15m, W=1.5m, Steel
Nyachoda	Culvert (1)	L=5m, W=3m, H=1m
	Culvert (2)	L=6m, W=4m, H=1.5m
	Footbridge	L=10m, W=1.5m, Steel
Masune	Borehole	with hand pump, max. 100m
	Toilet	10 compartment type
Kojunga	Footbridge* (1)	L=12m, W=3.5m, Steel
	Footbridge* (2)	L=12m, W=3.5m, Steel

Source: OD Study Team
Note: For culverts, L means the length in the cross-section of river and W means the length in flow direction.
* The footbridges at Kojunga village will also be used by vehicles. All other footbridges will only be used by pedestrians and bicycles.

The non-structural measures consist of three (3) packages. Package 1 includes two (2) sub-packages and Package 3 includes three (3) sub-packages. Overall there are six (6) separable packages/sub-packages. Table 2.3 below shows the contents of the non-structural measure packages/sub-packages.

1) Package 1: “Development of community based flood management organizations (CFMOs)”

This package is for organizing the communities. There are two (2) sub-packages:

i) Sub-package 1.1: Forming and building the capacity of community based flood management organizations. The community based organizations will be trained in self-reliance and be sustainable thorough the development of bylaws and training in fund raising.

ii) Sub-package 1.2: Technical O&M training for structural measures

2) Package 2: “Community flood management training” This package is for training the CFMOs in necessary actions in accordance with the flood disaster cycle. The flood disaster cycle comprises prevention, emergency response, evacuation, and rebuilding. Community flood management manuals are to be prepared, based on the flood disaster cycles. In addition, evacuation drills are to be carried out. (There are no sub-packages for Package 2.)

3) Package 3: “Education program and public relation program” This package is for promoting public awareness of flood management. There are three (3) sub-packages:

i) Sub-package 3.1: Education program for disaster prevention.

ii) Sub-package 3.2: Radio programs about flood management.

iii) Sub-package 3.3: Awareness campaign using posters about flood management.

Table 2.3 Non-structural Measures of the Project

No.	Package	Outline
1	Development of Community Based Flood Management Organizations	
	1.1 Forming and building the capacity of community based flood management organizations	a) Management and operation training: - Community sensitization; - Development of bylaws; - Organizational training; and - Financial management training. b) Training in writing proposals for fundraising (including preparation of a manual for writing proposals). c) Production and installation of 3 kinds of signboards: - Community hazard maps; - Signboards showing evacuation routes; and - A signboard at each evacuation center.
	1.2 Technical O&M training for structural measures	a) Both lectures and on-site training in O&M for the series of structures to be constructed by the Project. b) Preparation of O&M manuals.
2	Community Flood Management Training	a) Community Flood Management Training: - Training in flood disaster cycles; and - Training in first aid. b) Community Flood Management Manual. c) Evacuation Drills (The drills will be led by the community based flood management organizations (CFMOs) and utilize the communication network of communities.)
3	Education Program and Public Relation Program	
	3.1 Education program for disaster prevention	a) Targeting 16 primary schools identified within 24 villages. b) Teacher training in disaster prevention and flood management. c) Review and modification of the textbook for teaching pupils. d) Mass printing of the textbook.
	3.2 Radio programs on flood management	a) Long radio programs. b) Short spot radio programs.
	3.3 Awareness campaign using posters about flood management	a) Posters covering three (3) subjects: i) Storing water, food, and useful goods for evacuation; ii) Awareness when evacuating; and iii) Early warning. b) Distribution of posters.

Source: OD Study Team

2-2 OUTLINE DESIGN OF THE REQUESTED JAPANESE ASSISTANCE

2-2-1 Design Policy

(1) Basic Direction

To meet the Project objectives, the basic direction of the Project focuses on developing an integrated flood management system for flood-prone areas in the Nyando River Basin. In the Project, the structural and non-structural measures are implemented in an integrated way in order to develop and efficient and effective flood management system for the 24 villages in the lower areas of the Nyando River Basin.

In the MP Study, the contents of the structural and non-structural measures were proposed, based on the community action plans (CAPs) for each village. The Project that was requested by GOK follows the contents of the projects that were formulated in the MP Study. In the First Field Study that was undertaken in

Kenya, the OD Study Team carried out field reconnaissance and confirmed the validity of need for the requested facilities. The sequence of activities undertaken for the MP Study and the OD Study is as follows:

1) Selection of 24 Villages in the MP Study

Flood hazard maps were prepared for the lower areas of the Nyando River Basin. Based on these flood hazard maps, four (4) Locatoins[1] that were heavily affected by flooding were identified. A total of 24 villages located within the identified 4 Locations were selected through undertaking public meetings in each Location. As a result of the public meetings, the Nyando River Basin Water Management Forum approved the selection of the 24 villages as the priority areas.

2) Formulation of Structural and Non-structural Measures in the MP Study

Workshops were held in the 24 villages that were selected. These workshops utilized participatory rural appraisal (PRA) to prepare a community hazard map and a community action plan for each village. Based on the community hazard maps, evacuation places and evacuation routes were confirmed. The community action plans were formulated to show the measures proposed by the communities.

The structural measures proposed in the CAP were reviewed by using the following selection criteria: i) The facility must be related to flood management at the village level; ii) The facility must not extended to other villages; iii) The facility must not cause any negative impacts to neighboring villages; and iv) The facility must not conflict with existing land use arrangements. As a result, the contents of the structural measures of the Project were drafted.

3) Review of Structural and Non-structural Measures in the OD Study

The OD Study Team examined the function and design concepts of the proposed structural measures. In addition, the OD Study Team carried out a topographic survey. Thereafter, the OD Study Team reviewed the contents of the structural measures. The viewpoint of this review was as follows:

i) Boreholes, evacuation centers, toilets, and storage facilities

- Consistency with the location of evacuation places shown in the community hazard maps;
- Available land for the structural measures at the proposed scale without any conflict of land use arrangements;
- Impartial provision of structural measures in each village. A borehole and a toilet with 10 compartments are planned for existing evacuation centers, while a toilet with two compartments is planned for a new evacuation center; and
- People in Mowlem village and neighboring villages will evacuate to Rae Kanyaika Primary School in Mowlem village during the flood. More than 400 evacuees will stay in this primary school. Therefore, the Rae Kanyaika Primary School is considered as an exception; an evacuation center, toilet with ten compartments, and a borehole will be

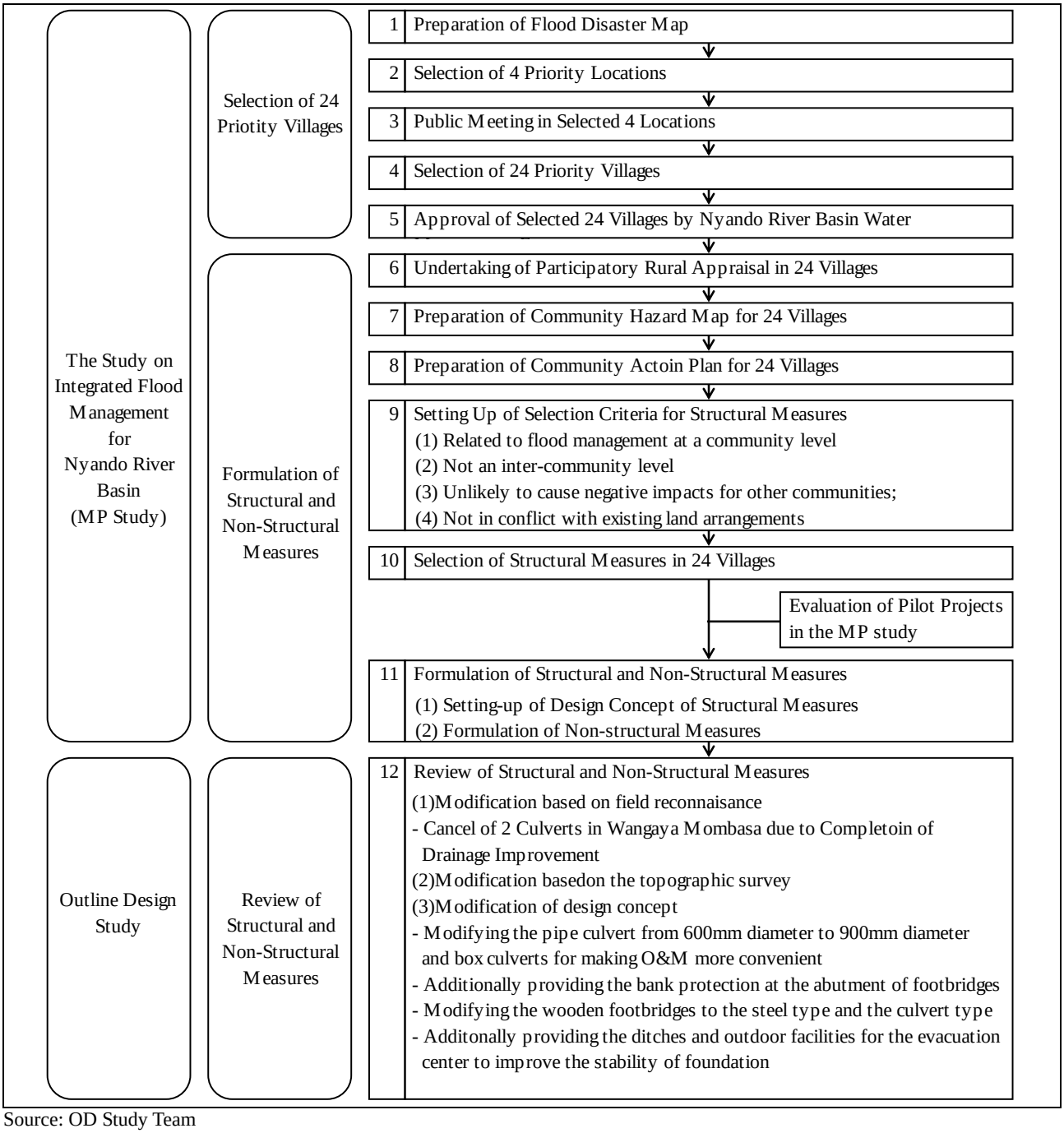
[1] Location is one of the administrative units higher than villages. The administrative units in Kenya consist of Province, District, Division, Location, and Sub-location.

provided.

ii) Culverts, footbridges, and weirs

- Consistency with the location of evacuation routes shown in the community hazard maps;
- Sustainable use by preventing topographic change in the future; and
- Availability of structural measures in the initial stage of a flood.

Figure 2.2 shows the sequences in the MP Study and the OD Study for the Project.



Source: OD Study Team

Figure 2.2 Flow of Study for the Structural and Non-structural Measures

Based on the field study, the structural measures were modified as follows:

- Cancellation of facilities: Culverts were originally planned at six locations to improve the evacuation route in Wangaya Mombasa village. Among these, two locations were canceled. This was because the National Irrigation Board (NIB) had completed repair work for part of the drainage and evacuation route.
- Modification of specification (pipe culvert): Pipe culverts that were originally specified as 600mm in diameter and having a rather long length were changed 900mm in diameter pipes. In addition, box culverts were substituted for pipe culverts that were already specified as 900mm diameter or larger and also had a rather long length or where a number of pipes were proposed to be installed one location. These changes were made to improve the O&M conditions, as the larger pipe diameter will allow easier cleaning of sediments that may accumulate inside the pipes.
- Modification of footbridge specification: To prevent corrosion around the abutment of the footbridges, the bank protection works are to be installed around the abutment. In addition, some wooden footbridges were changed to a culvert type to improve their durability.
- Modification of evacuation center specification: To ensure the stability of the foundations, the areas around the buildings will be covered by the concrete. In addition, water diversion ditches will be installed.

(2) Natural Conditions

There are two rainy seasons in the Project Area: i) The long rainy season from March to May; and ii) The short rainy season in November. In the Pilot Projects undertaken during the MP Study, facilities such as evacuation centers, toilets, and boreholes. were designed with the floor level set at 1.2m above the ground level in order to protect them from flooding. Following the experience of the Pilot Project, the same design criteria have been applied to the facilities included in the Project. These facilities include evacuation centers, toilets, storage facilities, and boreholes.

Access to the sites of the structural measures relies on the un-paved roads. Therefore, the construction schedule for the Project needs to take into consideration the reduced accessibility during the two rainy seasons.

The “Code of Practice for the Design & Construction of Buildings and other Structures in relation to Earthquakes” (1973) specifies the seismic zones and the class of structures in Kenya. The Project Area is located within Zone VI, while the type of buildings included for structural measures of the Project are categorized in Class A.

In the Project, the buildings have been designed as earthquake-proof structures. This is because Kenya has experienced earthquakes and the structural measures, such as evacuation centers, toilets, and storage facilities, will be used for disaster management. There is no observation record for earthquakes in Kenya, so the seismic intensity could not be confirmed. Therefore, the coefficient for the horizontal load of the earthquake needs to be set at the level based on the past earthquake in which there is no damage to the buildings and people feel the earthquake.

(3) Socio-Economic Conditions

The CFMOs will undertake the O&M and flood management activities after the Project is completed. However, the Project Area is located in areas that have a high rate of absolute poverty. Therefore, to improve the sustainability of the Project, the community must be encouraged to participate in the Project and to be trained.

To facilitate the process of encouragement and to promote capacity buildings, the non-structural measures will need to be designed at an early stage because the CFMOs will have to be developed prior to the start of construction work for the structural measures. In addition, the non-structural measures will include training for fundraising and financial management to develop the technical and financial capacity of the community. As mentioned in the item (6) below, the O&M system is also designed to take advantage of support from public authorities.

(4) Methods for Construction and Procurement

WRMA, which will be the implementing agency for the Project, has experience in the procurement of equipment. However, WRMA does not have experience in undertaking construction work. Therefore, Japanese specialists will be needed at both the tendering stage and the construction stage in order to manage the progress and undertake quality control. The Project management organization was determined by considering the following:

- A Japanese expert from a Procurement Agency shall be assigned during the prequalification, tender, and construction stages of the Project to support WRMA.
- Japanese engineers from the Consultant shall be assigned at the detail design and tender document preparation stage. In addition, since the structural measures for the Project consist of small-scale facilities, Japanese engineers will be spot-dispatched at the construction stage in order to supervise the work. During the construction supervision stage, inspection and operation work will be done by Kenyan experts, under instruction from the Japanese engineers.
- A Japanese specialist shall be assigned for the period of the tender, contract negotiation, commencement, and completion stages of the packages included the non-structural measures.

(5) Application of Local Contractor

Based on discussions with construction companies who have main offices and branches in Kisumu and Nairobi, the following issues have been confirmed:

- There are many construction companies in Nairobi who are potential contractors for the structural measures of the Project, based on their experience and their company scale.
- Around five construction companies in Kisumu have experience in similar construction projects, but only a few companies will be able to tenderer for the work because they are only small scale operations. However, although each company is a small-scale operation, one construction firm has constructed an elementary school that was funded by the Japanese government.

Based on the above, the application of local contractor is considered as follows:

- A tender process will be held to improve the quality of the Project and minimize the Project

cost through competition.

- Due to the limited number of construction firms in Kisumu that are available to undertake the Project, the tenderers will include construction firms in Nairobi.
- Since the construction companies in Kisumu have established relations with the community through their construction experience, these construction companies also have experience in collecting local laborers. Therefore, the local construction companies can carry out part of the Project as a partner in joint venture or as a subcontractor.
- The contractor's temporary site office and construction yard shall be provided at a suitable place near the construction site and located beside a trunk road.
- The residents of the 24 communities might be utilized as unskilled labor, which will be required to take charge earthworks etc.. Giving priority to the employment of local residents shall be specified in the tender documents so as to secure local employment.

(6) Operation and Maintenance

The capacity of CFMOs will be developed for the non-structural measures and for undertaking O&M and flood management activities. In the Project, a series of training programs will be implemented to: i) Organize the CFMO; ii) Prepare community flood management manuals according to the flood disaster cycle; iii) Conduct technical O&M; and iv) strengthen the community's financial management and fundraising capacity. In the financial management training, the financial resources for the O&M will be discussed so as to achieve agreement among the CFMOs. Potential financial resources include: i) Registration fees for joining the CFMOs; and ii) Wages for community members involved in the construction work for the Project. The financial management training will include fund raising, writing proposals for financial support to agencies and public authorities, etc. In addition, public authorities will be involved in the O&M of structural measure to support the CFMOs. This support will be required to assist the CFMOs if trouble arises that exceeds the management capacity of the CFMO.

(7) Type of Materials and Equipment

The materials and construction methods selected for the Project are designed to fit in with local practices. This will assist with O&M work for the structural measures, which will need to be done by the CFMOs after the Project is completed. The design standards that have been proposed follow both the domestic ones and the British Standards, which are widely applied in Kenya. Based on the results of the field study, the following design criteria have been set for the OD Study boreholes and footbridges.

- Boreholes: Existing shallow boreholes are contaminated by salt water. In the Project, the boreholes need converted to be deep wells. Water quality testing and pumping test will be carried out to confirm the quality. In addition, the designed depth of boreholes will be set at the maximum depth identified in the hydro-geological survey in order to secure the safety and reliability of the boreholes. This depth will be determined in the construction stage, based on the results of the water quality and pumping tests.
- Footbridges: Existing wooden footbridges have been damaged by flooding. Footbridges in the Project need to be constructed from culverts and steel in order to improve their durability. The footbridge abutment will be protected by bank protection work.

(8) Construction Method, Procurement Method, and Construction Period

1) Direction on construction method: All construction methods shall follow local practices on the assumption that the structural measures are constructed by local contractors.

2) Direction on procurement method: Table 3.4 below shows the number of construction companies registered with MWI. Companies having a poor construction capability or bad financial status shall be disqualified in the prequalification stage so as to eliminate ineligible companies. In addition, performance security and advance payment security shall be specified in the tender document to exclude ineligible companies.

Table 2.4 Construction Companies Registered with the Ministry of Water and Irrigation

Category	Number of Companies	Maximum Contract Price (Million Ksh)
A	97	No limit
B	54	200
C	116	100
D	128	50
E	147	20
F	154	10
G	216	5
Total	**912**	**N/A**

Source: Ministry of Water and Irrigation

3) Direction on the construction period: The 76 structures included in the Project are located in 24 villages within a 30km diameter area. In the rainy season, these sites are covered with the floodwater and it will be difficult to access to the sites. With reference to the flood record, April, May and November are defined as the flood seasons. The construction plan shall be formulated so that the construction works are suspended in the flood seasons. However, minor work such as pre-cast concreting, is excluded from this restriction,

2-2-2 Basic Plan (Construction Plan/ Equipment Plan)

(1) Building Works

All the buildings for the evacuation centers, toilets, and storage facilities will be constructed to function as evacuation places during a flood. The day to day use of each building will be determined through discussion and agreed to by the CFMOs as part of undertaking the Package 1 non-structural measures (Development of CFMOs) . Typical uses will be for training community members in financial management and providing technical instruction for O&M. In general, the buildings need to be used daily, as this will ensure proper O&M and inspections of the buildings. Therefore, the evacuation buildings could be used for the assembling places such as schools and churches.

1) Basic Plan for Evacuation Center

- Floor plan: The number of evacuees varies by each village. To impartially provide facilities for each village, the evacuation centers will all be designed on the same scale. Based on the experience of constructing evacuation centers during the Pilot Project, the new evacuation centers will consist of a hall, a storage room, and a kitchen. The hall will provide space for people to assemble and to take a rest. The storage room and the kitchen will be designed to

provide suitable living conditions during a flood. The floor area (m^2) of each room is shown in Table 2.5.

Table 2.5 Floor Area of Evacuation Center

Room	Floor Area (m^2)	Function
Hall	148.5	Assembling and taking rest during the flood
Storage Room	16.6	Storing equipment and apparatus
Kitchen	16.6	Cooking
Total	**181.7**	

Source: OD Study Team

- Section plan: As mentioned in the design policy, the interior floor level will be set at 1.2m above the ground level to provide protection from flooding. The exterior floor level will be set at 1.1m to prevent water flowing from the exterior floor area to the interior. The ceiling height will be set at 2.7m above the floor level in the hall and 2.5m in both the storage room and the kitchen. The materials used for construction of the ceiling will reduce noise in the rainy season and improve thermal insulation.
- Structural plan: Buildings will be rigid-framed structures using reinforced concrete. The foundation walls will be concrete hollow blocks so as to resist soil pressure. The void below the raised floor will be filled with compacted excavated soil. The roof structure will be a wood-truss frame covered by galvanized corrugated steel sheets. The section of the frame structure was determined based on the result of structural calculations. The required design bearing capacity of the ground has been set at $100kN/m^2$, while the required horizontal load coefficient for earthquake resistance has been set at 0.1. The required concrete strength has been set at $18N/mm^2$, while that of the reinforcing bars is set at $235N/mm^2$.
- Equipment plan: There is no piped water supply system or power distribution system in the Project Area. Therefore, natural ventilation will be used in the evacuation center. Mechanical equipment for air conditioning and power supply will not be provided, which is the same as for the evacuation centers constructed in the Pilot Project. Water supply for the evacuation centers will rely on rainwater collected from the roof; this water will be stored in a water tank.
- Construction materials: Construction materials have been selected by considering locally available materials and methods, based on the Pilot Project. Table 2.6 shows the construction method to be used for each part of the evacuation center.

Table 2.6 Construction Method for Each Part of Evacuation Center

Part		Evacuation Center		Local Construction Method	Reason for Selection
		Hall and Storage Area	Kitchen		
Interior	Floor	• Cement mortar • Steel trowel finish	• Ceramic tile (mat)	• Cement mortar • Steel trowel finish	• Locally available
	Skirting	• Cement mortar • Steel trowel finish	• Ceramic tile (gloss, H=2.1m)	• Cement mortar • Steel trowel finish	• Locally available
	Wall	• Cement mortar • Emulsion paint	• Cement mortar • Vinyl paint	• Cement mortar • Emulsion paint	• Locally available
	Ceiling	• Gypsum board	• Fiber cement board • Vinyl paint	• Gypsum board	• Locally available
Exterior	Floor	• Cement mortar • Steel trowel finish	• Cement mortar • Steel trowel finish	• Cement mortar • Steel trowel finish	• Locally available
	Wall	• Burnt clay face brick	• Burnt clay face brick	• Burnt clay face brick	• Locally available
	Window	• Steel casement + painting	• Steel casement + painting	• Steel casement + painting	• Locally available
	Door	• Steel casement + painting	• Steel casement + painting	• Steel casement + painting	• Locally available

Source: OD Study Team

2) Storage Facilities

- Floor plan: To supplement the space planned in the evacuation centers, additional storage facilities have been designed to provide rooms for taking a rest and stocking relief goods. Although the number of evacuees varies by each village, the same types of the storage facilities are designed to ensure impartially in the structural measures provided for each village. Table 2.7 shows the floor area (m^2) of the storage facilities.

Table 2.7 Floor Area of Storage Facilities

Room	Floor Area (m^2)	Function
Room (1)	16.3	Assembling and taking a rest during flooding
Room (2)	16.3	Assembling and taking a rest during flooding
Storage Room	8.3	Storing equipment and apparatus
Total	**40.9**	

Source: OD Study Team

- Section plan: The interior floor level has been set at 1.2 above the ground level, while the exterior floor level has been set at 1.1m. An insulated ceiling will be installed to reduce the noise from rainfall and improve insulation. The ceiling height has been set at 2.7m above floor level.
- Structural plan: Buildings will be rigid-framed structures using reinforced concrete, the same as the evacuation center. The roof structure will be a wooden-truss frame and covered by galvanized corrugated steel sheets.
- Equipment plan: Natural ventilation will be used in the storage facilities, the same as the evacuation center. Similarly, mechanical equipment for air conditioning and power supply will not be provided.
- Construction materials: Construction materials for the storage facilities have been selected by considering locally available construction materials and methods, and therefore they are the

same as used for the evacuation center. Table 2.8 shows the construction method for each part of the storage facilities.

Table 2.8 Construction Method for Each Part of the Storage Facilities

Part		Local Construction Method	Reason for Selection
Interior	Floor	• Cement mortar • Steel trowel finish	• Locally available
	Skirting	• Cement mortar • Steel trowel finish	• Locally available
	Wall	• Cement mortar • Emulsion paint	• Locally available
	Ceiling	• Gypsum board	• Locally available
Exterior	Floor	• Cement mortar • Steel trowel finish	• Locally available
	Wall	• Burnt clay face brick	• Locally available
	Window	• Steel casement & painting	• Locally available
	Door	• Steel casement & painting	• Locally available

Source: OD Study Team

3) Toilet

- Floor plan: A toilet with two compartments will be provided at sites where a new evacuation center will be constructed, while a toilet with ten compartments has been designed for the existing evacuation center. Compartments will be arranged to separate the sexes.
- Section plan: The interior floor level will be set at 1.2m above the ground level, while the exterior floor level will be set at 1.1m.
- Structural plan: Buildings will be rigid-framed structures with reinforced concrete, the same as the evacuation center. The roof structure will be formed by a wooden-truss frame covered by galvanized corrugated steel sheets.
- Waste treatment method: Latrine type treatment system fitted with a PVC pipe for ventilation will be used for the toilet.
- Construction material: Locally available construction materials will be used for the toilet and the construction method will be the same as for the evacuation center. Table 2.9 shows the construction method for each part of the toilet.

Table 2.9 Construction Method for Each Part of Toilet

Part		Toilet	Local Construction Method	Reason for Selection
Interior	Floor	• Ceramic tile (mat)	• Cement mortar • Steel trowel finish	• Locally available
	Skirting	• Ceramic tile (gloss)	• Cement mortar • Steel trowel finish	• Locally available
	Wall	• Cement mortar • Steel trowel finish	• Cement mortar • Steel trowel finish	• Locally available
	Ceiling	• Fiber cement board • Vinyl paint	• Fiber cement board • Vinyl paint	• Locally available
Exterior	Floor	• Cement mortar • Steel trowel finish	• Cement mortar • Steel trowel finish	• Locally available
	Wall	• Burnt clay face brick	• Burnt clay face brick	• Locally available
	Door	• Steel casement + painting	• Steel casement + painting	• Locally available

Source: OD Study Team

(2) Civil Works

1) Culverts

Culverts will be designed for installation at places where the evacuation routes are obstructed by rills, channels, and small rivers. Three types of culvert such as open ditches with covers, pipe culverts, and box culverts will be designed to improve the conditions of the evacuation routes.

Table 2.10 Type of Culverts

Structural Types	Open Ditch with Cover	Pipe Culvert	Box Culvert
Location	• Rills and channels with a depth of less than 600mm.	• Channels and small rivers with a depth of less than 1,500mm and a relatively narrow width.	• Rivers with a depth and width that are relatively large.
Remarks	• Open ditches with an RC cover will be preferable for easy maintenance.	• Commonly used in Kenya. • Pre-cast pipe culverts will be preferable for quality control and shorter construction period.	• The flow impediment ratio for a box culvert is smaller than for a pipe culvert.

Source: OD Study Team

Culverts will be designed based on the following criteria:

i) Open ditches with covers: Open ditches will be constructed in-situ from concrete. No reinforcement will be used because the height of the structures will be less than 1m, so the earth pressure will be relatively small. However, the cover will be reinforced to provide resistance to traffic loads.

ii) Pipe culverts: The Kenyan standard sizes for pipe culverts are 600mm, 900mm, and 1,200mm diameter. The length of a 600mm pipe culvert will be designed as less than 4m to ensure the ease of maintenance. The bed of a pipe culvert consists of two types: i) fully encased by reinforced concrete having a thickness of 150mm for 600mm diameter pipes or 200mm for both 900mm and 1,200mm diameter pipes that are used for vehicular roads; and ii) 180 degree concrete (half) casing for pedestrian footpaths.

iii) Box culverts: The Japanese standard "Guidelines for Earthworks: Culvert Structures" will be applied for the design of box culverts, taking into consideration the characteristics of local materials. The design strength will be set at 18kN/mm^2 for concrete, and 235kN/mm^2 for reinforcing bars.

In the rainy season, the villages are inundated. Evacuation routes, including culverts, will be submerged by the flood. On the other hand, the culverts are less necessary in normal conditions, since the water flow is small. Taking these conditions into consideration, the culverts will be designed to provide evacuation routes and to avoid the flash flood that usually occurs at the beginning of the flood.

2) Weirs

Weirs will be designed to mitigate the flash flood that occurs at the beginning of a flood event by storing the water and providing a safe evacuation route. In the dry season, the stored water

will be used for irrigating crops in the farmlands around the weirs. Grooves will be provided for end plates to be located at the rectangular opening of the weirs to allow more efficient management of the stored water.

A structural stability analysis of the weirs will be carried out in accordance with Japanese technical standards. Square-shaped RC piles (200mm x 200mm) will be installed below the weirs to form an underground wall, which will intercept the groundwater flow and improve the ground conditions. To be on the safe side, the stability analysis will be based on the situation where the water level of the flood is more than 100mm above the top to the weir. In addition, the bearing resistance of the RC piles will not be taken into account in the stability analysis. Gabion mattresses will be installed on the riverbed downstream of the weirs.

Revetments made from wooden piles and wooden bars will be installed within 10m upstream and downstream of the weir. These revetments will be designed to assure the stability of the river course.

3) Footbridges

Footbridges are designed for the locations where the river width is in the range of 8m to 15m. At these locations, river water is usually present in normal conditions. Since the river water is used for the agriculture, it can be contaminated. In addition, taking into account the ease of construction, the footbridges will be designed to have a single span. The footbridges will generally be designed for use by the pedestrians and bicycles. However, the two footbridges in Kojunga village will also be designed for use by vehicles. This is because Kojunga village does not have an evacuation place inside the village, so it would not otherwise be accessible from outside as two rivers lie across the evacuation route and these will obstruct evacuation activities. In addition, daily access to the village needs to be improved for vehicle transportation, as well as during an emergency. The footbridges comprise two types: i) Expanded metal; and ii) RC slab as described in Table 2.11.

Table 2.11 Type of Footbridges

Slab type	Expanded Metal	RC Slab
Location	• Footbridges, other than in Kojunga village.	• Footbridges at Kojunga village.
Remarks	• This type of structure was selected to avoid the buoyant force of overflow floodwaters.	• This type of structure was selected to allow use by vehicles.

Source: OD Study Team

The stress design method that will be applied to the structural calculations for the footbridges (pedestrian only and pedestrian with vehicular access), and the general configuration of these footbridges will be based on the Kenyan design standard “ROADS DESIGN MANUAL PART IV BRIDGE DESIGN, REPUBLIC OF KENYA MINISTRY OF ROADS AND PUBLIC WORKS, JANUARY 1982”.

In accordance with the Kenyan standard, the width of the footbridges for pedestrians will be set at 1.2m. The width of the two footbridges in Kojunga village, which will also be used by vehicles, will be set at 3.5m.

The main beams for the footbridges will be made from H-shaped steel girders. This will allow a shorter construction period and ensure that long spans can be constructed with a small cross section. Doing this will ensure smooth river flow around the footbridge structure. Expanded metal will be used for the walkway of all the pedestrian footbridges because expanded metal will not generate a buoyant force in the overflow floodwaters. However, a reinforced concrete (RC) slab will be used for the trafficable surface on the two footbridges in Kojunga village in order to support vehicular loads. The footbridge abutments will be designed as gravity type and made of concrete in-situ. A group of wooden piles of 150mm diameter will be installed to improve the soil foundation conditions. However, in the stability analysis, the bearing resistance of the wooden piles will not be taken into account.

(3) Boreholes

1) Designed Daily Water Supply Volume and Drilling Depth

Based on the Pilot Projects undertaken during the MP Study, the design daily water supply volume will be set at 20m^3/day for each borehole. The drilling depth of each borehole will be set based on the results of the hydro-geological survey conducted in the MP Study, as shown in Table 2.12. To determine the drilling depth in the construction stage, electric logging will be used. Since there are no official Kenyan regulations related to the water pumping criteria for successive boreholes, the volume for water pumping will be set at 330 l/hour or larger, according to the type of pump that is used and the technical guidelines for borehole development that are defined in the documentation for Japan's Grant Aid Scheme. The large amount of the groundwater is available in the Nyando River Basin. The design borehole depth will be set at the maximum depth based on the hydro-geological survey to cover the success rate of the boreholes.

Table 2.12 Design Borehole Depth

No.	Village	Design Depth (m)
1	Mowlem	100
2	Kamuga	130
3	Oyola	130
4	Kopudo	100

No.	Village	Design Depth (m)
5	Wangaya Mombasa	100
6	Achuodho	100
7	Wakesi	110
8	Kojiem	110

No.	Village	Design Depth (m)
9	Kanyilum	80
10	Kadika	100
11	Masune	100

Source: OD Study Team
Note: Since the designed depth follows the result of the Hydro-geological survey in the MP Study, the final drilling depth will be determined in the construction stage.

2) Typical Structure of Boreholes

Casing will be installed down to the bottom of the borehole to secure the durability and the quality of the boreholes. The casing diameter will be 150mm (six inches), as used in the boreholes for the Pilot Projects of the MP Study, and widely used in Kenya. The drilling diameter will be set at 216mm (8-1/2 inches), based on the casing diameter.

The screen will be made from uPVC, which is resistant to erosion and was applied to the Pilot Project. The screen will be a slot-type, common in Kenya.

Gravel packing will be installed in the gap between the casing and inside of the drilled hole, from the bottom up to 10 m above static water level. The section to within 10 m of the ground surface will be packed with the slime produced during the drilling, and the upper part to the ground

surface will be filled with cement mortar. Use of cement will prevent the intrusion of rainwater and wastewater near the borehole. A bottom plug will be provided at the bottom of the drilled hole, while a temporary top cover will be provided until the borehole casing work has been completed.

3) Pumping Test and Water Quality Test

During the borehole drilling work, electrical logging will be installed to identify the aquifer depth by provision of screen pipes at appropriate locations. Furthermore, a pumping test will be undertaken after completion of borehole construction in order to determine the water yield. The pumping test will comprise:

- Trial test: by identification of clean water, maximum 12 hours
- Step draw down test: more than four steps with more than 2 hours for each step
- Constant discharge test: more than 24 hours
- Recovery test: more than 8 hours

Water quality analysis will be undertaken for the items listed in Table 2.13 in accordance with the water quality standards for drinking water specified by MWI.

Table 2.13 Items of Water Quality Test

No	Parameter	Guide Value
1	pH	6.5-8.6
2	Suspended Solids	30mg/l
3	Nitrate	10mg/l
4	Ammonia	0.5mg/l
5	Nitrite	3mg/l
6	Total Dissolved Solids	1,200mg/l
7	Escherichia Coli	Nil
8	Fluoride	1.5mg/l
9	Phenols	Nil

No	Parameter	Guide Value
10	Arsenic	0.01mg/l
11	Cadmium	0.01mg/l
12	Lead	0.05mg/l
13	Selenium	0.01mg/l
14	Copper	0.05mg/l
15	Zinc	1.5mg/l
16	Alkyl Benzere Sulphonates	0.5mg/l
17	Permanganate Value	1.0mg/l

Source: MWI

4) Quality Control

A local borehole engineer will be assigned during the construction stage to secure the quality of the borehole development. He will supervise the borehole depth, casing installment, and gravel packing in accordance with the quality control plan specified in section 2-2-4-5 of this report.

5) Hand Pump

Hand pumps will be of the Afridev-type that is commonly used in Kenya. Taking the affects of flooding into consideration, the apron floor level for the hand pump will be set at 1.2m above the ground level, based on experience from the Pilot Projects. One set of standard tools and spare parts will be provided for each borehole.

6) Daily Use

Boreholes are designed to supply water during the flood. The daily use of each borehole will be discussed and agreed to in the CFMOs during the course of Package 1 (Development of Community Based Flood Management Organizations) for the non-structural measures.

2-2-3 Outline Design Drawing

The OD Study design drawings for the Project are shown in the Annex of this report.

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

(1) Construction Lot

Although the Project comprises a large number of structures (76 in total), the scale of each structure is small. The total construction price of the structural measures falls within the medium cost range. None of the structures require technically difficult construction methods. Therefore, the structural measures will be constructed in one package.

(2) Tender Process for the Structural Measures

The tender process for selection of the contractor shall is summarized below. The period from the time of making the public announcement of prequalification to the time of contract signing is assumed to be about three months.

1) Public notice for prequalification (PQ).
2) PQ evaluation by the Procurement Agent.
3) Approval by GOK of the PQ evaluation result.
4) Distribution of the Tender Document (holding a clarification meeting).
5) Questions and answers, followed by distribution of an addendum.
6) Submission of Tender documents.
7) Evaluation of technical documents.
8) Approval by GOK of the technical documents evaluation result.
9) Opening and evaluation of financial documents.
10) Contract negotiation.
11) Approval by GOK of the tender result.
12) Award of contract.
13) Signing of contract

Prior to implementing the Project, a Project Coordinating Committee shall be established. The committee will consists of the Permanent Secretary of MWI (Chairman), Chief Executive Officer of WRMA, Director of Water Resources of MWI, a representative of the Japanese Embassy, and a representative of JICA's Kenya office. The right of approval by GOK will only be authorized to the CEO of WRMA as the implementing agency. This will ensure smooth administrative processes, including prequalification, tender, authorization of design change, etc. in accordance with the Project schedule.

The documents which require approval by GOK shall be submitted to the WRMA Regional Office of Lake Victoria South Catchment and transferred to WRMA Headquarters. The approval by the CEO will be recognized as the approval of GOK.

(3) Procurement for the Non-Structural Measures

The Procurement Agency will procure a Japanese consulting firm to supervise the non-structural measure. The Japanese consulting firm will subcontract the local NGOs to implement the non-structural measures. The detailed process is mentioned in section 2-2-4-7 (5) of this report.

2-2-4-2 Implementation Conditions

In the Project Area, there are two peaks in the monthly average rainfall each year. The first peak is the long rainy season from March to May and the second peak is the short rainy season from October to December. Most floods occur from April to May during the long rainy season. Therefore, the Project implementation schedule shall incorporate a work suspension period of three months: i) April to May (2 months) and November (1 month).

2-2-4-3 Scope of Work

(1) Obligations of Japan and Kenya

Obligation of Japanese side and Kenya side are shown in Table 2.14.

Table 2.14 Obligations of Japan and Kenya

Obligations of Japan	Obligations of Kenya
• To implement the structural and non-structural measures shown in Section 2-1. • To maintain safety during the construction period and to inform the public about the construction work. • To procure construction materials and necessary equipment for the Project. • To prevent environmental pollution during the construction period. • To prepare tender documents and assist in tendering. • To carry out quality control and manage the work progress.	• To undertake procurement in accordance with the guidelines for Programme Grant Aid for Environment and Climate Change. • To exempt imported goods from taxes and customs duties and to exempt local goods from internal taxes. • To open a bank account at a Japanese bank authorized for undertaking foreign exchange and bear the commission charges by the bank. • To secure land for undertaking the construction work and maintenance after construction. • To coordinate and register the ownership of the structural measures with related organizations. • To coordinate the EIA approval for the structural measures. • To permit the entry into Kenya of Japanese and other nationality experts (if any) for the Project. • To assign counterpart staff full time to assist the Project. • To bear the cost of allowances and transportation for Kenyan officials to attend meetings and inspections in Kisumu and Nairobi.

Source: O/D Study Team

(2) Direct Construction

1) Temporary access road: During the flood season, the Project site will be covered with flood water. In addition, even after the heavy rain, the road condition will deteriorate and it will be difficult to access to the Project site. Therefore, improvement of the access road to the site is necessary for construction. A temporary access road having a width of 6m will be provided by

covering part of the existing road with a 200mm thick gravel mat.

2) Soil work (excavation, backfilling and embankment): Basically manual excavation shall be used. According to the result of a site survey, the excavated soil is not suitable for backfilling, therefore selected sandy soil shall be used.

3) Piling works (for the foundation of culverts, footbridges, and weirs): Piles will be driven to the designed depth by using a crane (or a back hoe) that is fitted with a vibratory hammer .

4) Concreting: A mobile concrete mixer (pot mixer) will be used for producing the concrete required for each structure. Manual concrete casting using a vibrator will be selected.

5) Reinforcement bar: The contractor shall keep all reinforcement bars in good condition, avoid putting them directly them on the ground, and cover them with a plastic sheet, etc. to prevent rusting . All rust and dirt shall be removed well before bar arrangement in the structures.

6) Boreholes:

- A DTH (Down the Hole) system using a rotary excavator shall be used. After drilling, electrical logging shall be done to determine the final depth.
- Water quality and the pumping tests shall be done after completion of drilling to confirm the water yield.

7) Building (Evacuation centers, storage facilities, and toilets): The construction method commonly used in Kenya shall be applied for building structures such as evacuation centers, storage facilities, and toilets.

8) Culverts: Pipe culverts and concrete covers for U-shaped ditches shall be fabricated at a construction yard and transported to the site.

9) Footbridges: Substructure works comprising earthworks, piling works and concreting works. After construction of the substructure, the bearings will be set on the base. Steel main girders and cross beams will be fabricated at a factory. Before transportation to the site, a trial assembly inspection shall be done at the factory. On site, the girders will be erected on the bearing by using a crane and connected with the other members. For the pedestrian footbridges, the expanded steel walkway will be connected with the main girders. For the footbridges at Kojunga village, which will also be used by vehicles, the concrete trafficable surface will be cast or connected with the main girders.

10) Project Plates: After completion of the structures, engraved Project Plates made from stainless steel shall be installed at the evacuation centers, storage facilities, toilets and boreholes. Details of the plates and the text to be engraved on them shall be decided through the discussion with JICA Kenya office and the approval of both the Embassy of Japan and GOK.

(3) Common Temporary Work

1) Safety measures: To ensure safety during the construction period, fences, fire extinguishers, temporary barricades, and colored cones shall be arranged appropriately.

2) Construction yard: The construction yard will be required for offices to accommodate the staff who will manage the quality of the construction works, as well as for storage of construction

materials. The construction yard shall be located beside the national trunk road near Ahero city. The construction yard will include: i) Contractor's office; ii) Stockyard for materials; iii) Production area for the pre-cast concrete structures, etc.; iv) Arrangement of reinforcement bar; and v) a rest station of workers. The yard will be built during the mobilization period available during the construction period, and removed during the demobilization period.

3) Others: Project sign boards shall be installed during the construction period to provide information to people about the Project that is funded by Japan's Grant Aid Scheme.

2-2-4-4 Consultant Supervision

(1) Consultant's Supervision

The Project site is distributed over 24 villages and there it will be difficult to supervise the construction of each structure. However, each structure is small-scale and construction methods will not be technically difficult. Therefore, there do not seem to be any major technical problems. As a result, construction supervision will mainly be carried out by local engineers and spot-dispatched Japanese engineers will manage the Project.

(2) Agent's Procurement Management

WRMA, which is the implementation agency for the Project, has no experience in procurement for construction work. Therefore, Japanese experts from a Procurement Agent will need to be assigned to support WRMA. Two Japanese experts will be assigned to work in Kenya, while one Japanese expert will be assigned to undertake work in Japan.

2-2-4-5 Quality Control Plan

A quality control plan will be formulated, based on common practices for construction works. Both the concreting work and the borehole development work needs quality control in order to secure the required quality and durability of the structural measures. Table 2.15 shows the items for the quality control measures required for the Project.

Table 2.15 Quality Control Measures

Item		Test	Method
Concreting	Aggregate Strength of concrete Workability Re-bar and formwork	Aggregate test Compressive strength test Slump test Placement inspection	Test result Test result Test result Visual inspection
Pipe culverts			Visual inspection, incl. re-bar arrangement
Steel material	Strength		Mill sheet
Buildings	Finishing		Visual inspection
Boreholes	Location of drilling Condition of drilling rig Depth of drilling Electrical logging Installation of casing screen Installation of filter material Water yield Quality of water Finishing	Pumping test Water quality test	Visual inspection Visual inspection Sampling Result of electrical logging Visual inspection Volume of material Test result Test result Visual inspection

Source: OD Study Team

2-2-4-6 Procurement Plan

All the equipment and materials required for the structural measures can be obtained locally in Kenya. The procurement situation for major items is described as below.

1) Cement: In Kenya, two major suppliers produce cement. One is Bamburi Cement and the other is East African Portland Cement.

2) Aggregate for concrete and gravel: Good quality aggregate for making concrete and road gravel can be found in the hills which are located in the northern part of the Nyando River Basin in the in both the east and west direction. Fine aggregate for making concrete can be found the beds of the Nyando River and Lake Victoria. Therefore, a supply of aggregate can be found near the Project Area.

3) Material for embankments: Sandy soil required for the embankment and backfilling is available near the construction site, such as bed of Nyando River.

4) Bricks: Bricks required for constructing the walls of buildings are produced near the site. However, each producer is small-scale, and quality control does not seem to be performed efficiently. Therefore attention should be paid to securing quality control for the manufacturing process.

5) Reinforcement bar: Reinforcement bar (re-bar) used for making reinforced concrete is produced in Mombasa or Nairobi. Generally, twist steel can be procured in the local market.

6) Structural steel: Steel required for the steel structures, such as H-shaped beams and L-section members used for footbridges, is available from local and international markets. The steel structures will be assembled into transportable modules at the factory and these will be transported to the site.

7) Concrete products: Concrete products, such as pipe culverts, are produced in the Kisumu district. Culverts having a diameter of 450mm, 600mm, 900mm, and 1,200mm were observed in the field study. It was found that the segment length was as short as 1m. In addition, the quality of some pipes did not seem to be high enough. Therefore attention should be paid to securing quality control for the manufacturing process.

8) Wood: Wood materials for buildings, pile foundations, and formwork are produced in Kenya.

2-2-4-7 Non-Structural Measures

(1) Background

The overall goal of the Project is to achieve the sustainable economic growth and poverty reduction in the Project Area. To achieve the overall goal, the Project objective is to establish community-based flood management systems in the Project Area.

To achieve the Project objective, the Project will implement both structural measures and non-structural measures comprising.

The structural measures comprise two kinds of facilities. The first kind includes construction of evacuation centers, toilets, storage facilities, and boreholes required to at evacuation places. The second kind includes culverts, footbridges, and weirs to provide evacuation routes. Even though the structural measures

are designed to provide or improve evacuation places and evacuation routes in 24 villages, community capacity building must also be implemented in order to develop a sustainable flood management system that can be managed by community based organizations. The community capacity building of the Project includes financial management, technical O&M of structural measures, and training for necessary activities based on the flood disaster cycle, e.g. early warning of flooding and flood evacuation procedures.

The Project has been designed to integrate implementation of the structural and non-structural measures for development of the flood management system. Hence, the non-structural measures are considered to be just as important as the structural measures of the Project.

(2) Objectives

To achieve a sustainable flood management system that can be managed by community based organizations, the non-structural measures of the Project have been designed around the formation of Community Based Flood Management Organizations (CFMOs) and improving their capacity. The objectives of the non-structural measures are as follows:

- To secure sustainable flood management, the CFMOs will be capable undertaking O&M for the structural measures, financial management, and organizing activities based on the flood disaster cycle; and
- To improve the public awareness of flood management by implementing public relations activities, including the radio programs and education programs for children.

(3) Outputs

In order to develop the flood management system for the community based organizations, the following six (6) output components have been designed:

- Development of community based flood management organizations: This component aims at organizing the CFMOs. It covers financial management training and the preparation of by-laws. In the financial management training, training in the writing of proposals to raise funds from the Water Service Trust Fund (WSTF) will be carried out, as well as holding workshops for identifying the financial resources that will be needed for undertaking O&M for the structural measures. In addition, signboards will be prepared and installed to show the evacuation routes and evacuation places in villages.
- Technical O&M training for structural measures: In this component, the communities will be trained through lectures and on-site training in the O&M of the structural measures. Technical O&M manuals based on the training will be prepared for each community.
- Community flood management training: In this component, the community flood management manual will be formulated to show the activities that need to be taken by the communities according to the flood disaster cycle. This cycle includes prevention, emergency response, evacuation, and rebuilding. Evacuation drills will also be carried out under by the CFMOs.
- Education program for disaster prevention: This component comprises training programs for primary school teachers and will provide them with teaching manuals for education about disaster prevention. In this component, the trained teachers will present lessons to their students by using a textbook that is also prepared under this initiative.

- Radio programs about flood management: This component consists of both long radio programs and short spot programs. The former programs will be broadcast before the rainy season, while the latter programs will be broadcast during the rainy season.
- Awareness campaign using posters about flood management: This component comprises preparation of posters about flood management, including the distribution of these posters to local governments.

The outputs of the non-structural measures will be confirmed though the records kept for the activities, outputs from the Lessons Learned Meetings, and the Questionnaire that will be distributed at the end of the Project. Table 2.16 shows a rating index for quantifying the outputs and the materials required for evaluation of the non-structural measures.

Table 2.16 Rating Index and Materials for Assessing the Non-structural Measures

Output	Indicators	Means of Verification
1 Community Based Flood Management Organizations will be developed in the Project Area.	1.1 By-laws will be formulated for each CFMO. 1.2 Financial plan will be formulated for each CFMO.	1.1.1 By-laws of each CFMO 1.1.2 Number of meetings and participants 1.2.1 Financial plan of each CFMO 1.2.2 Manual for writing proposals for fundraising of each CFMO 1.2.3 Number of meetings and participants
2 CFMO will be capable for O&M.	2 O&M manuals will be formulated for each CFMO.	2.1 O&M manuals of each CFMO 2.2 Number of lectures, on-site trainings, and participants 2.3 Questionnaire survey
3 CFMO will be capable for the flood management.	3.1 Community flood management manual will be formulated for each CFMO. 3.2 Evacuation plan will be formulated for each CFMO.	3.1 Community flood management manual of each CFMO 3.2 Number of participants in the evacuation drills
4 Public awareness will be promoted in the Project Area.	4.1 Education programs for disaster prevention will be formulated and carried out in the targeted 16 schools. 4.2 Radio programs about flood management will be broadcasted continuously. 4.3 Posters about flood management will be prepared and used for the public relation activities.	4.1.1 Number of teaching manuals 4.1.2 Number of textbooks for pupils 4.1.3 Result of assessment for teaching practice 4.1.4 Questionnaire survey of the pupils having received the education programs 4.1.5 Number of pupils 4.2.1 Record of broadcasted long and short radio programs 4.2.2 Rating of listeners 4.3 Number of distributed posters

Source: OD Study Team

(4) Activities

As mentioned in the previous section, the non-structural measures comprise six (6) components. For effective and efficient implementation, these components will be organized into three (3) contract packages, as listed below.

Package 1 “Development of Community Based Flood Management Organizations” aims at organizing the community through two (2) sub-packages: i) “Forming and Building the Capacity of CFMOs” for the development of the CFMOs (Sub-package 1.1); and ii) “Technical O&M Training for Structural Measures” for the technical O&M training (Sub-package 1.2).

Package 2 “Community Flood Management Training” aims at training the communities in carrying out activities according to the flood disaster cycle.

Package 3 “Education Program and Public Relations Program” focuses on building public awareness through three (3) sub-packages: i) “Education Program for Disaster Prevention”; ii) “Radio Programs about Flood Management”; and iii) “Awareness Campaign using Posters about Flood Management”.

In summary, the non-structural measures comprise:

a) Package 1: Development of Community Based Flood Management Organizations

- Sub-package 1.1: Forming and Building the Capacity of CFMOs
- Sub-package 1.2: Technical O&M Training for Structural Measures

b) Package 2: Community Flood Management Training

c) Package 3: Education Program and Public Relation Program

- Sub-package 3.1: Education Program for Disaster Prevention
- Sub-package 3.2: Radio Programs about Flood Management
- Sub-package 3.3: Awareness Campaign using Posters about Flood Management

Table 2.17 shows the activities of the non-structural measures according to each of the packages mentioned above.

Table 2.17 Activities of the Non-structural Measures by Package

Package	Activity
1 Development of Community Based Flood Management Organizations	
1.1 Forming and Building the Capacity of CFMOs	a) Management and operation training for Community Based Flood Management Organization (CFMOs) 1) Community awareness - Number of participants and training period: 30 persons per village x 1day per village - Target area: 24 villages 2) Development of bylaws for CFMOs - Number of participants and training period: 30 persons per village x 2 days per village - Target area: 24 villages 3) Organizational training for CFMOs - Number of participants and training period: 30 persons per village x 2 days per village - Target area: 24 villages 4) Financial management training for CFMOs - Number of participants and training period: 30 persons per village x 1day per village - Target area: 24 villages
	b) Training in writing proposals for fundraising by CFMOs and Water Resource Users Association (WRUA) - Number of participants and training period: (3 persons/village x 6 villages + 2 persons of WRUA) x 4 days/time - Number of training: 4 times
	c) Production and installation of 3 kinds of signboard - Contents of signboards: i) Community hazard maps, ii) Signboard for evacuation route, and iii) Signboard for evacuation center - Number of signboard (hazard map): 1 set per village - Number of signboard (evacuation route): 10 sets per village - Number of signboard (evacuation center): 1set per village - Workshop for selecting installation places: 1 day per village - Target area: 24 villages
	d) Lessons Learned Meeting and Questionnaire Survey - Number of samples: 10 samples/village/sub-package (excl. sub-package 3.1) - Number of samples: 10 samples/school (sub-package 3.1) - Lessons Learned meeting: 1 day/6 villages x 4 times

Package		Activity
1.2	Technical O&M Training for Structural Measures	a) Both lectures and on-site training in O&M for structures (evacuation centers, culverts, footbridges, boreholes, and storage facilities, etc.) - Number of participants and Training period: 30 persons/village x 3 days/village - O&M equipment: i) Wheel barrow 5 sets/village, ii) Shovel 5 sets/village, iii) Pick 5 sets/village, and iv) Bucket 10 sets/village - Follow-up: 1 month - Target area: 24 villages b) Preparation of O&M Manuals - Description: O&M skills including rules and manners for use of public facilities such as evacuation centers, toilets, storage facilities, and boreholes, etc. - Quantity: 5 sets/village - Target area: 24 villages
2 Community Flood Management Training		a) Community Flood Management Training (Training based on the flood disaster cycles from preparedness to rehabilitation including first aid) - Number of participants and training period: 50 persons/village x 4 days/village (for 24 villages) - Number of participants and training period: 2 persons/WRUA x 3 days (for 4 WRUAs in 1 time only) b) Preparation of Community Flood Management Manual - Workshop: 50 persons/village x 2 days/village - Quantity: 5 sets/village - Target area: 24 villages c) Evacuation drill - Number of participants and training period: 300 persons/village x 1 day/village - Equipment: Handy siren 1 set/village - Target area: 24 villages
3 Education Program and Public Relation Program		
3.1	Education Program for Disaster Prevention	a) Teacher training in disaster prevention and flood management - Number of participants and training period: 4 teachers/school x 4 days (1 time only) - Preparation of Teaching Manual: 5 sets/school x 16 schools - Target area: 16 existing primary schools in the 24 villages b) Review and modification of the textbook to teach pupils. - Number of participants and training period: 1 teacher/school x 2 days (1time only) - Target area: 16 existing primary schools in the 24 villages - Mass printing of the textbook: 3,000 sets c) Lessons and assessment of education program - Lessons in the primary schools: 1 month - Target pupils: Pupils from Grade 4 to Grade 7 in 16 primary schools - Assessment by Ministry of Education: and trainers Whenever necessary d) List of target schools - Mowlem: Rae Kanyaika Primary - Bwanda: Bwanda Primary - Kamuga: Ofunyu Primary - Oyola: Oyola Primary - Kowiti: Reru Primary - Kamnget Ugwe: Ugwe Primary - Kopudo: Bwanda Primary (different from Bwand Primary in Bwand village) - Kanyiamo: Ogenya Primary - Kolal: Nyangoto Primary - Kamagaga: Kigoche Primary - Wangaya: Mombasa Osembe Primary - Achuodho: Achuodho Primary - Wakesi: Keyo Primary - Kanyilum: Apondo Primary - Nyachoda: Nyachoda Primary - Masune: Ayweyo Luora Primary

Package		Activity
3.2	Radio Programs about Flood Management	a) Long radio programs - Description: Dialogues on the issues of flood management between radio presenter and professionals - Frequency and period for broadcasting: For 3 months before the rainy season and 1 time per week (60 minutes per time) - Subject (draft list) - 1st: Mechanism of flooding - 2nd: Education of flood management - 3rd: Evacuation drill - 4th: Structural Measure on flood management - 5th: First aid - 6th: Early warning - 7th: Possible Mitigation Measures at Household Level - 8th: Attention when evacuating - 9th: Living in evacuation centre - 10th: Summary (final) b) Short spot programs - Description: Awareness when evacuating, etc. - Frequency and period for broadcasting: For 3 months in the rainy season and 5 times per day (1 minute per time) - Subject (draft list): 1) Early warning 2) Possible mitigation measures at household level, and 3) Awareness when evacuating
3.3	Awareness Campaign using Posters about Flood Management	a) Preparation of posters - Subject (3 types): i) Storing water, food, and useful goods for evacuation; ii) Attention when evacuating; and iii) Early warning b) Distribution to local governments Quantity: 10,000 sheets/subject x 3 subjects

Source: OD Study Team

(5) Assignment of Personnel

The non-structural measures will be implemented by the local organizations such as NGOs with technical assistance and supervision being provided by the Japanese and local experts. In the Pilot Projects, the local NGOs carried out similar programs, except for the “Radio Programs about Flood Management” (sub-package 3.2) and “Awareness Campaign using Posters about Flood Management” (sub-package 3.3). However, in the field study, it was confirmed that there are NGOs that do have experience in preparing radio programs and posters.

Since the non-structural measures need to be implemented in coordination with the construction work and be kept on schedule, Japanese and local experts will need to supervise the work progress and provide technical assistance for the non-structural measures. The Procurement Agent will procure a Japanse consulting firm which will establish the management team for the non-structural measure and subcontract the local NGOs to implement the non-structural measure. The assignment period and tasks of the experts in the management team are as follow:

1) Japanese Experts

- Assigned for the overall supervision and preparation of the work schedule.
- Assigned for the tender and contract negotiation.
- Assigned for technical assistance and evaluation to local NGOs.
- Assigned for 12MM in total.

2) Local Experts

- Assigned for monitoring of the activities by local NGOs.
- Assigned for the coordinating with 24 villages and related authorities.
- Since the Project Area consists of the large number of villages (24), one local expert will need to be assigned for each district.
- Assigned for the period from the preparation of tenders to the completion of the non-structural measures. The assignment period for each local expert is planned at 21MM.

(6) Implementation Schedule

An implementation schedule for the non-structural measures has been formulated, as shown in Figure 2.3 below, based on the following conditions:

- The CFMOs need to be developed before the commencement of the construction work. This is because the availability of donations from labor payments for the construction work needs to be discussed during the financial management training. Hence, "Forming and Building the Capacity of CFMOs" (Sub-package 1.1) will need to commence before the start of construction work.
- Both "Technical O&M Training for Structural Measures" (Sub-package 1.2) and "Community Flood Management Training" (Package 2) will start after the structural measures are constructed in some villages. Hence, both activities are planned to start after the long rainy season, which lasts from March to May.
- "Education Program for Disaster Prevention" (Sub-package 3.1) will need to commence in time for the education programs to be completed before the start of the long rainy season starts.
- "Radio Programs about Flood Management" (Sub-package 3.2) will need to commence in time for the broadcast of the long radio programs to be completed before the long rainy season starts.
- "Awareness Campaign using Posters about Flood Management" (Sub-package 3.3) will need to commence in time to allow posters to be distributed after the long rainy season.

		Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	**Structural Measures**	Sign on E/N	▼																							
		Sign on contracts		▼																						
		Detailed Design			▬	▬																				
		PQ and Tender					▬	▬																		
		Contract with contractor							▼																	
		Construction works							▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬			
2	**Non-structural Measures (Soft Component)**																									
2.1	**Development of community based flood management organizations**																									
(1)	Tender and contract negotiation					▬																				
(2)	Sign on contract					▼																				
(3)	Submission of Monthly Progress Report							▽	▽	▽	▽	▽	▽	▽	▽	▽	▽	▽	▽	▽	▽	▽	▽	▽		
(4)	Submission of Draft Final Report																								▽	
(5)	Submission of Final Report																									▽
2.1.1	Forming and building the capacity of community based flood management organizations																									
(1)	Community sensitization	1 day/village x 30 persons/village x 24 villages					▬	▬																		
(2)	Preparation fo CFMO bylaws	2 days/village x 30 persons/village x 24 villages						▬	▬	▬																
(3)	Organizing training for CFMO	2 days/village x 30 persons/village x 24 villages								▬	▬	▬														
(4)	Financial management training for CFMO	1 day/village x 30 persons/village x 24 villages							▬	▬																
(5)	Training in writing proposal for CFMO and WRUA	4 days x 4 times											▬													
(6)	Preparation of the Writing proposal manual													▬												
(7)	Preparation and installaiton of signboards																									
	1) Discussion of objective																									
	2) Discussions for designing and selecting the installation place	1 day/village x 24 villages								▬	▬	▬														
	3) Preparation of signboards												▬													
	4) Installation of signboards													▬	▬	▬										
(8)	Lessons learned meeting and Questionnaire survey	1 day/6 villages x 4 times															▬							▬		
2.1.2	Technical O&M training for structural measures																									
(1)	Lectures and on-site training	3 days/village x 30 persons/village x 24 villages															▬	▬	▬	▬	▬	▬	▬			
(2)	Follow-up	1 month																						▬		
(3)	Preparation of O&M Manuals	5 sets x24 villages																				▬	▬			
2.2	**Community flood management training**																									
(1)	Tender and contract negotiation													▬												
(2)	Sign on contract													▼												
(3)	Training of community flood management (CFMO and selected residents)	4 days/village x 50 persons/village x 24 villages													▬	▬	▬	▬	▬	▬	▬					
(4)	Training of community flood management (WRUA)	3 days x 8 persons x 1 time																			▬					
(5)	Workshop of community flood management manual	2 days/village x 50 persons/village x 24 villages														▬	▬	▬	▬	▬	▬	▬				
(6)	Finalization of the Community Flood Management Manual	5 sets/village																					▬			
(7)	Evacuation drill	1 day/village x 300 persons/village x 24 villages																		▬	▬	▬	▬			
(8)	Submission of Monthly Progress Report															▽	▽	▽	▽	▽	▽	▽	▽	▽		
(9)	Submission of Draft Final Report																								▽	
(10)	Submission of Final Report																									▽
2.3	**Education Program and Public Relation Program**																									
(1)	Tender and contract negotiation						▬																			
(2)	Sign on contract						▼																			
(3)	Submission of Monthly Progress Report							▽	▽	▽	▽	▽		▽	▽	▽										
(4)	Submission of Interim Report													▽												
(5)	Submission of Draft Final Report																	▽								
(6)	Submission of Final Report																		▽							
2.3.1	Education program of disaster prevention																									
(1)	Preparation of the teaching manual							▬																		
(2)	Teachers training	4 days x 3 teachers/school x 16 school (1 time)							▬																	
(3)	Modification of the teaching manual	5 sets/school x 16 schools								▬																
(4)	Printing of textbooks (3,000 sets)	2 days x 1 person/school x16 schools (1time)								▬	▬	▬														
(5)	Lessons to pupils	1 month										▬	▬													
(6)	Assessment by MOE and trainers												▬	▬												
2.3.2	Radio programs on flood management																									
(1)	Preparation of the long radio programs	10 subjects							▬	▬																
(2)	Broadcasting of the long radio programs	60 minutes x 10 subjects (Janurary to March)										▬	▬	▬	▬											
(3)	Preparation of the short sport programs	3 subjects								▬	▬															
(4)	Broadcasting of the short sport programs	1 minute x 5 times/day (March to May)												▬	▬	▬	▬									
2.3.3	Awareness campaign using poster on flood management																									
(1)	Preparation of alternatives of the posters	3 subjects x 3 alternative												▬	▬	▬										
(2)	Selection and modification of the posters															▬										
(3)	Printing and distribution of the posters	10,000 sheets/subject x 3 subjects															▬	▬								

Source: OD Study Team

Figure 2.3 Implementation Schedule of the Non-structural Measures

(7) Report

Table 3.18 shows the reports and outputs of the non-structural measures for each package.

Table 2.18 Reports and Outputs of the Non-structural Measures by Package

Package	Report and Output
1 Development of Community Based Flood Management Organizations	a) Monthly progress report : 6 sets/month b) Draft final report : 6sets c) Final report : 6sets
1.1 Forming and Building the Capacity of CFMOs	d) Monitoring and evaluation report : 6sets e) CFMO bylaws : 5 sets/village f) Manual for writing proposals : 140 sets (5 sets/village and 5 sets/WRUA) g) Signboard (community hazard map) : 1 location/village h) Signboard (evacuation route) : 10 location/village i) Signboard (evacuation center) : 1 location/village
1.2 Technical O&M Training for Structural Measures	j) O&M manuals : 5 sets/village k) O&M equipment : Wheelbarrow, Shovel, Pick, and Bucket
2 Community Flood Management Training	a) Monthly progress report : 6 sets/month b) Draft final report : 6sets c) Final report : 6sets d) Community Flood Management Manual : 5 sets/village e) Equipment (handy siren) : 1 set/village
3 Education Program and Public Relations Program	a) Monthly progress report : 6 sets/month b) Interim report : 6sets c) Draft final report : 6sets d) Final report : 6sets
3.1 Education Program for Disaster Prevention	e) Teaching manual : 5 sets/school (16 schools) f) Textbook for pupils : 3,000 sets
3.2 Radio Programs about Flood Management	g) Long radio programs : CD-Rom h) Short sport programs : CD-Rom
3.3 Awareness Campaign using Posters about Flood Management	i) Poster : 10,000 sheets/subject (3 subjects in total)

Source: OD Study Team

(8) Obligations of the Recipient Country

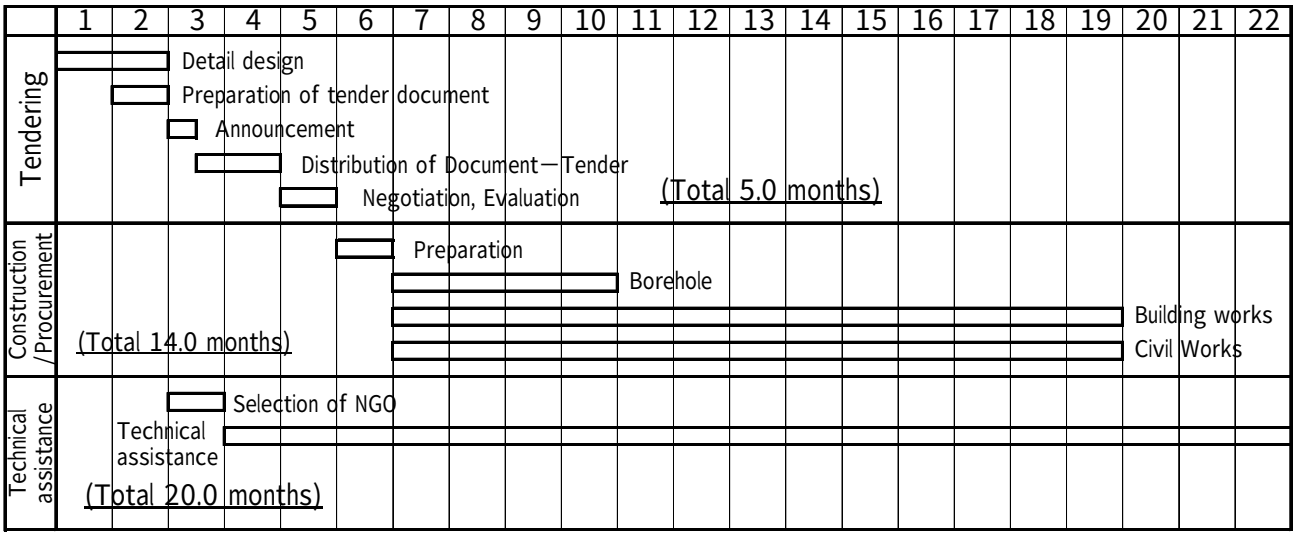
To implement the non-structural measures, the GOK will be responsible for the following items:

- Presence at the meetings with the communities;
- Coordination with the Water Resource Users Association (WRUA) for training in writing proposals for fundraising;
- Presence at the long radio programs and coordination with experts for participating in the long radio programs;
- Coordination with related authorities for the education programs, including: the assessment of the education programs and the preparation and distribution of textbooks; and
- Coordination with local governments and related authorities for distributing the posters.

2-2-4-8 Implementation Schedule

The implementation period is estimated at 23.0 months after the signing of Exchange Notes (E/N). The implementation period includes the periods required for the detail design and tendering.

The construction period for the structural measures is estimated at 17 months, including the inspections after completion and the suspended work periods during the flood seasons (long and short). The period required for implementing the non-structural measures is estimated at 20 months, which is longer than that of the structural measures. This is because the non-structural measures, such as organizing the Community Based Flood Management Organizations, needs to start before the construction work can start. Figure 3.4 shows the implementation schedule for the Project.



Source: O/D Study Team

Figure 2.4 Project Implementation Schedule

2-3 OBLIGATIONS OF RECIPIENT COUNTRY

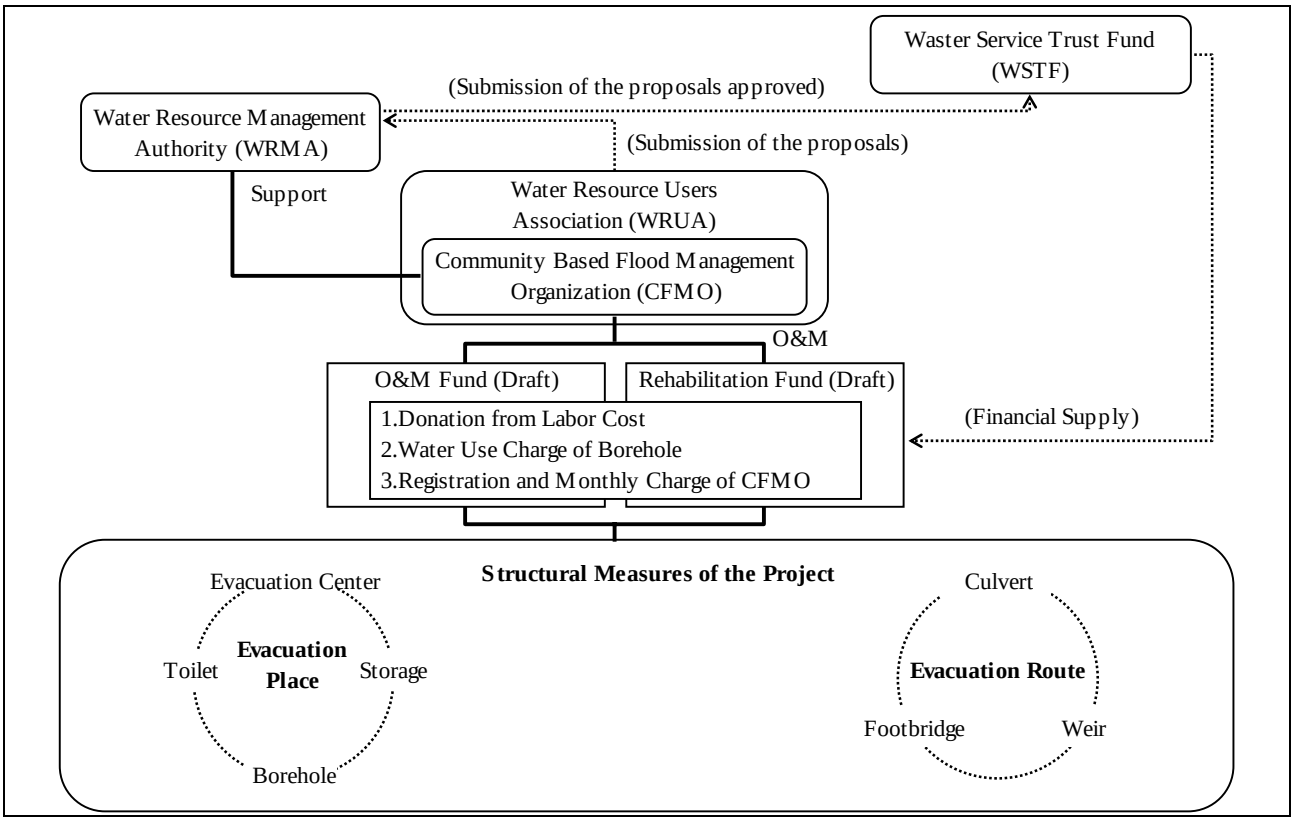
To implement the Project, the GOK will be responsible for the following items:

- To undertake procurement for the Project in accordance with the guidelines for the Programme Grant Aid for Environment and Climate Change;
- To arrange the exemption of taxes and customs duties for imported goods and the exemption of internal taxes for local goods;
- To undertake the Bank Arrangement at a Japanese bank authorized for undertaking foreign exchange and bear the commission charges applied by the bank;
- To ensure that land is available for the structural measures and to undertake the O&M;
- To arrange required procedures to register the ownership of the structural measures with related authorities;
- To arrange permissions from related authorities, including EIA approval for the structural measures, as required to implement the Project;
- To permit entry into Kenya of Japanese and other nationality experts (if any) related to the Project;

- To assign permanent staff from the Water Resource Management Authority - Lake Victoria South Catchment Regional Office as full time counterparts for the duration of the Project; and
- To bear the cost of transportation, accommodation, and other relevant expenditure that may be incurred for Kenyan officials to attend meetings and inspections in Naibori and Kisumu.

2-4 PROJECT OPERATION PLAN

The CFMOs will undertake the O&M required for the structural measures. In case the CFMOs are not capable of operating and maintaining the structural measures, WRMA as the implementation body for the Project and the responsible public authority, will support the CFMOs in collaboration with related authorities. Figure 2.5 shows the framework for undertaking the O&M.



Source: OD Study Team

Figure 2.5 Framework for Undertaking the O&M Required for Structural Measures

Table 2.19 lists the contents of the O&M activities and the required frequencies. Periodical inspections for the hand pumps are to be carried out by both the CFMOs and the technicians.

Table 2.19 Operation and Maintenance (O&M) Plan

Facility	Contents of O&M Work	Frequency
Evacuation Centers	• Periodical inspection of roofs and gutters. • Cleaning of water tank. • Cleaning of the interior and exterior.	• Minimum 2 times per year (before and after the long rainy season). • Minimum 2 times per year (before and after the long rainy season). • Whenever required.
Toilets	• Cleaning of interior and exterior.	• Whenever required.
Boreholes	• Periodical inspection of the hand pump by the CFMO. • Periodical inspection of the hand pump by a technician.	• Once a year. • Once a year.
Culverts	• Cleaning of sediments in the culverts. • Backfilling of road surface.	• Minimum of 4 times per year (before and after the long and short rainy seasons). • Minimum of 4 times per year (before and after the long and short rainy seasons).
Weirs	• Cleaning of sediments at the upper stream of the weir.	• Minimum of 4 times per year (before and after the long and short rainy seasons).
Footbridges	• Cleaning of sediments at the upper stream of the weir. • Repair of painting.	• Minimum of 4 times per year (before and after the long and short rainy seasons). • Once every five years.

Source: OD Study Team

2-5 PROJECT COST ESTIMATION

2-5-1 Initial Cost Estimation

The Project cost to the GOK for implementing the Project is estimated at 6.66 million Japanese Yen. This cost estimate is provisional and will be further examined by the Government of Japan when considering the approval of the Grant.

(1) Project Cost Borne by GOK: **4,500 thousand Ksh (6.66 million Japanese Yen)**

1) Staff of counterparts: 3,520 thousand Ksh (5.21 million Japanese Yen)

2) Lease land for construction yard: 880 thousand Ksh (1.30 million Japanese Yen)

3) Banking commission: 100 thousand Ksh (0.15 million Japanese Yen)

(2) Condition of Cost Estimate

1) Timing of cost estimate: November 2008

2) Exchange rate: US$ 1 =105.71Yen

Ksh 1 =1.480 Yen

3) Construction Period: The tendering and construction period are shown in the construction schedule.

4) Others: The Project will be implemented in conformity with the Japan's Grant Aid Scheme.

2-5-2 Operation and Maintenance Cost

As mentioned previously in Section 2.4, the CFMOs will undertake the O&M for the structural measures after the Project is completed. A financial plan, including the O&M costs, will be formulated in the financial management training undertaken as part of the non-structural measures, and in collaboration with the technical O&M training program. Alternative financial resources include the following:

- Donations from the community: The community will donate to the CFMOs 10% of the wages received in payment for labor that is required for the construction works. This scheme was applied to the Pilot Projects in the MP Study.
- Registration and monthly charges for the CFMOs: Existing CBOs apply a registration fee in the range from Ksh 50 to Ksh 200 per household and the monthly charge is in the range of Ksh 20 to Ksh 50 per household.
- Water use charges for boreholes.

In addition, training in writing proposals for fundraising from the Water Service Trust Fund (WST) is included in the non-structural measures. The CFMOs will develop self-reliance capabilities for obtaining financial resources and gaining public support through this training.

The operational life of the Afridev hand pumps is estimated at eight (8) years if proper maintenance procedures are followed. The Afridev hand pumps require maintenance once a year at the community level and another regular annual inspection by a technician. As a result, the O&M inspection will be required 8 times by the CFMOs and 8 times by a technician (16 times in total) over the operational life of the hand pump. Hence, the annual O&M cost is estimated at Ksh 20,829 as shown in Table 2.20.

Table 2.20 O&M Cost for Hand Pumps

Item	Unit Cost (Ksh)	Frequency	O&M Cost (Ksh/year)
Evacuation Center			
Periodical inspection of roofs and gutters.	1,200	2 times/year	2,400
Cleaning of water tank.			
Culvert			
Cleaning of sediments in the culverts.	1,200	4 times/year	4,800
Backfilling of road surface.			
Weir (Cleaning of sediments at the upper stream of the weir)	1,200	4 time/ year	4,800
Footbridge			
Cleaning of sediments at the upper stream of the weir.	1,200	4 time/ year	4,800
Repair of painting.	4,800	1 time/5 years	960
Hand Pump			
Pump cost	65,000	1 time/8 years	8125
O&M by CFMO (spare parts)	1,190	1 time/year	1,190
O&M by technician (spare parts)	10,514	1 time/year	10,514
Transportation cost (of the technician)	1,000	1 time/year	1,000
Total	N/A	N/A	**20,829**

Source: OD Study Team

2-6 OTHER RELEVANT ISSUES

There are several other issues to be addressed in order to implement the Project efficiently and effectively, as listed below:

- GOK will undertake without delay the obligations mentioned in Section 2-2-4-7 (8) related to

the non-structural measures;

- GOK will undertake without delay the obligations mentioned in Section 2-3.
- GOK will arrange the budget to implement the Project, as mentioned in Section 2-5.
- GOK will arrange without delay the meetings and approvals requested by the Procurement Agent which are required to implement the Project.

CHAPTER 3

PROJECT EVALUATION AND RECOMMENDATIONS

CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATIONS

3-1 PROJECT EFFECT

Table 3.1 summarizes the direct and indirect effects of the Project.

Table 3.1 Direct and Indirect Effects of the Project

Existing Conditions and Problems	Methods implemented in the Project	Direct Effects	Indirect Effects
• Twenty-four villages in the Project Area are located in flood prone parts of the Nyando River Basin. • The affected villages are located within the Nyando District and the Kisumu District. Both of these districts experience a high rate of absolute poverty. • Climate change is increasing the affects attributed to flood disasters. • Flood management needs to be developed urgently in order to achieve sustainable economic growth in the affected areas.	• To improve the evacuation places and evacuation routes for the affected 24 villages by providing structural measures. • To develop CFMOs by through non-structural measures. • To develop a flood management system for the affected 24 villages in an integrated manner through both the structural measures and non-structural measures.	• To improve the capacity for the flood management in the 24 villages (approximately 20,000 people). • To improve public awareness of flood management widely in the Nyando River Basin.	• To protect the basis for the economic activities in the project area. • To mitigate the effects by the natural disasters due to the climate change.

Source: OD study team

3-2 RECOMMENDATIONS

To implement the Project effectively, the GOK will be responsible for the issues mentioned below:

(1) Support for the CFMOs by Public Authorities

In the non-structural measures, the CFMOs will be developed and trained. This will include training in financial and technical management. In case the CFMOs are not capable of overcoming particular difficulties, the CFMOs will require support from public authorities. Hence, as the GOK will have ownership of the structural measures, GOK will need to take responsibility for financial and technical support of the CFMOs.

(2) Continuation of Education Programs and Public Awareness Campaigns

The non-structural measures include education programs for the disaster prevention and public awareness campaigns, including radio programs and the distribution of posters. After the Project is completed, the GOK will need to continue these programs. The education programs need to be officially incorporated into the education curriculum, while the radio programs (both long and short) will need to be re-broadcast periodically. In addition, the posters will need to be updated and re-distributed in the future.

(3) Replication of the Project to Other Villages

Both the structural and non-structural measures of the Project are implemented by utilizing local resource. Hence, based on the experience of the Project, the GOK will need to make an effort to utilize local resources for initiating the creation of CFMOs in other villages, thereby replicating the Project.

(4) Collaboration with Other Donors

The Project itself will focus specifically on 24 villages. Red Cross Kenya is currently formulating a new program for flood management in the Nyando River Basin. This new program will focus on non-structural measures. However, it is expected that Red Cross Kenya will undertake the new program in other villages that are not included in the 24 Project villages.