

ケニア共和国  
環境・水・天然資源省  
水資源管理庁

ケニア共和国  
洪水に脆弱な地域における効果的な  
洪水管理のための能力開発プロジェクト  
プロジェクト業務完了報告書  
第2巻 技術協力成果品

平成26年9月  
(2014年)

独立行政法人  
国際協力機構 (JICA)  
株式会社 ニュージェック

環境
JR
14-155

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報告書の構成

第1巻 主報告書

- 第I部 プロジェクトの背景と概要
  - 第II部 プロジェクト活動内容（成果1）
  - 第III部 プロジェクト活動内容（成果2）
  - 第IV部 プロジェクト活動内容（全成果共通）
- 添付資料

第2巻 技術協力成果品

第3巻 付属資料（1/2）

第4巻 付属資料（2/2）

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2014年3月

## 第2巻 技術協力成果品リスト

成果資料 1. ニヤンド川流域におけるコミュニティ防災活動の事例・教訓集

1. Lessons learnt from Nyando River Basin

成果資料 2. 洪水管理に係る研修マニュアル、教材

- 2-1 Flood Management Technical Training Manual (Second edition)
- 2-2 Flood Management Technical Training Text (Second edition)

成果資料 3. コミュニティ防災活動（構造物）のための支援マニュアル

3. Manual on supporting community-based flood management activities for WRMA and WRUA

成果資料 4. コミュニティ防災活動のための活動マニュアル及び事例教訓集

4S **【Manuals of Structure measures】**

- 4S1 Manual on Evacuation centre including raised toilets and drainage culverts
- 4S2 Manual on Do-nou raised road
- 4S3 Manual on River bank protection using gabion

4N **【Manuals of Non-Structure measures】**

- 4N1 Manual on Community based flood early warning system
- 4N2 Manual on Flood disaster education
- 4N3 Manual on Evacuation drill
- 4N4 Manual on Community-based flood hazard map

4L **【Lessons learnt】**

- 4L1 Lessons learnt from Pilot activities



**Ministry of  
Environment, Water  
and Natural Resources**



**Water Resources  
Management Authority**



**Japan International  
Cooperation Agency**

**Republic of Kenya**

**Project on Capacity Development for**

**Case Example Nyando Project**

**Lesson Learnt from Nyando River Basin**



**April 2014**

**Japan International Cooperation Agency**

**NEWJEC Inc.**



**Linking nature and people through technology**

## Preface



The Government of Kenya established the Water Resources Management Authority (WRMA), through the sector reform brought by Water Act 2002. WRMA is the lead agency in the management of water resources in the country through six (6) regional offices and twenty six (26) sub – regional offices of the respective water resources catchment areas.

Since its operationalization in 2005, WRMA has made significant progress in making water resources recognized as being fundamental for socio-economic and environmental sustainability. In this regard, integrated floods management is viewed as necessary component in water resources management.

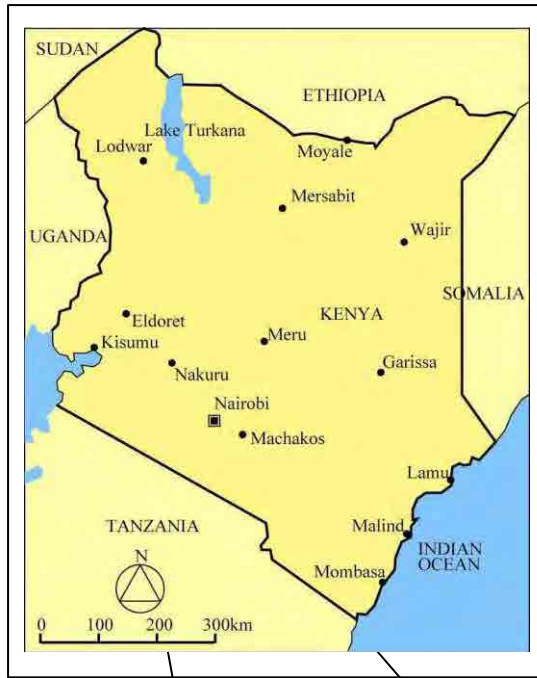
Based on the request from GOK, JICA carried out the “Study on the Integrated Flood Management (IFM) for Nyando River Basin (2006 – 2009)” as the Technical Cooperation Scheme and “Programme for Community based Flood Disaster Management to Adapt to Climate Change in the Nyando River Basin (2009-2011)”. This was a Grant Aid Programme with the aim of establishing a flood management system in the southern part or Lake Victoria Basin through IFM, where WRMA was the implementing agency. Through the above projects, community based flood management activities have been implemented through integrating non- structural and structural measures such as community based flood hazard mapping and construction of flood counter measure structures in prioritized flood prone areas.

Based on the achievement of Nyando project, the Project on Capacity Development for Effective Flood Management was formulated to expand IFM in other flood prone areas in Kenya. Three pilot river basins were selected namely: Isiolo, Gucha-Migori and Lumi to promote community based flood management activities. The main purpose of the project was to build institutional framework of flood management in the context of integrated water resource management for effective and sustainable implementation of community based activities. Through the project WRMA has developed strategies and guidelines in managing floods which have since been incorporated in the revised Catchment Management Strategies (CMS) and WRUA Development Cycle (WDC) manual. In order to develop capacity of WRMA officers in the field of community-based integrated flood management, a training system has been developed where the Project conducted IFM Training for WRMA officers who in turn trained the WRUAs. The Training Materials for community based flood management have been developed. These include supplemental manuals, lessons learnt and case studies.

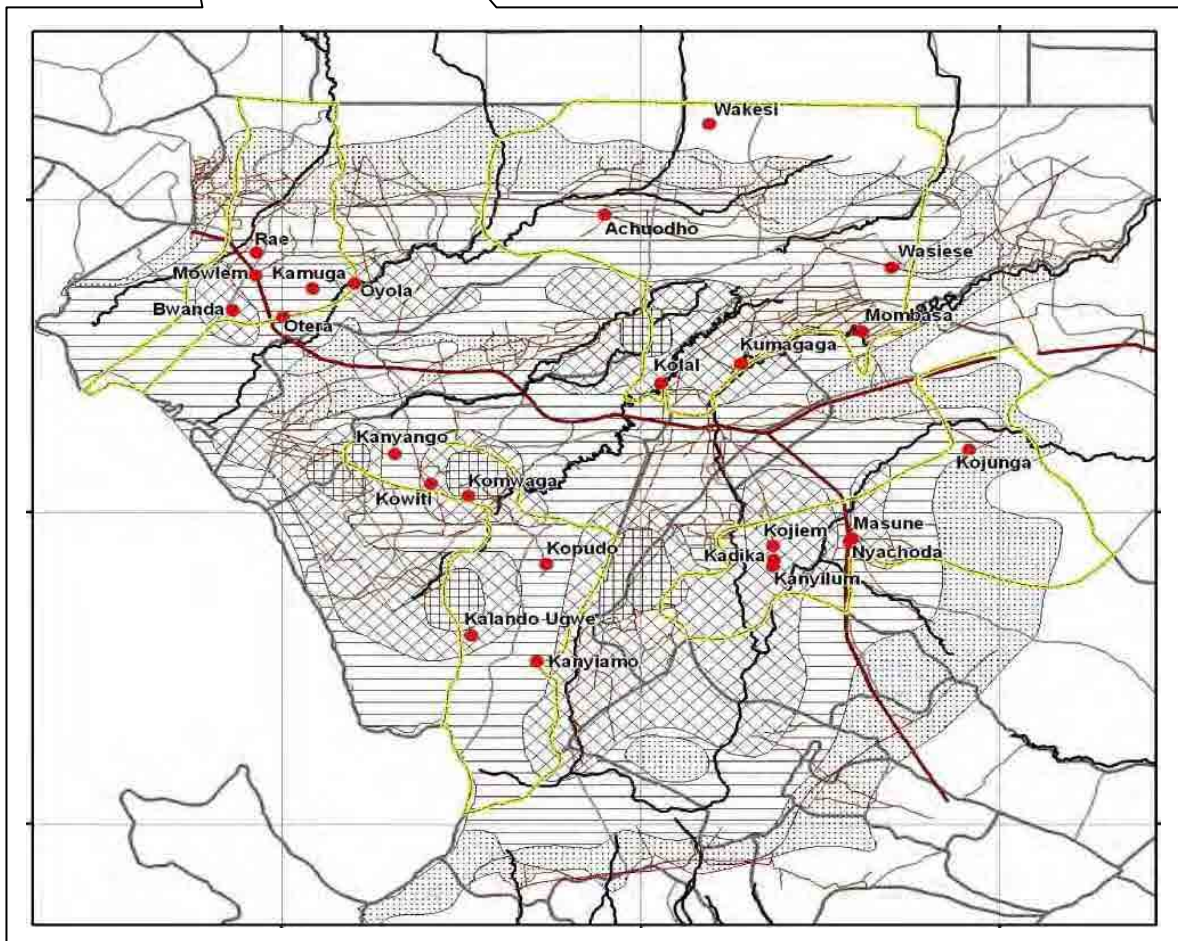
A handwritten signature in blue ink, appearing to read 'John P. Olum'. The signature is stylized and written on a light blue background.

*Eng. John P. Olum, HSC*  
*Chief Executive Officer, WRMA*





**KENYA**



(Source: JICA O/D Study Report 2008)

**PROGRAMME AREA**

## Acronyms and Glossary

BL/R	Baseline Report
CBO	Community Based Organization
C/P	Counter Part
CMS	Catchment Management Strategy
CFMO	Community-driven Flood Management Organization
DC	District Commissioner
DDMC	District Disaster Management Committee
DEO	District Education Officer
DO	District Officer
DDO	District Development Officer
DOC	Disaster Operation Centre
FDC	Flood Disaster Cycle
FMU	Flood Management Unit
FMP	Flood Management Plan
GOK	Government of Kenya
GIS	Geographic Information System
GM	Gucha Migori
IC/R	Inception Report
IPCC	The Intergovernmental panel on Climate Change
IFM	Integrated Flood Management
IFMC	Integrated Flood Management Committee
LOGUMI	Lower Gucha Migori
KRCS	Kenya Red Cross Society
LOGUMI WRUA	Lower Gucha Migori Water Resource User Association
MEWNR	Ministry of Environment, Water Natural Resources
M/M	Minutes of Meeting
R/D	Record of Discussions
OJT	On the Job Training
O&M	Operation and Maintenance
JCC	Joint Coordinating Committee
JICA	Japan International Cooperation Agency
JOCV	Japan Overseas Cooperation Volunteers
PCM	Project Cycle Management
PDM	Project Design Matrix
P/R	Progress Report
SC	Sub-catchment
SCMP	Sub-catchment Management Plan
SRO	Sub-regional Office
NWRMS	National Water Resource Management Strategy
NWRS	National Water Resource Strategy
RGS	River Gauging Station
RO	Regional Office
WRUA	Water Resource User Association
WSTF	Water Service Trust Fund
WDC	WRUA Development Cycle
WRMA	Water Resource Management Authority
WG	Working Group

Source Inception Report



**Project on Capacity Development  
for  
Effective Flood Management  
in  
Flood Prone Areas  
Lesson Learnt: Case Study Nyando Project**

**TABLE OF CONTENTS**

<b>1</b>	<b>BACKGROUND OF THE NYANDO RIVER BASIN.....</b>	<b>- 1 -</b>
1.1	OVERVIEW OF THE NYANDO RIVER BASIN.....	- 1 -
1.2	NYANDO RIVER BASIN FLOOD MANAGEMENT PROJECTS.....	- 4 -
<b>2</b>	<b>PROJECT OUTLINE.....</b>	<b>- 5 -</b>
2.1	MASTER PLAN STUDY.....	- 5 -
2.2	PROGRAMME.....	- 6 -
2.3	PROJECT AREA FOR THE PROGRAMME.....	- 6 -
<b>3</b>	<b>TYPE OF THE FLOOD MEASURE ACTIVITIES .....</b>	<b>- 8 -</b>
<b>4</b>	<b>CASE STUDIES.....</b>	<b>- 10 -</b>
4.1	MASTER PLAN STUDY.....	- 11 -
4.1.1	<i>Odesso Village.....</i>	<i>- 11 -</i>
4.1.2	<i>Kokwaro village .....</i>	<i>- 13 -</i>
4.1.3	<i>Kasiru village .....</i>	<i>- 17 -</i>
4.1.4	<i>Kogwedhi village .....</i>	<i>- 21 -</i>
4.1.5	<i>Siwot and Kamiwa village.....</i>	<i>- 23 -</i>
4.2	THE PROGRAMME .....	- 25 -
<b>5</b>	<b>LESSON LEARNT FROM THE NYANDO PROJECTS.....</b>	<b>- 37 -</b>
5.1	BRAINSTORMING SESSION.....	- 39 -
5.2	PROCESS OF DEVELOPING PROBLEM TREE.....	- 39 -
5.3	EVALUATION OF THE PROJECT .....	- 44 -
<b>6</b>	<b>CONCLUSIONS AND RECOMMENDATIONS .....</b>	<b>- 50 -</b>

# **1 Background of the Nyando River Basin**

In the Nyando Basin perennial floods are not a new phenomenon but the magnitude and the impacts of these floods have been on increase and this has led to disruption of livelihoods affecting both economic and social infrastructure of the region. The challenge that confronts the basin in the context of floods is as follows: how can this flood water that comes once or twice a year and wrecks havoc in the region can be harnessed and properly utilized especially during the drought spells that follows often after the floods in order to ensure sustainable economic growth and reduce poverty in the region.

It is worth noting that Nyando River Basin experiences two seasons of rainfall March to May which is characterized by long rains while October to December is characterized by short rains. Climate change has led to increase in the magnitude and areas that are affected by flooding. Japan International Cooperation Agency (hereinafter referred to as the “JICA”) carried out the Master Plan Study in 2006-2008 which had a component of pilot projects in five villages. Thereafter the Programme for Community-based Flood Disaster Management to Adapt to Climate Change in the Nyando River Basin which was implemented in twenty four (24) villages and it entailed both structural and non-structural measures. In the structural measures evacuation centres, storage, toilets, footbridges, culverts, weir and boreholes were constructed while in the non-structural measures various capacity building trainings in community flood management were undertaken that aimed to empower community members to undertake various measures in mitigating through proper management of floods.

## ***1.1 Overview of the Nyando River Basin***

The Geographic location of the Project Area is between 95° 40' East longitudes and between 05° 15' and 8° 05' 40' North latitude. The average annual rainfall is 1,000 mm/year. In the Project Area there are two major rainfall seasons that are experienced i.e. long rainy season (experienced between March and May), and the short rainy season experienced between October and November. Nyando river basin in western Kenya is one of the basins that drain into Lake Victoria in Eastern Africa. It stretches from the Nandi hills to the East all the way to Lake Victoria. The upper part of the Nyando river basin lie between 1800 and 3000 meters above sea level. The River Nyando basin covers three administrative districts namely; Muhoroni, Kisumu East and Nyando districts. In the lower parts of NyandoBasin we find Kano Plains, the area is called Kano Plains because of the flatness of the land. Given the nature of its topography, Kano plains are often affected by floods twice a year.

There are two rainy seasons in the Nyando River Basin. Both rainy seasons affects the NyandoBasin leading to floods. The long rains season is usually in March till May and the short rains season is between September and December.

The source of Nyando River is traced to two indigenous forests; the Mau forest and Tinderet forest located in the Rift Valley. The other sources include the small rivers, streams and springs which feed into the main river and its surrounding. Some of the

examples of the small rivers and streams are; Awach, Nyalbiego, Asawo, Ombeyi, Miriu, Sondu, Omondo, Nyaidho, irrigation canals.

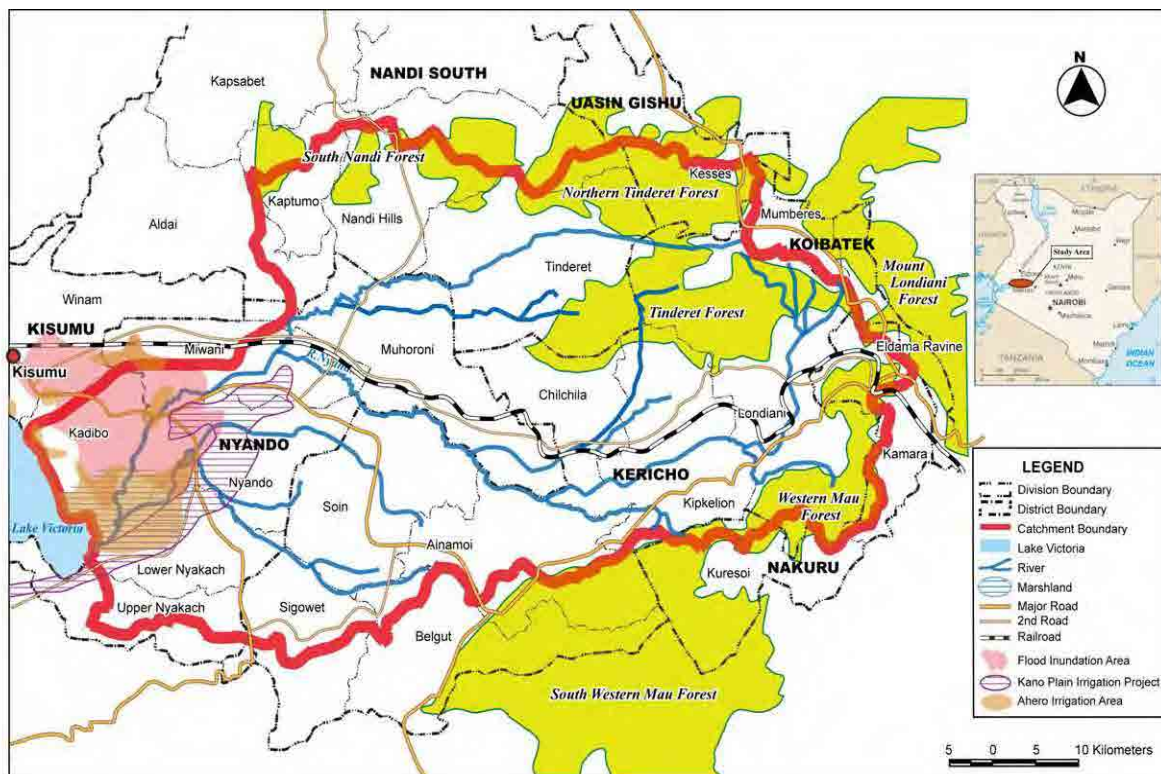
River Nyando basin is characterized by steep gradient of the terrain, and therefore, the basin experiences high level of soil erosion and thereby silting the river and drainage channels.

a) Water channels

There various water bodies in the Nyando River Basins which include rivers, streams, swamps, lakes etc. the river and streams flow through which water flows in the lower Nyando river basin are:

- ❖ River Nyando
- ❖ Awach stream
- ❖ Nyalbiego stream
- ❖ Asawo stream
- ❖ Ombeyi stream
- ❖ Miriu stream
- ❖ Sondu river
- ❖ Omondo stream
- ❖ Nyaidho stream
- ❖ Irrigation canals

These stream and rivers are made shallow by silt deposits causing the water to overflow their channels thereby causing floods.



(Source: JICA IFM Study Team)

**Figure 1: Drainage pattern for Nyando River**

b) Gradient

It is the general slope of the land. In the highlands the slope are steep, water therefore flows at

a high speed. The water carries a lot of debris to the lowlands, which get deposited in the channels due to low speed. The deposits make the channels shallow and may also block them, causing the water to overflow the traditional channels, resulting to floods.

c) Type of soil

The lower Nyando river basin has black cotton soil (clay soil) which has fine particles. The fine particles close up when wet, reducing the rate of water infiltration into the soil. A lot is therefore retained on the surface causing flooding. Heavy vegetation blocking the water channel causes the water to overflow the already shallow channels thereby causing floods.



d) River meanders

In the lower catchments of Nyando river basin the gradient is low, thereby reducing the speed of water flowing in river channel.

This results in high deposits of silts blocking the channel. The river water therefore finds a new channel in which it flows on, by meandering, hence causing floods.

*(Source: Flood Management Textbook for Primary Pupils produced by Japan grant aid Project)*

***A meandered river channel***

e) The velocity of water.

When the water enters the lower catchments of the Nyando River Basin the speed slows down. This is partly due to the gentle gradient found in Kano Plains and the high deposits of silt and debris. The river channel is made shallow hence not able to contain the large amounts of water coming from uphill. The amount of water levels in this channel leads to overflowing of the river which results into floods.

## ***1.2 Nyando River Basin Flood Management Projects***

Nyando River Basin is one of the flood worst hit river basins in Kenya. In the Nyando Basin perennial floods are not a new phenomenon but the magnitude and the impacts of these floods have been on increase leading to dire devastation of economic and social infrastructure of the basin. It is based on this serious flood disaster problem that two Projects have been undertaken in the river basin.

In concert with a request of the Government of Kenya, the Government of Japan determined to provide both a ‘Technical Assistance Project’ and a ‘Programme Grand Aid for Environment and Climate Change’ for establishing a flood management system by implementing structural and non-structural measures in the Nyando River Basin.

On behalf of the Japanese Government, both the Japan International Cooperation Agency (JICA) and the Japan International Cooperation System (JICS) carried out the two Projects in Nyando River Basin in Kisumu County :

- JICA’s Study on ‘the Integrated Flood Management for Nyando River Basin (MP Study)’ ; and
- JICS’s Study on ‘Nyando Community-based Flood Disaster Management to Adapt to Climate Change in the Nyando River Basin (NCFM Project)’, respectively.

Currently the Japan Government in concerted effort to assist Kenya Government in dealing with flood disaster has funded the implementation of the Project for Capacity Development for Effective Flood Management in Flood Prone Areas. The Project is currently being implemented in three pilot Project Areas i.e. Gucha Migori River Basin, Isiolo River Basin and Lumi River Basin. It is imperative therefore to have a glimpse of the flood management in the Nyando as a case study of success story of community driven integrated flood management approach in flood prone areas.

The main objectives of the case study are:

- To understand the strengths and weakness of the Nyando Project;
- To extract lessons from the Nyando Project and share these lessons;
- To improve on the Nyando by avoiding bad experiences and improving on the good lessons on flood management activities in Nyando, and
- To expand such flood management activities to other catchments.

## 2 PROJECT OUTLINE

### 2.1 *Master Plan Study*

#### **JICA's Study on the Integrated Flood Management for the Nyando River Basin**

Study on the Integrated Flood Management for Nyando River Basin was implemented in the year 2006 to 2008. During the MP Study there were pilot project areas that were implemented in five villages namely Odesso, Kokwaro, Kasiru, Kogwedhi (all from the downstream) and Chilichilla (in the upstream).

Structural measures were undertaken in the five villages as follows: 1) Odesso Village: Riverbank protection at R. Nyamasaria and installation of evacuation routes and Flood Hazard Map signboard; 2) Kokwaro Village: Raised road, Evacuation Centre, two compartment toilets and installation of evacuation routes and Flood Hazard Map signboard; 3) Kasiru Village: Raised road, borehole with a handpump, two compartment toilets and installation of evacuation routes and Flood Hazard Map signboard; 4) Kogwedhi Village: Compacted 100M dyke and installation of evacuation routes and Flood Hazard Map signboard; 5) Siwot and Chilichilla Villages: Riverbank protection at R. Kobieyet.

Non-structural measures which were mainly trainings and workshops were undertaken in the five villages as follows: 1) Odesso Village; 2) Kokwaro Village; 3) Kasiru Village; 4) Kogwedhi Village and 5) Chilichilla Village. For the villages in the downstream the trainings entailed community based flood management, basic first aid training, evacuation drills, organization establishment and management and operation and maintenance for the constructed structures. Also there was the education programme on flood management in primary school that targeted only class five. For the one village in the upstream only two trainings were undertaken i.e. organization establishment and management and operation and maintenance for the constructed structures.

During the implementation of the MP Study there was the Nyando Integrated Flood Management Forum that was established. The Forum consisted of stakeholders in the Nyando River Basin and they included community members, opinion leaders, relevant government agencies, relevant non-governmental organizations, academicians, KRCS and religious leaders.

The JICA Study Team and WRMA Regional Office Kisumu organized the Forum meeting. The first meeting was held at Imperial Hotel and the main issue raised was the allowances for the participants. The same issue was raised in the subsequent two meetings. The JICA Study Team reported the progress of the development of the Master Plan for Nyando and the implementation of the pilot projects.

During the meetings the suggestions and opinions of the stakeholders was taken into

account to eventually reflect in the final Master Plan for Nyando River Basin on Flood Management.

## **2.2 Programme**

### **JICA's Study on 'Nyando Community-based Flood Disaster Management to Adapt to Climate Change in the Nyando River Basin**

Japan Government through the Grant Aid for Adapting to Climate Change funded the Programme for Community-based Flood Disaster Management to Adapt to Climate Change in the Nyando River Basin.

The overall project objective of the Programme was to develop flood management systems within the communities located in flood prone areas in the Nyando River Basin. This objective therefore necessitated the Programme to be divided into two projects namely the Project for Construction of Evacuation Places and Routes and the Project for Building of Communities' Capacity in Flood Disaster Management.

The Programme was implemented in the twenty four (24) villages locate. The list of the villages was as follows:

01 Rae Kanyaika	07 Kanyango	13 Kolal	19 Kojiem
02 Mowlem	08 Komwaga	14 Wasiese	20 Kanyilum
03 Bwanda	09 Kowiti	15 Kamagaga	21 Kadika
04 Otera	10 KamgetUgwe	16. Wangaya Mombasa	22 Nyachoda
05 Kamuga	11 Kopudo	17 Achuodho	23 Masune
06 Oyola	12 Kanyiamo	18 Wakesi	24 Kojunga

## **2.3 Project Area for the Programme**

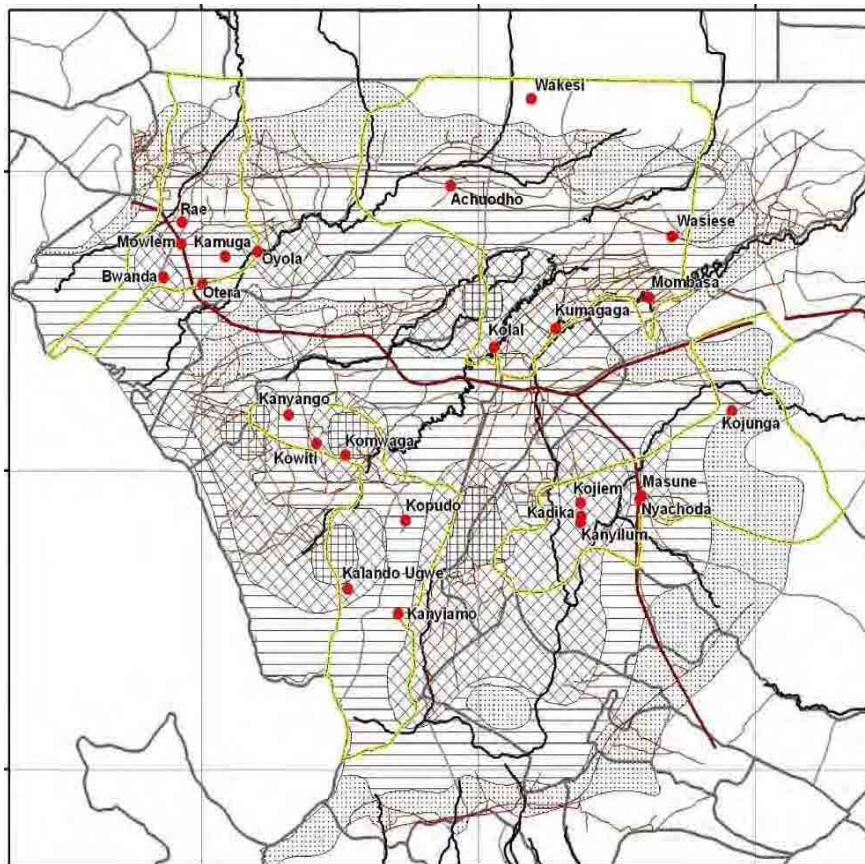
The Project Area consisted of the twenty-four (24) villages located in Kisumu East, Nyando and Muhoroni Districts in Nyanza Province in the Republic of Kenya. These twenty-four (24) villages were predetermined by the O/D Study based on developed Community Action Plan (CAP) by each of the twenty four villages.



**Table 1 Targeted Villages within their Provincial Administration Location**

District	Location	Sub-Location	Village
Kisumu East	Kolwa Central	Nyalunya	01 Rae Kanyaika
			02 Mowlem
			03 Bwanda
			04 Otera
			05 Kamuga
			06 Oyola
	Bwanda	Upper Bwanda	07 Kanyango
			08 Komwaga
			09 Kowiti
	Kanyagual	Central Bwanda	10 KamgetUgwe
		Anyuro	11 Kopudo
Muhoroni	Ombeyi	Ogenya	12 Kanyiamo
		Kore	13 Kolal
			14 Wasiese
		Rice Scheme	15 Kamagaga
			16 WangayaMombasa
		Kang'o	17 Achuodho
		Obumba	18 Wakesi
Nyando	Wawidhi	Magina	19 Kojiem
			20 Kanyilum
			21 Kadika
		Ayweyo	22 Nyachoda
			23 Masune
			Nyakong'o

(Source: The Consultants)



(Source: JICA O/D Study Report 2008)

**Figure 2 Nyando Project Area**

### 3 TYPE OF THE FLOOD MEASURE ACTIVITIES

During the implementation of Nyando Project both for MP Study and the Programme the integrated approach on the countermeasures was adopted. In both Projects the Structural Measures and Non-structural Measures were implemented concurrently and complimentarily.

The table 2 below indicates the structure and non-structure measures that were implemented under the MP Study.

**Table 2 Flood Countermeasures for pilot projects under MP Study**

Measures	Odesso Village	Kokwaro Village	Kasiru Village	Kogwedhi Village	Siwot&Kamiwa Village
<b>Structural Measures</b>					
Riverbank Protection	○				○
Evacuation Center		○			
Toilets (2 compartment)		○	○		
Borehole			○		
Dyke				○	
Signboards	○	○	○	○	
<b>Non-structural Measures</b>					
Group formation (org.)	○	○	○	○	
Organization Development	○	○	○	○	
Resource Mobilization (funds)	○	○	○	○	
O&M of constructed structures	○	○	○	○	
Community based flood management	○	○	○	○	
First Aid and safety measures during floods	○	○	○	○	
Evacuation drill	○	○	○	○	
Education Programmes for pupils	○	○	○	○	

The table 3 below indicates the structure and non-structure measures that were implemented under the Programme.

**Table 3 Flood Countermeasures under the Programme**

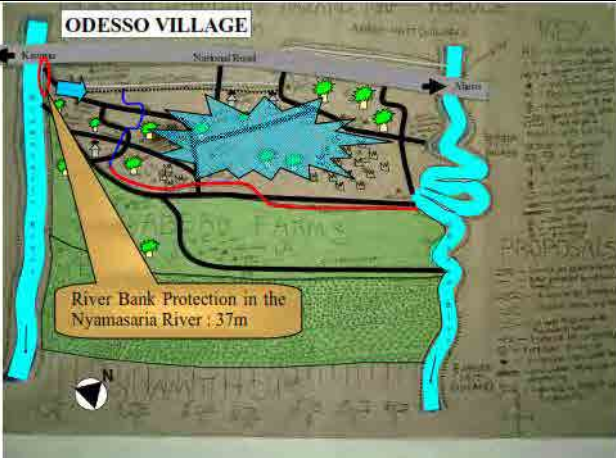
Villages	Evacuation Center	Storage	Toilets	Borehole	Weir	Culverts	Footbridges	Signboards
01 Rae Kanyaika						○		○
02 Mowlem	○		○					○
03 Bwanda				○		○		○
04 Otera						○		○
05 Kamuga	○		○	○		○		○
06 Oyola				○		○		○
07 Kanyango	○				○	○		○
08 Komwaga	○		○					○
09 Kowiti		○	○					○
10 KamgetUgwe						○		○
11 Kopudo				○		○		○
12 Kanyiamo	○		○			○		○
13 Kolal	○		○					○
14 Wasiese						○		○
15 Kamagaga	○		○				○	○
16 WangayaMombasa				○			○	○
17 Achuodho	○		○	○		○		○
18 Wakesi				○		○		○
19 Kojiem				○				○
20 Kanyilum		○		○				○
21 Kadika				○			○	○
22 Nyachoda						○	○	○
23 Masune			○	○				○
24 Kojunga							○	○

## 4 CASE STUDIES


During the implementation of the MP Study there were five pilot projects that were undertaken in five locations.

## 4.1 Master Plan Study

### 4.1.1 Odesso Village

Sub-county	Kisumu East
Location	Kolwa Central
Sub-location	Kasule
Village/ Community	Odesso
Location	
Natural condition	<p>The major river in the area is the Nyamasaria River which flows in a northeast to southeast direction as it passes through the village. There is also Odesso River which is a seasonal river but becomes a big river during rainy seasons. The greater Kano Plains area wherein this village is located is underlain by a succession of sediments. These deposits are both fluvial and lacustrine in origin and vary from colluviums to alluvium, and lacustrine clays of permanent swamps. The village borders the River Nyamasaria which carries and deposits sand in the area. Therefore upper layer of soils in the area is mainly sandy soil which overlays on the black cotton soil.</p> <p>The drainage system in the village is poor and inadequate and needs regular maintenance especially the scooping of silt from the drainage canals in the area.</p>
Social economic condition	Odesso is a para-urban village located near Kisumu City. Because of the proximity of the village to Kisumu City the area is cosmopolitan with people from other areas having their residence at Odesso. The indigenous community members are mainly farmers and fishermen and also keep livestock, the young men in the area are also involved in sand harvesting
Flood characteristic	The drainage system in the village is poor and during heavy rains the area is affected by flash floods. River Nyamasaria breaks its bank near the bridge and inundates the village
Structural measure	<ul style="list-style-type: none"> <li>-A: Riverbank protection</li> <li>-B: Signboards for purposes of evacuation</li> </ul>
Non-Structural measure	<ul style="list-style-type: none"> <li>-A: CFMO Organization development</li> <li>-B: First Aid and safety measures during floods</li> <li>-C: Evacuation drills</li> <li>-D: Operation and Maintenance of constructed structures</li> <li>-E: Education Programme for primary pupils: Target Class STD five</li> </ul>

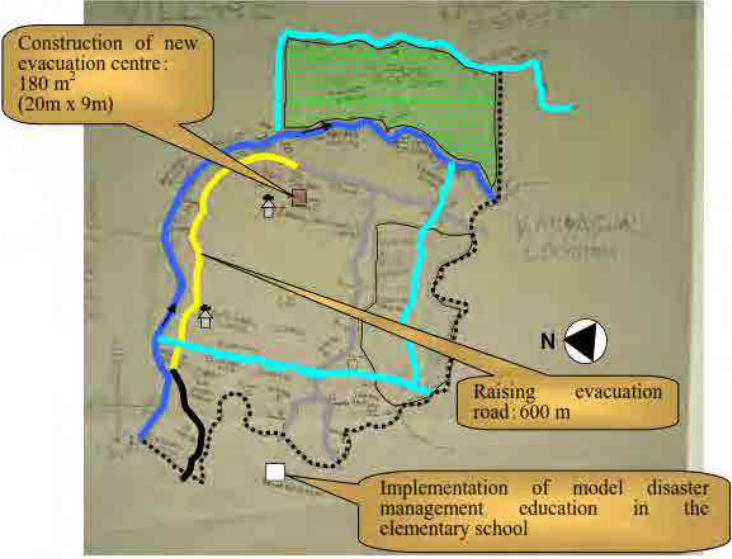
Structural measure A

	Riverbank Protection
Outline	Riverbank protection using gabion mattress
Selected reason	The river breaks the bank at one particular point as a result of debris that blocks the water way leading to water to overflow into the Odesso village
Drawings / Picture	
Outline of construction works	-Construction cost : 2,908,000 KSH -Construction work period: 6 month -Picture of construction
Management system	Community managed through the Odesso CBO
Impact	Reduced flood damage in Odesso village
Comment from community	Since the riverbank was constructed community members have diligently taken care of the gabions to avert vandalism of the wire mesh. The riverbank protection has reduced the impact of floods in Odesso village by keeping the water in the river channel.

(Source of pictures in the above table: JICA MP Study Report 2006-2008)




#### 4.1.2 Kokwaro village

Sub-county	Kisumu East
Location	Kanyagual
Sub-location	Anyuro
Village / Community	Kokwaro
Location	
Natural condition	<p>River Miriu passes through Kokwaro village as it flows downstream to the L. Victoria. The greater Kano Plains area wherein this village is located is underlain by a succession of sediments. These deposits are both fluvial and lacustrine in origin and vary from colluviums to alluvium, and lacustrine clays of permanent swamps. The village borders the River Nyamasaria which carries and deposits sand in the area. Therefore upper layer of soils in the area is mainly sandy soil which overlays on the black cotton soil.</p> <p>The drainage system in the village is poor and inadequate and needs regular maintenance especially the scooping of silt from the drainage canals in the area.</p>
Social economic condition	The area consist people from the Luo Tribe and mainly from Kokwaro clan. The community members are predominantly rice farmers and Also fishermen but they also keep livestock.
Flood characteristic	The area is affected by long-term inundation as a result of R. Mirui overflowing. The overflow is not necessarily as a result of heavy rains in the area but rain from the upstream.
Structural measure	<ul style="list-style-type: none"> <li>-A: Evacuation centre</li> <li>-B: Toilets</li> <li>-C: Raised Road</li> <li>-D: Signboards</li> </ul>
Non-Structural measure	<ul style="list-style-type: none"> <li>-A: CFMO Organization development</li> <li>-B: First Aid and safety measures during floods</li> <li>-C: Evacuation drills</li> <li>-D: Operation and Maintenance of constructed structures</li> <li>-E: Education Programme for primary pupils: Target Class STD five</li> </ul>

(Source of pictures in the above table: JICA MP Study Report 2006-2008)



Structural measure A


	Evacuation Centre
Outline	Construction of evacuation centre that has kitchen and store
Selected reason	The village is affected by long-term inundation leading to longer period of evacuees staying out in the cold or disrupting education programmes at a nearby Bwanda Primary School
Drawings / Picture	
Outline of construction works	<ul style="list-style-type: none"> <li>-Construction cost : 4,000,000 KSH</li> <li>-Construction work period: 14 months</li> <li>-Picture of construction</li> </ul>
Management system	Community managed through the Kokwaro CBO
Impact	Affected community members have a rescue centre, the evacuation centre is used as kindergarten leading to improvement of school enrolment
Comment from community	The evacuation centre has given community members confidence to evacuate without fear of being asked to leave because of interference with programmes. Community members store their rice at evacuation centre after harvest instead of selling their produce to middlemen at throw away prices. Evacuation centre now acts as a kindergarten during dry season which has enhanced child enrollment in schools.

Structural measure B

	Toilet
Outline	Two compartment raised toilets with concrete works down from the pit
Selected reason	The village is collapse and caving in of toilets during floods leading to sanitation and hygiene crisis during floods
Drawings / Picture	
Outline of construction works	-Construction cost : 300,017 KSH -Construction work period: 5 months -Picture of construction
Management system	Community managed through the Kokwaro CBO
Impact	Improved sanitation and hygiene around the evacuation place leading to reduced new infections of waterborne diseases
Comment from community	The toilet does not cave in during floods but because of lack of bathroom evacuees use the toilet as bathroom while they stay at the evacuation centre.

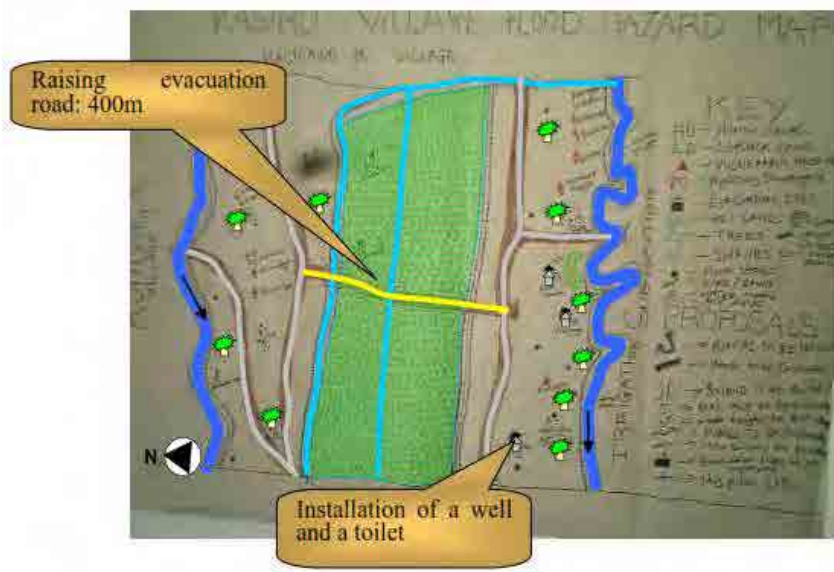
(Source of pictures in the above table: JICA MP Study Report 2006-2008)

Structural measure C

	Raised road
Outline	Community driven raised road that is raised using community labour and sandbagging and compaction raised 1M high which is above the flood depth
Selected reason	The village becomes inaccessible as a result of floods and also most injuries are accrued during evacuation wading through flood water.
Drawings / Picture	
Outline of construction works	-Construction cost :900,000 KSH -Construction work period: 3 months -Picture of construction
Management system	
Impact	
Comment from community	The raised road acts as a dyke and in some cases has led to flooding in the homesteads that were initially not affected by floods. The drainage canal that was a borrow pit for the raised road has become a breeding ground for fish fingernails that community use to trap fish in the Lake.


(Source of pictures in the above table: JICA MP Study Report 2006-2008)

### 4.1.3 Kasiru village

Sub-county	Muhoroni
Location	Ombeyi
Sub-location	Kore
Village / Community	Kasiru
Location	
Natural condition	<p>The rivers flowing through Kolal Village are river Miriu and Bacho Stream. The village is surrounded by rice paddies. The greater Kano Plains area wherein this village is located is underlain by a succession of sediments. These deposits are both fluvial and lacustrine in origin and vary from colluviums to alluvium, and lacustrine clays of permanent swamps. Therefore upper layer of soils in the area is mainly sandy soil which overlays on the black cotton soil.</p> <p>The drainage system in the village is poor and inadequate and needs regular maintenance especially the scooping of silt from the drainage canals in the area.</p>
Social economic condition	<p>The area consists of people from the Luo Tribe. The community members are predominantly rice farmers but they also keep livestock. The village is close to Ahero Township and therefore some of the community members are engaged in small businesses at Ahero.</p>
Flood characteristic	<p>The area is affected by long-term inundation as a result of R. Miriu and Bacho stream and rice paddies canals overflowing. The overflow is not necessarily as a result of heavy rains in the area but rain from the upstream.</p>
Structural measure	<ul style="list-style-type: none"> <li>-A: Raised toilet</li> <li>-B: Borehole</li> <li>-C: Raised</li> <li>-D: Signboards</li> </ul>
Non-Structural measure	<ul style="list-style-type: none"> <li>-A: CFMO Organization development</li> <li>-B: First Aid and safety measures during floods</li> <li>-C: Evacuation drills</li> <li>-D: Operation and Maintenance of constructed structures</li> <li>-E: Education Programme for primary pupils: Target Class STD five</li> </ul>

(Source of pictures in the above table: JICA MP Study Report 2006-2008)

Structural measure A

	Toilets
Outline	Two compartment raised toilets with concrete works down from the pit
Selected reason	The village is affected by collapse and caving in of toilets during floods leading to sanitation and hygiene crisis during floods
Drawings / Picture	
Outline of construction works	-Construction cost : 300,017 KSH -Construction work period: 5 month -Picture of construction
Management system	Community managed through the Kasiru CBO
Impact	Improved sanitation and hygiene at the evacuation place
Comment form community	The constructed toilet does not cave in during floods. The toilets are being used by community members especially their guest who visit the village

(Source of pictures in the above table: JICA MP Study Report 2006-2008)

Structural measure B

	Borehole
Outline	Drilling of borehole and installation of hand-pump
Selected reason	The village is affected by lack of clean drinking water during floods
Drawings / Picture	
Outline of construction works	-Construction cost : 1.2 Million KSH -Construction work period: 5 months -Picture of construction
Management system	Community managed through the Kokwaro CBO
Impact	Borehole addressed the problem of scarcity of clean drinking water, a shop was constructed near the borehole to tap into the big number of people that frequented the borehole
Comment form community	The village has clean drinking water that during dry spell not only community from Kasiru village draw water from the borehole but the whole sub-location walk long distances to draw water from the borehole.

(Source of pictures in the above table: JICA MP Study Report 2006-2008)



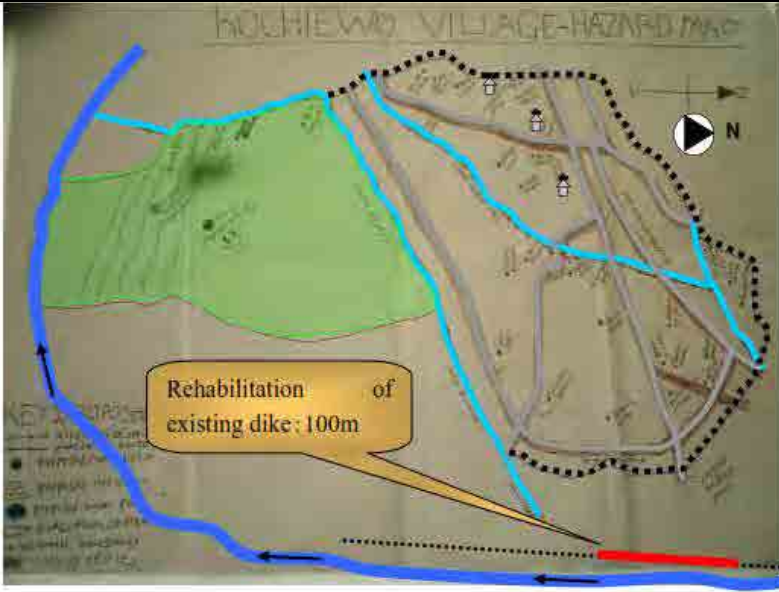
Structural measure C

	Raised road
Outline	Community driven raised road that is raised using community labour and sandbagging and compaction raised 1M high which is above the flood depth
Selected reason	The village becomes inaccessible as a result of floods and also most injuries are accrued during evacuation wading through flood water.
Drawings / Picture	
Outline of construction works	-Construction cost : 900000 KSH -Construction work period: XXX month -Picture of construction
Management system	Community managed through the Kasiru CBO
Impact	Improved accessibility in the village with the area that was divided by rice paddies being made accessible by the raised road
Comment from community	The raised road acts as a link between the two divides of the village that are separated by rice paddies and become totally inaccessible during floods but after construction now the village is accessible.

(Source of pictures in the above table: JICA MP Study Report 2006-2008)



#### 4.1.4 Kogwedhi village

Sub-county	Nyando
Location	Wawidhi
Sub-location	Magina
Village / Community	Kogwedhi
Location	
Natural condition	<p>The river that flows through Kogwedhi is river Nyando. The village is surrounded by sugarcane plantations. The greater Kano Plains area wherein this village is located is underlain by a succession of sediments. These deposits are both fluvial and lacustrine in origin and vary from colluviums to alluvium, and lacustrine clays of permanent swamps. Therefore upper layer of soils in the area is mainly sandy soil which overlays on the black cotton soil.</p> <p>The drainage system in the village is poor and inadequate and needs regular maintenance especially the scooping of silt from the drainage canals in the area.</p>
Social economic condition	<p>The area consists of people from the Luo Tribe. The community members are predominantly farmers but they also keep livestock. The main cashcrop in the area is sugarcane and rice. The village is also close to Ahero Township and therefore some of the community members are engaged in small businesses at Ahero.</p>
Flood characteristic	<p>The area is affected by long-term inundation as a result of R. Nyando breaking its banks and overflowing into the village. The overflow is not necessarily as a result of heavy rains in the area but rain from the upstream.</p>
Structural measure	<p>-A: Dyke -B: Signboards</p>
Non-Structural measure	<p>-A: CFMO Organization development -B: First Aid and safety measures during floods -C: Evacuation drills -D: Operation and Maintenance of constructed structures -E: Education Programme for primary pupils: Target Class STD five</p>

Structural measure A

	Dyke
Outline	Construction of a 100M dyke with compaction after every 30CM reinforced by sandbags and the edges of the dykes are planted by grass and a cattle ramp
Selected reason	The village is affected by rampant breach of the constructed dykes
Drawings / Picture	
Outline of construction works	-Construction cost : 2,842,040 KSH -Construction work period: 8 months -Picture of construction
Management system	Community managed through the Kogwedhi CBO
Impact	Reduced flood damage to homes near the dyke, the dyke has never ever been breached in spite of the intensive floods in the area.
Comment form community	The constructed dyke has never been breached and the grass on the side have stabilized the dyke


(Source of pictures in the above table: JICA MP Study Report 2006-2008)

#### 4.1.5 Siwot and Kamiwa village

Sub-county	Kericho
Location	Chilchilla
Sub-location	Chilchilla
Village / Community	Siwot and Kamiwa
Location	
Natural condition	The major river in the area is the Bararget River which through Siwot and Kamiwa village. The soil is volcanic alluvial soil.
Social economic condition	The indigenous community members are of Kalenjin Tribe. The community members are mainly farmers and livestock keepers. The main cash crop planted in the area include coffee, tea and sugarcane and the food crop planted include maize and beans
Flood characteristic	The area is affected by flash floods as a result of the river breaking its bank
Structural measure	-A: Riverbank protection -B: Signboards for purposes of evacuation
Non-Structural measure	N/A

(Source of figure in the above table: JICA MP Study Report 2006-2008)

Structural measure A

	Riverbank Protection
Outline	Riverbank protection using gabion mattress
Selected reason	The river breaks the bank at one particular point as a result of debris that blocks the water way leading to water to overflow into the Siwot and Kamiwavillage
Drawings / Picture	
Outline of construction works	-Construction cost : 634,000 KSH -Construction work period: 3 months -Picture of construction
Management system	Community managed through the Chilichilla CBO
Impact	The water does not overflow to the road leading to disruptions of transport network
Comment from community	Since the riverbank was constructed community members have diligently taken care of the gabions to avert vandalism of the wire mesh. The riverbank protection has reduced the impact of flash floods in Siwot and Kamiwa village by keeping the water in the river channel.

(Source of pictures in the above table: JICA MP Study Report 2006-2008)

## **4.2 The Programme**

The natural conditions, soil type and conditions of existing drainage structures is as indicated below. The source of this information is the Community based Flood Management Manual that was developed under the Nyando Project

### **(1) Rae Kanyaika Village**

#### **a) River and catchment areas (physical conditions)**

The major river in the area is the Nyamasaria River which flows in a northeast to southeast direction as it passes through the village.

#### **b) Soil type**

The soil in the area is mainly sandy soil which overlays on the black cotton soil.

#### **c) Conditions of the existing drainage structures**

The drainage system in the village is poor and inadequate and needs regular maintenance especially the scooping of silt from the drainage canals in the area.

### **(2) Mowlem Village**

#### **a) River and catchment areas (physical conditions)**

The two main rivers in the area are Rivers Nyamasaria and Odesso (which is a seasonal river).

#### **b) Soil type**

The greater Kano Plains area wherein this village is located is underlain by a succession of sediments. These deposits are both fluvial and lacustrine in origin and vary from colluviums to alluvium, and lacustrine clays of permanent swamps. The village borders the River Nyamasaria which carries and deposits sand in the area. Therefore upper layer of soils in the area is mainly sandy soil which overlays on the black cotton soil.

#### **c) Conditions of the existing drainage structures**

The drainage system in the village is poor and inadequate and needs regular maintenance especially the scooping of silt from the drainage canals in the area.

### **(3) Bwanda Village**

#### **a) River and catchment areas (physical conditions)**

Odesso River (a seasonal river) functions as a border between Bwanda and the neighbouring Odesso village. Proximity of Bwanda facing to Lake Victoria makes the area vulnerable to the drawback waters from the lake when the Nyamasaria River and other rivers in the region that are draining into the lake. Because of the receding phenomena of the waters of Lake Victoria, a gulf of fertile land has since emerged which the communities in the area have converted into farmlands known as Nyamthoi whereby most of the farming activities in the village take place.

**b) Soil type**

The soil type in Bwanda Village is mainly Black Cotton Soil.

**c) Condition of the existing drainage structures**

The drainage system in the village is poor and inadequate and needs regular maintenance especially the scooping of silt from the drainage canals in the area.

**(4) Otera Village**

**a) River and catchment areas (physical conditions)**

There is Nyamria seasonal stream in the village.

**b) Soil type**

The soil type in Otera Village is mainly Black Cotton Soil.

**c) Conditions of the existing drainage structures**

The drainage system in the village is poor and inadequate and needs regular maintenance especially the scooping of silt from the drainage canals in the area.

**(5) Kamuga Village**

**a) River and catchment areas (physical conditions)**

River Mayenya/Lwando is crossing through the village.

**b) Soil type**

The area is extensively covered by sandy soil that overlays and mixes with the clay soil leading to soil formation of loamy soil.

**c) Conditions of the existing drainage structures**

The drainage system in the village is poor and inadequate and needs regular maintenance especially the scooping of silt from the drainage canals in the area.

**(6) Oyola Village**

**a) River and catchment areas (physical conditions)**

River Mayenya/Lwando passes through the village.

**b) Soil type**

The soil type is mainly black cotton soil but there are areas with large amounts of sandy soils.

**c) Conditions of the existing drainage structures**

The drainage system in the village is poor and inadequate and needs regular maintenance especially the scooping of silt from the drainage canals in the area.

**(7) Kanyango Village**

**a) River and catchment areas (physical conditions)**

The Ombeyi River passes through the village, Orije stream is located in the village and Bwije canal also passes through the village.

**b) Soil type**

The soil type in the area is purely black cotton soil.

**c) Conditions of the existing drainage structures**

The existing drainage structures are adequate.

**(8) Komwaga Village**

**a) River and catchment areas (physical conditions)**

There are two main rivers in Komwaga Village are Ombeyi and Orije.

**b) Soil type**

The main soil type in the project village is black cotton soil.

**c) Conditions of the existing drainage structures**

The existing drainage structures for the village are adequate and functions in channeling flood water away from the village.

**(9) Kowiti Village**

**a) River and catchment areas (physical conditions)**

The village has two (2) streams, Orojno and Orije.

**b) Soil type**

The soil type in the village is majorly black cotton soil.

**c) Conditions of the existing drainage structures**

The existing drainage structures are adequate and functions efficiently channeling flood waters away from the village.

**(10) KamgetUgwe Village**

**a) River and catchments areas (physical conditions)**

The rivers that flow through KamgetUgwe including Aguko, Dajo and Abwogo village are the tributaries of River Nyando.

**b) Soil type**

Soil type for KamgetUgwe is mainly black cotton soil.

**c) Conditions of the existing drainage structures**

The existing drainage structures are inadequate and need proper maintenance.

**(11) Kopudo Village**

**a) River and catchment areas (physical conditions)**

River Miriu passes through Kopudo village as it flows downstream.

**b) Soil type**

The soil type for Kopudo Village is black cotton soil.

**c) Performance of the existing drainage structures**



The existing drainage structures are inadequate and need proper maintenance and improvement.

**(12) Kanyiamo Village**

**a) River and catchment areas (physical conditions)**

The two (2) rivers flowing through the village are Miriu and Aguko.

**b) Soil type**

The soil type for Kanyiamo Village is majorly black cotton soil.

**c) Conditions of the existing drainage structures**

The existing drainage structures are inadequate and need proper maintenance.

**(13) Kolal Village**

**a) River and catchment areas (physical conditions)**

The rivers flowing through Kolal Village are river Miriu and Bacho Stream.

**b) Soil type**

The soil type for Kolal Village is majorly black cotton soil.

**c) Conditions of the existing drainage structures**

The existing drainage structures in Kolal are adequate for channeling away excessive run off.

**(14) Wasiese Village**

**a) River and catchment areas (physical conditions)**

The rivers that flow through the village are River Oroba-Ombeyi and River Nyakoko.

**b) Soil type**

The soil type in the village is majorly black cotton soil.

**c) Condition of the existing drainage structures**

The existing drainage structures are inadequate and need proper maintenance.

**(15) Kamagaga Village**

**a) River and catchment areas (physical conditions)**

The rivers flowing through Kamagaga village are River Nyando and River Miriu.

**b) Soil type**

The soil type in the village is mainly black cotton soil.

**c) Condition of the existing drainage structures**

The existing drainage structures are inadequate and need proper maintenance for

**(16) Wangaya Mombasa Village**

**a) River and Catchment Areas (Physical Conditions)**

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River Nyando prominently passes through the village on its border as the river flows downstream.

**b) Soil type**

The soil type in the village is majorly black cotton soil.

**c) Condition of the existing drainage structures**

The existing drainage structures are adequate and are regularly maintained by the NIB.

**(17) Achuodho Village**

**a) River and catchment areas (physical conditions)**

Angwecha Stream flows through Achuodho village.

**b) Soil type**

The soil type in the village is majorly black cotton soil

**c) Condition of the existing drainage structures**

The existing drainage structures are not adequate and most of which are blocked due to irregular and at times lack of maintenance.

**(18) Wakesi Village**

**a) River and catchment areas (physical conditions)**

The two rivers flowing through Wakesi Village are River Aol and River Oseng'teti.

**b) Soil type**

The soil type in the village is primarily black cotton soil with a lot of silt deposits.

**c) Condition of the existing drainage structures**

The existing drainage structures are not adequate due to lack of maintenance.

**(19) Kojjem Village**

**a) River and catchment areas (physical conditions)**

There are four (4) rivers that flow through Kojjem village these including: i) Rivers Nyando, ii) R. Agala, iii) R. Nyaidho and iv) R. Awach Kano.

**b) Soil type**

The soil type in the village is basically black cotton soil.

**c) Condition of the existing drainage structures**

The existing drainage structures are inadequate and the few that are in existence are blocked due to lack of maintenance.

**(20) Kanyilum Village**

**a) River and catchment areas (physical conditions)**

River Nyando passes through Kanyilum village as it flows downstream to Lake Victoria.

**b) Soil type**

The soil type in the village is majorly black cotton soil

**c) Condition of the existing drainage structures**

The existing drainage structures are inadequate and the few that are in existence are blocked due to lack of maintenance.

**(21) Kadika Village**

**a) River and catchment areas (physical conditions)**

There are three rivers that are crossing through Kadika Village namely R. Nyando, R. Awach Kano and R. Nyalbiego.

**b) Soil type**

The soil type in the village is majorly black cotton soil.

**c) Condition of the existing drainage structures**

The existing drainage structures are inadequate but also they are silted due to lack of maintenance.

**(22) Nyachoda Village**

**a) River and catchment areas (physical conditions)**

There are three main rivers that flows through Nyachoda Village namely R. Awach Kano, R. Chamrogi and R. Burlo

**b) Soil type**

The soil type in the village is majorly black cotton soil with patches of sandy areas.

**c) Condition of the existing drainage structures**

The existing drainage structures are inadequate and also they are poorly maintained.

**(23) Masune Village**

**a) River and catchment areas (physical conditions)**

River Chamrogi flows through Masune Village.

**b) Soil type**

The soil type in the village is majorly black cotton soil with patches of sandy areas.

**c) Condition of the existing drainage structures**

The existing drainage structures are not adequate and are poorly maintained.

**(24) Kojunga Village**

**a) River and catchment areas (physical conditions)**

Ogari Stream is the main water body in Kojunga village.

**b) Soil type**

The soil type in the village is majorly black cotton soil.

**c) Performance of the existing drainage structures**

The existing drainage structures are adequate.

Table 4 below highlights the flooding conditions in the twenty four villages under the Programme.

**Table 4 Flooding Conditions in the 24 villages under the Programme**

Name of the village	Source of floods	Periods of Flooding	Duration of Inundation	Condition of Flooding
Rae Kanyaika	R. Nyamasaria, surface run-off water	April-May	3-7 days	1. Roads fairly accessible
		Oct, Nov and Dec.	1-2 days	2. Evacuate to Rae Kanyaika Primary 3. Lives lost and Crops and livestock are washed away
Mowlem	R. Nyamasaria, surface run-off water	April-May	3-7 days	1. Roads fairly accessible
		Oct, Nov and Dec.	1-2 days	2. Evacuate to Rae Kanyaika Primary 3. Lives lost and Crops and livestock are washed away
Bwanda	R. Nyamasaria, R. Odesso and surface run-off water	April-May	7-14 days	1. Roads becomes difficult in a accessibility
		Oct, Nov and Dec.	5-7 days	2. Evacuate to Bwanda Primary 3. Lives lost and Crops and livestock are washed away
Kamuga	R. Mayenya, surface run-off water	April-May	2-5 days	1. Roads are not easily accessible
		Oct, Nov and Dec.	2-3 days	2. Evacuate to Ofunyu Primary 3. Lives lost and Crops and livestock are washed away
Otera	R. Mayenya, surface run-off water	April-May	2-5 days	1. Roads are not easily accessible
		Oct, Nov and Dec.	2-3 days	2. Evacuate to Buoye Primary and raised homesteads in the village 3. Lives lost and Crops and livestock are washed away
Oyola	R. Mayenya, surface run-off water	April-May	2-5 days	1. Roads are not easily accessible
		Oct, Nov and Dec.	2-3 days	2. Evacuate to Oyola Primary 3. Lives lost and Crops and livestock are washed away
Kanyango	R. Orognno, R. Mirui, R. Orije and rice scheme water channels and surface run-off water	April to June	10-14 days	1. Roads becomes impassable
		Oct, Nov and Dec.	10-14 days	2. Evacuate to Kadete Primary 3. Lives lost and Crops and livestock are washed away
Kowiti	R. Orije and surface run-off water	April to June	7-10days	1. Roads becomes impassable
		Oct, Nov and Dec.	5-7 days	2. Evacuate to ACK Kowiti and Reru Primary 3. Lives lost and Crops and livestock are washed away
Komwaga	R. Orije and surface run-off water	April to June	7-10days	1. Roads becomes impassable
		Oct, Nov and Dec.	5-7 days	2. Evacuate to newly constructed evacuation centre 3. Lives lost and Crops and livestock are washed away
Kopudo	R. Mirui and R. Orognno	April to June	7-10days	1. Roads becomes difficult in accessibility
		Oct, Nov and Dec.	5-7 days	2. Evacuate to Bwanda Primary 3. Lives lost and Crops and livestock are washed away
KamgetUgwe	R. Mirui and R. Orognno and back flow from the Lake Victoria	April to June	10-21days	1. Roads becomes difficult in accessibility
		Oct, Nov and Dec.	10-14 days	2. Evacuate to Ugwe Primary 3. Lives lost and Crops and livestock are washed away
Kanyiamo	R. Nyatani and R. Mirui and	April to June	7-14days	1. Roads becomes difficult in accessibility

	surface run-off water	Oct, Nov and Dec.	5-7 days	2. Evacuate to the Local church and neighboring Primary school 3. Lives lost and Crops and livestock are washed away
Kolal	R. Bacho and R. Mirui and surface run-off water	April to June	10-21days	1. Roads becomes impassable
		Oct, Nov and Dec.	5-7 days	2. Evacuate to the newly constructed evacuation centre 3. Lives lost and Crops and livestock are washed away
Wasiese	R. Nyando and R. Mirui and surface run-off water	April to June	10-21days	1. Roads becomes difficult in accessibility
		Oct, Nov and Dec.	5-7 days	2. Evacuate to local church and Wagai Primary in neighbouring village 3. Lives lost and Crops and livestock are washed away
Kamagaga	R. Bacho and R. Mirui and surface run-off water	April to June	10-21days	1. Roads becomes fairly inaccessible
		Oct, Nov and Dec.	5-7 days	2. Evacuate to the newly constructed evacuation centre and Kigoche Primary 3. Lives lost and Crops and livestock are washed away
Wangaya Mombasa	R. Nyando , Rice plantation water channels and surface run-off water	April to June	10-21days	1. Roads becomes inaccessible
		Oct, Nov and Dec.	5-7 days	2. Evacuate to Osembe Primary 3. Lives lost and Crops and livestock are washed away
Achuodho	R. Angwecha and R. Landi and surface run-off from the hills	April to June	10-21days	1. Roads becomes inaccessible
		Oct, Nov and Dec.	5-7 days	2. Evacuate to Achuodho Primary 3. Lives lost and Crops and livestock are washed away
Wakesi	Aol and Osengeti streams and surface run off water. Affected mainly by flash floods.	April to June	2-5 days	1. Roads becomes inaccessible
		Oct, Nov and Dec.	1-3 days	2. Evacuate to Legio Maria Church and Keyo Primary 3. Lives lost and Crops and livestock are washed away
Kojjem	R. Nyando and R. Awach	April to June	2-7 days	1. Roads becomes inaccessible
		Oct, Nov and Dec.	2-5 days	2. Evacuate to Apondo Primary 3. Lives lost and Crops and livestock are washed away
Kanyilum	R. Nyando bursting its banks	April to June	10-21days	1. Roads becomes difficult in accessibility
		Oct, Nov and Dec.	5-14 days	2. Evacuate to Apondo Primary 3. Lives lost and Crops and livestock are washed away
Kadika	R. Nyando and R. Awach	April to June	10-21days	1. Roads becomes difficult in accessibility
		Oct, Nov and Dec.	5-14 days	2. Evacuate to Apondo Primary 3. Lives lost and Crops and livestock are washed away
Nyachoda	R. Nyalibiego and R. Nyaidho	April to June	7-14days	1. Roads becomes fairly inaccessible
		Oct, Nov and Dec.	5-10 days	2. Evacuate to Nyachoda Primary 3. Lives lost and Crops and livestock are washed away
Masune	R. Nyalibiego and R. Nyaidho	April to June	7-14days	a) Roads becomes fairly inaccessible
		Oct, Nov and Dec.	5-10 days	b) Evacuate to AyweyoLuora Primary c) Lives lost and Crops and livestock are washed away
Kojunga	R. Nyaidho and R. Ogari	April to June	7-14days	4. Roads becomes fairly inaccessible
		Oct, Nov and Dec.	5-10 days	5. Evacuate to Nyakongo Primary in the neighbouring village 6. Lives lost and Crops and livestock are washed away

Source: Community-based Flood Management Manual.

**Table 5 The structural measures implemented in the 24 villages under the Programme**

Village No	Village Name	Type of Flood Structure	Reason for countermeasure	Cost of the structure in KSH
1	Rae Kanyai-ka	Box Culvert	To improve evacuation route and drainage system	
		Box Culvert		
		Pipe Culvert		
		Box Culvert		
		Pipe Culvert		
		Box Culvert		
2	Mowlem	EvacuationCenter	Long inundation that used to lead evacuees to move to school and thereby disrupting learning programme	
		Toilet(10)	Toilets in the area cave in during floods and therefore lack of toilets that leads to poor sanitation and hygiene	
		Borehole	During flood there area experiences contamination of portable water	
3	Bwanda	Box Culvert	To improve evacuation route and drainage system	
		Box Culvert		
		Box Culvert		
		Pipe Culvert		
		Box Culvert		
		Pipe Culvert		
4	Otera	Pipe Culvert	To improve evacuation route and drainage system	
		Box Culvert		
		Box Culvert		
		Pipe Culvert		
		Box Culvert		
5	Kamuga	Toilet(10)	Toilets in the area cave in during floods and therefore lack of toilets that leads to poor sanitation and hygiene	
		Box Culvert	To improve evacuation route and drainage system	
		Borehole	During flood there area experiences contamination of portable water	
		Evacuation Center	Long inundation that used to lead evacuees to move to school and thereby disrupting learning programme	
6	Oyola	Pipe Culvert	To improve evacuation route and drainage system	
		Pipe Culvert		
		Box Culvert		

		Box Culvert		
		Pipe Culvert		
		Box Culvert		
		Borehole	During flood there area experiences contamination of portable water	
		Footbridge	To improve evacuation route and drainage system	
7	Kanyango	Box Culvert	To improve evacuation route and drainage system	
		Box Culvert		
		Box Culvert		
		Weir&Revetment	To improve evacuation route and ensure that water is stored for purposes of irrigation	
		Evacuation Center	Long inundation that used to lead evacuees to move to school and thereby disrupting learning programme	
8	Komwaga	Evacuation Center	Long inundation that used to lead evacuees to move to school and thereby disrupting learning programme	
		Toilet(2)	Toilets in the area cave in during floods and therefore lack of toilets that leads to poor sanitation and hygiene	
9	Kowiti	Storage	Long inundation that used to lead evacuees to lose their properties or sale their crops at a throw away prices and also walking long distances for medical assistance	
		Toilet(10)	Toilets in the area cave in during floods and therefore lack of toilets that leads to poor sanitation and hygiene	
		Pipe Culvert	To improve evacuation route and drainage system	
10	KamgetUgwe	Pipe Culvert	To improve evacuation route and drainage system	
		Pipe Culvert		
		Box Culvert		
11	Kopudo	Borehole	During flood there area experiences contamination of portable water	
12	Kanyiaomo	Pipe Culvert	To improve evacuation route and drainage system	
		Pipe Culvert		
13	Kolal	EvacuationCenter	Long inundation that used to lead evacuees to move to school and thereby disrupting learning programme	
		Toilet(2)	Toilets in the area cave in during floods and therefore lack of toilets that leads to poor sanitation and hygiene	
14	Wasiese	Box Culvert		
15	Kamagaga	EvacuationCenter	Long inundation that used to	



			lead evacuees to move to school and thereby disrupting learning programme	
		Toilet(2)		
		Footbridge	To improve evacuation route and drainage system	
16	Wangaya Mombasa	Pipe Culvert	To improve evacuation route and drainage system	
		Pipe Culvert		
		Pipe Culvert		
		Pipe Culvert		
		Borehole	During flood there area experiences contamination of portable water	
17	Achuodho	Toilet(10)	Toilets in the area cave in during floods and therefore lack of toilets that leads to poor sanitation and hygiene	
		Pipe Culvert	To improve evacuation route and drainage system	
		Pipe Culvert		
		Borehole	During flood there area experiences contamination of portable water	
		Evacuation Center	Long inundation that used to lead evacuees to move to school and thereby disrupting learning programme	
18	Wakesi	Box Culvert	To improve evacuation route and drainage system	
		Borehole	During flood there area experiences contamination of portable water	
19	Kojiem	Borehole	During flood there area experiences contamination of portable water	
20	Kanyilum	Storage	Long inundation that used to lead evacuees to lose their properties or sale their crops at a throw away prices and also walking long distances for medical assistance	
		Toilet(10)	Toilets in the area cave in during floods and therefore lack of toilets that leads to poor sanitation and hygiene	
		Borehole	During flood there area experiences contamination of portable water	
21	Kadika	Pipe Culvert	To improve evacuation route and drainage system	
		Footbridge	To improve evacuation route	
		Borehole	During flood there area experiences contamination of portable water	
22	Nyachoda	Pipe Culvert	To improve evacuation route and drainage system	
		Box Culvert		
		Footbridge	To improve evacuation route	
23	Masune	Borehole	During flood there area experiences contamination of portable water	
		Toilet(10)	Toilets in the area cave in during floods and therefore lack of toilets that leads to poor sanitation and hygiene	



24	Kojunga	Footbridge	To improve evacuation route	
		Footbridge		

The map of the structures constructed under the Nyando Project is showed in the figure 3



below.

## 5 LESSON LEARNT FROM THE NYANDO PROJECTS

The Project Area of the Nyando Project is one of the worst flood ravaged areas in Kenya. Before the Nyando Project the community members had developed coping strategies but the human casualty and human suffering was high. After the Project the conditions have since improved.

The figure below shows the conditions in some of the villages within the Project Area before and after the Project.



(Source: Nyando Project's Project Outline 7<sup>th</sup> Edition)

**Figure 4** *Nyando Project Area before and after the Project*

The Nyando Project was implemented in to basically to phases i.e. the Master Plan Phase i.e. pilot projects that were implemented in five villages in the year 2006 to 2008 and Japan Grant Aid Nyando Project that was implemented in the twenty four villages in the year 2009 to 2011. During the above mentioned Nyando Projects there are major lesson learnt that can be extracted therein for purposes of replication and also improvement of future flood management projects or undertakings not only in the Nyando River Basin but other parts of Kenya.

During the implementation of the Project on Capacity Development for Effective Flood Management in Flood Prone Areas, the JICA Project Team organized for an excursion visit to the Nyando River Basin for the three Pilot Project Areas WRUAs i.e. LOGUMI WRUA,

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Lower Lumi WRUA and Isiolo WRUA. During the excursion visit the following lesson learnt were extracted:

The Nyando River Basin is a model for community based flood management. There were good practices in flood management that can be replicated in other flood prone areas. Herein below are some good practices in flood management that were noted:

- i. Education Programme on Flood Management. It was noted that the pupils within the Nyando River Basin were well acquainted with concepts of flood management. This can be attributed to the education programme on flood management. One teacher at Rae Kanyaika primary School explained that the teachers were trained on how to infuse flood management subject into the regular school curriculum subjects like social studies, science and English. He also clarified that a teachers' handbook on flood management and flood management textbook for primary pupils were produced and distributed to the school. He further pointed out that the pupils were able to share their experiences and what they had been taught on flood management with their parents and friends from other school. This kind of education programme is worth being implemented in the flood prone areas not only in raising flood awareness but as a tool in flood management;
- ii. Evacuation drills conducted by the CFMO. It was observed via video recording that community members after training were able to conduct flood evacuation drill. This activity as a preparatory exercise that enables affected family to evacuate effectively was noted as a good practice in flood management. WRMA-LVSC RO staff noted that in the recent floods experienced in the Nyando River Basin, there was zero human causality unlike other flooding periods before the Nyando Project wherein evacuation drills were conducted;
- iii. Community organizations with the sole purpose of managing floods. In the Nyando River Basin the affected villages have organized themselves and established Community based Flood Management Organizations (CFMO) that are registered with Ministry of Social Services. The CFMOs are effective tool within the affected villages in the management of floods in their respective village. Community members through the CFMOs are able to establish channel of communication, consensus building and development agenda. In the case of one village where a raised road was constructed but it had negative impact on the homes located near the river and through mutual agreement the group agreed to rip open some parts of the road to allow quick flow of flood water rather than causing havoc to the homes near the river. The core issue here is not ripping open the raised road but the ability of the community to sit and discuss their problem and possible solutions and going ahead and implementing what the group agreed upon;
- iv. Flood management can be achieved at the community level. The redundant paradigm has been that floods or any other disaster was a prerogative of the government or KRCS. Nyando case reveals that flood management can also be achieved at community level. The structure measures undertaken in the Nyando are not huge high investment structure like dyke or dam but simple structures like raised toilet, raised borehole, small culvert construction, footbridge etc. These above mentioned structures can be implemented at community level especially after the community having been empowered in the art of proposal writing or the CFMO joining WRUA where the CFMO can access funds from WSTF;
- v. Efficacy of integrated flood management. In the Nyando River Basin it was noted that there was close correlation between the structures that were constructed in the region and training community members received e.g. for all the structures constructed there was the corresponding O&M training for such structure. It was also noted that the structures con-



structured in Nyando River Basin aimed at flood management but structures on their own cannot manage floods and therefore the capacity of the community members was also developed in flood management. The integrated approach was noted as a good practice in flood management;

- vi. High priority that is accorded to safety. It was noted that in Nyando River Basin human safety during seasons of floods is given a high priority. Culture is an important tenet in human civilization and Nyando River Basin is not an exception. In the Nyando cultural dynamics forbids mother-in-law and son-in-law to share toilet facility. But during floods the human safety comes first before culture and the affected community members use the structures without consideration cultural dynamics. The act of prioritizing human safety above any other societal requirement is a good practice in flood management that needs to be replicated;
- vii. Sharing of information. In the Nyando River Basin it was noted that the communities that were beneficiary of the Nyando Project shared information with the neighbouring communities for example in Kamagaga village the CFMO members were able to share their experience with their neighbours even taught them how to write proposals. The sharing of information to other communities that are affected is a good practice in flood management that is worth being replicated in other flood prone areas;
- viii. Stakeholders' cooperation and involvement. It was noted in Nyando River Basin that school institutions cooperates with the community in flood management. Schools as institutions within the affected community cooperate with this communities as exemplified in the school acceptance to the flood management structures to be constructed within the school compounds. The school management cooperate with the community in the O&M. During implementation of the evacuation drills the KRCS as key stakeholder in flood management were also involved. It is therefore noted that stakeholder involvement and cooperation as good practice that can be replicated in the pilot project areas; and
- ix. Raised structures above the inundation flood depth. It was noted that the structures constructed within the evacuation places like evacuation centre, toilets and borehole were all raised above the flood depth in those area. This a good practice in flood management not only in improving evacuation places but also it is the model of building within flood prone areas for example hospitals, schools, market etc should be constructed with their foundations raised.

It is based on these observations that demanded a critical analysis of the lesson learnt for the impressive Nyando Projects.

### ***5.1 Brainstorming Session***

In order to extract lessons learnt from the Nyando Project a problem tree toolkit for determining the flood damage in Nyando was adopted. The problem tree toolkit is an effective tool for determining cause and effect. The concept of a problem tree is predicated on this premise i.e. one problem that is thesis generates an antithesis which stimulates a synthesis and this synthesis in turn becomes the thesis and the progression of the problem through cause and effect.

### ***5.2 Process of developing problem tree***

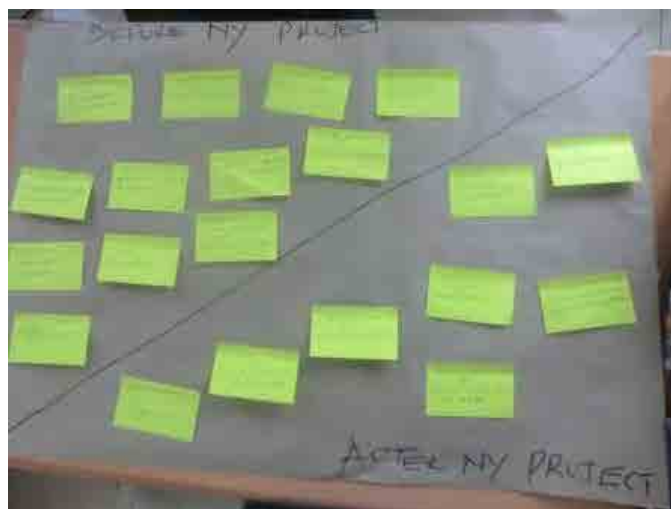
This entailed the use of a manila paper and A 6 cards was used wherein the various flood damage were written on the A6 card and thereafter pasted on the manila paper. Flood damage in Nyando was captured before, during and after the Nyando Project. Thereafter the flood damage was divided into two i.e. the flood damage before the Nyando Project

and Flood damages after the Nyando Project.



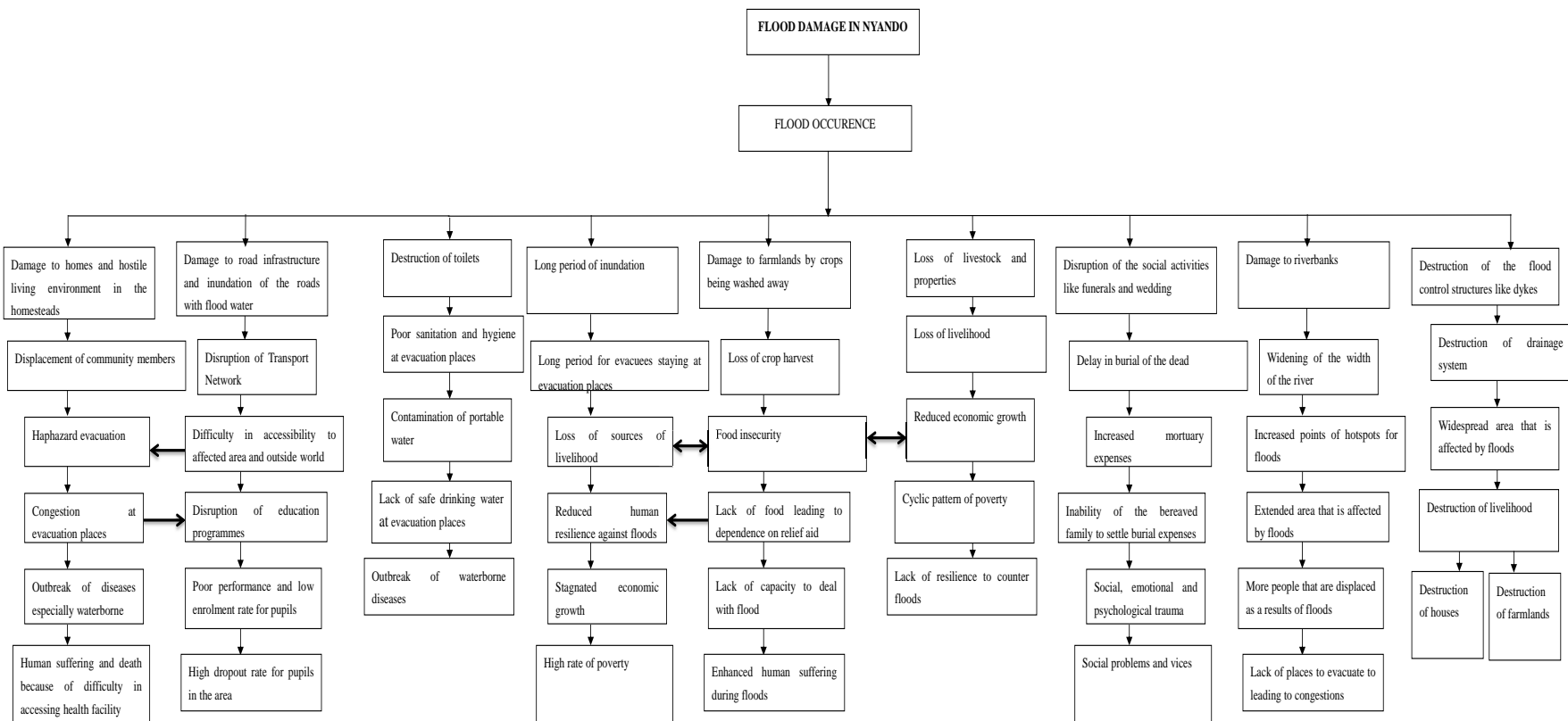
(Source: JICA PCDEFM Team 2011-2014)

**Figure 5 Photo for A7 card on flood damage pasted on Manilla paper**



(Source: JICA PCDEFM Team 2011-2014)

**Figure 6 Photo for A7 card on flood damage before and after the Project**



(Source : JICA PCDEFM Team II 011-2014)

**Table 6 Flood damage before and after the Nyando Project**

Flood Damage			
Type	Condition before Project	Condition after Project	Remarks
1) Long period of inundation	Occurs	Occurs	Drainage has improved in the area through food for work activities but some areas still experience long inundation period.
2) Long period for evacuees staying at evacuation places	Occurs	Occurs	Evacuees stay at evacuation centre for more than weeks
3) Damage to homes and hostile living environment in the homesteads	Occurs	Occurs	The damages to homes are still extensive but where the dyke has been constructed the damages to houses has been reduced.
4) Displacement of community members	Occurs	Occurs	Community members get displaced but after the project in places where dykes were constructed it has reduced
5) Congestion at evacuation places	Occurs	Rarely	Congestion at evacuation places has reduced by construction of evacuation centres.
6) Outbreak of diseases especially waterborne	Occurs	Sporadic	Outbreak of diseases has reduced by virtue of improved sanitation and hygiene at evacuation places.
7) Human suffering and death because of difficulty in accessing health facility	Occurs	Sporadic	Human suffering and death at evacuation places has reduced because of improved accessibility for evacuees and response oriented stakeholders.
8) Damage to road infrastructure and inundation of the roads with flood water	Occurs	Occurs	Damage to road infrastructure still occurs but has reduced due to improved drainage.
9) Disruption of Transport Network	Occurs	Occurs	It still occurs but has reduced in magnitude due to constructed culverts, footbridges and vehicular bridges.
10) Hazardous evacuation	Occurs	Rarely	Community members have been empowered by evacuation drills that have been implemented in the area.
11) Difficulty in accessibility to affected area and outside world	Occurs	Rarely	It has reduced because of improved accessibility for evacuees and response oriented stakeholders.
12) Disruption of education programmes	Occurs	Rarely	It has reduced because of evacuation centres in the area that has enables pupils to use their classrooms
13) Poor performance and low enrolment rate for pupils	Occurs	Rarely	This has since improved with improved enrolment in primary schools
14) High dropout rate for pupils in the area	Occurs	Reduced	Because of reduce interruptions of school activities the dropout rate has reduced.
15) Destruction of toilets	Occurs	Occurs	Destruction of toilets is on the decrease as community members adapt to constructing raised toilets.
16) Poor sanitation and hygiene at evacuation places	Occurs	Reduced	Sanitation and hygiene has improved because of the constructed toilet facilities at evacuation places.
17) Contamination of portable water	Occurs	Occurs	Flood water still contaminates the open shallow well dug in the homes.



18) Lack of safe drinking water at evacuation places	Occurs	Reduced	Drilling of borehole and installation of raised apron and hand pump has enable availability of clean water
19) Damage to farmlands by crops being washed away	Occurs	Occurs	Still occurs because community members have encroached riparian lands
20) Loss of livestock and properties	Occurs	Occurs	Still occurs because community members do not evacuate until the flood water starts flowing into the village.
21) Food insecurity	Occurs	Occurs	This has improved because of the stores at evacuation centre and storage facility where community members can store their food.
22) Lack of food leading to dependence on relief aid	Occurs	Occurs	CFMOs have planted banana trees at evacuation places and they had been trained on preparation of emergency food.
23) Loss of sources of livelihood	Occurs	Occurs	Still occur but at a reduced rate because affected families can still access their farmlands and markets.
24) Lack of capacity to deal with flood	Occurs	Reduced	Has been drastically reduced because of the training on community based flood management.
25) Enhanced human suffering during floods	Occurs	Reduced	It has reduced because of the evacuation drills and basic first aid training.
26) Reduced human resilience against floods	Occurs	Reduced	There has been improvement on the resilience because of the trainings but resilience to floods is still very low.
27) Stagnated economic growth	Occurs	Occurs	Because of low resilience against floods the cyclic stagnation of economic growth is still experienced.
28) Disruption of the social activities like funerals and wedding	Occurs	Occurs	Because of improved accessibility disruption of social activities has reduced.
29) Delay in burial of the dead leading to Inability of the bereaved family to settle burial expenses which leads to Social, emotional and psychological trauma which causes Social problems and vices	Occurs	Occurs	Delay in burial as a result of inundation is still common.
30) Damage to riverbanks leading to Widening of the width of the river which implies increased points of hotspots for floods which leads to extended area that is affected by floods and therefore more or increased number of people affected by floods	Occurs	Occurs	This is still common in the area.
31) Lack of places to evacuate to leading to congestions	Occurs	Reduced	This has reduced drastically as a result of construction of evacuation centres and improvement of evacuation places.
32) Destruction of the flood control structures like dykes	Occurs	Occurs	This has reduced and the dyke constructed in 2007 under pilot project is yet to be breached.
33) Destruction of drainage system	Occurs	Reduced	This has improved as a result of food for work initiatives.

34) Destruction of houses	Occurs	Occurs	This is still common but in areas where dyke has been constructed has been reduced.
35) Cyclic pattern of poverty leading to high rate of poverty	Occurs	Occurs	Poverty is still high in the area

(Source: JICA PCDEFM Team 2011-2014)

### ***5.3 Evaluation of the Project***

It is expedient to note that it is difficult to control floods because it is a natural characteristic of the river to flood and there are human settlement and activities in the flood plains. But it is possible to manage floods as exemplified by the Nyando Project. It is important to note that despite the Nyando Project the flood damages are still being experienced in the Nyando but the impact level of these damages has dramatically reduced. It is noted that the involvement of community in flood management rather than relying on the government and non-governmental organizations has enhanced positively flood management in the Nyando. There are shortfalls and challenges in the Nyando like the CFMOs are still amorphous organizations that heavily rely on the benevolence and ability of the chairman rather than the CFMOs as institution by themselves.

## Lesson Learnt Pictorial Description



Description : Raised Evacuation centre above flood depth



Description : Poorly maintained weir with some wood planks having been vandalized



Description : Weir is silted and community members have not remove the silt inspite of the dry season leading to overflow of water



Description : CFMO at Kanyango has managed to install a 60M deep borehole with a handpump at EVC









Description : Well-maintained water tank that is used for drinking in the village. CFMO charges Kshs. 2/- per 20Lts gallon



Description : Well-maintained EVC that hosted at least 200 flood affected persons in the last flood occurrence



	
<p>Description : Development Partner from the MWI with rods for borehole O&amp;M training for Kanyango CFMO</p>	<p>Description : Clinical Officer Posted at Storage facility that now acts as a health facility in Kowiti village</p>
	
<p>Description : Medical supplies stored at the health facility constructed as Storage facility being currently used as a dispensary</p>	<p>Description : Culvert has increased accessibility to Bwanda school but was damaged by heavy lorry</p>
	
<p>Description : Some Community members have adopted constructing raised toilets in their homes</p>	<p>Description :Culvert that has enhanced accessibility in Bwanda to Nyamthoi farmlands and markets even during flood occurrence</p>

	
<p>Description : In spite of constructed culvert community members still wade through water so long as river water levels are low</p>	<p>Description : Poorly maintained weir with some wood planks having been vandalized</p>
	
<p>Description : Community members cross the river via the raised culvert that has enhanced accessibility in Bwanda village</p>	<p>Description : Storage facility at Kanyilum village that community members are using as a health facility. It has 2 Clinical Officer stationed there</p>
	
<p>Description :Storage facility that acts as a health facility is infested by bees which community members have tried to terminate the bees but in vain</p>	<p>Description : Storage facility that community members are using as a health facility</p>



	
<p>Description : Borehole at Kanyilum village is damaged since Dec. 2013 is yet to be repaired though it had been repaired before but only once</p>	<p>Description : Toilets that the school pupils (girls), teachers and patients use but because the borehole is not repaired washing them demands that pupils</p>
	
<p>Description : Borehole at Kadika village was saline and is currently damaged and even though the CFMO were given spare tools they are yet to repair it</p>	<p>Description : Footbridge has enhanced accessibility in Kadika village. Before the Nyando Project the area was inaccessible during rainy season</p>
	
<p>Description : Borehole at Kojjem village handpump was removed and kept at the chair's house for fear of vandalism after the bolt that holds the hand-pump to the slab was breached</p>	<p>Description : Breached Borehole installed in Kojjem Village before the NY Project near the borehole drilled during the NY Project has its hand-pump intact</p>

	
<p>Description : The evacuation route signboard kept at members home after vandalism attempt</p>	<p>Description : Evacuation centre signboard at evacuation place</p>
	
<p>Description : Community Flood Hazard Map pasted on the big signboard, this kind of signboard was installed in all the twenty four villages</p>	<p>Description : Damage to houses as a result of floods still occurs</p>

(Source of pictures in the above table: JICA PCDEFM Team 2011-2014)



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## 6 CONCLUSIONS AND RECOMMENDATIONS

This was quite a good case study of an area that had previously been ravaged by floods. Lessons learnt through non-structural measures such as evacuation drills should be enacted at least on an annual basis.

Implementation of major structural measures e.g. the proposed Koru Dam would be useful and ideal but rather long term measure. Implementation of measures that the community members can undertake by themselves would be of more immediate importance.

Interaction between CFMOs and WRUAs should be strengthened and institutionalized within a framework where they can attract funding. Measures should be undertaken to turn flood disaster into a useful opportunity. The possibility of harnessing flood water say in water pans for use during drought should be explored and where viable implemented.

It would be essential subsequently to undertake capacity building for the community members in the management of the water pans for sustainability.

- ✓ The Integrated Flood Management adopted in the Nyando River Basin is an appropriate approach for flood management in a flood prone areas;
- ✓ Community-based Flood Disaster Management in the Nyando River Basin clearly shows that community by themselves come up with strategies that can enable them engage in self-help activities in the management of flood disaster;
- ✓ Structure measures alone are not sufficient in effective management of flood but if structures measures are complimented by the non-structural measure then the impact of such an approach is vast and long lasting;
- ✓ From experience structure measure is not a security from disaster but measures to only mitigate and manage disaster. Huge dykes have been breached by floods in many areas in Kenya particularly Bundalangi area therefore empowering community with knowledge plays an important role. It is therefore prudent that flood prone areas be engaged in capacity building exercise to empower community to manage floods;
- ✓ It is important to acknowledge that small scale projects that can easily be implemented by community through proposal writing and raising funds is an effective approach. For example in improving evacuation routes in the Nyando basin small culverts were constructed in Rae Kanyaika village that has since improved drainage and therefore made evacuation routes safer than they were and reduced duration of inundation;
- ✓ Community can actively participate in the operation and maintenance of the structures constructed within their villages. In the Nyando Basin communities after the capacity building trainings are actively involved in opening up drainages, managing boreholes appropriately and being community custodian in evacuation processes including taking good care of evacuation centre and toilets therein;
- ✓ To undertake the Project especially in the construction of structures in the villages improved the accessibility of these villages through road improvements that were done to ensure that the goods needed at the site arrived without hitches in the Nyando and with the same Project adopted then accessibilities of such villages will greatly be enhanced; and

- ✓ Training of communities in preparation of emergency food including precautionary measures therein involved as a caution against springing a new disaster as the flood disaster is being managed. Also planting of banana plantations at evacuation centre to ensure food security during emergency.
- ✓ There were some cases that the CFMO could not function sufficiently. In Nyando case, the chairperson of the CFMO exchanged the MoU with the head teacher of the school, but the MoU changed to become ineffective because of the head teachers replacement. The successor did not take over the MoU, and then the MoU became ineffective.
- ✓ There are troubles in operation of borehole providing water because of lack of maintenance costs. The reason of this problem is the decision by the chairperson of CFMO. He decided the water fee was free because he would like to get votes when he stand as a candidate for a representative.
- ✓ Strong leadership will be required to operate a CFMO. In Nyando case, the project strongly assisted the operation of the CFMO, but after the project, the activities of CFMO declined rapidly. Especially, when a CFMO will be established under a WRUA, raising a strong leader will be very important theme.



(Source: Kamuga CFMO, picture taken by Kamuga CFMO Member)

**Implementation Agency:**



**Water Resources  
Management Authority**

**Employer:**



**Japan International  
Cooperation Agency**



**Ministry of  
Environment, Water  
and Natural Resources**



**Water Resources  
Management Authority**



**Japan International  
Cooperation Agency**

**Republic of Kenya**

**Project on Capacity Development**

**for Effective Flood Management in Flood Prone Areas**

**WRMA**

**Technical Training Manual  
for Flood Management**

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**Japan International Cooperation Agency**

**NEWJEC Inc.**

## Preface




The Government of Kenya established the Water Resources Management Authority (WRMA), through the sector reform brought by Water Act 2002. WRMA is the lead agency in the management of water resources in the country through six (6) regional offices and twenty six (26) sub – regional offices of the respective water resources catchment areas.

Since its operationalization in 2005, WRMA has made significant progress in making water resources recognized as being fundamental for socio-economic and environmental sustainability. In this regard, integrated floods management is viewed as necessary component in water resources management.

Based on the request from GOK, JICA carried out the “Study on the Integrated Flood Management (IFM) for Nyando River Basin (2006 – 2009)” as the Technical Cooperation Scheme and “Programme for Community based Flood Disaster Management to Adapt to Climate Change in the Nyando River Basin (2009-2011)”. This was a Grant Aid Programme with the aim of establishing a flood management system in the southern part or Lake Victoria Basin through IFM, where WRMA was the implementing agency. Through the above projects, community based flood management activities have been implemented through integrating non- structural and structural measures such as community based flood hazard mapping and construction of flood counter measure structures in prioritized flood prone areas.

Based on the achievement of Nyando project, the Project on Capacity Development for Effective Flood Management was formulated to expand IFM in other flood prone areas in Kenya. Three pilot river basins were selected namely: Isiolo, Gucha-Migori and Lumi to promote community based flood management activities. The main purpose of the project was to build institutional framework of flood management in the context of integrated water resource management for effective and sustainable implementation of community based activities. Through the project WRMA has developed strategies and guidelines in managing floods which have since been incorporated in the revised Catchment Management Strategies (CMS) and WRUA Development Cycle (WDC) manual. In order to develop capacity of WRMA officers in the field of community-based integrated flood management, a training system has been developed where the Project conducted IFM Training for WRMA officers who in turn trained the WRUAs. The Training Materials for community based flood management have been developed. These include supplemental manuals, lessons learnt and case studies.

A handwritten signature in blue ink, appearing to read 'John P. Olum', written over a light blue grid background.

*Eng. John P. Olum, HSC*  
*Chief Executive Officer, WRMA*

## Table of Contents

1. Purpose of this manual .....	1
2. Outline of execution of training program.....	1
2.1. Organization.....	1
2.2. Activities.....	2
3. Planning training.....	3
3.1. Objectives of training.....	3
3.2. Assessment of current capacity and the needs .....	4
3.3. Planning training program.....	4
3.3.1. Syllabus .....	4
3.3.2. Teaching materials.....	5
3.3.3. Time table .....	6
3.4. Selection of training participants.....	6
3.4.1. Number of participants .....	6
3.4.2. Selecting individual participants .....	7
3.5. Appointing trainers.....	7
3.6. Documentation of plan.....	8
3.7. Execution plan .....	8
4. Execution of training program .....	9
5. Evaluation and feedback .....	10
5.1. Evaluation of participants' achievement .....	10
5.2. Evaluation of training program and feedback.....	10
6. Sample documents .....	11

## 1. Purpose of this manual

This manual was prepared over the course of the technical training activities conducted in "the Project on Capacity Development for Effective Flood Management in Flood Prone Areas (the Project)". The training in the Project was conducted in three stages; 1<sup>st</sup> stage to raise flood management trainers among WRMA staff, 2<sup>nd</sup> stage to train WRMA's flood-management related officers by the trainers raised in the 1<sup>st</sup> stage, and 3<sup>rd</sup> stage to guide and instruct, by the WRMA officers trained in the 2<sup>nd</sup> stage, WRUA people who would actually carry out community-based flood management activities. The main purpose of this manual is to serve those who are in charge of planning, executing and managing WRMA's flood management trainings, that are equivalent to the 2<sup>nd</sup> stage training of the Project, but to be conducted by WRMA's own initiative after the Project.

The training provided by the Project had been planned, prepared and executed by joint efforts among WRMA's Human Resource Department (HRD), Flood Management Unit (FMU) and the Project Team. The program and materials used in the 2<sup>nd</sup> stage training of the Project have already been modified and improved by the WRMA's trainers from their original forms. Therefore, they are still relevant and effective to be used as they are for the time being. However, when deemed necessary, both program and materials will have to be revised and updated, so will this manual.

## 2. Outline of execution of training program

### 2.1. Organization

Training activities in WRMA are in general planned and executed by HRD. Flood management trainings should be organized by HRD with help from Flood Management Department (FMD). Those FMD members who have been trained in the Project to be trainers should take part in the planning process, not only as candidates for trainers.

It is very much practical and useful to set up a secretariat for the execution of training, either temporarily or permanently. Members of the secretariat shall consist of HRD and FMD members and are directly in charge of flood management training activities of WRMA. Also, the secretariat should report to the Training Committee of WRMA, which is chaired by CEO.

The importance of setting up the secretariat is to show, to participants to the training in particular and to WRMA staff in general, that the secretariat takes the leadership, and its members are responsible for the planning and execution of the training. When participants to the training are selected and notified of the program, they should be also informed of the members of the secretariat and their contacts.



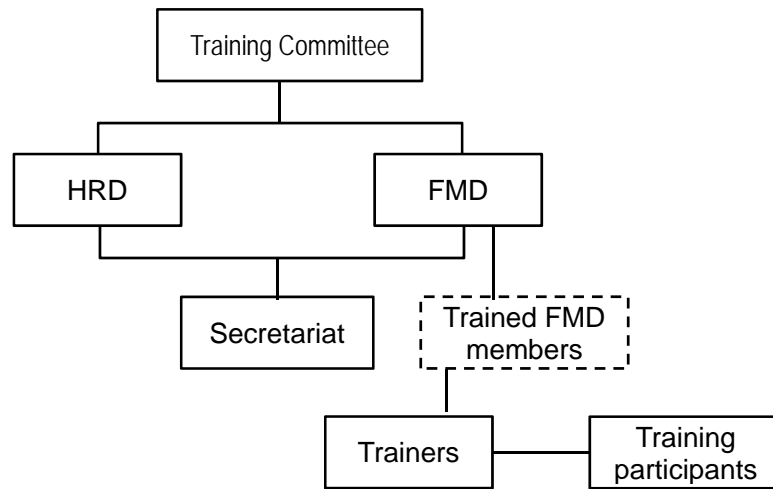


Figure 1 Organization for Flood-Management Training in WRMA

## 2.2. Activities

To execute training is a long process requiring many different activities. This section outlines what are to be done in sequence.

Timing	Activity	Description
At latest six months before execution	1) Setting Objectives	- Clearly define the objectives of the training
	2) Assessment of Capacity and Needs	- A group of staff who receive the training be identified, - Current capacity of the group to meet the objectives be assessed, and their development needs be identified
At latest three months before execution	3) Setting Syllabus and target	- Training subjects and their contents be determined
At latest two months before execution	4) Preparation of Time Tables	- Time table of training be prepared
	5) Preparation of Materials	- Preparation of presentation slides, hand-outs
	6) Selection of Participants	- Participants selected, - Authorisation by Training Committee
	7) Appointment of Trainers	- Selection of candidates - Agreement - Preparation
At latest one month before	8) Documentation of plan and	- Training Program - Cost Estimation

Timing	Activity	Description
execution	budgeting	- Approval
	9) Execution of Training	
Within a month after the training	10) Evaluation and feedback	<ul style="list-style-type: none"> <li>- Achievement of trainees evaluated</li> <li>- Training plan and program evaluated</li> <li>- Reflection and improvement of program</li> </ul>

If the flood management training is chosen as one of regular training programs to be undertaken by HRD every year, it is helpful to lay out all these activities on the calendar.

When the same training program is repeated for different participants, not all these activities have to be covered; possibly only the activities 6), 7), 9) and 10) are repeated. However, when a revision to the program is desired or planned, all the activities may have to be reconsidered again.

In the case that there are people or organizations outside WRMA are involved in the training, we may have to allow for more time in the preparation phase as his/her participation may require budget provision of the organization he/she belongs to.

### 3. Planning training

#### 3.1. Objectives of training

Objectives of the training should be thoroughly and clearly defined. Who the people to be trained are, and what specifically they will be able to do after the training, must be carefully considered. At the same time, the target level of accomplishment made by training participants should be set. It is also important to distinguish the ultimate level to be reached in the long-run, and the level to be targeted in the training under planning.

There are two major objectives for the flood management training: one is as a regular training program of WRMA to improve the general understanding of flood management among technical staff, and the other is as a special program to prepare those officers in charge of working with and helping WRUA and other people in the river basin drafting the flood management plan for themselves. In the syllabus discussed in the following section, these two objectives are co-existing as the training done by the Project had these two objectives. The syllabus can be split into two, each of which corresponds to one

of these objectives, although split syllabuses may still share many of the topics.

### 3.2. Assessment of current capacity and the needs

Considering the objectives of the training defined above, the target group of people to be trained is to be identified, by department, office, rank, speciality, daily task, etc. Current capacity of people in the target group in each area of training subjects must be assessed. One of the methods to assess the capacity is a discussion in work-shop, attended by people belonging to the target group, together with people outside the target group, such as managers in their supervising positions, HRD, etc., where the participants discuss freely of the matters related to the capacity in that area of training subject, and summarize the results. This was the method adopted in the Project. The assessment shall be followed by identifying training needs for each training subject. Meeting the needs will fill the gap between the current capacity and the desired target-level capacity.

The result of capacity assessment carried out in the Project is shown in Appendix-A as a sample.

### 3.3. Planning training program

A training program consists of a syllabus, teaching materials (texts), time table, lists of trainers and participants, etc., each of which is discussed in the following subsection.

#### 3.3.1. Syllabus

A syllabus is a list of subjects to be covered in the training, with some description on each subject, teaching method (lectures, exercises and field works), required time, level of achievement envisaged, and reference books and materials, etc. It should be made in a way that the objectives of the training and what will be taught in the training can be understood at a look.

For the Project, a syllabus was prepared in a combined form for the 1st and 2nd stage training, and for the 3rd training where WRMA staff teaches WRUA people, using newly prepared WDC manual flood management modules.

The syllabus prepared for the Project is shown in Appendix-B. It should be noted that this syllabus was developed according the result of capacity assessment shown in Appendix A, but later revised for its structure to correspond to the WDC manual flood management modules.

The syllabus was made in all-in-one concept: that is, all subjects in flood management at entry level are covered. This should not necessarily be this way. As discussed in 3.1,

we could have separate programs, hence separate syllabuses, for objectives 1) general flood management coverage and 2) more specific flood management planning training.

In the questionnaire survey conducted after the 1st stage training of the Project, following comments were given by the participants:

- Training should include more practical exercises conducted in the field,
- Presenting more in-depth case studies should be helpful in understanding various issues, etc.

If we separate the program, we can spend more time on field exercises and case materials, according the objective of the separated program.

The syllabus also included topics for future training, meaning, topics appropriate for advanced-level participants, which were excluded from 1<sup>st</sup> and 2<sup>nd</sup> stage training. Therefore, the syllabus provided by the Project shown in Appendix B can be further developed into training programs for different purposes and different achievement levels, depending on the objectives of training that WRMA considers desirable.

### 3.3.2. Teaching materials

There are two kinds of materials for training provided by the Project. One is those used in training sessions; i.e., presentation slides and hand-outs, etc. The other is those not used in training sessions but recommended to be referred to by the trainers and participants for their reviews and further study. The former is of a primary concern in the preparation of the training, while the latter is optional, still very useful to accommodate people with various backgrounds and capacities in a training program and for the purpose of planning and preparing for future (advanced) training programs. The presentation slides and hand-outs shall be prepared according to the syllabus of the training. Those materials used in training in the past can be used again, as long as they are relevant and trainers have a full understanding of the contents. The trainers can modify and add to the existing materials as he or she thinks helpful to improvement of the training. There have been many comments given by the participants to the 1<sup>st</sup> and 2<sup>nd</sup> stage trainings that they wanted more Kenya-related, real-life materials in the presentations. It is of course desirable to have elements that participants can feel familiar with in the lecture materials. It also helps the understanding of the topic by participants, as long as local materials added are relevant to the subject. Some trainers in 2<sup>nd</sup> stage training have already modified the presentation with their own materials. However, complete change of the materials, which is not inhibited though, should be consulted with supervising managers, other trainers or secretariat, as it may undermine the integrity of the syllabus. Also, participant's comments and opinions

surveyed by the post-training questionnaire should be considered carefully, and revisions/modifications should be made only if judged necessary and appropriate.

Aside from the teaching materials mentioned above, it is helpful to participants if a textbook with good amount of narratives is provided because presentation materials sometimes lack explanations that are given orally in the lecture room. Other optional materials include mini-exams and/or work sheets to be used in and out of the training room. It would be helpful in assessment of programs if such exams are standardized for the syllabus.

There also was a comment by a participant that participants could contribute to the training by providing materials related to the topics. This is true in many cases: local information, photos of floods and damages, measurement data and analysis, stories of experiences, etc., can help both deepen and broaden the understandings. If a trainer wishes such contributions to be made by participants, it should be notified in advance, possibly in the notice of the training delivered to the participants.

### 3.3.3. Time table

A time table is a schedule of lectures, exercises and field works that correspond to the subjects set out in the syllabus. Each day is segmented for subjects, each of which is given specific time (duration). Subjects should be ordered properly, so that the training moves along the sequence of understanding.

At the stage of making a draft time table, the specific dates of the training to take place may not have been fixed. We can use some abstract date, e.g. "day 1, day 2" or "1st Monday, 1st Tuesday", etc.

More important, time for questions and discussions is indispensable for many subjects, as many participants pointed out in post-training questionnaires. Sufficient time should be allotted for these.

In addition, if pre- and post-training examinations and/or questionnaire survey are planned for evaluation purpose, these must be given time on the first and last days of the training period.

A sample of a time table, which has been used in the preparation work of the training in the Project, is attached in Appendix-C.

## 3.4. Selection of training participants

### 3.4.1. Number of participants

The number of participants to the training should be carefully chosen. If too small, it is not efficient. If too large, the communication between the trainer and training

participants may become weakened, which undermines the effectiveness of the training. For the Project, proper number of participants was considered to be around ten to twenty. As the number of participants affects the size of the expenses, budgeting constraints should also be considered in determining the number.

#### 3.4.2. Selecting individual participants

A target group of WRMA staff for which the training is planned should have already been defined in the stage of objective setting. Participants should be selected to meet the objectives of the training.

Selection process should be fair and clear so that those who are not selected would not feel dissatisfaction or discouragement. HRD should be consulted and the training committee should authorize the decision.

Also, to participate in a training means there will be an absence of members in their department or office, and continuation of daily works and activities of the department or office without them should be considered as well.

#### 3.5. Appointing trainers

The Project has trained more than dozens of prospective trainers already, there is sufficient number of qualified trainers for the time being. In the long-run, there will be new appointment of trainers from capable staff members of WRMA, which is very much desirable. Of course this does not eliminate the possibility of appointing appropriate trainers from outside WRMA if there is a good candidate. In either case, the ability of the individuals appointed as trainers is what matters most.

To be a trainer can be an onerous task for the person appointed. Therefore, his or her efforts shall be properly considered in personnel evaluation, which serves as an incentive to do better job as a trainer.

After the appointment of trainers it is very important for the trainers to fully understand the subject he or she is going to teach. It is useful to set up a working group consisting of trainers to discuss and help each other in the preparation of training.

The results of the questionnaire survey conducted after the 1st stage training of the Project revealed that evaluation of trainers by participants was very much variable, meaning that some trainers performed well, while some others did not. As the quality of trainers mostly determines the quality of training, their performance should be checked in some way. Participant questionnaire survey or peer review can be effective methods of evaluation.

### 3.6. Documentation of plan

The purpose of preparing documentation of the training plan is to make sure the plan is consistent and complete, and to facilitate the understanding of related people including WRMA's management, the training committee, HRD, trainers, participants, etc.

The contents of the document are shown below;

- 1) The objectives of the training,
- 2) Target group and participants to be trained,
- 3) Subjects of the training (Syllabus),
- 4) Trainers,
- 5) Teaching materials,
- 6) Time table,
- 7) Evaluation plan,
- 8) Cost estimation,
  - venue (room, equipment for rent, refreshment, meal, etc.)
  - accommodation/meal allowance of participants
  - travel cost of participants
  - fee, per diem, expense compensation for trainers
  - copy of hand-out materials, etc.

Using the training plan document, authorization of WRMA management should be sought.

### 3.7. Execution plan

After making the whole plan of the training, the execution plan should be prepared; who should do what and when, before and during the training period. There are miscellaneous things that have to be done and to be confirmed, before and during the execution of the training, which may include, but not limited to;

- Venue: accessibility, size, lighting, screen, projector, white board, power sockets, extension cables
- List-up necessary equipment and stationaries: banners, laser pointer, white board markers, large paper and markers, attendance list,
- Preparing hand-outs to be distributed,
- Transportation of trainers and participants,
- Arrangement and order of refreshments and meals: catering of tea/coffee, snacks, lunch, etc.



- Arrangement of payment of expenses and allowance, to venue, trainers, participants, etc.

The date of the training should be fixed, and reflected on the time table, which should be informed to trainers and participants at the earliest timing as possible.

The venue should be inspected well ahead of the date of training opening, for matters such as; room, furniture, accessibility, extra services, affordability, etc.

Sometimes, it is desirable to take records of proceeding of training sessions, which will benefit for future trainers to prepare their own lectures. The forms of records can be video-recording, voice-recording, shorthand, etc. These also require arrangements in advance.

These works necessary in preparation for the training are miscellaneous and can be time consuming. However, they are very important in the successful execution of training. Using a check list may greatly help make sure that things to be done are certainly done. A sample of a check list, which has been used in the preparation work of the training in the Project, is attached in Appendix-D.

#### 4. Execution of training program

There are many things to be done before the start of the training, and even during the training. As mentioned above, it is advisable to use a check list to make sure that things that have to be done are done in time.

The things that have to be done by the day before the start of the training include;

- Preparing copies of teaching materials to be distributed to participants (it should benefit the participants if they receive the materials well ahead of the start of the training),
- Arrangement of stationaries and equipment, including checking working of equipment, etc.

On the day of the start of the training, the members of the secretariat should set up the venue well before the starting time, which includes setting up a registration table, so that the participation of individual participants is properly and correctly recorded.

There must be a moderator who guides the proceeding of the training program. Adherence to the time-schedule is very important to keep the program in order, and show authority of the program to the participants. It is useful for trainers and participants if the moderator explains the time table and the outline of the training at the beginning of the sessions, not just distributing the information on paper.

When all the sessions of the training program are over, the secretariat should make sure that the payments due are all done, to the venue and trainers from outside WRMA, if any, and confirm that necessary receipts and certificates have been collected.

It is also important that the completion of the training program is reported to WRMA management hopefully on the day.

Further, wrapping up works such as compilation of teaching materials for record and future-use purposes and review of questionnaires answered by the participants, etc. should be commenced as soon as possible.

## 5. Evaluation and feedback

There are two kinds of evaluation that should be considered to be done after the training program: one is the evaluation about the participants' achievement, and the other is the evaluation of the training program, including appointment of trainers.

### 5.1. Evaluation of participants' achievement

Evaluation of achievement of participants can be done in such methods as pre- and post-training examinations, wrap-up meeting and presentation by participants, trainer's report on the performance of participants, etc.

Pre- and post-examinations are convenient method as we can see the difference of ability to answer the questions before and after the training.

Holding a wrap-up meeting is also effective in that we can directly confirm with each participant what he or she learned in the training. It also helps participants to review the contents of the training for oneself. Having discussions among participants and their managers is also meaningful.

Trainers also can evaluate the effort made by each participant by attitude, involvement, contributions from him or her in training sessions.

Certification of participation to training program must be of course part of the training plan. To praise the good achievement of individual participant by an award of prize or distinction in certificate is an appropriate option to boost the participants' motivation of doing well in the program. A fairness of evaluation is crucial here.

In either case, to have such evaluation event should be informed to the participants in advance, and its schedule has been planned as part of whole training plan.

### 5.2. Evaluation of training program and feedback

Evaluation of the program and feedback are vital factors that keep the flood

management training relevant and effective in WRMA. Most common way to do the evaluation is to have a questionnaire survey among participants. Right after the last session of the program, participants are asked to answer questionnaire, which may contain questions such as;

- Level of satisfaction to the syllabus, training subjects and methods,
- Evaluation of trainers,
- Evaluation of teaching materials and other information provided,
- Evaluation on overall execution of the program, etc.

The results of the questionnaire survey should be compiled, reviewed by relevant parties such as HRD and WRMA management. And most important is how to use the results in the improvement of the training program. Receiving comments does not necessarily means that the comments should be accepted. There must be a careful judgment whether and how the comment is reflected to any part of the program.

Also, trainers can contribute to the revision and improvement of the program. They face and interact directly with the participants, and see the reaction thereof.

The process and method of evaluation can be a standardized one that HRD applies to any other training programs it administers. Post program working group discussion may be a good occasion for trainers to look into problems they encountered in the lecture rooms, and summarize recommendations.

In the long run, there should be a major overhaul of the program, as revisions and adjustments based on the results of participant survey trainers' review may not be effective enough to solve the structural obsolescence of the program.

## 6. Sample documents

To serve preparation of future training events, including further execution of WRMA flood management training, the following documents are attached to this manual as samples;

- |            |   |
|------------|---|
| Appendix-A | Summary of Capacity Assessment of WRMA on Flood Management,                   |
| Appendix-B | Syllabus of WRMA Training in line with Flood Management Module in WDC Manual, |
| Appendix-C | Time Table of WRMA Flood Management Training,                                 |
| Appendix-D | Check List of WRMA Training Preparation.                                      |

## Appendix A : Capacity Assessment and Development Planning for WRMA

Project Purpose: In the Project target areas, institutional framework of flood management in the context of integrated water resource management is established for effective and sustainable implementation of community based activities.

Output 1) At each level of WRMA (headquarters, regional offices and sub-regional offices), sustainable organizations in charge of flood management are strengthened.

Output 2) For promoting community based activities of flood management, capacity of WRMA to support WRUAs and communities is strengthened.

WRMA Capacity to be developed	Required Capacity Elements	Assessment of current capacity level (Consultant's assessment with additional inputs from discussions in WG)	Development needs (Consultant's proposition with additional inputs from discussions in WG)	priority	Time scope	Specific method of development adopted in the Project	Target Group
1. To develop a system for collecting information/data with respect to flood phenomena	[Personal aspects]						
	1-1 To collect and organize information and data about the rain and the river flow which is the cause of floods	<p><b>Knowledge and Skills:</b> Regarding collecting and organizing information and data of rain and river flow which is the cause of floods, staffs of WRMA HQ, RO and SRO have skills and knowledge of low water, but they don't have enough skills and knowledge of high water.</p> <p>Regarding the observation of rainfall, WRMA HQ, RO and SRO staffs don't have enough knowledge and technology for short time interval rainfall observation. Regarding the observation of river water level and river flow, they don't have enough knowledge and technology for one-hour interval water level observation and flood discharge observation.</p> <p><b>Supplementary Notes:</b> There are opportunities for training the staff of the HQ, there are few opportunities for training of staff of RO and SRO. Technology instruction book does not exist.</p>	<p>- Staffs of WRMA-HQ, RO and SRO will be able to utilize the basic knowledge of meteorology, hydrology, river engineering, rainfall observation, river water level gauging, river flow observation, river survey, river investigation, data processing and statistical processing in their flood management work.</p> <p>- Some trained staff of WRMA will be able to be lecturers of WRMA technical training in second training course.</p>			<p><b>[Training in Kenya]</b></p> <ul style="list-style-type: none"> <li>- Creating instruction book about basic knowledge of meteorology, hydrology, river engineering, rainfall observation, river water level gauging, river flow observation, river survey, river investigation, data processing and statistical processing.</li> <li>- Seminars and training on the basic knowledge of meteorology, hydrology, river engineering, rainfall observation, river water level gauging, river flow observation, river survey, river investigation, data processing and statistical processing.</li> </ul>	SRO,RO,HQ
	1-2 To collect and organize information and data on impacts and damages by floods	<p><b>Knowledge and Skills:</b> WRMA-SRO staff members are not able to collect and organize information and data about the human damage such as the number of missing persons and the number of deaths and the physical damage such as the number of destroyed houses and crops affected by floods as flood damage.</p>	<p>-From other related organizations and districts, WRMA-SRO staff will be able to obtain information related to flood damage.</p>			<p><b>[Training in Kenya and On the Job Training (OJT) ]</b></p> <ul style="list-style-type: none"> <li>- Training in Kenya and OJT to collect and organize the human damage and physical damage by floods</li> </ul>	SRO
	1-3 To collect and organize characteristics of the river basin and the causes and the effects of floods by using the map	<p><b>Knowledge and Skills:</b> WRMA-SRO Staffs usually don't use maps in their works because topographical maps have not been distributed in SRO offices. Flooded area have not been identified and delineated on the maps, too. And, river course changing records have not been identified and shown on the maps, too. Only for Lumi River, such kind of records was organized on a hand writing map. WRMA SRO officers don't have a map which shows the location of rainfall stations and river water level gauging stations.</p>	<ul style="list-style-type: none"> <li>- WRMA-SRO officers will be able to arrange the characteristics of river basin and the situation of the variation of the river channel by using a topographic map.</li> <li>- WRMA-SRO officers will be also able to indicate the locations of rainfall stations and river water level gauging stations on a map.</li> </ul>			<p><b>[Training in Kenya and OJT]</b></p> <ul style="list-style-type: none"> <li>- Training and OJT to organize basin characteristics and flood affected area, river course, rain gauges, water level gauges on the map,</li> </ul>	SRO, RO
	1-4 The ability to summarize and report the status of flood and its damage	<p><b>Knowledge and Skills:</b> WRMA-SRO officers don't have enough knowledge and skill to collect and organize information of rainfall, river flow rate and geographical characteristics as causes of floods and to collect and organize information of the affected area and affected population as flood damage and to formulate reports.</p>	<ul style="list-style-type: none"> <li>- WRMA-SRO officers will be able to collect and organize information of rainfall, river flow rate and geographical characteristics as causes of floods and to collect and organize information of the affected area and affected population as</li> </ul>			<p><b>[Training in Kenya and OJT]</b></p> <ul style="list-style-type: none"> <li>- Training of writing flood report</li> <li>- Formulation of flood reports through OJT</li> </ul>	SRO

Project Purpose: In the Project target areas, institutional framework of flood management in the context of integrated water resource management is established for effective and sustainable implementation of community based activities.

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WRMA Capacity to be developed	Required Capacity Elements	Assessment of current capacity level (Consultant's assessment with additional inputs from discussions in WG)	Development needs (Consultant's proposition with additional inputs from discussions in WG)	priority	Time scope	Specific method of development adopted in the Project	Target Group
			flood damage and to formulate reports.				
[Organizational aspects] (human, physical, financial, knowledge, etc.)							
	1-5 Collection and arrangement of information and data related to rainfall and river discharge which are causes of floods shall be conducted systematically and appropriately.	<p><b>Organization:</b> There is no nationwide common method of installation, maintenance and calibration of observation equipment. There is no particular system for it. Although there are officers in charge of data collection, there is no system of guidance for volunteer observers. There is no officer in charge of checking data and processing statistically. Officers in charge of database were stationed in SRO, RO and HQ. There is no system to share the result of observation. Standing Orders: There is no such regulatory document of posts.</p> <p><b>Budget Measures:</b> Insufficient budget</p> <p><b>Equipment:</b> RO has an Acoustic Doppler Current Profiler (ADCP) and an Acoustic Doppler Velocity-meter (ADV). SRO has a SEBA Current Flow Meter Number and the volume of hard disk of personal computer is not enough.</p> <p><b>Supplementary Notes:</b> Access to the observation station is poor and it is a factor that interferes with data collection and maintenance.</p>	<ul style="list-style-type: none"> <li>- WRMA HQ will be able to prepare regulatory documents on the installation, operation and maintenance and calibration of rainfall, water level and water flow.</li> <li>- WRMA SRO will be able to prepare observation record without data missing and wrong typing.</li> <li>- WRMA SRO will be able to check and correct data missing and wrong typing.</li> <li>- WRMA RO will be able to conduct statistical analysis of observed data.</li> <li>- WRMA HQ will be able to establish a database of observed data which can be used by all RO and SRO offices.</li> <li>- WRMA HQ will be able to prepare annual reports of observed data by using the observation database.</li> <li>- WRMA HQ will be publish and share the annual report with RO and SRO.</li> </ul>			<p><b>[Advise by JICA experts, training in Kenya and training in Japan]</b></p> <ul style="list-style-type: none"> <li>- Training on how to install, maintain and calibrate observation equipment.</li> <li>- Technical advice and training on the system of installation, maintenance and calibration of observation equipment.</li> <li>- Technical advice and training on collecting observed data of rainfall, river water level and river flow rate.</li> <li>- Technical advice and training on the methods of checking and statistical analysis of rainfall, river water level and river flow rate.</li> <li>- Technical advice and training on the system of checking and statistical analysis of rainfall, river water level and river flow rate.</li> <li>- Technical advice and training on the database of rainfall, river water level and river flow rate.</li> <li>- Technical advice and training on the sharing methods on annual reports of observed data.</li> <li>- Technical advice and training on the system for publishing annual reports of observed data.</li> </ul>	SRO,RO,HQ
	1-6 To collect and organize information and data about the effects and damage of floods is done properly in an organized manner	<p><b>Organization:</b> There is no Flood Management Officer in RO and SRO.</p> <p><b>Standing Orders:</b> There is no such regulatory document of posts.</p> <p><b>Budget Measures:</b> Insufficient budget</p> <p><b>Equipment:</b> Number of personal computers and vehicles is not enough.</p>	Flood Management Officers will be stationed in ROs and SROs. And to collect and organize information about the effects and damage of floods will be noted in the mandate of that post. Necessary equipment such as computers and vehicles will be deployed with an appropriate budget.			<p>[Advise, training in Kenya and training in Japan]</p> <ul style="list-style-type: none"> <li>- Advice on organizational structure, human resources and budget</li> <li>- Training in Kenya</li> <li>- Training in Japan</li> </ul>	SRO, RO

Project Purpose: In the Project target areas, institutional framework of flood management in the context of integrated water resource management is established for effective and sustainable implementation of community based activities.

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WRMA Capacity to be developed	Required Capacity Elements	Assessment of current capacity level (Consultant's assessment with additional inputs from discussions in WG)	Development needs (Consultant's proposition with additional inputs from discussions in WG)	priority	Time scope	Specific method of development adopted in the Project	Target Group	
	1-7 It is made properly collected and organized in an organized manner by using the map on characteristics of the river basin and the causes and the effects of floods.	<p><b>Organization:</b></p> <ul style="list-style-type: none"> <li>- It is very rare to use maps in all of SRO, RO and HQ.</li> <li>- There are two officers to be able to use GIS in HQ. They are medium to upper class.</li> <li>- There are almost 2 officers to be able to use GIS in RO. They are beginner class. It is very hard to use GIS for their work.</li> <li>- There is no officer to be able to use GIS.</li> </ul> <p><b>Standing Orders:</b> There is no such regulatory document of posts.</p> <p><b>Budget Measures:</b> Insufficient budget</p> <p><b>Equipment:</b> Number of personal computers and vehicles is not enough.</p> <p><b>Supplementary Notes:</b> There is no clear methodology to check and make statistical analysis.</p>	Flood Management Officers who will be stationed in ROs and SROs will be able to use GIS. And to collect and organize information about the effects and damage of floods will be noted in the mandate of that post. Necessary equipment such as computers and vehicles will be deployed with an appropriate budget.			<p><b>[Advise, training in Kenya and training in Japan]</b></p> <ul style="list-style-type: none"> <li>- Advice on organizational structure, human resources and budget</li> <li>- Training in Kenya</li> <li>- Training in Japan</li> </ul>	SRO, RO	
	1-8 Report summarizing the situation of flood damage shall be shared nationwide through HQ and RO	<p><b>Organization:</b> There is no Flood Management Officer in RO and SRO.</p> <p><b>Standing Orders:</b> There is no such regulatory document of posts.</p> <p><b>Budget Measures:</b> Insufficient budget</p> <p><b>Equipment:</b> Number of personal computers and vehicles is not enough.</p>	Flood Management Officers who will be stationed in ROs and SROs will be able to prepare flood reports. And to collect and organize information about the effects and damage of floods will be noted in the mandate of that post. Necessary equipment such as computers and vehicles will be deployed with an appropriate budget.			<p><b>[Advise, training in Kenya and training in Japan]</b></p> <ul style="list-style-type: none"> <li>- Advice on organizational structure, human resources and budget</li> <li>- Training in Kenya</li> <li>- Training in Japan</li> </ul>	SRO, RO	
	[Institutional aspects]							
	1-10 There is an agreement or system on sharing of observed data of rainfall, water level and flow rate with related organizations	<ul style="list-style-type: none"> <li>- There is no agreement between WRMA, which is conducting meteorological and hydrological observation, and KMD, which is conducting meteorological observation to exchange and share observed data. WRMA provide rainfall observed data to KMD. There were movement to promote data sharing agreement many times in the past, but still the agreement has not been made.</li> <li>- However, there is a framework of KMD observed data sharing such as the ASAL Secretariat, which is a platform of countermeasures to drought, and NPDRR, which is a national platform for disaster risk reduction, formulated by the Government of Kenya.</li> </ul>	<ul style="list-style-type: none"> <li>• WRMA to participate as an organization in charge of flood management in NPDRR. .</li> </ul>			<p><b>[Advice and Workshops]</b></p> <ul style="list-style-type: none"> <li>-Prior consultation with all the ministries/organizations concerned</li> <li>- Fostering a common awareness of the relevant ministries/organizations through workshops</li> <li>-Agreement with the relevant ministries in JCC</li> </ul>	HQ	
2. To analyze cause and effect of floods by using related information/data	[Personal aspects]							
	2-1 Basic knowledge of topographic maps and mapping technique	<p><b>Knowledge and Skills:</b> WRMA staffs are short on experience in reading topographic maps and mapping process, because topographic maps are not in common in Kenya.</p> <p><b>Incentive:</b> no incentive scheme</p> <p><b>Supplementary Notes:</b> WRMA staffs have no chances for attending training seminars of reading maps and mapping technique; no technical reference materials.</p>	<ul style="list-style-type: none"> <li>■ WRMA staffs are to apply the basic knowledge of topographic maps and mapping technique to flood management services.</li> <li>■ Lecturers for the WRMA technical training, 2<sup>nd</sup> stage training in Kenya, are to be trained out of WRMA staffs, who will get the training in Kenya.</li> </ul>			<p><b>[Training in Kenya]</b></p> <ul style="list-style-type: none"> <li>■ Training and practical work on reading ability of maps and mapping technique</li> </ul>	SRO,RO,HQ	

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	2-2 Basic knowledge of high water discharge observation	<b>Knowledge and Skills:</b> WRMA staffs are short on experience and understanding in high water discharge observation, although WRMA staffs understand the importance of low water discharge observation. <b>Incentive:</b> no incentive scheme <b>Supplementary Notes:</b> WRMA staffs have no chances for attending training seminars of high water discharge observation; no technical reference materials.	<ul style="list-style-type: none"> <li>WRMA staffs are to apply the basic knowledge of high water discharge observation to flood management services.</li> <li>Lecturers for the WRMA technical training, 2<sup>nd</sup> stage training in Kenya, are to be trained out of WRMA staffs, who will get the training in Kenya.</li> </ul>			<b>[Training in Kenya]</b> <ul style="list-style-type: none"> <li>Training and practical work on high water discharge observation</li> </ul>	SRO,RO,HQ
	2-3 Basic knowledge of flood disaster databases	<b>Knowledge and Skills:</b> WRMA staffs are short on experience in constructing flood disaster database, although WRMA staffs understand the importance of it. <b>Incentive:</b> no incentive scheme <b>Supplementary Notes:</b> WRMA staffs have no chances for attending training seminars of constructing and managing databases.	<ul style="list-style-type: none"> <li>WRMA staffs are to apply the basic knowledge of flood disaster databases to flood management services.</li> <li>Lecturers for the WRMA technical training, 2<sup>nd</sup> stage training in Kenya, are to be trained out of WRMA staffs, who will get the training in Kenya.</li> </ul>			<b>[Training in Kenya &amp; Japan]</b> <ul style="list-style-type: none"> <li>Training on constructing flood disaster database</li> </ul>	SRO,RO,HQ
[Organizational aspects] (human, physical, financial, knowledge, etc.)							
	2-4 Framework for observing high water discharges	<b>Organization Framework:</b> WRMA has no observation framework on discharges. Each WRMA Office is in own way of discharge observation. For example, Kakamega RO is conducting a routine observation of discharges, while Kisumu RO has no observation of discharges. No ROs have conducted any observation of high water discharges. <b>Standing Orders:</b> nonexistent <b>Budget Measures:</b> not enough <b>Equipment:</b> ROs have no discharge observation instruments, although ROs have them. <b>Supplementary Notes:</b> WRMA has unclear practice and procedure for observing high water discharges; no manuals on discharge observation	<ul style="list-style-type: none"> <li>Framework for observing high water discharges is to be formed in WRMA.</li> <li>Framework for sharing discharge observation instruments between RO and SRO is to be formed in WRMA.</li> <li>Lecturers for the WRMA technical training, 2<sup>nd</sup> stage training in Kenya, are to be trained out of WRMA staffs, who will get the training in Kenya.</li> </ul>			<b>[Technical Advice; Training in Kenya &amp; Japan]</b> <ul style="list-style-type: none"> <li>Technical advice and training on high water discharge observation</li> <li>Technical advice and training on high water discharge observation system</li> </ul>	SRO,RO,HQ
	2-5 Framework for developing and administrating flood disaster database in Kenya	<b>Organization Framework:</b> WRMA has not developed a flood disaster database in Kenya, although it recognizes the importance of the database. <b>Standing Orders:</b> nonexistent <b>Budget Measures:</b> not available <b>Equipment:</b> no problem <b>Supplementary Notes:</b> JICA Consulting Team has offered a prototype of the disaster database in Kenya, which was made by disaster data compiled by an existing database "CRED"; no manuals for developing database	<ul style="list-style-type: none"> <li>Framework for developing and administrating flood disaster database is to be formed in WRMA.</li> <li>The flood disaster database is to be used as one of knowledge management tools of flood management.</li> <li>Lecturers for the WRMA technical training, 2<sup>nd</sup> stage training in Kenya, are to be trained out of WRMA staffs, who will get the training in Kenya.</li> </ul>			<b>[Technical Advice; Training in Kenya &amp; Japan]</b> <ul style="list-style-type: none"> <li>Technical advice and training on developing flood disaster database in Kenya</li> <li>Technical advice and training on administrating flood disaster database in Kenya</li> </ul>	SRO,RO,HQ
	2-6 Framework for evaluating flood affected areas and flood damages	<b>Organization Framework:</b> WRMA have no evaluation framework on flood affected areas and flood damages. <b>Standing Orders:</b> nonexistent <b>Budget Measures:</b> not available	<ul style="list-style-type: none"> <li>Framework for evaluating flood affected areas and flood damages is to be formed in WRMA.</li> <li>Lecturers for the WRMA technical training,</li> </ul>			<b>[Technical Advice; Training in Kenya &amp; Japan]</b> <ul style="list-style-type: none"> <li>Technical advice and training on evaluating flood affected areas</li> </ul>	SRO,RO,HQ



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		<b>Equipment:</b> nonexistent <b>Supplementary Notes:</b> Ignoring the data on flood affected areas and flood damages, WRMA has not gained one of important tools for appealing flood management.	2 <sup>nd</sup> stage training in Kenya, are to be trained out of WRMA staffs, who will get the training in Kenya.			and flood damages ■ Technical advice and training on framework for evaluating flood affected areas and flood damages	
	[Institutional aspects]						
	2-7 Legal systems for assisting high water discharge observation	WRMA has no legal stipulation for making compulsory at high water discharge observation.	■ Compulsory observation on high water discharge is to be made in WRMA.			<b>[Workshops]</b> ■ Proposal for legal stipulation on compulsory observation of high water discharges	SRO,RO,HQ
	2-8 Legal systems for assisting evaluation for flood affected areas and flood damages	WRMA has no legal stipulation for making compulsory at evaluation of flood affected areas and flood damages, although since 2009 CRC has been collected disaster data, such as affected areas and damages by floods.	■ Compulsory evaluation for flood affected areas and flood damages is to be made in WRMA.			<b>[Workshops]</b> ■ Proposal for legal stipulation on compulsory evaluation for flood affected areas and flood damages	SRO,RO,HQ
	2-9 Legal systems for assisting development and management on flood disaster database	WRMA has no legal stipulation for making compulsory at flood disaster database in Kenya.	■ Compulsory development and management and flood disaster database is to be made in WRMA.			<b>[Workshops]</b> ■ Proposal for legal stipulation on compulsory development and management on flood disaster database in Kenya	SRO,RO,HQ
3. To coordinate relevant stakeholders for better flood management in communities	[Personal aspects]						
	3-1 Basic knowledge on monitoring of rainfall and water level, and Early Warning System	<b>Knowledge and Skills:</b> systems of monitoring of rainfall and water level, and Early Warning have not been implemented. However, WRMA staff has basic understanding on these systems, <b>Incentive:</b> N/A, <b>Supplementary Notes:</b> There are no reference materials made available to WRMA.	■ WRMA staff will be able to apply his basic knowledge on monitoring of rainfall and water level, and Early Warning System to his flood management activities (such as provision of information). ■ WRMA will consider implementation of EWS using automatic observation data. ■ Among WRMA staff received the training in the project, there will be a few staff members who are able to lecture in WRMA's own training system.			<b>[Training in Kenya and Japan]</b> ■ To provide training on monitoring of rainfall and water level, and Early Warning	SRO,RO,HQ
	3-2 Basic knowledge on Hazard Mapping	<b>Knowledge and Skills:</b> Hazard maps are not very common but WRMA staff understands their importance in flood management. There are few occasions to experience making of hazard maps._ <b>Incentive:</b> N/A, <b>Supplementary Notes:</b> There are few chances of receiving trainings on hazard maps. There are no reference materials made available to WRMA.	■ WRMA staff will be able to apply his basic knowledge on hazard maps and technically advise WRUAs when WRUAs make their own hazard maps. ■ Among WRMA staff received the training in the project, there will be a few staff members who are able to lecture in WRMA's own training system.			<b>[Training in Kenya and Japan]</b> ■ To provide training on making hazard maps	SRO,RO,HQ

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[Organizational aspects] (human, physical, financial, knowledge, etc.)							
	3-3 Having methodologies and organizations for community based flood responses (monitoring of rainfall, water level and flood damages, etc.)	<p><b>Organization Framework:</b> WRMA is well aware of the importance of monitoring systems of water level and flood damages, and early warning systems and has agreement on his intention to establish such systems in the near future.</p> <p><b>Standing Orders:</b> nonexistent</p> <p><b>Budget Measures:</b> not available</p> <p><b>Equipment:</b> N/A</p> <p><b>Supplementary Notes:</b> no technical reference materials available</p>	<ul style="list-style-type: none"> <li>■ WRMA will have established a network to collect and disseminate information on the results of rainfall and water level monitoring and other observations.</li> <li>■ Among WRMA staff received the training in the project, there will be a few staff members who are able to lecture in WRMA's own training system.</li> </ul>			<p><b>[Technical Advices, Training in Kenya and Japan]</b></p> <ul style="list-style-type: none"> <li>■ Training and practices on monitoring systems for water level and flood damages, and early warning.</li> </ul>	SRO,RO,HQ
	3-4 Having methodologies and organizations for preparing and utilizing hazard maps	<p><b>Organization Framework:</b> There is no established technical advice organization to support communities to prepare hazard maps.</p> <p><b>Standing Orders:</b> nonexistent</p> <p><b>Budget Measures:</b> not available</p> <p><b>Equipment:</b> There are no topographic maps and GIS software available</p> <p><b>Supplementary Notes:</b> WRUAs are trying to make hazard maps on their own. JICA consultant team is preparing prototype base maps using GIS. There is no technical standard available.</p>	<ul style="list-style-type: none"> <li>■ WRMA will have established organization to make, collect, update and manage hazard maps.</li> <li>■ WRMA will be able to provide WRUA with hazard maps.</li> <li>■ Among WRMA staff received the training in the project, there will be a few staff members who are able to lecture in WRMA's own training system.</li> </ul>			<p><b>[Technical Advices, Training in Kenya and Japan]</b></p> <ul style="list-style-type: none"> <li>■ Training and practices on organization for technical advices provided to communities preparing hazard maps.</li> </ul>	SRO,RO,HQ
[Institutional aspects]							
	3-5 Legal systems for collection and dissemination of communities' flood responses (monitoring of rainfall, water level and flood damages)	WRMA has no legal stipulation for collecting and disseminating community based flood responses, in particular, flood-related information.	<ul style="list-style-type: none"> <li>■ Establishment of WRMA's system to support community based flood responses (collection and dissemination of flood-related information)</li> </ul>			<p><b>[Workshops]</b></p> <ul style="list-style-type: none"> <li>■ Proposal for legal stipulation on compulsory provision of support to community based flood responses (collection and dissemination of flood-related information)</li> </ul>	SRO,RO,HQ
4. To advise WRUAs technically to formulate SCMPs							
[Personal aspects]							
	4-1 Basic knowledge on technical advices to community based flood responses (evacuation, flood fighting, etc.)	<p><b>Knowledge and Skills:</b> WRMA's current Knowledge and Skills: on community based flood responses (evacuation, flood fighting, etc.) is not very high. At this level, it is difficult for WRMA staff to technically advise communities on their flood responses.</p> <p><b>Incentive:</b> no Incentive: scheme</p> <p><b>Supplementary Notes:</b> There is no technical reference material available.</p>	<ul style="list-style-type: none"> <li>■ WRMA staff will be able to apply his knowledge on community based flood responses (evacuation, flood fighting, etc.) and provide technical support to WRUAs when WRUAs are to execute flood response activities.</li> <li>■ Among WRMA staff received the training in the project, there will be a few staff members who are able to lecture in WRMA's own training system.</li> </ul>			<p><b>[Training in Kenya and Japan]</b></p> <ul style="list-style-type: none"> <li>■ Training and practices, in collaboration with CMDRR and KRCS, on community based flood responses (evacuation, flood fighting, etc.)</li> </ul>	SRO,RO,HQ

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	4-2 Basic knowledge on technical advices to flood control works (structural measures)	<p><b>Knowledge and Skills:</b> WRMA's current Knowledge and Skills: on flood control works (structural measures) is not very high. At this level, it is difficult for WRMA staff to technically advise communities on their efforts to design, implement and manage flood control works.</p> <p><b>Incentive:</b> no Incentive: scheme</p> <p><b>Supplementary Notes:</b> There is no technical reference material available.</p>	<ul style="list-style-type: none"> <li>■ WRMA staff will be able to apply his knowledge on flood control works (structural measures) and provide technical support to WRUAs when WRUAs are to implement flood control works.</li> <li>■ Among WRMA staff received the training in the project, there will be a few staff members who are able to lecture in WRMA's own training system.</li> </ul>			<p><b>[Training in Kenya and Japan]</b></p> <ul style="list-style-type: none"> <li>■ Preparation of technical reference materials for designing, implementing and managing flood control works.</li> <li>■ Training and practices on provision of technical support for designing, implementing and managing flood control works.</li> </ul>	SRO,RO,HQ
	4-3 Basic knowledge on technical advices to community level disaster prevention education	<p><b>Knowledge and Skills:</b> WRMA's current Knowledge and Skills: on community level disaster prevention education is not very high. At this level, it is difficult for WRMA staff to technically advise communities on their efforts to educate community members.</p> <p><b>Incentive:</b> no Incentive: scheme</p> <p><b>Supplementary Notes:</b> There is no technical reference material available.</p>	<ul style="list-style-type: none"> <li>■ WRMA staff will be able to apply his knowledge on community level disaster prevention education and provide technical support to WRUAs when WRUAs are to carry out education activities.</li> <li>■ Among WRMA staff received the training in the project, there will be a few staff members who are able to lecture in WRMA's own training system.</li> </ul>			<p><b>[Training in Kenya and Japan]</b></p> <ul style="list-style-type: none"> <li>■ Training and practices on provision of technical support for community level disaster prevention education</li> </ul>	SRO,RO,HQ
	4-4 Basic knowledge on technical advices to obtain funds for community based activities	<p><b>Knowledge and Skills:</b> WRMA's current Knowledge and Skills: on obtaining funds such as WDC is not very high. At this level, it is difficult for WRMA staff to technically advise communities on their efforts to apply for funds.</p> <p><b>Incentive:</b> no Incentive: scheme</p> <p><b>Supplementary Notes:</b> There is no technical reference material available.</p>	<ul style="list-style-type: none"> <li>■ WRMA staff will be able to apply his knowledge on funds and provide technical support to WRUAs when WRUAs are to apply for such funds.</li> <li>■ Among WRMA staff received the training in the project, there will be a few staff members who are able to lecture in WRMA's own training system.</li> </ul>			<p><b>[Training in Kenya]</b></p> <ul style="list-style-type: none"> <li>■ Training and practices on provision of technical support for WRUAs' application for funds</li> </ul>	SRO,RO,HQ
[Organizational aspects] (human, physical, financial, knowledge, etc.)							
	4-5 Establishing methods and organization to technically support WRUAs in preparing SCMPs	<p><b>Organization Framework:</b> WRMA is currently not providing adequate technical support to WRUAs in their preparation of SCMPs.</p> <p><b>Standing Orders:</b> nonexistent</p> <p><b>Budget Measures:</b> not available</p> <p><b>Equipment:</b> N/A</p> <p><b>Supplementary Notes:</b> There is no technical standard or materials for providing technical advices to WRUAs.</p>	<ul style="list-style-type: none"> <li>■ WRMA will establish organization to apply his knowledge on flood management and provide technical support to WRUAs when WRUAs are preparing SCMPs.</li> <li>■ Among WRMA staff received the training in the project, there will be a few staff members who are able to lecture in WRMA's own training system.</li> </ul>			<p><b>[Technical advices, training in Kenya, workshops]</b></p> <ul style="list-style-type: none"> <li>■ Providing advices and training to provide support to WRUAs in preparing SCMPs</li> </ul>	SRO,RO,HQ
	4-6 Establishing methods and organization to technically support WRUAs in applying for funds	<p><b>Organization Framework:</b> WRMA is currently not providing adequate technical support to WRUAs in their application for funds. WRMA technically appraises the applications of WRUAs for funds.</p> <p><b>Standing Orders:</b> nonexistent</p> <p><b>Budget Measures:</b> not available</p> <p><b>Equipment:</b> N/A</p>	<ul style="list-style-type: none"> <li>■ WRMA will establish organization to apply his knowledge on funds and provide technical support to WRUAs when WRUAs are applying for funds.</li> <li>■ Among WRMA staff received the training in the project, there will be a few staff</li> </ul>			<p><b>[Technical advices, training in Kenya]</b></p> <ul style="list-style-type: none"> <li>■ Providing advices and training to provide support to WRUAs in applying for funds.</li> </ul>	SRO,RO,HQ

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		<b>Supplementary Notes:</b> There is no technical standard available.	members who are able to lecture in WRMA's own training system.				
	[Institutional aspects]						
	4-7 Legal systems for technical support to WRUA in preparing SCMPs	WRMA has a mandate to provide technical support to WRUA in preparing SCMPs.	—			—	—
5. To formulate and update a training manual on flood management and conduct training seminars to HQ/RO/SRO Officers of WRMA	[Personal aspects]						
	—	—	—	—	—	—	—
	[Organizational aspects] (human, physical, financial, knowledge, etc.)						
	5-1 Designing WRMA's own technical development system	<b>Organization Framework:</b> WRMA has not established his organization to design his own technical development system. <b>Standing Orders:</b> nonexistent <b>Budget Measures:</b> not available <b>Equipment:</b> N/A <b>Supplementary Notes:</b>	<ul style="list-style-type: none"> <li>■ WRMA will have established WRMA's own technical development system to train staff members of regions other than pilot areas, by lecturers who have been trained in training in Kenya provided by the project and nominated as lecturers.</li> <li>■ It is expected that in WRMA's own development system lecturers are raised, reference materials prepared, and trainings organized and executed.</li> </ul>			<b>[Technical advices, training in Kenya]</b> <ul style="list-style-type: none"> <li>■ Providing advices and practices to WRMA's own technical development training</li> <li>■ JICA and the consultant are expecting the WRMA technical development system to be self-sustaining in WRMA's own capacity.</li> </ul>	SRO,RO,HQ
	5-2 Preparation of WRMA's technical reference materials	<b>Organization Framework:</b> WRMA has not prepared technical reference materials for his technical development system. <b>Standing Orders:</b> nonexistent <b>Budget Measures:</b> not available <b>Equipment:</b> N/A <b>Supplementary Notes:</b> There is no technical standard available.	<ul style="list-style-type: none"> <li>■ WRMA will have prepared and edited technical reference materials for his own technical development system.</li> </ul>			<b>[Technical advices, training in Kenya]</b> <ul style="list-style-type: none"> <li>■ Providing support for WRMA technical development system reference materials and programs.</li> </ul>	SRO,RO,HQ
5-3 Raising lecturers for WRMA's technical development system	<b>Organization Framework:</b> WRMA has not established a method to raise lecturers for his own technical development system. <b>Standing Orders:</b> nonexistent <b>Budget Measures:</b> not available <b>Equipment:</b> N/A <b>Supplementary Notes:</b>	<ul style="list-style-type: none"> <li>■ Lecturers for WRMA technical development system will be selected from staff members who have received trainings in Kenya provided by the Project.</li> <li>■ WRMA will have considered technical modules to be used in technical development and lecturers will understand the objectives of technical development system and its contents.</li> </ul>			<b>[Technical advices]</b> <ul style="list-style-type: none"> <li>■ Provide advices on WRMA's raising lecturers for technical development system.</li> </ul>	SRO,RO,HQ	

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	5-4 Operation of technical development system	<p><b>Organization Framework:</b> WRMA is not currently operating technical development system.</p> <p><b>Standing Orders:</b> nonexistent</p> <p><b>Budget Measures:</b> not available</p> <p><b>Equipment:</b> N/A</p> <p><b>Supplementary Notes:</b> There is no standard for operation of technical development system.</p>	<ul style="list-style-type: none"> <li>WRMA will be operating WRMA's own technical development system to train staff members of regions other than pilot areas.</li> </ul>			<p><b>[Technical advices]</b></p> <ul style="list-style-type: none"> <li>Provide advices on WRMA's establishment of standards for operation of technical development system.</li> <li>Provide advices on WRMA technical development system</li> </ul>	SRO,RO,HQ	
	[Institutional aspects]							
	5-5 Legal systems for WRMA technical development system	WRMA has no legal stipulation for establishing his own technical development system.	<ul style="list-style-type: none"> <li>WRMA will be mandated to operate his own technical development system.</li> </ul>			<p><b>[Workshops]</b></p> <ul style="list-style-type: none"> <li>Proposal for legal stipulation on WRMA's establishment of technical development system.</li> </ul>	SRO,RO,HQ	
6. To introduce a concept of "River Basin Flood Management Plan (RBFMP)", which should be set between the CMS and the SCMPs	[Personal aspects]							
	6-1 Having basic knowledge on Integrated Flood Management (IFM)	<p><b>Knowledge and Skills:</b> WRMA staff members understand the necessity of IFM, but do not have acquired specific experiences to implement IFM and knowledge required.</p> <p><b>Incentive:</b> N/A</p> <p><b>Supplementary Notes:</b> There is no technical reference material available.</p>	<ul style="list-style-type: none"> <li>WRMA staff will be able to apply his basic knowledge on IFM and provide technical support to WRUAs when WRUAs prepare SCMPs.</li> </ul>			<p><b>[Training in Japan]</b></p> <ul style="list-style-type: none"> <li>Provide training on IFM</li> </ul>	SRO,RO,HQ	
	[Organizational aspects] (human, physical, financial, knowledge, etc.)							
	6-2 Establishing methods and organization for River Basin Flood Management Plan (RBFMP)	<p><b>Organization Framework:</b> WRMA understands the necessity of RBFMP, but has not established organization to prepare RBFMP.</p> <p><b>Standing Orders:</b> nonexistent</p> <p><b>Budget Measures:</b> not available</p> <p><b>Equipment:</b> N/A</p> <p><b>Supplementary Notes:</b> There is no technical standard available.</p>	<ul style="list-style-type: none"> <li>WRMA will be able to consider the necessity of RBFMP and contents of plans for the river basins he manages.</li> </ul>			<p><b>[Technical advices, training in Japan]</b></p> <ul style="list-style-type: none"> <li>Provide technical advices and training for establishing organization to formulate RBFMPs.</li> </ul>	SRO,RO,HQ	
[Institutional aspects]								
	6-3 Legal systems for RBFMP	WRUA is mandated to prepare SCMP for his sub-region, and WRMA prepare CMSS. RBFMP is a concept newly proposed in the Project and there is no legal provision to prepare RBFMPs.	<ul style="list-style-type: none"> <li>WRMA will be mandated to prepare a RBFMP for each river basin he manages.</li> </ul>			<p><b>[Workshops]</b></p> <ul style="list-style-type: none"> <li>Proposal for legal stipulation on preparation of RBFMPs</li> </ul>	SRO,RO,HQ	

**Appendix B : Syllabus of WRMA Training in line with Flood Management Module in WDC Manual**

30/9/2013

WDC Module(ver1)	Sessions ( based on WDC FMM Ver.1)	WRUA Level Training (WDC)		WRMA Level Training (stage 1&2)		WRMA level (future)	Reference Texts & Videos	Relevant section in capacity assessment	
		Objectives	Topics to be covered	Objectives	Additional topics to be covered			WRUA	WRMA
1 Flood Disaster and Flood Management	1-1 Cause and Effect of Flood	The participants will have an understanding of: 1) meaning of floods and flood disasters; and 2) meaning of sediment disasters.	- basic mechanisms of flood/sediment disasters	To enable the participants to lecture on: 1) meaning of floods and flood disasters; and 2) meaning of sediment disasters.	- community's perception of disasters				
1 Flood Disaster and Flood Management	1-1 Cause and Effects Flood	To enable the participants to understand; 1. Where floods occur and their causes	- Topography - land use - heavy rain - sediment - climate change - environmental change	To enable the participants to lecture on; 1. Mechanisms of flood, 2. Factors that affect occurrence of flood 3. Identify such factors in topographic maps.	- map literacy	- general meteorology - general hydrology - river engineering - geology	T-29) T-33) T-34) T-35) T-36)	\$2-1	\$1-1 \$2-1
1 Flood Disaster and Flood Management	1-1 Cause and Effects Flood	To enable the participants to understand; 1. Effects of flood and their impacts on various aspects of community, 2. That damages can be reduced by community's responses to the flood.	- human damage - economic damage - ecological damage - community's responses and responding capacity	To enable the participants to understand; 1. Flood risks as a combination of flood hazard and exposure/vulnerability/responding capacity of community, 2. Importance of collection and analysis of flood damage information, 3. WRMA's role in accumulation and dissemination of flood information	- exposure/vulnerability/ collection and analysis of damage data - flood disaster database - reporting floods and damages	- institutional arrangement for evaluation of flood damages		\$2-1 \$2-5 \$2-6	\$1-2 \$1-3 \$1-4 \$1-6 \$2-3 \$2-5 \$2-6 \$2-8 \$2-9
1 Flood Disaster and Flood Management	1-2 Understanding Flood Management	The participants will be able to: 1) understand the concept of river basin; 2) understand the meaning of flood management; and 3) learn the steps involved in flood management activities.	- river basin - integrated river basin flood management	To enable the participants to lecture on: 1) the concept of river basin; 2) meaning of flood management; and 3) steps involved in flood management activities.	- case example of IRBFM	- method of planning IRBFM	T-15) T-21)		\$6-1 \$6-2 \$6-3
1 Flood Disaster and Flood Management	1-3 Flood Disaster Management	The participants will be able to: 1) understand the phases in the flood disaster management cycle; and 2) understanding the importance of the MAPRRR in minimizing impacts of disasters.	- MAPRRR: Mitigation, Assessment, Preparedness, Response, Recovery & Reconstruction	To enable the participants to lecture on: 1) various phases in the flood disaster management cycle, including the activities involved in each phase; and 2) why and how each phase of the MAPRRR is important in minimizing impacts of flood disasters.	- importance of activities in each phase				
2 Rainfall and Flood Observation	2-1 Rainfall Observation 2-2 Rainfall Data and Statistical Processing	To enable the participants to understand: 1. Methods of measuring rainfalls, and 2. How to record measured data.	- manual rainfall observation - automated rainfall observation - observation errors	To enable the participants to: 1. Lecture on methods of measuring rainfalls, 2. Lecture on how to record measured data, 3. handle measurement equipment, installation, maintenance and calibration, 4. build a database and prepare periodical reports on measured data	- accumulation of data - rainfall database - sharing data (reports)	- installation, maintenance, calibration of equipment - data processing and statistical processing - verification of data	T-37)	\$8-3	\$1-1 \$1-5
2 Rainfall and Flood Observation	2-3 Discharge Observation	The participants will: 1) know where Rain Gauge Stations (RGSs) are located in their neighbourhood area; 2) understand how to measure water levels; and 3) understand the concept of converting water levels to river discharges.	- water level observation - rating curve and discharge - high water & low water	To enable the participants to: 1) lecture on locations and types of RGS at each sub-region; 2) lecture on how to measure water levels; 3) lecture on how to record measured data; 4) understand rating curves and their derivation; and 5) build a database and preparing periodical reports on measured data.	- high water observation - hydrological database - sharing data (reports)	- river survey - installation, maintenance, calibration of equipment - data processing and statistical processing - verification of data - legal provision for assisting high water observation	T-37)	\$8-3	\$1-1 \$1-5 \$2-2 \$2-4 \$2-7
3 Integrated River Basin Flood Management and Measures of Flood Hazards	3-1 Integrated River Basin Flood Management (IRBFM)	The participants will be able to: 1) understand the concept of river basin; 2) understand the meaning of flood management; and 3) learn the steps involved in flood management activities.	- river basin - integrated river basin flood management	To enable the participants to lecture on: 1) the concept of river basin; 2) meaning of flood management; and 3) steps involved in flood management activities.	- case example of IRBFM	- method of planning IRBFM	T-15) T-21)		\$6-1 \$6-2 \$6-3
3 Integrated River Basin Flood Management and Measures of Flood Hazards	3-2 Community Managed Flood Disaster Risk Reduction	At the end of this session participants will be able to: 1. Understand chief actors in flood management activities, 2. Appreciate the importance of self-help, 3. Explore possibilities of mutual support groups for the affected communities, 4. Seek participation of the public entities in assisting the affected communities	- formation of self-help groups - roles of relevant actors	To enable the participants to lecture on; 1. Chief actors in flood management activities, 2. Importance of self-help, 3. Possibilities of mutual support groups for the affected communities, 4. Role of public entities in assisting the affected communities	- demarcation of responsibilities among relevant actors			\$1-2 \$3-2	

Appendix B : Syllabus of WRMA Training in line with Flood Management Module in WDC Manual

30/9/2013

WDC Module(ver1)	Sessions ( based on WDC FMM Ver.1)	WRUA Level Training (WDC)		WRMA Level Training (stage 1&2)		WRMA level (future)	Reference Texts & Videos	Relevant section in capacity assessment	
		Objectives	Topics to be covered	Objectives	Additional topics to be covered			WRUA	WRMA
3 Integrated River Basin Flood Management and Measures of Flood Hazards	3-2 Community Managed Flood Disaster Risk Reduction	The participants will understand: 1) the concept of CMDRR; 2) the factors that influence CMDRR within their region; and 3) main stakeholders in CMDRR.	- community based organization, - ownership and responsibilities, - leadership, - WRUA constitution, - establishing flood management group	To enable the participants to: 1) have their understanding of CMDRR enhanced; 2) lecture on factors that influence adoption of CMDRR within a sub-region; 3) identify the main stakeholders in a CMDRR process; and 4) have their abilities enhanced to assess risks in communities.	- community's resources, - community's capacity, - making operating plans - case example of flood fighting activities		T-1) T-2) T-16)	\$1-1 \$1-3 \$3-1 \$3-3 \$3-4 \$3-5 \$3-6 \$5-2	
3 Integrated River Basin Flood Management and Measures of Flood Hazards	3-3 Vulnerability Assessment	To enable the participants to recognise; 1. Nature of floods in extent and distribution within their neighbourhood, 2. Community's exposure and vulnerability to flood.	- distribution of depth and velocity and dangerous points - exposure and vulnerabilities	To enable the participants to recognise; - Collect information from community members on past floods, - Understand the nature of floods in extent and distribution on topographic maps, - Understand community's exposure and vulnerability to, and community's awareness of flood.	- community's knowledge and awareness	- knowledge management	T-4.5A) T-10) T-11) T-12) T-13) T-25)	\$2-2 \$2-3 \$6-3	\$1-7 \$3-2 \$3-4
3 Integrated River Basin Flood Management and Measures of Flood Hazards	3-4 Developing a Community Flood Hazard Map	To enable the participants to; 1. Arrange flood related information on paper, 2. Understand the use of flood hazard map in a community. 3. Understand the importance of community's participation as a source of local information on past floods.	- basic understanding of hazard map - evacuation centres, existing health facilities and safe evacuation routes - evacuation planning - dissemination of information - knowledge on disaster prevention	To enable the participants to; 1. Instruct community members on how to draw a flood hazard map, 2. Lecture on how to utilise flood hazard maps, 3. Lecture on importance of flood related information to be shared among community members, 4. Accumulate flood hazard maps at the WRMA offices as sources of basic flood information of sub-catchment level.	- technical advice on preparing hazard map - case examples of utilization of flood hazard map	- Geographical Information System (GIS) - analysis using maps - inundation simulation	T-4.5A) T-10) T-11) T-12) T-13) T-25)	\$2-4 \$6-1 \$6-2 \$6-5	\$1-8 \$3-4
4 Flood Early Warning	4-1 Flood Early Warning System	The participants will understand: 1) elements of FEWS; and 2) the importance of a FEWS in flood disaster mitigation.	- hydro/meteorological data collection - transmission of information	To enable the participants to lecture on: 1) elements of FEWS; and 2) importance of a FEWS in for flood disaster mitigation.	- case examples of Nzoia River - case examples of advanced FEWS	- hydro/meteorological data analysis	T-20) T-27)	\$8-3 \$8-4 \$8-6	\$3-1 \$3-3
4 Flood Early Warning	4-2 Community Based Flood Early Warning	To enable the participants to understand: 1. Elements of community-based Flood Early Warning System 2. management of community-based Flood Early Warning System	- organizing Flood Early Warning groups - autonomous measurement - flow of information (organizations and individuals) and its rules - criteria for Flood Early Warning	To enable the participants to lecture on: 1. Elements of community-based Flood Early Warning System 2. management of community-based Flood Early Warning System				\$8-4	\$3-1
4 Flood Early Warning	4-3 Introduction to Integrated Flood Analysis System (IFAS) and Global Flood Alert System (GFAS)	To enable the participants to know; 1. flood related information available on internet (GFAS)	- internet access to GFAS data	To enable the participants understand; 1. What IFAS entails 2. Meaning of GFAS	- Outline of GFAS - Outline of IFAS		T-38) T-39)	-	\$3-1 \$3-3
5 Flood Disaster Evacuation Programme	5-1 Evacuation Planning	To enable the participants to understand; 1. Elements and steps of disaster evacuation planning	- evacuation routes & evacuation centres - hazards in the area - consideration on vulnerable segment of community	To enable the participants to lecture on; 1. Elements and steps of disaster evacuation planning	- methods of community-based flood responses - network to collect and disseminate real-time information	- institutional arrangement on evacuation order and rescue	T-8) V-2) V-6) V-7)	\$2-6 \$7-1 \$7-2 \$7-3 \$8-1	\$3-3 \$3-5 \$4-1
5 Flood Disaster Evacuation Programme	5-2 Evacuation Centre Management	To enable the participants to understand; 1. what is required in an evacuation centre 2. resources needed in O&M 3. rules in the management of an evacuation centre.	- stocks - securing safe water - hygienic management - organizing O&M group	To enable the participants to lecture on; 1. what is required in an evacuation centre 2. resources needed in O&M 3. rules in the management of an evacuation centre.	- financing O&M		T-24) V-2) V-6) V-7)	\$8-1	\$3-5 \$4-1
6 Communicatoin, Public Awareness Raising and Education	6-1 Capacity for Transmitting and Communication Skills	The participants will understand: 1) the importance of communication in flood risk management; 2) parties involved in FRC; and 3) necessary information to be communicated.	- recognition of local flood risks - handing down experiences of floods - disclosure/dissemination of information	To enable the participants to lecture on: 1) roles and the importance of communication in flood risks; 2) parties involved in FRC; and 3) necessary information to be communicated.	- method of risk communication among related parties	- flood risk assessment - flood risk management	V-5)	\$1-4 \$1-10	
6 Communicatoin, Public Awareness Raising and Education	6-2 Communication on Disired Information to Schools	The participants will understand: 1) role of schools as centres for relaying messages on disasters.	- necessary elements in preparing for flood education (community leaders, materials, lecturers, etc.)	To enable the participants to understand: 1) role of schools as centres for relaying messages on disasters; and 2) use of school curriculum to disseminate information on floods within their WRUAs and communities.	- vulnerable segment of community - area characteristics - case example of flood education		T-3) T-4) T-9) T-14)	\$3-2 \$4-2 \$4-3 \$4-4 \$4-5	\$4-3



**Appendix B : Syllabus of WRMA Training in line with Flood Management Module in WDC Manual**

30/9/2013

WDC Module(ver1)	Sessions ( based on WDC FMM Ver.1)	WRUA Level Training (WDC)		WRMA Level Training (stage 1&2)		WRMA level (future)	Reference Texts & Videos	Relevant section in capacity assessment	
		Objectives	Topics to be covered	Objectives	Additional topics to be covered			WRUA	WRMA
6 Communicatoin, Public Awareness Raising and Education	6-3 Effective Public Awareness Raising on Flood	The participants will: 1) understand what public awareness is and its importance; 2) understand how to create public awareness on floods; and 3) inculcate the best method of message transmission in case of floods.	- awareness and knowledge on flood disaster prevention - risk communication	At the end of the session, (The participants will be able to: 1) lecture on what awareness is and its importance; 2) lecture on how to create public awareness on floods; and 3) lecture on the best method of message transmission on floods.	- leadership, ownership & incentive	- vulnerability analysis	T-1) T-5)	\$4-1	\$4-3
7 Planning, Design, Construction, Operation and Maintenance of Flood Damage Mitigation Facilities	7-1 Planning and Design of Flood Mitigation Measures 7-2 Flood Damage Mitigation Non-Structural Measures including Community Based Measures	To enable the participants to be acquainted with; 1. Structural/non-structural measures 2. Use of forecasting and warning system 3. Disaster control planning 4. Role of education and training 5. Community mobilization and awareness	- examples of structural and non-structural measures	To enable the participants to lecture on the outlines of; 1. Structural/non-structural measures 2. Use of forecasting and warning system 3. Disaster control planning 4. Role of education and training 5. Community mobilization and awareness	- case examples of structural and non-structural measures - case examples of emergency operation during flood			\$6-2 \$6-3	\$2-1 \$4-3
7 Planning, Design, Construction, Operation and Maintenance of Flood Damage Mitigation Facilities	7-3 Flood Damage Mitigation Structural Measures Including Community Based Measures	To enable the participants to understand; 1. types of flood mitigation structural measures	- outline and effect of each structural measure - selection of measures	To enable the participants to lecture on; 1. types of flood mitigation structural measures	- case examples of structural measures; design, construction, and O&M - case examples of traditional flood control structures		T-6), T-7), T-18), T-19), T-23), T-28), T-31), T-32), T-41), V-1)	\$6-1	\$4-2 \$4-3
7 Planning, Design, Construction, Operation and Maintenance of Flood Damage Mitigation Facilities	7-3 Flood Damage Mitigation Structural Measures Including Community Based Measures	To enable the participants to understand; 1. process of implementing a construction project	- outline of project cycle; problem identification feasibility study/cost estimation detailed design/securing budget construction operation and maintenance	To enable the participants to lecture on; 1. process of implementing a construction project	- comparison of alternatives - environmental impact analysis - procurement (contracting works) - construction supervision	- planning structural measures - feasibility study - cost-effectiveness/cost benefit analysis	T-6), T-7), T-18), T-19), T-23), T-28), T-31), T-32), T-41), V-1)	\$6-4	
7 Planning, Design, Construction, Operation and Maintenance of Flood Damage Mitigation Facilities	7-3 Flood Damage Mitigation Structural Measures Including Community Based Measures	To enable the participants to understand; 1. basics of construction of flood mitigation structures 2. Operation of flood mitigation structures	- types of implementation; community work/contracting	To enable the participants to lecture on; 1. basics of construction of flood mitigation structures 2. Operation of flood mitigation structures	- providing advices on; selection of measures, budget estimation, contracting works, construction supervision, inspection of works	- designing structural measures	T-6), T-7), T-18), T-19), T-23), T-28), T-31), T-32), T-41), V-1)	\$6-6 \$6-7	
7 Planning, Design, Construction, Operation and Maintenance of Flood Damage Mitigation Facilities	7-3 Flood Damage Mitigation Structural Measures Including Community Based Measures	To enable the participants to understand; 1. Maintenance of structural measures.	- necessary works - organization	To enable the participants to lecture on; 1. Maintenance of structural measures.	- organisation and budget, practices in other sub-regions		T-6), T-7), T-18), T-19), T-23), T-28), T-31), T-32), T-41), V-1)	\$6-7	
8 Co-operation between Upstream and Downstream Stakeholders and Coordination	8-1 Co-operation and Co-ordination between Upstream and Downstream	The participants will understand: 1) how to cooperate between WRUAs and other stakeholders; 2) coordination process among the major stakeholders in dealing with a flood risk and reduction process.	- information sharing and networking - public involvement	To enable the participants to lecture on: 1) how to cooperate between WRUAs and other stakeholders; and 2) coordination process among the major stakeholders in dealing with a flood risk and reduction process.			T-16)	\$5-3	
8 Co-operation between Upstream and Downstream Stakeholders and Coordination	8-1 Co-operation and Co-ordination between Upstream and Downstream	The participants will understand: 1) why it is important to cooperate among WRUAs; and 2) areas of cooperation and coordination among WRUAs.	- information network - area characteristics	To enable the participants to lecture on: 1) why it is important to cooperate among WRUAs; and 2) areas of cooperation and coordination among WRUAs.				\$5-4	
8 Co-operation between Upstream and Downstream Stakeholders and Coordination	c) Roles of WRMA 8-2 Role of Cooperation and Coordination	The participants will understand: 1) roles of WRMA; 2) assistance to be obtainable from WRMAs; and 3) cooperation between WRMA and WRUA.	- mandate of WRMA for flood management - monitoring projects and disseminating information	To enable the participants to lecture on: 1) roles of WRMA; 2) assistance to be obtainable from WRMA; and 3) cooperation between WRMA and WRUAs.	- collecting information on community's flood management activities from WRUA - evaluating related information and disseminating lessons learnt			\$1-4	\$3-5
8 Co-operation between Upstream and Downstream Stakeholders and Coordination	a) Roles of local government 8-3 Co-operation with County Government, WRUA and DDMC	To enable the participants to understand; 1. local government's role in flood disaster prevention and risk management	- flood risk management - disaster response - communication channels	To enable the participants to lecture on; 1. local government's role in flood disaster prevention and risk management	- disaster monitoring - disaster assessment		T-15)	\$1-4	\$3-5
8 Co-operation between Upstream and Downstream Stakeholders and Coordination	b) Roles of District Disaster Management Committee (DDMC) 8-4 Role of District Disaster Management Committee (DDMC)	The participants will understand: 1) roles for DDMCs; and 2) role of the committee members in DDMCs.	- constituent members of DDMC - functional capability of DDMC	To enable the participants to lecture on: 1) roles for DDMCs; and 2) role of the committee members in DDMCs.			T-15)	\$1-4	\$3-5

## Appendix C : Time Table of 2nd Stage Training

Time		DEC 9 (DEC 16) (Mon)	DEC 10 (DEC 17) (Tue)	DEC 11(DEC 18) (Wed)	DEC 12 (DEC 19) (Thu)	DEC 13 (DEC 20) (Fri)
8:00	<b>Venue</b>	Sunset Hotel in Kisumu	Sunset Hotel in Kisumu	Sunset Hotel in Kisumu	Sunset Hotel in Kisumu	Sunset Hotel in Kisumu
<b>Registration</b>						
8:15	<b>Session 1</b>	8.30 Opening Address 8.45 Guidance	3-3 Vulnerability Assessment	4-2 Community-based Flood Early Warning	Field Exercise in Nyando  3-4 Developing Community- based Flood Hazard Maps	8-1 Co-operation and Co- ordination between Upstream and Downstream WRUAs in a River Basin
9:15	<b>15min Break</b>					
9:30	<b>Session 2</b>	Initial Questionnaire on Flood Management	3-4 Developing Community- based Flood Hazard Maps	4-3 Introduction to Integraed Flood Analysis System (IFAS) and Global Flood Alert System (GFAS)	same as above	8-2 Role of Co-operation and Co- ordination
10:30	<b>Tea Break</b>					
10:45	<b>Session 3</b>	1-1 Cause and Effect of Floods	2-1A Rainfall Observation 2-1B Rainfall Data and Statistical Processing	5-1 Evacuation Planning	same as above	8-3 Co-operation with County Government, WRUA and DDMC 8-4 Role of District Disaster Management Committee (DDMC)
11:45	<b>15min Break</b>					
12:00	<b>Session 4</b>	1-2 Understanding Flood Management	2-2 Flood Discharge Observation	7-1 Planning and Design of Flood Damage Mitigation Measures	same as above	- Final Questionnaire on Flood Management
13:00	<b>Lunch Break</b>					
14:00	<b>Session 5</b>	1-3 Flood Disaster Management	6-1 Capacity for Transmitting and Communication Skills 6-2 Communication on Desired Information to Schools	7-2 Flood Damage Mitigation for Non-Structural Measures including Community-based Measures	same as above	- Discussion - Closing Remarks
15:00	<b>15 min Break</b>					
15:15	<b>Session 6</b>	3-1 Integrated River Basin Flood Management (IRBFM)	6-3 Effective Public Awareness Raising on Floods	7-3 Flood Damage Mitigation Structural Measures including Community-based Measures	same as above	Handover of Certification
16:15	<b>Tea Break</b>					
16:30	<b>Session 7</b>	3-2 Community-managed Flood Disaster Risk Reduction (DRR)	4-1 Flood Early Warning System	5-2 Evacuation Centre Management	same as above	
17:30						

17:30

## Appendix D : Logistics for Training at 2<sup>nd</sup> Stage

No	Content	Person in charge	Due Date dd/mm (Week)	Completion Check	Remarks
<b>I . Preparation process for the training up until a month ago</b>					
1-1	To fix a content of training				
1-2	To prepare a training plan				
1-3	To prepare a list of lecturers				
1-4	To prepare a list of trainees				
1-5	To fix a training schedule				
1-6	To fix a venue for the training-Nairobi -Kisumu				
1-7	To book a venue for the training -Nairobi -Kisumu				
1-8	To fix a list of lecturers				
1-9	To fix a list of trainees				
1-10	To receive quotations on venue, accommodations, meal, equipment, recompense to lectures, travel allowance for trainees, etc.	Procurement			
1-11	To make an arrangement with lecturers on contents of the training				
1-12	To prepare invitation letters to lecturers				
1-13	To send off for invitation letters to lecturers				
1-14	To prepare concept and get approval				
<b>II . Preparation process for the training process- a week prior</b>					
2-1	To make an arrangement with lecturers on the content of session				
2-2	To make an arrangement with the administration office of the venue on preparation of the training	Procurement			
2-3	To make a preliminary inspection of the venue				
2-4	To arrange meal, water, tea, etc. for the training at the venue	Procurement			
2-5	To send a confirmation e-mails to lecturers on the time schedule and the content of the training				
2-6	To prepare invitation letters to trainees and send them				
2-7	Arrangement on transport to sites in Nyando area (hire of a private van)				
2-8	To procure manuscript notes—syllabuses and PPTs— from the lecturers				
2-9	To arrange a training equipment, such as computer, projector, screen, etc.	Procurement			
2-10	To make questionnaires on Flood Management and WRMA Training				
2-11	To make photocopies of distributed materials (XX copies)				
2-12	To arrange a vehicle to bring distributed materials				
<b>III . Procedure on the training day</b>					

Check List for Executing WRMA Training

No	Content	Person in charge	Due Date dd/mm (Week)	Completion Check	Remarks
3-1	To check on the training equipment, such as computer, projector, screen, etc.				
3-2	To make an arrangement for the training at the venue				
3-3	To make a reception work for trainees—check attendance				
3-4	To moderate the training				
3-5	To operate the computer & slide projector				
3-6	To make Videos & Photos during the training				
3-7	To give lecturers and trainees information on next day's training schedule.				
3-8	To ensure the venue's cleaned up.				
<b>IV. Procedure soon after the final day of the training</b>					
4-1	To pay an expense for the venue				
4-2	To pay an expense for meal, water, tea, etc.				
4-3	To edit Videos & Photos of the training				
4-4	To edit Questionnaires on Flood Management & WRMA Training				
<b>V. Procedure for a period of a month after the training</b>					
5-1	To evaluate the training results at the 2 <sup>nd</sup> Stage Training				
5-2	To evaluate the training results at the 2 <sup>nd</sup> Stage Training				
5-3	To discuss on the content of the 3 <sup>rd</sup> Stage Training with WRMA-FMU and JICA-PT				
5-4	To compile a draft of WDC Flood Management Manual for the 3 <sup>rd</sup> stage training				