付属資料 3-20

Isiolo パイロット事業契約報告

添付資料-1

2013 年 11 月 15 日

㈱ニュージェック

現地再委託契約の締結に関する報告書

1）案件名：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関発プロジェクト(第2年次)

2）再委託契約名：Construction of Riverbank Protection along the Eastern Marania river,

3）再委託契約業者名：Waso Building and Road Works Co. Ltd

- 担当者名　　：Mr. Osman Maalim Daud, Managing Director,
- 住所　　：403　60300　Isiolo
- 電話番号　　：0721-701-741

4）再委託契約履行期間：契約締結日より 3 カ月

5）再委託契約金額：KSh 4,980,907.-

ただし、コミュニティ貢献業務の度合いにより減額修正がありうる。

6）再委託業務の概要

イシオロタウン南方、東マラニア川の国道との交差点近くの湾曲部（高さ 4.5m、長さ 40m）にガビオン（ふとん籠）石積み方式で護岸工事を実施する。

7）選定方法

現地再委託先の選定には、貴機構が平成 18 年 6 月に制定した「コンサルタント等契約における現地再委託契約手続きガイドライン」に基づいて、指名競争入札方式とした。以下にその経緯を述べる。

1）地方行政機関（イシオロ・ディストリクト調達局 Isiolo District Procurement Officer: IDPO）に登録している工事業者のうち溜池やダム、河川工事に適した工事業者を推薦してもらい、24 社のリストを作成した（IDPO 推薦の業者リストは添付資料①参照）。

2）上記リストの全業者にレターを出し、事業への関心を聴取。

3）11 の業者が関心表明を提出。この 11 業者をロングリストとして 2013 年 9 月 20 日、WRUA、WRMA、プロジェクトチームで調達委員会を開催し、関心表明とともに提出された法人登録関係資料、実績関係資料、取り組み体制等の資料を評

価。結果、下記の 5 社を指名先（ショートリスト）として選定した。

業者名	住所／電話番号
1) Imenti Construction Company	BOX 169, MERU/ TEL. 0725 937 105
2) Soelleta General	BOX 569, ISIOLO/ TEL. 0733 451 702
3) Baretu General Construction Co.	BOX 330, ISIOLO/ TEL. 0721 921 186
4) Waso Building & Road Works Co. Ltd	BOX 403, ISIOLO/ TEL. 0721 701 741
5) Times Tec Construction	BOX 151, ISIOLO/ TEL. 0728 428 813

9 月 27 日、これら 5 社の指定業者に対して仕様書、指示書を含む入札図書を配布することを通知し、10 月 4 日 12:00 までに入札書類を提出するように指示した。入札の日程は以下の通りである。

9 月 28 日	8:00～15:00	業者に入札図書配布
10 月 4 日	12:00	入札書類提出締切
10 月 4 日	14:00～16:00	開札

4）10 月 4 日、WRUA 調達サブ委員会議長、WRMA サブ地域事務所長、プロジェクト業務主任の立会のもと、入札会を開催。指名 5 社中、2 社が応札。他の 3 社は、入札締め切り時刻に遅れて入札書類を持参したため、入札図書・入札説明書（Instruction to Bidders）18 条「Late Bid」に従い、入札書類は開札の対象とせずそのまま返却した。応札した 2 社について書類を確認したところ、いずれも入札図書に対し responsible であって有効、また、会社の法人登録、実績から本事業を実施する能力があると判断された。

5）入札結果は以下のとおりであった。

	業者名	応札価格(Ksh)	順位
1	Imenti Construction Company	5,173,878.40	2
2	Soelleta General	Late Bid として対象外	－
3	Baretu General Construction Co.	同上	－
4	Waso Building & Road Works Co. Ltd	4,980,907.00	1
5	Times Tec Construction	Late Bid として対象外	－

開札後、上記 2 社の応札価格を計算チェックした。その結果、計算間違いはなく、最低価格業者に変動はなく、Waso Building & Road Works Co. Ltd 社を契約交渉に招聘した。

6）最低価格落札者 WASO 社と、10 月 4 日に契約交渉を実施。事業に対し、コミュニティ貢献によるインプット（Gabion 材料の玉石収集）が存在すること、これにより、最終契約額に減額調整があること、降雨・出水の際は安全を優先し事業を中断する（プロジェクトマネージャ判断により）ことがあり、それに応じ契約期間は延長されるが金銭保証はなされないこと、等を説明。最低価格落札者はこれに同意。WRUA、WRMA、プロジェクトチーム（主任）に最低価格落札者代表を加えた 4 名でミニッツを作成し、上記説明事項と WASO 社を契約相手とすることを確認した。

7）以上を持って、プロジェクト業務主任と WASO 社代表の間で、2013 年 11 月 8 日付で契約を取り交わした。

以上

添付：

① IDPO 推薦業者リスト
② 指名業者（ショートリスト）選定結果
③ 入札書類提出記録
④ 開札記録
⑤ 応札価格チェック結果

TENDER NO. ISL/21/2012-2013 – PRE-QUALIFICATION FOR WATER PANS,DAMS, WATER RESERVIOUR & OTHER WATER WORKS.

The under listed are the pre-qualified contractors from whom competitive bidding should be sought.

ISL/21/2012-2013/1	**SOELLETA GENERAL** **BOX 569, ISIOLO** **TEL: 0733451702**
ISL/21/2012-2013/2	**JATIM ENGINEERING** **BOX 58, ISIOLO** **TEL: 0720875677**
ISL/21/2012-2013/3	**WAGUMI CONTRACTORS** **BOX 329, ISIOLO** **TEL: 0721463592**
ISL/21/2012-2013/4	**BARETU GENERAL CONSTRUCTION CO.** **BOX 330 ISIOLO** **TEL: 0721921186**
ISL/21/2012-2013/5	**EL – ADI CONSTRUCTION CO. LTD** **BOX 226, MOYALE**
ISL/21/2012-2013/6	**CENTER STAR CO. LTD** **BOX 16335, NAIROBI** **TEL: 0722523264**
ISL/21/2012-2013/7	**RONCCON GENERAL CONTRACTORS** **BOX 345, ISIOLO** **TEL: 0721841660**
ISL/21/2012-2013/8	**AKARIM CONSTRUCTION CO. LTD** **BOX 32268, NAIROB** **TEL: 0726293622**

C.A.T.C.

DISTRICT PROCUREMENT OFFICER ISIOLO
Date 28/8/13

ISL/21/2012-2013/9	NORTH GATE INVESTMENTS LTD BOX 300, ISIOLO TEL: 0722844727
ISL/21/2012-2013/10	SACCRED VENTURES LTD BOX 258, ISIOLO TEL: 0711586025
ISL/21/2012-2013/11	SHIBLI ENTERPRISES BOX 30, ISIOLO TEL: 064-52229
ISL/21/2012-2013/12	SILVER SPREAD HARDWARE BOX 997, MERU TEL: 0721156999
ISL/21/2012-2013/13	IMENTI CONSTRUCTION COMPANY BOX 169, MERU TEL: 0725937105
ISL/21/2012-2013/14	WASO BUILDING & ROAD WORKS CO. LTD BOX 403, ISIOLO TEL: 0721701741
ISL/21/2012-2013/15	A. M. GULEID BOX 30, ISIOLO TEL: 0721963047
ISL/21/2012-2013/16	MODOGASHE AGENCIES LTD BOX 73, ISIOLO TEL: 0721675321
ISL/21/2012-2013/17	ISIOLO MWANGAZA CO. LTD BOX 677, ISIOLO TEL: 0733273399

ISL/21/2012-2013/18	TIMES TEC CONSTRUCTION BOX 151, ISIOLO TEL: 0728428813
ISL/21/2012-2013/19	NORTHERN RESOURCES DEVELOPMENT BOX 40, ISIOLO TEL: 0721698756
ISL/21/2012-2013/20	JOSERA HOLDING LTD BOX 9336, NAIROBI TEL: 0722821765
ISL/21/2012-2013/21	ZEPPELIN ENGINEERING SERVICE & CO. BOX 13, ISIOLO TEL: 0727868095
ISL/21/2012-2013/22	MI – DESIGN ENGINEERING WORKS LTD. BOX 9588 – 00100 TEL: 0722387055
ISL/21/2012-2013/23	MATHOBE CONSTRUCTION CO. LTD BOX 14334 – 00100 TEL: 0722665677
ISL/21/2012-2013/24	DAWAB ENTERPRISES LTD. BOX 70803 – 00400 TEL: 0722387055

C.A.T.C.

DISTRICT PROCUREMENT OFFICER ISIOLO
Date 28/8/13

PROJECT ON CAPACITY DEVELOPMENT FOR EFFECTIVE FLOOD MANAGEMENT IN FLOOD PRONE AREAS
EVALUATION FOR SHORTLISTING OF CONTRACTORS

Bidder 1	TIMES TEC CONSTRUCTION
Bidder 2	SHIBLI ENTERPRISES
Bidder 3	CENTER STAR CO. LTD
Bidder 4	SOELLETA GENERAL CONTRACTORS
Bidder 5	BARETU GENERAL CONSTRUCTION
Bidder 6	IMENTI CONSTRUCTION COMPANY
Bidder 7	WASO BUILDING AND ROAD WORKS
Bidder 8	WAGUMI LIMITED
Bidder 9	ISIOLO MWANAGAZA HARDWARE AND CONSTRUCTION
Bidder 10	MODOGASHE AGENCIES LIMITED
Bidder 11	NORTHGATE INVESTEMENT LTD

			Weighted Marks	Bidder 1	Bidder 2	Bidder 3	Bidder 4	Bidder 5	Bidder 6	Bidder 7	Bidder 8	Bidder 9	Bidder 10	Bidder 11
1	STATUS		**15**											
	Max. Score 15	Certificate of Incorporation	5	5	5	Nil	5	5	5	5	5	5	5	5
		Class of Registrartion	5	3	2	Nil	5	5	5	5	2	4	Nil	5
		KRA- certificate of Compliance	5	5	Nil	Nil	5	5	5	5	Nil	5	Nil	Nil
2	Experience on Similar works for last 3 yrs		**40**											
		Minimum 3 jobs	40	40	Nil		40	40	40			Nil		Nil
		Minimum 2 jobs	30		Nil	30						Nil		Nil
		1 Job	20		Nil					20	20	Nil	20	Nil
		Nil	10		Nil									
3	FINANCIAL		**15**											
	Max. score=15	Audited Accounts last 3 yrs	15	Nil	Nil	10	0	15	15	10	Nil	10		Nil
		Bank statements	5	Nil	Nil	5	0				Nil		3	Nil
4	Personel		**30**											
		Site Manager	10	Nil	10	10	10	Nil	10	10	Nil	Nil	10	Nil
		Surveyor	10	Nil	10	Nil	10	Nil	10	10	Nil	Nil	10	Nil
		Artisans	5	Nil	Nil	Nil	Nil	Nil	5	Nil	Nil	Nil	0	Nil
		Storekeeper	5	Nil	5	Nil	Nil	Nil	5	5	Nil	Nil	5	Nil
TOTAL SCORE			**100**	**53**	**32**	**55**	**75**	**70**	**100**	**70**	**27**	**24**	**53**	**10**
				Qualified	Disqualified	Disqualified	Qualified	Qualified	Qualified	Qualified	Disqualified	Disqualified	Disqualified	Disqualified

QUALIFIED BIDDERS

BIDDER	COMPANY NAME	SCORE
Bidder 1	TIMES TEC CONSTRUCTION	53
Bidder 4	SOELLETA GENERAL CONTRACTORS	75
Bidder 5	BARETU GENERAL CONSTRUCTION	70
Bidder 6	IMENTI CONSTRUCTION COMPANY	100
Bidder 7	WASO BUILDING AND ROAD WORKS	70

THE PROJECT ON CAPACITY DEVELOPMENT FOR EFFECTIVE FLOOD MANAGEMENT IN FLOOD PRONE AREAS

Record of Evaluation of Bid Documents for: Riverbank Protection Works　　Date: October, 4 2013

No.	Company Name	Form of Tender	Form				Company data	Registration	completeness	Tender Price (Kshs)	Lowest
			Form 1	Form 2	Form 3	Form 4					
1	WASO BUILDING AND ROAD WORKS	✓	✓	✓	✓	✓	✓	✓	Accepted ✓ Not Accepted	4,980,907	✓
2	INENTI CONSTRUCTION CO.	✓	✓	✓	✓	✓	✓	✓	Accepted ✓ Not Accepted	5,173,878.40	
3									Accepted Not Accepted		
4									Accepted Not Accepted		
5									Accepted Not Accepted		

Chairperson Proc. Com`tee
Isiolo WRUA
Name: Peter Mwongera

JICA Project Supervisor
Isiolo Project Site
Jared Otieno

Project C/P
WRMA Isiolo sub-Region
Abraham Gitonga

Team Leader
JICA Project
Hideki Sawa

JICA Kenya Office
Meri Fukai

PRICED BILL OF QUANTITIES FOR THE PROCUREMENT OF WORKS FOR CONSTRUCTION OF RIVERBANK PROTECTION

				Waso building & road works		Baretu Construction		Times Tec		Soelleta		Imenti Construction	
No.	Work Item	Unit	Quantity	Unit Cost (Shs)	Amount (kshs)	Unit Cost (Shs)	Amount (kshs)	Unit Cost (Shs)	Amount (kshs)	Unit Cost (Shs)	Amount (kshs)	Unit Cost (Shs)	Amount (kshs)
1	Construction of Riverbank Protection Works												
1.1	Mobilization	LS	1	275,000	275,000		-		-		-	500,000	500,000
1.2	Earthwork				-		-		-		-		-
1.2.1	Care of Water	LS	1	250,000	250,000		-		-		-	800,000	800,000
1.2.2	Clearing and Grading	m^2	120	1,520	182,400		-		-		-	1,000	120,000
1.2.3	Excavation os Slope in the lower part	m^3	80	1,027	82,160		-		-		-	2,000	160,000
1.2.4	Transportation of soil to and From Site	m^3	80	1,300	104,000		-		-		-	1,000	80,000
1.2.5	Backfill	m^3	75	163	12,225		-		-		-	1,000	75,000
1.2.6	Disposal of Waste soil	m^3	5	520	2,600		-		-		-	1,000	5,000
1.2.7	sodding 1m width at top of slope	m^2	40	850	34,000		-		-		-	2,000	80,000
1.2.8	Miscellaneous	LS	1	285,000	285,000		-		-		-	250,000	250,000
	Subtotal				**1,227,385**		**-**		**-**		**-**		**2,070,000**
1.3	Piling up of Gabion Mattress												
1.3.1	Procurement of stones	m^3	180	2,500	450,000		-		-		-	2,000	360,000
1.3.2	Procurement of Gabion Mattress	Nos	180	4,500	810,000		-		-		-	4,718	849,240
1.3.3	Procurement of Geotextile	m^2	340	1,500	510,000		-		-		-	1,000	340,000
1.3.4	Procurement of Wooden pile/stock	Nos	40	7,000	280,000		-		-		-	2,000	80,000
1.3.5	laying of Gravel on the foundation	m^3	12	1,550	18,600		-		-		-	4,000	48,000
1.3.6	Setting up of Gabion Mattress	m^3	180	2,500	450,000		-		-		-	2,500	450,000
1.3.7	Miscellaneous	LS	1	150,000	150,000		-		-		-	100,000	100,000
1.4	Procurement of tools						-		-		-		-
1.4.1	Mattock complete with Handle	Pcs	5	1,200	6,000		-		-		-	1,500	7,500
1.4.2	Shovel complete with Handle	Pcs	5	950	4,750		-		-		-	850	4,250
1.4.3	Wheel barrow	Pcs	5	4,950	24,750		-		-		-	4,500	22,500
1.4.4	masons Hammer	Pcs	5	1,500	7,500		-		-		-	1,250	6,250
1.4.5	Galvanized Binding Wire	Roll	2	1,200	2,400		-		-		-	10,000	20,000
1.4.6	Pliers	Pcs	5	500	2,500		-		-		-	500	2,500
	Sub Total of Piling up Gabion Mattress				**2,716,500**		**-**		**-**		**-**		**2,290,240**
1.5	Demobilization and clean up	LS	1	350,000	350,000		-		-		-	100,000	100,000
1.6	**Total**				**4,293,885**		**-**		**-**		**-**		**4,460,240.00**
1.7	16% VAT				**687,022**		**-**		**-**		**-**		**713,638.40**
1.8	**Grand Total (After Correction)**				**4,980,907**		**-**		**-**		**-**		**5,173,878.40**
	Grand Total (Before Correction)				**4,980,907**								**5,173,878.40**

付属資料 3-21

Lumi コミュニティ防災活動実施計画案

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

Lumi 川流域
コミュニティ防災活動(パイロット事業)
実施計画（案）

2013 年 7 月

株式会社ニュージェック

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

－Lumi 川流域－
コミュニティ防災活動(パイロット事業)実施計画（案）

目　次

1. パイロット事業の選定

1.1 洪水管理計画で実施する洪水対策（構造物対策）

洪水管理計画においては、洪水対策事業のロングリストを作成し、事業の優先度をつけ、緊急度や調査や測量、関係者との協議などの準備期間等も考慮して、5 か年計画の中での事業の実施スケジュールを作成した。

選定された構造物対策とその実施の順番は以下の通りとなっている。

- 避難キャンプ地の整備
- トイレ嵩上げ
- 排水路 / 堤防の補修の調査
- コミュニティ道路の整備の調査
- 泉の汚染及び保護の必要性に関する検討調査
- Lumi 川の改修の調査
- Jipe 湖の浚渫の調査
- 小規模砂防ダム建設の検討調査
- 支川の護岸の調査
- 雨水貯留タンクの設置検討調査

表 1.1.1　LUMI 川流域洪水対策（構造物対策）の実施スケジュール(案)

	対策/活動内容	対策実施に必要な準備等	メインアクター（実施者）	支援アクター			WRMAの役割	WRUAの役割	1年次	2年次	3年次	4年次	5年次	6年次以降
				NGO	行政官庁	技術官庁								
構造物	避難キャンプ地の整備		WRUA	KRCS	County/District、教育省	MWI, WRMA	技術アドバイス	計画・建設への参画、避難所自主運営						
	トイレ嵩上げ		WRUA/コミュニティ/個人		County/District、保健衛生省	MWI, WRMA	技術アドバイス	計画・建設への参画、住民意識啓発						
	排水路 / 堤防の補修	調査・測量・協議	NWCPCか County		County/District	MWI, WRMA	関連省庁との連携	計画作成・維持管理での協働	調査・測量・協議					
	コミュニティ道路の整備	調査・測量・協議	WRUA		County/District、道路省、KeRRA	KeRRA, MWI, WRMA	技術アドバイス	計画・建設・維持管理への参画		調査・測量・協議				
	泉の保護	調査・測量・協議	WRUA		County/District	MWI, WRMA	技術アドバイス	計画・建設・維持管理への参画	調査・測量・協議					
	Lumi川の改修	調査・測量・協議	NWCPCか County		County/District	MWI, WRMA	関連省庁との連携	計画作成・維持管理での協働				調査・測量・協議		
	Jipe湖の浚渫	調査・測量・協議	NWCPCか County		County/District	MWI, WRMA	関連省庁との連携	計画作成・維持管理での協働				調査・測量・協議		
	小規模砂防ダム	調査・測量・協議	NWCPC、MWIか County		County/District、MWI, WRMA	MWI, WRMA	技術アドバイス	計画・建設・維持管理への参画		調査・測量・協議				
	護岸	調査・測量・協議	WRUA		County/District、MWI, WRMA	MWI, WRMA	技術アドバイス	計画・建設・維持管理への参画				調査・測量・協議		
	雨水貯留タンク	調査・測量・協議	Town Council/WRUA		Town Council	MWI, WRMA	技術アドバイス	計画・建設・維持管理への参画		調査・測量・協議				
非構造物	防災教育		学校, WRUA	KRCS	教育省, County/District	MWI, WRMA	関連省庁との連携	連携・参画・住民啓発						
	コミュニティによるフラッシュフラッドへの早期警報システム		WRUA	KRCS	KMD/スペシャルプログラム省	MWI, WRMA	技術アドバイス	計画・構築・運営管理への参画	構築					
	下流域への早期警報システム(IFAS/GFAS)		WRUA/コミュニティ	KRCS	KMD/スペシャルプログラム省	MWI, WRMA	関連省庁との連携	連携・参画・住民啓発	検討					
	植林活動		ユースグループ/住民	KRCS	Kenya Forest Service	MWI, WRMA	関連省庁との連携	連携・参画・住民啓発						
	土地利用規制		KFS		Kenya Forest Service	MWI, WRMA	関連省庁との連携	連携・参画・住民啓発	検討					

メインアクター：実際に事業を実施する主体。規模によって複数の選択肢があり得る。
支援アクター

NGO：事業実施を支援する NGO
行政官庁：事業実施を支援あるいは、許可権限を有する官庁
技術官庁：事業実施にあたって技術的支援を行う官庁

1.2 洪水対策事業（コミュニティ防災活動）の評価項目と着眼点

洪水管理計画に挙げられた構造物対策は、その規模や実施主体等において様々なものが含まれている。これらの中で、WRUA が実施主体であって、「共助」に分類される事業から、本プロジェクトにおけるパイロット事業を選択して実施する。

パイロット事業の評価項目、着眼点について説明する。

ここでは、コミュニティ防災活動事業に対して、本プロジェクトとの関連性の高さを次の評価項目で評価し、最も評価点の高い事業をパイロット事業として選定する。

表 1.2.1 パイロット事業としての実現性に関する評価項目と着目点

	評価項目	着目点
1	WRUA での実施可能性	・ WRUA が実施主体になり得るか ・ コミュニティレベルで実施できるか ・ SCMP の中に入れ込める可能性はあるか
2	事業期間	・ 通常 3～5 年の計画で策定される SCMP の期間内に実施できるか ・ 当プロジェクトの期間内で完了できるか
3	事業予算	・ SCMP 等を通して、WRUA が予算準備を可能な額であるか（現在 WSTF 基金が WRUA からの一回の申請に対し拠出した最高金額は 500 万シリング（レベル 3)。制度上は 5,000 万シリングまでのレベルが用意されている。） ・ 当プロジェクトの予算内であるか

洪水対策（構造物対策）評価マトリクスに、パイロット事業としての実現性の評価を加えたものを以下に示す。

1.3 評価マトリクス

表 1.3.1 洪水対策事業の本プロジェクトとの関連性の評価

対象		Lumi 川下流・長期浸水エリア		
対策		避難キャンプ地（場所）の整備		
概要		氾濫時に住民が一時退避し、当座の生活拠点となる施設の環境整備		
イメージ				
メリット		既に避難キャンプ地(場所)として利用されている場所の環境整備であるため、効果が見えやすい。		
デメリット		継続的な維持管理が必要 場所によっては用地取得が必要		
環境への負の影響		なし		
EIA の必要性		不要		
住民負担の有無		WDC マニュアルによると、Alarm Status に指定されている当サブ流域では、地元住民は 15%の負担をすることが定められている。それは、現金、労働、物品のいずれでも構わない		
事業実施者（メインアクター）		WRUA		
事業関係機関		<許認可>County/District、教育省（学校を利用する場合） <技術支援>MWI, WRMA <他の支援機関>KRCS		
公助（行政レベル） 共助（コミュニティレベル） 自助（個人レベル）		共助		
パイロット事業としての実現性	WRUA による実施可能性	コミュニティ活動で整備可能な防災施設を揃えていく形態であり、WRUA での取り組みにふさわしい。SCMP を通して資金を獲得することで実施は可能である。	A	3
	事業期間	整備する施設によるが、数カ月単位の期間が想定される。当プロジェクトの期間内に実施可能。ただし、地域において一定の調整は必要である。	B	2
	事業予算	整備する施設によるが、WSTF 資金で実施可能な事業は多いと考えられる。プロジェクトの予算でも実施可能。	A	3
評価点の合計			8	
評価コメント		Lumi 川下流の長期浸水が発生するエリアには学校を中心に既に避難キャンプ地として使われている場所があり、地元から整備を求める声が多い。避難生活上必要なものを順次整備していく方式は WRUA での実施が適切である。これらの観点から、パイロット事業としての実施も難しくないものと考えられる。		

A(3 点): Excellent / B（2 点）: Good / C（1 点）: Poor

表 1.3.2　洪水対策事業の本プロジェクトとの関連性の評価

対象		Lumi 川下流・長期浸水エリア		
対策		トイレ嵩上げ		
概要		トイレの高さを上げてトイレへの水の流入を防ぎ、汚物の流出を防止する。		
イメージ				
メリット		短期間で準備可能 公衆衛生省と協働できれば、更なる効果を期待できる。 波及効果が高い		
デメリット		修繕補修等の継続的な維持管理が必要		
環境への負の影響		なし		
EIA の必要性		不要		
住民負担の有無		WDC マニュアルによると、Alarm Status に指定されている当サブ流域では、地元住民は 15%の負担をすることが定められている。それは、現金、労働、物品のいずれでも構わない		
事業実施者（メインアクター）		WRUA、個人		
事業関係機関		<許認可>County/District、保健衛生省 <技術支援>MWI, WRMA		
公助（行政レベル） 共助（コミュニティレベル） 自助（個人レベル）		共助・自助		
パイロット事業としての実現性	WRUA による実施可能性	集落、村などの単位で取り組むべき事業であり、WRUA での実施は適切である。SCMP を通して資金を獲得することで実施は可能である。	A	3
	事業期間	個別の施設では数カ月単位の期間がかかる。当プロジェクトの期間内に実施可能である。ただし、地域全体での衛生面の効果を高めるには、複数の箇所での整備が必要である。	B	2
	事業予算	WSTF 資金で実施可能な範囲であり、規模によってプロジェクト予算でも実施可能である。	A	3
評価点の合計			8	
評価コメント		多くの場所で必要な施設であり、ニャンドの事例は WSTF ファンドで実施するには高価であり、今後設計の標準化などが行われ、簡易に展開されていくことが考えられる。パイロット事業は、この標準化にも寄与するものとして期待される。		

A(3 点): Excellent　/ B（2 点）: Good　/ C（1 点）: Poor

表 1.3.3　洪水対策事業の本プロジェクトとの関連性の評価

対象		Lumi 下流西側にある Cacal A/B/C		
対策		排水路の改修		
概要		堆積した土砂を取り除き、流下能力の回復を図る。		
イメージ				
メリット		対策による効果は極めて大きい		
デメリット		対象となる Canal ABC 全ての改修は、大規模な工事であり、改修完了までに多大なコスト及び時間を要する。 また、その後の維持管理にも費用がかかる。		
環境への負の影響		上下流の河床変動への影響 生物多様性		
EIA の必要性		必要		
住民負担の有無		WDC マニュアルによると、Alarm Status に指定されている当サブ流域では、地元住民は 15%の負担をすることが定められている。それは、現金、労働、物品のいずれでも構わない		
事業実施者（メインアクター）		NWCPC 、County		
事業関係機関		<許認可> County/District <技術支援>MWI, WRMA		
公助（行政レベル） 共助（コミュニティレベル） 自助（個人レベル）		公助・共助		
パイロット事業としての実現性	WRUA による実施可能性	部分的な水路の改修であれば WRUA として取り組み可能な事業となりうるが、現状では 3 つの水路の全体が改修を必要としている状況とみられ、大規模に建設機械を用いる改修工事を行わなければ効果は少ない。	C	1
	事業期間	計画・実施に複数年を必要とする大事業となり、当プロジェクトの期間では実施困難。	C	1
	事業予算	高額な予算が必要になる。WSTF 資金、及び本プロジェクトの予算の範囲を超えている。	C	1
評価点の合計			3	
評価コメント		現状では、いずれの水路も全面的な改修を必要としており、大規模な工事を行う必要があり、WRUA だけでの実施は不可能である。期間・予算も当プロジェクトの枠内では収まらない。パイロット事業としての実施は難しい。		

A(3 点): Excellent　/ B（2 点）: Good　/ C（1 点）: Poor

表 1.3.4　洪水対策事業の本プロジェクトとの関連性の評価

対象		Lumi 下流西側にある Canal C		
対策		堤防の補修		
概要		Canal C の破堤部を補修し、Lumi 川本川からの溢水が拡散しないようにする対策工		
イメージ				
メリット		対象となる Canal C の破堤部のみの改修は効果に対して比較的容易で短期間で実施可能であり、即効性もある。		
デメリット		計画、設計、施工のそれぞれのプロセスである程度の時間・コストがかかる		
環境への負の影響		なし		
EIA の必要性		不要		
住民負担の有無		WDC マニュアルによると、Alarm Status に指定されている当サブ流域では、地元住民は 15%の負担をすることが定められている。それは、現金、労働、物品のいずれでも構わない		
事業実施者（メインアクター）		NWCPC 、County		
事業関係機関		<許認可> County/District <技術支援>MWI, WRMA		
公助（行政レベル） 共助（コミュニティレベル） 自助（個人レベル）		公助・共助		
パイロット事業としての実現性	WRUA による実施可能性	部分的な補修であれば、WRUA が SCMP に入れ込んで実施をすることも可能であるが、現状では全体的な修復の必要性が不明であり、一定の効果を得るには大掛かりな工事を必要とする可能性が高い。	C	1
	事業期間	すくなくとも数カ月以上の期間がかかると見られ、さらに事前の調査が必要である。部分的・小規模な工事ですむ場合のみ、当プロジェクトの期間内に実施可能。	B	2
	事業予算	工事の規模によるが、大規模工事の必要性が予測されるため、WSTF 資金、及び本プロジェクト予算の範囲を超えている可能性が高い。	C	1
評価点の合計			4	
評価コメント		Lumi 川下流域にある Canal C には堤防があるものの、破壊されている。しかし、必要な補修の範囲がどの程度となるか、現状では不明である。長い区間の補修が必要とされる場合には、プロジェクトの予算では収まらず、パイロット事業としての実施は困難である。		

A(3 点): Excellent　/ B（2 点）: Good　/ C（1 点）: Poor

表 1.3.5　洪水対策事業の本プロジェクトとの関連性の評価

対象		Lumi 川下流・長期浸水エリア		
対策		コミュニティ道路の整備		
概要		道路の嵩上げやカルバートの設置などで道路が使用不能になることを防ぐ		
イメージ				
メリット		短期間で効果が出る		
デメリット		継続的な維持管理が必要。 計画・設計・工事のそれぞれのプロセスである程度の期間が必要である。		
環境への負の影響		なし		
EIA の必要性		不要		
住民負担の有無		WDC マニュアルによると、Alarm Status に指定されている当サブ流域では、地元住民は 15%の負担をすることが定められている。それは、現金、労働、物品のいずれでも構わない		
事業実施者（メインアクター）		WRUA		
事業関係機関		<許認可>County/District、道路省、KeRRA <技術支援>MWI, WRMA		
公助（行政レベル） 共助（コミュニティレベル） 自助（個人レベル）		公助・共助		
パイロット事業としての実現性	WRUA による実施可能性	洪水時の道路の不通は生活、時には生命に直結する問題であり、WRUA で取り組むにふさわしい事業である。特にコミュニティ道路等の小規模なものであれば SCMP に入れ込んで資金を獲得し、実施することは可能である。	A	3
	事業期間	大規模な工事でなければ、工事に関しては数カ月単位の期間で可能ではあるが、計画や道路管理者との調整には時間を要することも考えられる。したがって、当プロジェクトの期間内での実施は困難。	B	2
	事業予算	予算は事業規模に依存する。コミュニティ道路等の大きくない道路で区間が長すぎなければ、WSTF 資金での実施も可能である。規模によってはプロジェクトの予算でも実施可能。	B	2
評価点の合計			7	
評価コメント		コミュニティの中の小規模道路の工事であれば、工事期間や金額の面では当プロジェクトの中でも実施可能だと考えられるが、計画や道路管理者との調整に時間がかかることが想定され、パイロット事業としての実施は難しい。		

A(3 点): Excellent　/ B（2 点）: Good　/ C（1 点）: Poor

表 1.3.6　洪水対策事業の本プロジェクトとの関連性の評価

対象		Lumi 川下流・長期浸水エリア		
対策		泉の保護（蛇籠の設置）		
概要		泉の周辺に蛇籠を設置し、川からの氾濫水や雨水の浸入を防ぐ		
イメージ				
メリット		着手しやすく、高い効果が期待できる 泉の保護対策は Njoro Kubwa Springs で UNDP が、Kitobo 地区では WSTF 基金によって既に実施されている。		
デメリット		修繕補修等の維持管理が必要		
環境への負の影響		なし		
EIA の必要性		不要		
住民負担の有無		WDC マニュアルによると、Alarm Status に指定されている当サブ流域では、地元住民は 15%の負担をすることが定められている。それは、現金、労働、物品のいずれでも構わない（石の確保・運搬、籠の組み立て等の設置作業）		
事業実施者(メインアクター)		WRUA		
事業関係機関		<許認可>County/District <技術支援>MWI, WRMA		
公助（行政レベル） 共助（コミュニティレベル） 自助（個人レベル）		共助		
パイロット事業としての実現性	WRUA による実施可能性	洪水時の生活に直結する問題であり、WRUA での実施にふさわしい事業である。SCMP に入れ込み資金を獲得することで実施が可能。ただし、現状ではかなり取り組みが進んでいる。	B	2
	事業期間	比較的短期間で実施可能である。当プロジェクトの期間内に実施可能。	B	2
	事業予算	予算程度は大きくなく、WSTF 資金での実施は可能である。プロジェクトの予算でも実施可能。	A	3
評価点の合計			7	
評価コメント		個々の泉への手当ては、工事規模としては小さく、本プロジェクトで実施するにあたって期間的、予算的な制約は少ない。ただし、Lumi 下流粋では、これまである程度実施されてきているため、新規性は小さく、パイロット事業としての適性は高くない。		

A(3 点): Excellent　/ B（2 点）: Good　/ C（1 点）: Poor

表 1.3.7　洪水対策事業の本プロジェクトとの関連性の評価

対象		Lumi 川下流・長期浸水エリア		
対策		小規模砂防ダム		
概要		土砂流出及び河床上昇の抑制		
イメージ				
メリット		土砂流出及び河床上昇の抑制		
デメリット		計画、設計、施工の各プロセスにおいてある程度の時間を要する。 効果の持続性が低い。		
環境への負の影響		常時流水がある場所では規模により生物環境に影響あり		
EIA の必要性		必要		
住民負担の有無		WDC マニュアルによると、Alarm Status に指定されている当サブ流域では、地元住民は 15%の負担をすることが定められている。それは、現金、労働、物品のいずれでも構わない		
事業実施者（メインアクター）		County、MWI、NWCPC		
事業関係機関		<許認可> County/District、MWI, WRMA <技術支援>MWI, WRMA		
公助（行政レベル） 共助（コミュニティレベル） 自助（個人レベル）		公助・共助		
パイロット事業としての実現性	WRUA による実施可能性	砂防ダムの整備自体は、難易度は高いが、特に小規模な場合 WRUA 単位で不可能な事業ではない。ただし、Lumi 下流では上流域からの土砂流出が問題となっているため、上流・下流での連係が必要である。したがって、ひとつの WRUA 単独での実施は困難である。	C	1
	事業期間	砂防ダム 1 基による土砂流出抑制効果は限定的なため、複数のダムを効果的に配置することが必要である。そのための調査・設計および建設には時間を要する。	C	1
	事業予算	上記の通り、複数のダムを配置する必要があるため、全体の予算も大きなものになる。他方、1 基ずつ計画的・継続的に建設していく場合には、長期間を要するものの、WSTF 資金での実施は可能となる場合もある。	B	2
評価点の合計			4	
評価コメント		広域的な（上下流の）連係の必要な事業で、実施地域と裨益地域のずれもあるため、基本的には公的な機関により実施すべき事業と考えられる。		

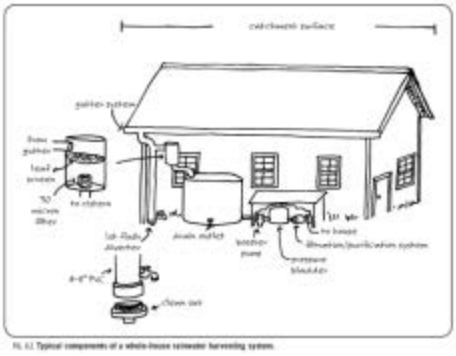
A(3 点): Excellent　/ B（2 点）: Good　/ C（1 点）: Poor

表 1.3.8　洪水対策事業の本プロジェクトとの関連性の評価

対象		Lumi 下流支川エリア		
対策		護岸		
概要		Lumi 川の川岸をかためる対策工。河岸の浸食を防ぐ		
イメージ				
メリット		短期間で効果を発揮、修繕しやすい		
デメリット		計画・設計・工事のそれぞれのプロセスである程度の時間が必要である。既設の工法には改善が必要である。		
環境への負の影響		規模による		
EIA の必要性		規模による		
住民負担の有無		WDC マニュアルによると、Alarm Status に指定されている当サブ流域では、地元住民は 15%の負担をすることが定められている。それは、現金、労働、物品のいずれでも構わない（石の確保・運搬、籠の組み立て等の設置作業）		
事業実施者（メインアクター）		WRUA		
事業関係機関		<許認可>County/District、MWI, WRMA <技術支援>MWI, WRMA		
公助（行政レベル） 共助（コミュニティレベル） 自助（個人レベル）		公助・共助		
パイロット事業としての実現性	WRUA による実施可能性	地域の生活に危険を及ぼす場所の護岸は WRUA で取り組むことも重要であると考えられる。SCMP を通して獲得できる資金で実施は可能である。	B	2
	事業期間	工事は数カ月単位で実施可能である。一方、まずは優先順位の検討が必要であり、事前調査に時間を要する。以上から当プロジェクトの期間内での実施は困難である。	C	1
	事業予算	必要な予算は SCMP を通しての獲得できる資金での実施も可能なレベルである。プロジェクトの予算でも実施可能。	A	3
評価点の合計			6	
評価コメント		護岸の効果は局所的ではあるが、地域におけるガリーの浸食は多くの箇所で見られ、WRUA では取り組みの必要性が認識されている。同時並行的な護岸工事は困難と考えられ、優先順位をもって順次取り組むことが必要である。		

A(3 点): Excellent　/ B（2 点）: Good　/ C（1 点）: Poor

表 1.3.9　洪水対策事業の本プロジェクトとの関連性の評価

対象		Lumi 川下流・長期浸水エリア		
対策		雨水貯留タンク		
概要		雨水貯留システムの整備による流出抑制		
イメージ				
メリット		普及させやすく、波及効果が高い オーナーシップが醸成しやすい 利水上の効果がある		
デメリット		維持管理、修繕に必要な材料が得られない可能性がある		
環境への負の影響		なし		
EIA の必要性		不要		
住民負担の有無		WDC マニュアルによると、Alarm Status に指定されている当サブ流域では、地元住民は 15%の負担をすることが定められている。それは、現金、労働、物品のいずれでも構わない		
事業実施者（メインアクター）		Town Council/WRUA		
事業関係機関		<支援行政機関> Town Council <技術支援>MWI, WRMA		
公助（行政レベル） 共助（コミュニティレベル） 自助（個人レベル）		共助・自助		
パイロット事業としての実現性	WRUA による実施可能性	洪水管理の観点からは、洪水時の生活用水確保の効果が認められるものの、流出の抑制の効果はほとんど期待できない。生活用水確保を主目的で WRUA などの団体で取り組む意義は認められる。	C	1
	事業期間	導入自体は、短期間での実施は可能である。ただし、設置先の機関や家屋等との調整が必要であり、事業へのコンセンサスを得るまでに長い期間を要することも考えられる。	B	2
	事業予算	規模による。	B	2
評価点の合計			5	
評価コメント		生活用水の確保には有効であるが洪水対策上の効果はほとんど期待できず、本プロジェクトでの実施は考えがたい。		

A(3 点): Excellent　/ B（2 点）: Good　/ C（1 点）: Poor

1.4 パイロット事業の選定

前節で、洪水対策事業のうち、コミュニティ防災活動として実施される計画となっている構造物対策について、パイロット事業にふさわしい事業を選択するための評価を行った。その対策を以下の表に示す。この結果、トイレのかさ上げと避難キャンプ地の整備が、最も本プロジェクトとの関連性が高い洪水対策事業として評価される結果となった。

表 1.4.1 各洪水対策事業の本プロジェクトとの関連性・評価結果

対策案	点数
トイレの嵩上げ	8
避難キャンプ地の整備	8
泉の保護（蛇籠の設置）	7
コミュニティ道路の整備	7
護岸	6
雨水貯留タンク	5
堤防の補修	4
小規模砂防ダム	4
排水路の改修	3

以上から、トイレの嵩上と避難キャンプ地の整備をパイロット事業候補として選定する。

2. パイロット事業の実施計画

2.1 パイロット事業の内容の検討

当パイロット地区においては、整備された避難所はなく、浸水しない空地が事実上の避難キャンプ地になっている。そこには、避難民の衛生環境を保全するトイレ等の設備もない。したがって、パイロット事業の内容の検討にあたっては、対応策の最上位である 2 案を予算・工期を勘案したうえで組み合わせ、パイロット事業として提案することとしたい。

2.1.1 候補地の現状と課題

Lumi 本川からの溢水や破堤による広範囲かつ長期的な浸水は、特に Lumi 川河口付近西側の氾濫区域に位置している Kimorigho location での被害が大きく（深いところの浸水深で約 1m 以上）、浸水期間 2 ヶ月と長期的である。洪水発生時は多くの住民は避難を余儀なくされるが、人口も多いため洪水時の避難場所が不足している。したがって、Kimorigho location を対象に避難場所の整備を検討する。

現状で次の 2 ヶ所が避難場所として使われている。

(A) Kimorigho A Village の空き地
(B) Eldoro-Girls High School のグラウンド

ただし、これらの場所は公的に定められた避難場所ではなく、洪水時に実情利用されているに過ぎない。これらの場所に近接する公的な施設であり、避難場所の候補となりうる候補地としては以下の 2 カ所がある。

(C) Abori Primary School
(D) Eldoro Primary School

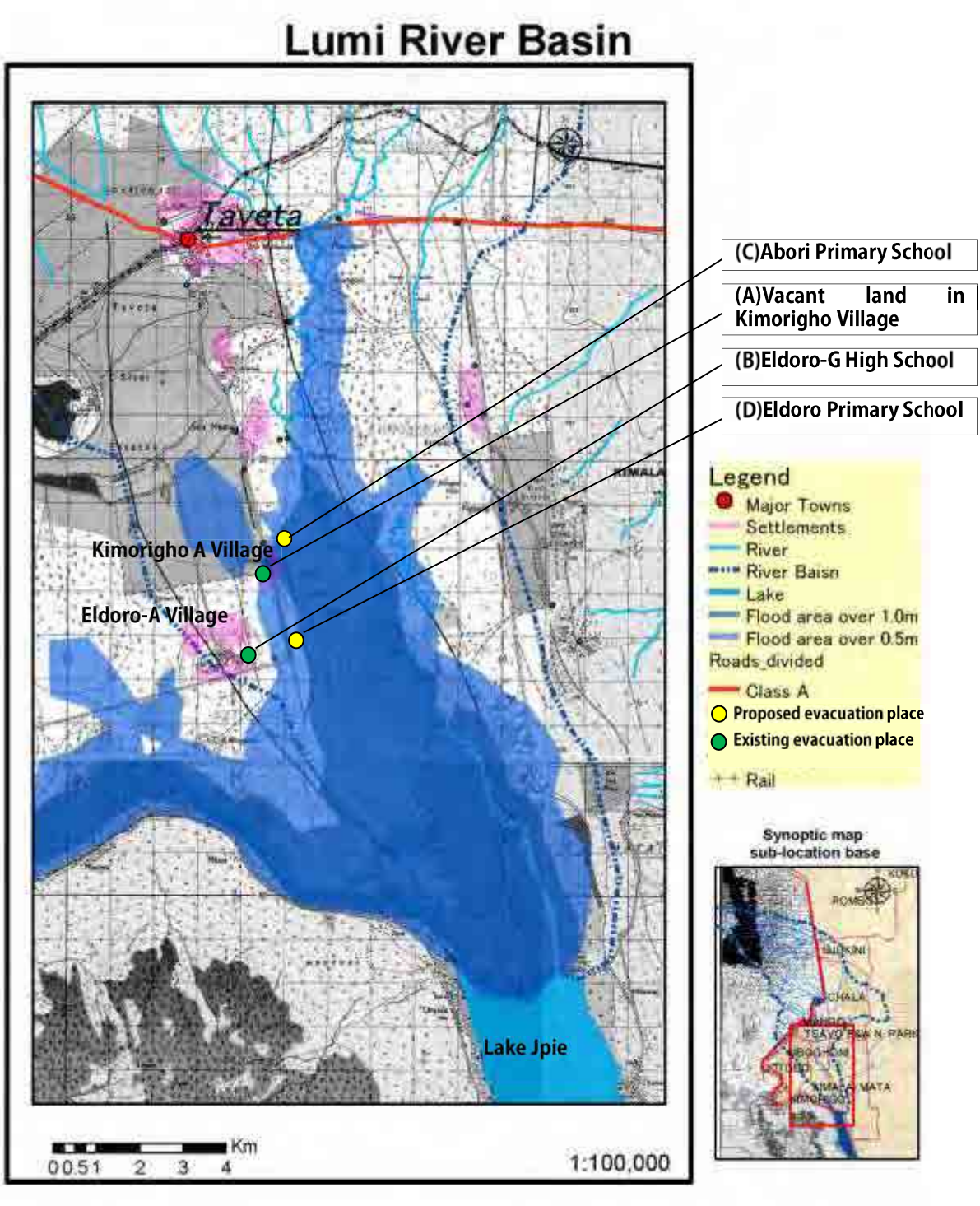
Lower Lumi サブ流域内におけるこれらの 4 ヶ所の位置関係を次ページの図に示す。

Kimorigho-location における避難民の大多数は Kimorigho A Village の住民である。同 Village の世帯数は約 450 であるが、避難時には世帯主である男性は家に残るということであり、避難するのは女性、子供、老齢者が中心である。その結果、避難民は 1,500 人ほどとなっている。

避難場所(A) Kimorigho Village の空き地は、洪水の規模が小さく水位が低いときには浸水しないが、規模の大きい洪水時には浸水する。したがって、Kimorigho Village の住民は洪水が始まり水位が低い段階では、まず居住地に近い(A) Kimorigho Village に避難し、水位が上昇するとより標高の高い(B) Eldoro-Girls High School のグラウンド

に移動している。

4 つの避難場所のうち、(A)と(C)は Kimorigho A Village の集落から至近距離にある。一方、(B)と(D)の 2 ヶ所は Eldoro A Village にあるため、Kimorigho A Village の集落からはそれぞれ 4km、3km ほど離れている。距離が集落から遠いにもかかわらず Kimorigho の住民が(B)に移動してくる理由は、(B)が避難先としては最も高い標高であり、ほとんど浸水しない場所であることによる。なお、Kimorigo A Village、Eldoro A Village の両エリアは水道が整備されており、水害時の水の確保には問題がない。



出典：JICA プロジェクト・チーム

図 2.1.1 Lower Lumi サブ流域内避難場所の現状

以下、避難場所の整備事業の候補地の特徴を述べる。

(1) A: Kimorigho A Village の空き地


Kimorigho A Village の空き地

Kimorigho A Village に位置しており、通常時は運動場として活用されている。周辺全域が浸水する規模の洪水が発生した時には、この場所も浸水することが多い。

写真に示す通り、現状ではただの空き地であり設備は存在しない。そのため、雨風をしのげる建屋を含め嵩上げした施設が新たに必要となる。また、ここにはトイレも井戸もなく、避難が長期にわたる場合には、避難民にとって生活することが極めて困難な状況が継続する。

また、この場所は私有地とされており、複数の個人が所有権を裁判で係争中であり、整備をする上での障害となっている。

図 2.1.2 Kimorigho A Village の空き地の現状

Kimorigho A Village の空き地の特徴を以下に整理する。

表 2.1.1 Kimorigho Village の空き地の特徴

No	項目	内容	備考
1	避難戸数・人口	Kimorigho A Village の 450 戸・1500 名	
2	避難回数	年 2 回	年 2 回の雨期に使用されることが多い
3	避難時における滞在期間	最大 2 ヶ月におよぶ	洪水の規模による
4	洪水時の浸水状況	水位が上げれば浸水することもある	
5	近隣の公共機関、重要施設	Dispensary, Chief's office	
6	避難民用の施設	なし	普段は運動場
7	集落からのアクセス	Kimorigho A Village の集落から至近距離	域内主要道路は嵩上げされている
8	住民の要望	具体的には挙げられていない	
9	その他	土地の所有権をめぐって裁判で係争中	施設（トイレ等）の設置が困難

(2) B: Eldoro-Girls High School のグラウンド

本地点は Eldoro A Village に位置しており、Kimorigho A Village の集落からは 4km ほど離れている。写真に示す通り、現状ではただの空き地であり、施設は存在しない。本地点は、比較的高い標高であるため、浸水することが稀であるため、洪水時の避難場所として使用されている。


Eldoro Girls High School の避難キャンプ地

洪水時に避難民が集まってきた場合には、避難民の代表が World Vision や KRCS に支援を要請し、それから 2 日程度を経て World Vision や KRCS の担当者が現状把握のための調査を行う。その後、これらの組織内で協議し、支援の決定がなされてから、避難民用のテント、ポータブルトイレ、医薬品、食料等が支給される。このプロセスに約 2 週間を要する。

避難民にとって、この 2 週間は避難生活の質を極めて低下させる要素となっている。特にテントが設置され雨の直撃をしのぐことができるようになるまでに、応急措置としてポリエチレン製のシートを使って屋根のかわりにしているというのが現状である。このシートは住民が常備しているもので、耐久性に乏しいものである。

図 2.1.3 Eldoro-Girls High School の現状

Eldoro-Girls High School の特徴を以下に整理する。

表 2.1.2 Eldoro-Girls High School のグラウンドの特徴

No	項目	内容	備考
1	避難戸数・人口	450 戸・1500 名 （洪水が甚大な場合、Eldoro A Village の 300 名が加算される）	Eldoro 集落に隣接
2	避難回数	2009, 2012, 2013 年 4 月	多くの場合は、隣接する Kimorigho の住民が利用
3	避難時における滞在期間	最大 1 ヶ月	
4	洪水時の浸水状況	ほとんど浸水しない	近隣の避難キャンプ場のうち最も標高が高い
5	近隣の公共機関、重要施設	学校のみ	学校まで 300m 離れている
6	避難民用の施設	なし	発生から 2 週間後に KRCS 等がテント、食料等の支援物資を支給
7	集落からのアクセス	Kimorigho 集落から 4km（徒歩 1 時間程度）, Eldoro 集落から至近距離。	域内主要道路は嵩上げされている
8	住民の要望	アクセス道路の嵩上げ、輪中堤の整備、校舎の床の嵩上げ	
9	その他	テントが支給されるまでは屋外での避	雨露をしのげない

		難生活を余儀なくされる。 Eldoro Girls High School は寄宿学校であり、避難所として使用困難	

(3) C: Abori Primary School

Abori Primary School は Kimorigho A Village に位置し、Kimorigho A Village は Lumi 川からの洪水氾濫により頻繁に浸水する地区である。Abori Primary School も洪水時には周辺と同様に浸水し、浸水深は平均的に 60cm 程度である。したがって、現在のところ避難場所として使われているわけではない。

Abori Primary School の校舎

しかし、可能な避難先が集落に隣接する(A)や距離のある(B)で、いずれも屋外の避難場所であるため、住民は近隣に屋内の避難場所を希望している。そのため、地元では、学校を含む集落を取り囲むような輪中堤を設ける、域内の主要道路から学校までのアクセス道路を嵩上げする、学校を避難所とする、などの構想を持っている模様である。

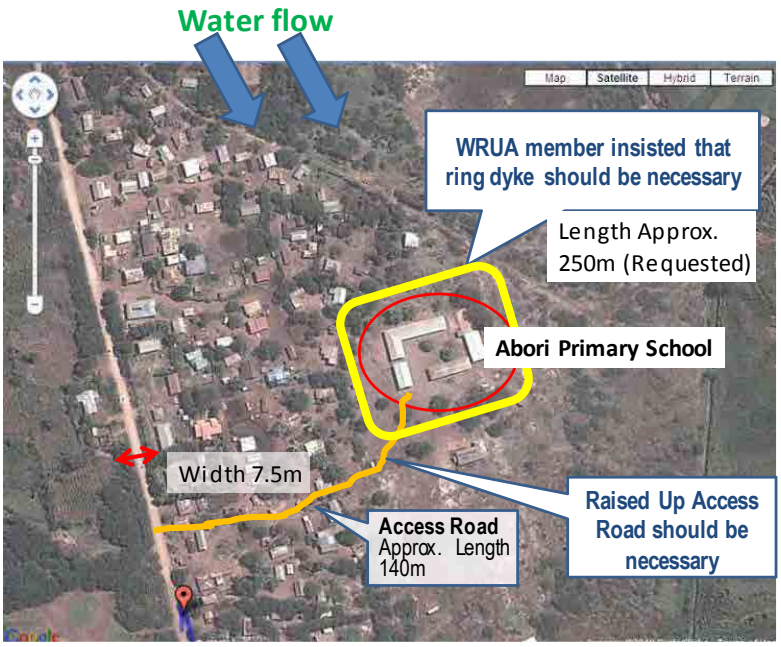


図 2.1.4 Abori Primary School の現状

Abori Primary School の特徴を以下に整理する。

表 2.1.3 Abori Primary School の特徴

No	項目	内容	備考
1	避難戸数・人口	使用実績なし	
2	避難回数	使用実績なし	
3	避難時における滞在期間	使用実績なし	
4	洪水時の浸水状況	ほとんど毎年浸水する。	平均では浸水深 0.6m 既往最大は 1.2m
5	近隣の公共機関、重要施設	Church, Dispensary and Chief's office	
6	避難民用の施設	校舎、倉庫	
7	集落からのアクセス	Kimorigho A Village の集落から至近距離	洪水時に学校へのアクセス路が浸水する 域内主要道路は嵩上げされている
8	住民の要望	輪中堤の整備、学校へのアクセス道路の嵩上げ、学校の避難所化	学校敷地は浸水するため、対策がなければ避難所として使うのは困難
9	その他	避難先として整備するには多くの対策を施す必要がある	

(4) D: Eldoro Primary School

Eldoro A Village に位置しており、Kimorigho の集落からは 3km ほど離れている。Eldoro Girls High School の避難キャンプ地(B)よりも 1km ほど Kimorigho A Village の集落から近い位置にある。

学校の敷地は浸水しないわけではないが、平均的には 30cm 程度と、前述の Abori Primary School と比較すると浅い。しかし、敷地の一部分で、嵩上げされた域内道路の影響で雨水と氾濫水の排水が悪化し、湿地化している問題である。校舎のほか 6 基のトイレがあり、地元ではこれらの施設を洪水に強いものにかえ、避難場所として整備したいとの構想がある。

Eldoro Primary School の校舎

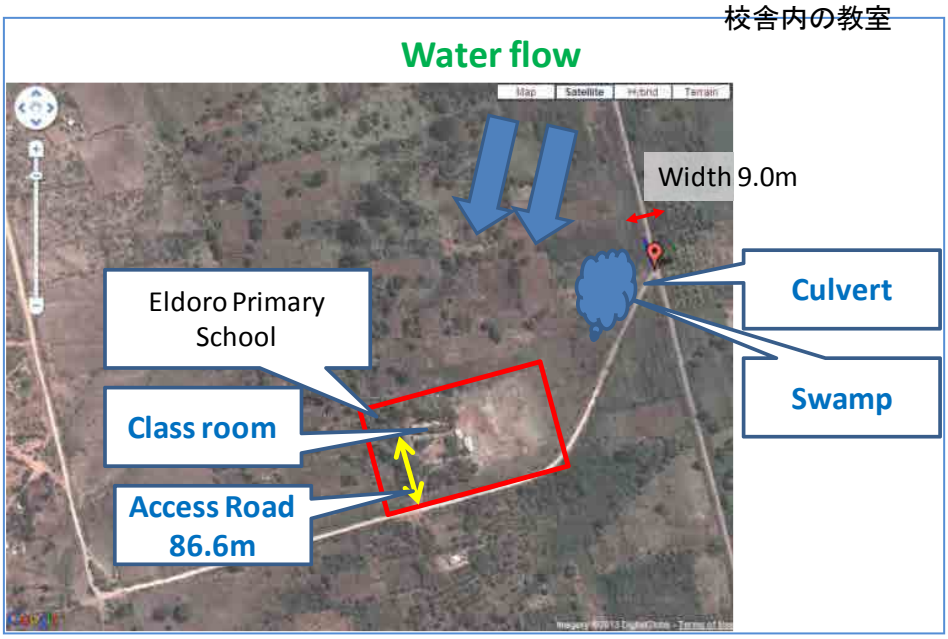


図 2.1.5 Eldoro Primary School の現状

Eldoro Primary School の特徴を以下に整理する。

表 2.1.4 Eldoro Primary School の特徴

No	項目	内容	備考
1	避難戸数・人口	使用実績なし	
2	避難回数	使用実績なし	
3	避難時における滞在期間	使用実績なし	
4	洪水時の浸水状況	浸水する場合がある	平均では浸水深 0.3m 既往最大は 1.0m
5	近隣の公共機関、重要施設	なし	
6	避難場所内の施設	校舎、トイレ	
7	集落からのアクセス	Kimorigho A Village の集落から 3km（徒歩 45 分程度）, Eldoro A Village の集落から 1km ほど	域内主要道路は嵩上げされている
8	住民の要望	アクセス道路の嵩上げ、学校の避難所としての整備、トイレの嵩上げ、カルバート設置	嵩上げされた域内主要道路が流水を堰き止め、敷地に水が流入している。
9	その他	なし	

2.1.2 避難場所整備事業の方針

以下では、上に述べたそれぞれの候補地において、避難場所整備事業の内容を検討する。ただし、(A)の Kimorigho A Village の空き地は、前述のとおり土地の所有権について裁判で係争中であり、避難場所として整備することは不可能であるため、以下の検討から除外する。

(1) B: Eldoro Girls High School のグラウンドの整備方針案

Eldoro Girls High School のグラウンドは、浸水する心配はないものの、避難先となる建物やトイレ等の施設が全くないため、KRCS 等の支援が来るまで、屋外で 2 週間以上避難生活を送らざるをえないことが問題である。また、トイレや水道は、近傍の民家のものを借りることもあるとされる。

そうした状況を改善し、避難生活が安全かつ健康に行えるように、雨露をしのぐ避難所の建物が第一に必要である。しかし、普段は学校のグラウンドとして使用されているため、大規模な建物を建設することはできず、すべての避難民を収容する計画とはなりえない。したがって、小規模避難所の建設に加え、テント等の資材を収納する防災倉庫を建設し、災害時に備えることが考えられる。避難所にはトイレ等を設置するが、避難者の数が非常に大きいため、全避難者を対象としたサービスは困難となる可能性もある。また、避難用資材の調達はパイロット事業では行わないため、別途調達し、管理する必要がある。

以上から、避難場所としての整備内容は以下のとおりとなる。

整備内容：小規模な避難所建物、防災倉庫の建設

(2) C: Abori Primary School の整備方針案

要避難民である Kimorigho A Village からの避難民 1,500 名にとっては、最も避難距離が短く、洪水時にアクセスしやすい。しかしながら、洪水時には平年の浸水深で 0.6m、既往最大の浸水深は 1.2m に達し、また、付近一帯が水没する。

したがって、Abori Primary School を避難場所にするためには、校内への避難スペースの確保、嵩上げトイレの整備、そしてこれら施設へのアクセスを確保するアクセス道路の嵩上を行う必要がある。

なお、同校の校舎規模での収容数には限りがあるため、既に避難場所として使われ

ている Eldoro Girls High School のグラウンドのテント避難も継続することになる。

将来的には、パイロット事業で整備する避難スペースと同様に、校舎の嵩上に取り組んでいくなど、避難所を兼ねた校舎の整備も可能であり、避難所収容人数の拡大を図っていくことができる。

以上から、避難場所としての整備内容は以下のとおりとなる。

整備内容：アクセス道路の嵩上げ、避難スペースの確保、トイレの嵩上げ

(3) D: Eldoro Primary School の整備方針案

Eldoro Primary School は、現状では避難場所として使用されていないが、避難対象者である Kimorigho A Village の避難民（合計約 1,500 名）にとっては、Eldoro Girls High School よりも近いことから、この小学校を改良して、避難場所として利用することは有益である。

その実現の方策としては、Abori Primary School と同様に、避難スペースの確保、嵩上げトイレの整備、そしてこれら施設へのアクセスを確保するアクセス道路の嵩上が必要である。また、先に述べたとおり、嵩上げされた道路により氾濫水が堰き止められ学校の敷地に流入しているため、嵩上げ道路にカルバート等の排水施設を設置することが考えられる。

Abori Primary School より浸水深が小さいことから、工事量・費用は少なく、より安心な候補地と言うことができる。一方、可能収容数の制約から Eldoro Girls High School のグラウンドのテント避難も継続することは、Abori Primary School の場合と同様である。

また、将来的には、パイロット事業で整備する避難スペースと同様に、校舎の嵩上に取り組んでいくなど、避難所を兼ねた校舎の整備も可能であり、避難所収容人数の拡大を図っていくことができる。

整備内容：アクセス道路の嵩上げ、避難スペースの確保、トイレの嵩上げ、排水施設（カルバート）の設置

2.1.3 避難場所整備事業案の比較・選定

前述した 3 つの避難場所の整備事業案から、本プロジェクトにおけるパイロット事業として実施する事業案を比較・選定する。

比較・選定に当たっては、次の 3 つの視点で評価した。

＜事業案の評価視点＞

1) 洪水対策事業効果の視点
- 裨益者数
- 安全・健康
- 避難時ならびに避難生活時におけるアクセス

2) WRUA 開発サイクル(WDC)の視点
- 地域住民参加の容易さ

3) 環境社会配慮からの視点
- 自然環境面の影響の有無や大きさ
- 社会環境面の影響の有無や大きさ

評価結果は以下に示すとおり、裨益者数、快適性、住民の要望への貢献度、地域住民参加の容易さの点で、他よりも優位であり、かつ、環境社会配慮の視点からも特に問題がないため、D: Eldoro Primary School に避難場所を整備することを選定する。

表 2.1.5 避難場所の整備事業案の比較表

評価基準		B: Eldoro Girls High School のグラウンド	C: Abori Primary School	D: Eldoro Primary School
事業内容		小規模な避難スペース、防災倉庫の建設、	アクセス道路の嵩上げ、避難スペースの確保、トイレの嵩上げ	アクセス道路の嵩上げ、避難スペースの確保、トイレの嵩上げ、カルバートの設置
1) 洪水対策事業効果の視点	裨益者数	避難スペースの収容人数は少数である。テント等の避難用資材の事前調達・管理を行うことができれば、避難開始時から雨を避けた避難生活が可能となる。 △	避難スペースの収容人数は少数である（35名）。 将来、校舎兼避難所が整備されれば、大きくなる。 ○	避難スペースの収容人数は少数である（35名）。 将来、校舎兼避難所が整備されれば、大きくなる。 ○
	安全・健康	屋外でテント生活になる。トイレや水道は、近傍の民家のものを借りる避難民も多くなり、安全・健康面では良くない。 ×	避難民は、屋内での避難生活が可能となる。水道やトイレも利用可能。 ○	避難民は、屋内での避難生活が可能となる。水道やトイレも利用可能。 ○
	避難時ならびに避難生活時におけるアクセス	Kimorigho A Village から 4 ㎞。 ほとんど浸水しない。 ○	Kimorigho A Village,から至近。 浸水深は平年で 0.6m 程度で、嵩上げ済み主要道路から距離がある。 △	Kimorigho A Village,から 3 ㎞。 浸水深は平年で 0.3m 程度で、嵩上げ済み主要道路に面している。 ○
2) WRUA 開発サイクル(WDC)の視点	地域住民参加の容易さ	私立の学校であるため、住民との利害が必ずしも一致するとは限らない。 △	受益者であるコミュニティが至近であり、参加しやすい。 学校側の協力も得やすい。 ○	受益者であるコミュニティはやや距離があるが、生活圏内。 学校側の協力も得やすい。 ○
3) 環境社会配慮からの視点	自然環境面の影響の有無や大きさ	なし ○	なし ○	なし ○
	社会環境面の影響の有無や大きさ	なし ○	なし ○	なし ○
総合評価		浸水の可能性が小さいため、避難先として適性は高いものの、私有地としての制約があり、施設整備には不向きである。	多数の要避難民が存在する集落に最も近い。しかし、敷地が水没し、嵩上げ道路からも離れているため、孤立する危険性もあり、避難場所としては必ずしも好ましくない。	各評価基準からは Abori 小学校とほぼ同じであるが、浸水深が小さい分工事量が小さく、また安全性も相対的に高い。

2.2 避難場所整備事業（ELDORO PRIMARY SCHOOL）の基本設計

Eldoro Primary School を避難場所として利用できるように整備するため、1）アクセス道路の嵩上げ、2）避難スペースの確保、3）嵩上げトイレの新設、4）道路下カルバートの増設を実施する。

設計に当たっての基本条件は次のとおりとする。

アクセス道路の嵩上げ高：0.5m

→ WRUA や学校関係者の情報によると、Eldoro Primary School は、洪水時に浸水することがあるものの、その湛水深は 0.3m、既往最大で 1.0m 程度である。また、域内の主要道路は嵩上げ対策済みであり、効果をあげている。これらのことから、アクセス道路の嵩上げ高は、学校前面の嵩上げ済み主要道路レベルまで嵩上げを行うこととする。必要な嵩上げ高は 0.5m である。これは、下記の建築物と異なり、コミュニティ事業として事後的に追加嵩上げが可能であることも考慮した設定である。

建築物の嵩上げ高：1.1m

→ 新設されるトイレは、以下の項で述べるが、地下タンク貯留式となるため、床面が水没しない設計とする必要がある。また、一旦設置したトイレの床を事後的にさらに嵩上げすることはできない。したがって、トイレの床高は、学校における既往最大湛水深 1.0m に 10cm の余裕高を見込んで、1.1m とする。また、避難スペースの地盤高の嵩上げも事後的な嵩上げはできないため、同じく 1.1m とする。

次ページに概略平面図を示し、それぞれの構造物について後述する

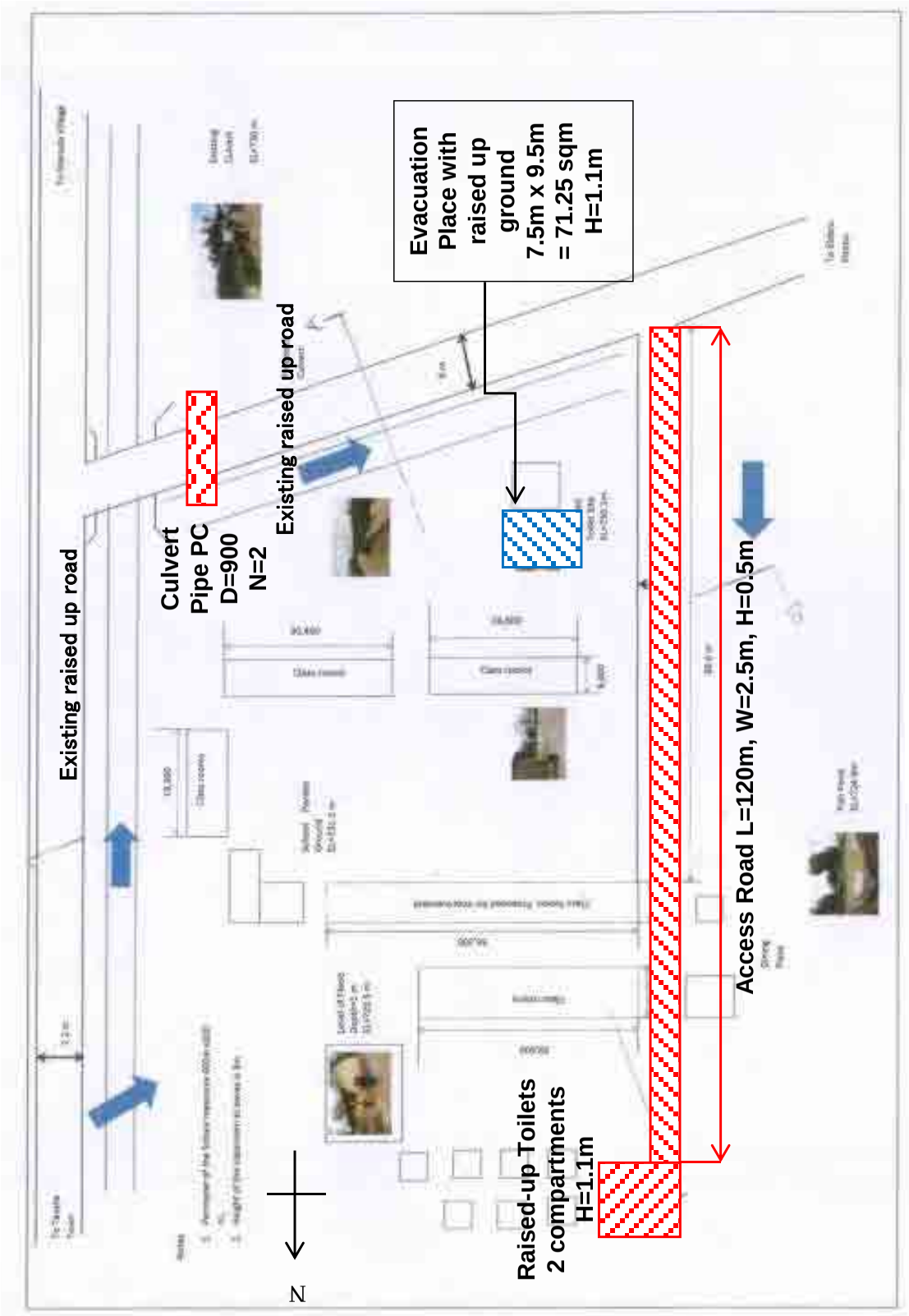

Evacuation Place with raised up ground 7.5m x 9.5m = 71.25 sqm H=1.1m
Existing raised up road
Culvert Pipe PC D=900 N=2
Existing raised up road
Access Road L=120m, W=2.5m, H=0.5m
Raised-up Toilets 2 compartments H=1.1m
N

図 2.2.1 概略平面図

2.2.1 アクセス道路の嵩上げ

避難所へのアクセス道路は、長さ L=120m, 天端幅 TW=1.0m, 底面幅 BW=2.5m, 高さ H=0.5m で嵩上げするものとする。

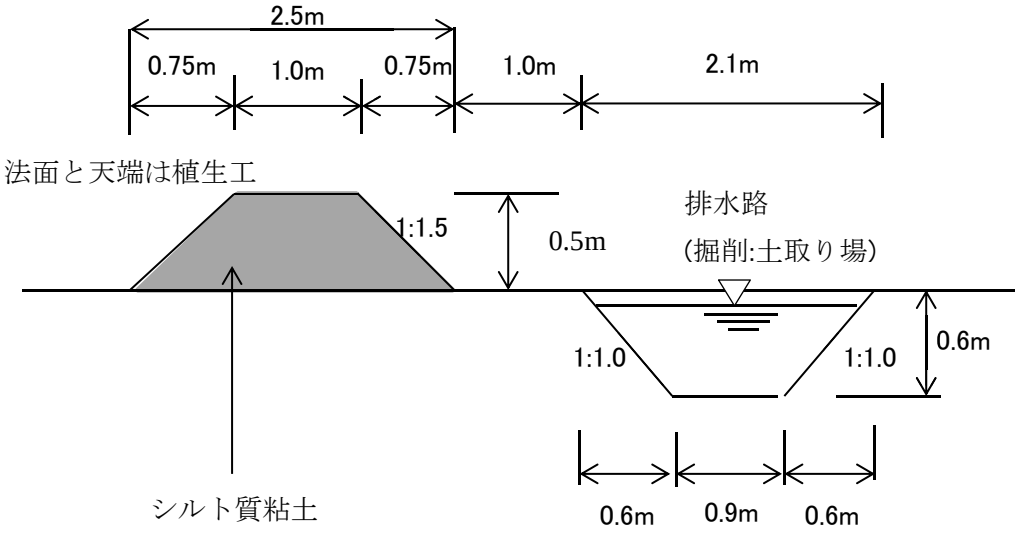


図 2.2.2 避難所アクセス道路標準横断図

図 2.2.3 アクセス道路の現況

2.2.2 避難スペースの確保

洪水時に避難した人々が一時的に居住できるように、敷地の一部を嵩上げするとともに避難スペースを建設する。嵩上げする床面積は概ね A= 9.5m x 7.5m = 71.2sqm であり、高さ H=1.1m 嵩上げする。

収用できる避難者の人数の目安は、1 名当たり 2 ㎡とすると、35 名となる。

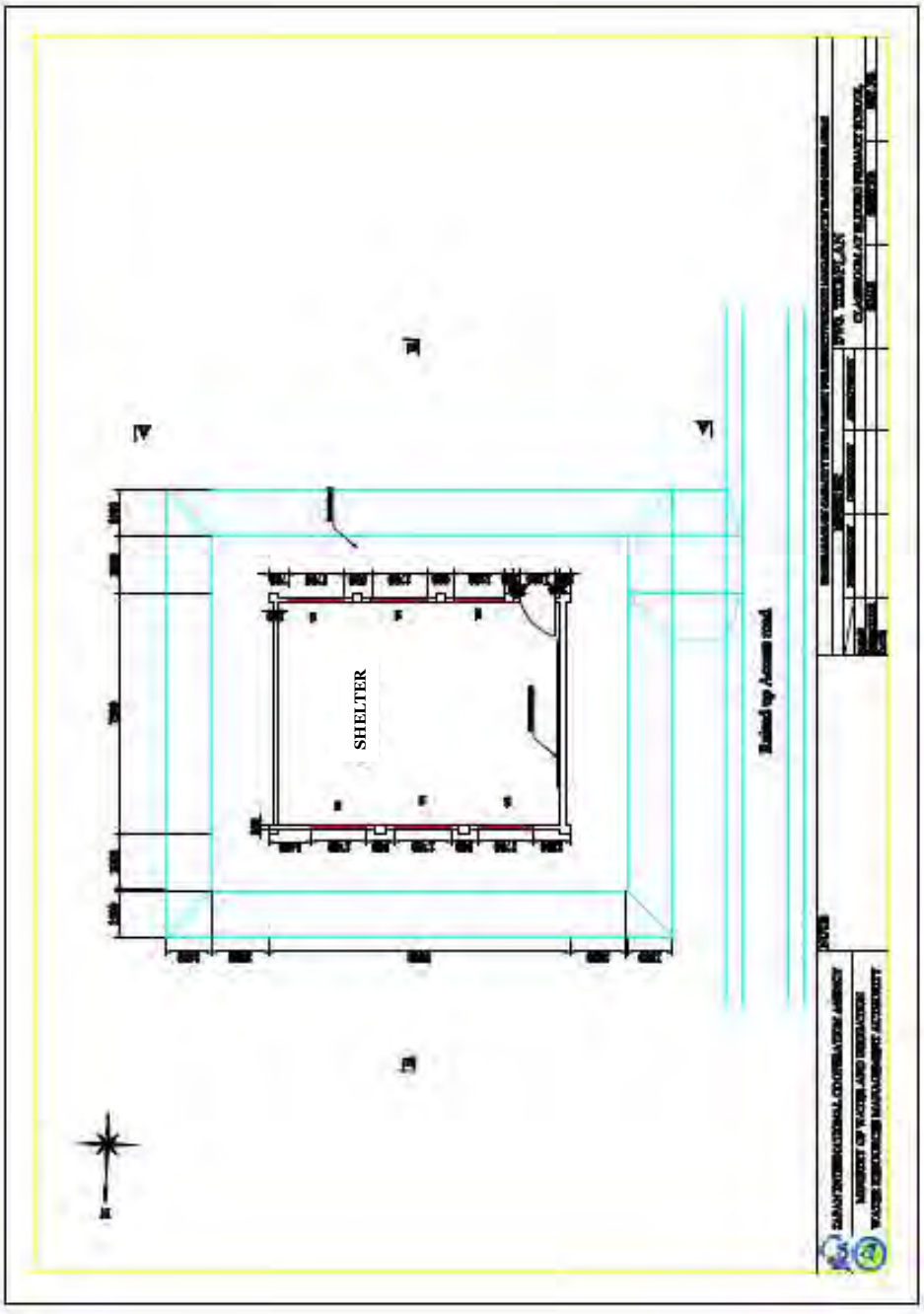


図 2.2.4 地盤および避難スペースの平面図

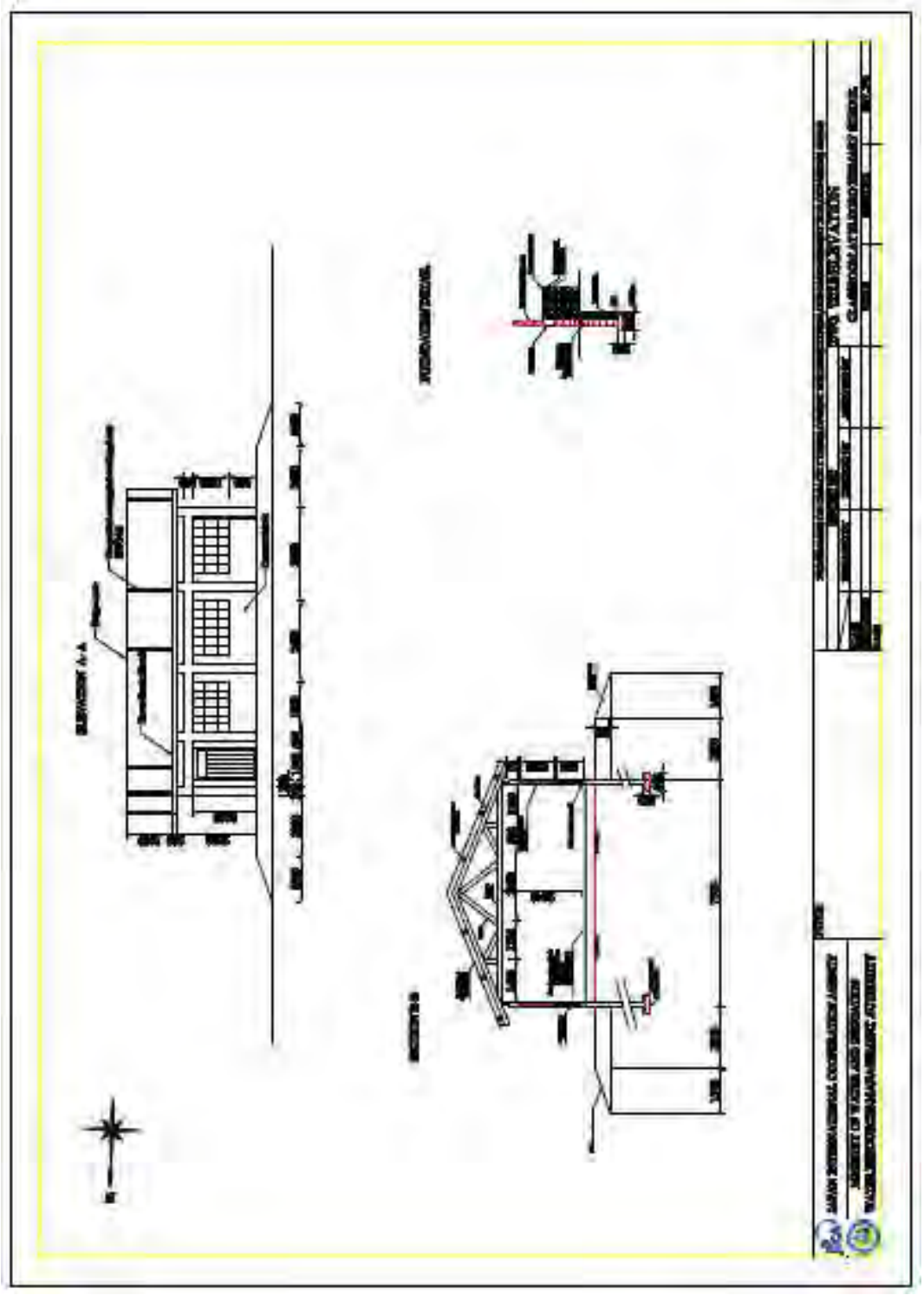


図 2.2.5 避難スペースの標準横断図

図 2.2.6 学校内の空き地

2.2.3 嵩上げトイレの新設

既存のトイレが 6 つ設置されているが、洪水時は水没して使用できないため、嵩上げトイレ（2 コンパートメント）を設置するものとする。

避難者 100 名当たり 1 基を設置基準とする。

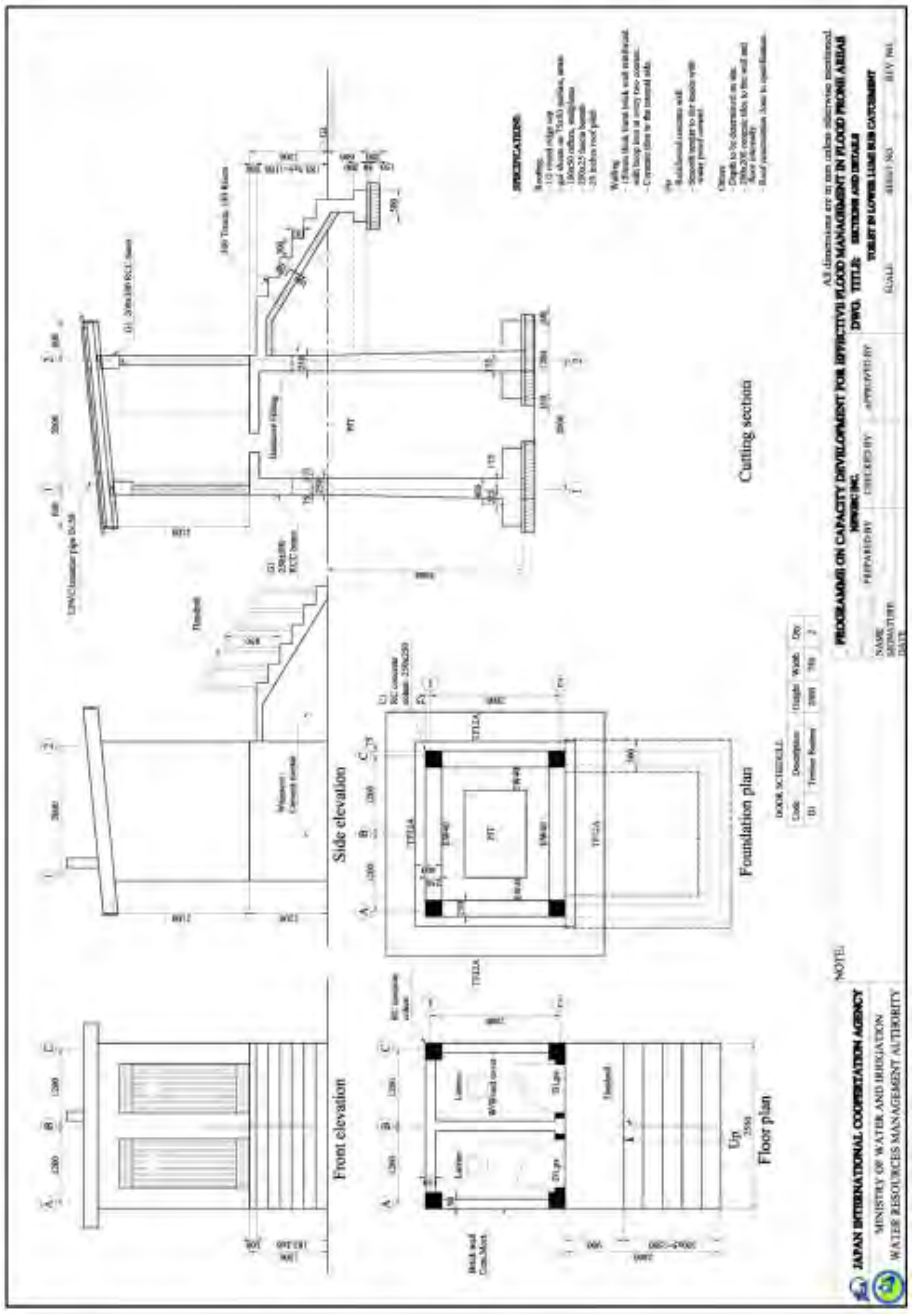


図 2.2.7 嵩上げトイレの設計図

2.2.4 道路下カルバートの増設

既存の嵩上げされた道路によって、氾濫水が流下することが阻害されているため、小学校の敷地に氾濫水が流れてきている。既存で道路下にカルバートが設置されているが、十分な疎通能力がないため滞留している。したがって、カルバートを増設し、滞留している氾濫水を下流側に流すようにする。カルバートは直径 900mm を 2 本とし、道路幅は 9m あるので、カルバート部は 10m とする。

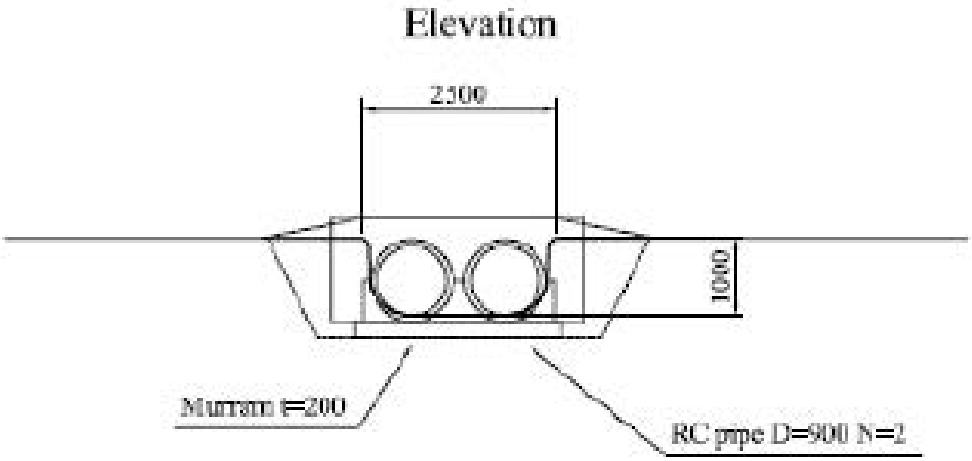


図 2.2.8 カルバート標準断面

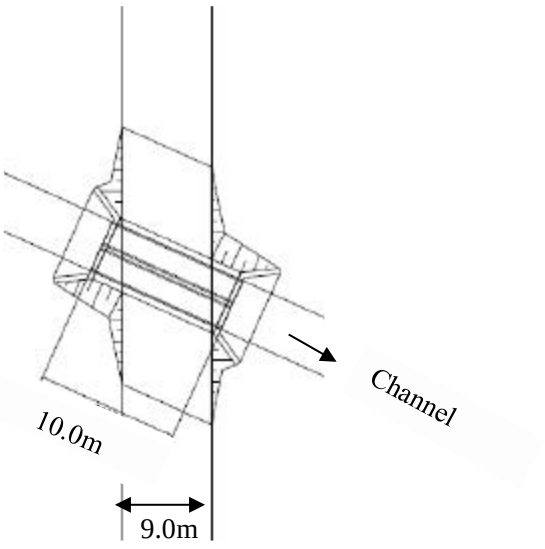


図 2.2.9 カルバート平面図

2.2.5 数量表及び概算事業費

アクセス道路の嵩上げ、避難スペースの確保、嵩上げトイレの新設、道路下カルバートの増設に必要な工種及びそれぞれの数量を以下の数量表に整理した。

また、上記数量に市場での単価調査結果及び WSTF が用いている設計単価を適用すると、約 470 万 Ksh.という結果が得られた。これは、草の根無償の事例からも妥当なものと考えられる。

表 2.2.1 数量表(アクセス道路嵩上げ)

Construction Item	Work Item		Description	Unit	Quantity	Unit Rate (Kshs)	Amount (Kshs)
	Raising up access road						
Earthworks							
	1	Common Excavation	h < 1.5 m	Cu.m	105.00	819.00	85,995
	2	Embankment	Sandy material	Cu.m	105.00	850.00	89,250
	3	Well compacted clay core		Cu.m	105.00	143.00	15,015
						Total Amount	190,260

表 2.2.2 数量表(避難スペースの確保)

Construction Item	Work Item		Description	Unit	Quantity	Unit Rate (Kshs)	Amount (Kshs)
	Shelter						
		Earthworks					
	1	Common Excavation A	h < 1.5 m	Cu.m	30.00	819	24,570
	2	Back filling type	Sandy material	Cu.m	14.25	1,250	17,813
	3	Embankment	Sandy material	Cu.m	72.85	850	61,923
	4	Back filling type	Hardcore filling, Rubble stone bed	Cu.m	14.25	1,500	21,375
		Concrete works					
	5	Concrete Class 20/20 (1:2:4)		Cu.m	20.00	16,379	327,580
	6	Concrete Class Q (1:3:6)	Leveling Concrete	Cu.m	1.50	12,500	18,750
	7	Formwork	H < 3.5 m	Sq.m	302.00	733	221,366
	8	Reinforcing bar	Material and Installation	Kg	2,850.00	108	307,800
		Architectural works					
	9	Concrete Blocks	Blocks t= 190/150 mm with re-bar	Sq.m	110.00	2,269	249,590
	10	Plastering	Floor t=30mm	Sq.m	71.25	707	50,374
	11	Plastering	Skirting h=100mm	Sq.m	2.00	725	1,450
	12	Plastering	Interior t=20mm	Sq.m	69.00	421	29,049
	13	Plastering	Keying	Sq.m	15.00	2,400	36,000
	14	Plastering	Wainscot t=30mm h=600 mm	Sq.m	6.30	707	4,454
	15	Plastering	Lintel t=30mm	Sq.m	10.50	775	8,138
	15	Door	Wooden Door	Nos	1.00	2,500	2,500
	16	Window	steel Casement	Nos	6.00	9,500	57,000
	17	Window Glasses	t = 5 mm	Nos	108.00	1,200	129,600
	18	Painting	Oil paint for steel structure	Sq.m	2.60	362	941
		Painting	Oil paint for wooden structure	Sq.m	14.82	322	4,772
	19	Painting	Emulsion paint for interior	Sq.m	69.00	323	22,287
	20	Wooden Structual	Wooden Truss	Cu.m	27.00	25,050	676,350
	21	Roof gutter	Pre-painted sheet 150x100x180	Lin.m	20.00	1,000	20,000
	22	Roofing	Pre-painted corrugated galvanized sheet	Sq.m	168.00	1,950	327,600
	23	Down Spout	PVC pipe	Lin.m	10.00	800	8,000
		Total construction cost					**2,629,281**

表 2.2.3 数量表（嵩上げトイレ）

Construction Item	Work Item		Description	Unit	Quantity	Unit Rate (Kshs)	Amount (Kshs)
	Toilets (2 Compatments)						
Earthworks							
	1	Common Excavation	h < 1.5 m	Cu.m	356.00	819.00	291,564
	2	Back filling	Sandy material	Cu.m	305.00	1,250.00	381,250
	3	Embankment	Sandy material	Cu.m	2.00	850.00	1,700
	4	Waste Material	Dumpling and leveling	Cu.m	49.00	950.00	46,550
	5	Back filling	Hardcore filling, Rubble stone bed	Cu.m	5.00	1,500.00	7,500
Concrete works							
	1	Concrete Class 20/20 (1:2:4)		Cu.m	28.00	16,379.00	458,612
	2	Formwork	H < 3.5 m	Sq.m	127.00	733.00	93,091
	3	Reinforcing bar	Material and Installation	Kg	2,420.00	108.00	261,360
Architectural works							
	1	Brick	Bricks t = 150 mm with er-ber	Sq.m	13.00	2,307.00	29,991
	2	Ceramic tiles floor works	(150 x 150 x 6) mm	Sq.m	4.00	66.00	264
	3	Ceramic tiles wall works	(150 x 200 x 6) mm	Sq.m	19.00	84.00	1,596
	4	Plastering	Floor t=30mm	Sq.m	12.00	707.00	8,484
	5	Plastering	Interior t=20mm	Sq.m	2.00	421.00	842
	6	Plastering	Exterior t=25mm	Sq.m	17.00	589.00	10,013
	7	Plastering	Wainscot t=30mm h=1,300	Sq.m	8.00	707.00	5,656
	8	Door	Wooden made	Sq.m	2.00	1,250.00	2,500
	9	Painting	Oil paint for wooden structure	Sq.m	11.00	322.00	3,542
	10	Painting	Oil paint for steel structure	Sq.m	2.00	362.00	724
	11	Painting	Emulsion paint for interior	Sq.m	2.00	323.00	646
	12	Painting	Vinyl Emulsion for Ceiling	Sq.m	10.00	327.00	3,270
	13	Wooden Structual	Wooden Truss	Sq.m	1.00	5,050.00	5,050
	14	Ceiling installation	ceiling board t=10mm	Sq.m	10.00	975.00	9,750
	15	Ceiling installation	connices	Lin.m	8.00	120.00	960
	16	Steel hand rail		Lin.m	3.00	2,500.00	7,500
	17	Roofing	Pre-painted corrugated galvanized sheet	Sq.m	11.00	1,200.00	13,200
	18	Ceiling inspection chamber	600x600	Nos	2.00	1,200.00	2,400
						Total Amount for Toilet (2) works	1,648,015

表 2.2.4 数量表（道路下カルバート）

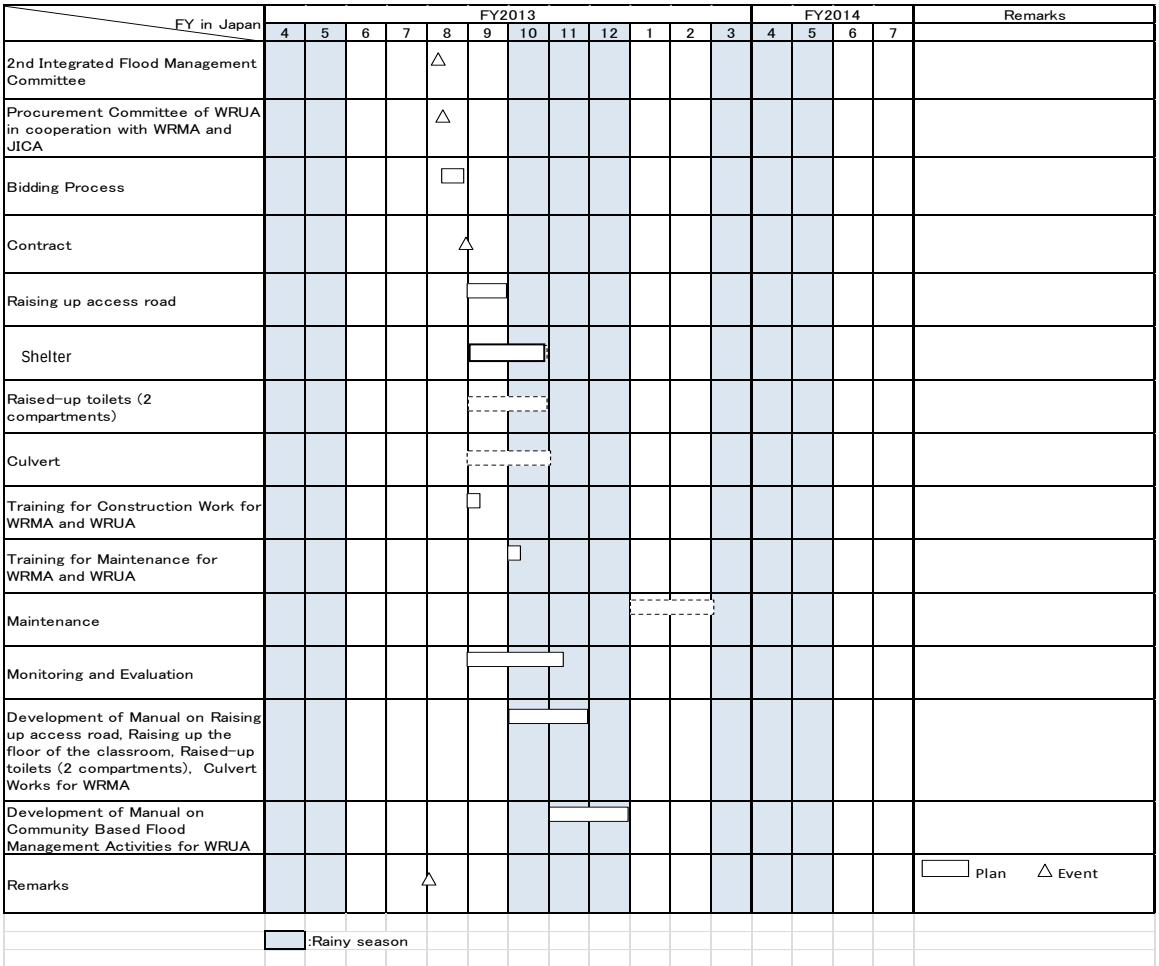
Construction Item	Work Item		Description	Unit	Quantity	Unit Rate (Kshs)	Amount (Kshs)
	Culvert						
Earthworks							
	1	Common Excavation	h < 1.5 m	Cu.m	30.00	819.00	24,570
	2	Back filling	Sandy material	Cu.m	12.20	1,250.00	15,250
	3	Waste Material	Dumpling and leveling	Cu.m	17.80	950.00	16,910
	4	Murram	50mm murram	Cu.m	5.00	292.00	1,460
	5	RC pipe culvert	D=900mm, L=1.0m	No	20.00	9,000.00	180,000
						Total Amount	238,190

2.3 概略スケジュール

パイロット事業の概略スケジュールは以下のとおり、8 月下旬に契約を行い、直ちに工事に着手し､10 月末までの約 2 ヶ月間で終了することを予定する｡これらの工事は、道路下のカルバートは、雨季の出水の影響を受ける可能性があるので、9 月中に終了することを予定する。他の構造物は付近が浸水しない限り、雨季においても工事が可能であるため、雨季に入っても工事を継続するものとするが、10 月末には終了するようにする。

一方、後述のとおり、WDC にもとづく WRUA の事業においては住民からの貢献が求められる。仮に、住民が労働力を提供することにより、この事業への貢献を行うとすると、このことが工事のスピードや事業期間に影響を及ぼす可能性がある。

表 2.3.1 パイロット事業概略スケジュール



2.4 パイロット事業実施の意義・狙い

Lumi 川流域でのパイロット事業として避難キャンプ地を整備することによる意義・狙いを、改めて以下に整理する。

2.4.1 構造物対策そのものの観点

アクセス道路の嵩上げについては、自分たちで実施可能となれば、洪水対策事業として挙げられていたコミュニティ道路の整備を自分たちで実施していくことも可能であるため、今回の事業をパイロットとして WRUA が引き続き必要な個所に対策を実施していくことが可能となる意義がある。

避難スペースの確保については、今回のパイロットでは、1 つだけ整備するものであるが、これも、自分たちで実施可能となれば、洪水対策事業として WRUA が引き続き残りの地盤の嵩上げと建物の建設を実施していくことが可能となるところに意義がある。

嵩上げトイレについては、避難キャンプ地に設けるトイレだけでなく、各世帯で設置されるトイレにも、同じ構造が普及することが望ましいため、そのための、設計・施工での見本となるところに意義がある。

道路下のカルバートについては、盛土構造の道路が水の流下を妨げ、浸水を助長している地区が多いため、他にも設置の必要な個所は多数存在する。また、コミュニティ道路の整備と一緒にカルバートも設置していかねばならないものであるため、今回の事業をパイロットとして WRUA が引き続き必要な個所に設置していくことが可能となる意義がある。

パイロット事業を契機として、水資源・河川管理者である WRMA が、地方道路管理者である KeRRA やカウンティなどと、洪水管理事業を対象とした具体的協議が必要であることとその内容を認識する。

2.4.2 WRUA が構造物対策を実施する観点

WRUA では、コントラクターへの発注を行って洪水対策の構造物を建設した経験はない。

構造物対策事業の実施を通じて、WDC マニュアルによる Procurement の仕組みがどのように機能するかを実例を持って確かめる。あるいは、機能させるために必要な仕組みがあれば、それを用意して補充する。

WRUA が、パイロット事業のコピーでもよいので複数の同種同類事業に取り組んでい

き、実践経験を積みながら、より大きな事業やタイプの異なる事業に応用する実力を養っていく。

2.4.3 維持管理

工事完了後も継続的な維持管理が必要であり、そのためには継続的なコミュニティメンバーの協力が必要であることを理解する。

維持管理の体制を構築する際には、他流域に先行する経験があり、そういった情報を相互に共有しながら有効かつ効率的な体制作りに役立てることを学ぶ。

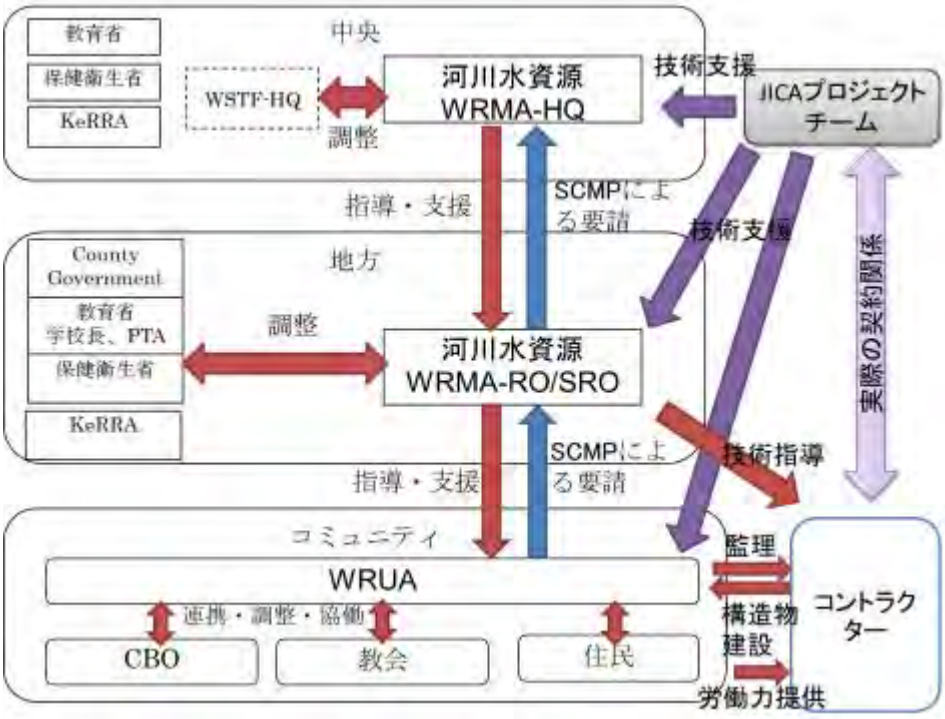
2.5 パイロット事業の実施体制

2.5.1 構造物事業実施における関係者の役割

避難キャンプ地の整備という事業は、County や District といった地方行政機関の所管であり、水資源・河川管理者である WRMA は技術的な支援を行う機関である。WRUA から SCMP 形成等の過程を通じて WRMA に上げられた要望をもとに、WRMA は、総合的な洪水防災体制の一環として避難キャンプ地を、どこに、どのような構造の施設の整備が必要であるという技術的判断を行い、WRUA や関係する機関に適切にアドバイスを行い、WRUA が WSTF の基金を獲得して実施する、という形態が、WDC における想定である。

今回のパイロット事業のように学校を対象に避難キャンプ地の整備を行う場合には、学校の管理者である教育省や、学校長、PTA などの理解と協力が不可欠である。また、トイレの設置に当たっては、保健衛生省との調整が必要となる。なお、環境影響についてはないと考えられる。道路下のカルバートの設置には KeRRA との調整が必要である。それぞれ、地方での調整を行い、地方での調整が良好に進まない場合には中央で調整を行う必要がある場合もある。また、地方では、カウンティ政府との調整も必要である。

WRUA が工事を実施するためには、WRMA-SRO が WRUA への技術的な指導・支援を行うことが前提である。また、WRUA からコントラクターへ工事を発注するに当たっては、SRO は、WRUA への調達に関する指導やコントラクターへの技術的指導・監督も実施しなければならない。一方、WRUA は、現地コミュニティにおける CBO や教会、土地所有者、住民等との連携・調整・協働を行う必要がある。さらに、WRUA はコミュニティの労働力（あるい現金他の形での貢献）を事業実施時に提供することが求められている。



出典：JICA プロジェクト・チーム

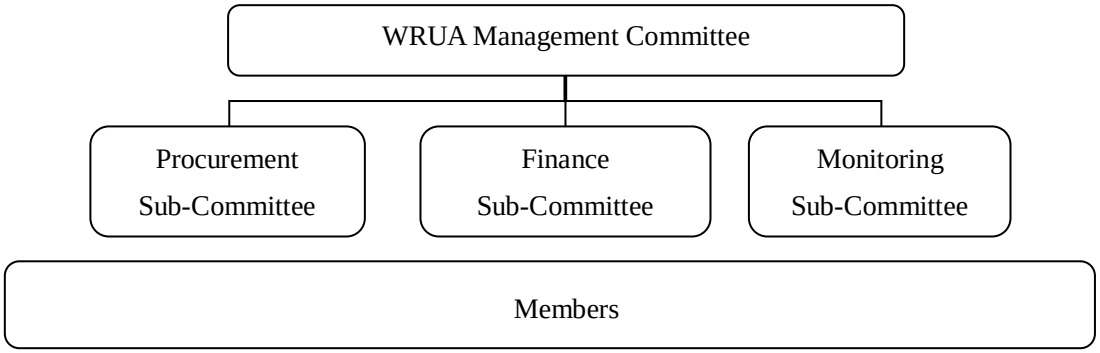
図 2.5.1　パイロット事業実施体制

以上のように、事業の実施にあたって WRMA と WRUA にはそれぞれ様々な役割がある。本パイロット事業においては、それぞれの組織に WDC 事業の実施時と同様の役割を与え、それぞれの機能状況を確認しながら、WRMA と共に必要な支援を検討し提供する。そして、上図中の赤い矢印で示された役割を WRMA、WRUA が遂行できるようになることを目標とする。

2.5.2　WDC による WRUA 内部の組織と役割

WDC マニュアルでは、WRUA には、Management Committee、Procurement Sub-Committee、Finance Sub-Committee、Monitoring Sub-Committee という管理組織が作られており、それらの役割は下表のとおりである。

パイロット事業の実施時には、それぞれの委員会に WDC 事業の実施時と同様の役割を与え、各委員会の機能状況を確認しながら、WRMA と共に必要な支援を行う。そして、支援の過程で得られた知見を、主に WRUA 向けのマニュアル（活動マニュアル）にまとめるものとする。



出典：WDC Toolkit をもとに JICA プロジェクト・チームが作成

図 2.5.2 WRUA の管理組織の構造

表 2.5.1 WRUA 管理組織の役割

委員会	役割
Management Committee 管理委員会	全体監督、及びプロジェクトや全ての活動による建設の管理を行い、提供された資金が適切に会計処理されているか、意図された目的に使われているか、結果がお金に見合ったものかを確認する責任を有している。
Procurement Committee 調達委員会	商品やサービスの提供者の選定や、3 者以上からの見積の要請や受領について責任を持つ。商品やサービスの提供者は価格または金額をもとにして選定される。いったん調達された材料の質や量は、チェックされた後、保管される。
Finance Committee 財務委員会	全ての財務処理に責任を有し、総会において資金の使い方についての独立した報告を行う。そして、資金の使い方に関係する現在の情報が一般への掲示板に掲示されることを確実にする責任がある。
Monitoring Committee モニタリング委員会	資金の使い方や、実施された活動や提供された材料に関係する質や貨幣価値のモニタリング、提供された材料の質のチェックと店への搬入に責任を有している。そして、店をモニタする。そして、総会において独立した報告を行い、さらに、他の委員会によって掲示される一般に提供可能な材料が提供されることを確認する責任を有している。

出典：WDC Toolkit をもとに JICA プロジェクト・チームが作成

2.5.3 WDC による WRUA と WRMA の役割分担

WDC のプロセスでは、次表に示すとおり、計画策定、フィージビリティ調査、設計、法的承認、調達、建設、運用という段階ごとの業務を、WRUA と WRMA が協働して役割分担しながら実施することとなっている。したがって、パイロット事業の実施にあたっては、JICA プロジェクト・チームだけで業務を計画・実施するのではなく、WRUA 及び WRMA と共同で実施していく、あるいは、少なくとも JICA プロジェクト・チームの検討内容を WRUA 及び WRMA と共有していくことが必要である。そこで、

WRUA からは調達委員会やモニタリング委員会のメンバー、WRMA-SRO からはコミュニティ担当者を集め、JICA プロジェクト・チームとの 3 者による共同推進チームを設ける予定である。

プロジェクト・チームは、それぞれの段階での WRMA と WRUA の役割をマッピングし、理解を促すとともに、機能状況を見ながら必要な支援を提供する。そして、支援の過程で得られた知見を、WRMA 向けのマニュアル（支援マニュアル）、及び WRUA 向けのマニュアル（活動マニュアル）に取りまとめるものとする。

表 2.5.2 構造物対策実施時の WRUA と WRMA の役割分担

段階	実施事項	WRUA と WRMA の役割分担
法的承認段階	土地利用等	・土地所有者との交渉は WRUA が主体 ・行政側との交渉は、WRMA が主体
調達段階	工事業者のショートリスト作成（指名業者の選定）	・WRMA-SRO が MWI 作成のロングリストを入手する ・WRMA-SRO と WRUA Procurement Committee が共同で、ロングリストから抽出する条件を検討しショートリストを作成する ・WRUA Management Committee によるショートリストの承認
	工事の入札	・WRMA-SRO と WRUA Procurement Committee が共同で工事入札図書（仕様書、図面、数量表等）を作成する ・WRUA Procurement Committee がショートリストされた業者に入札参加要請の通知を送る
	入札結果の評価	・WRUA Procurement Committee が開札と評価の準備をする ・WRUA Procurement Committee が開札し、WRMA-SRO と共同で評価を行う ・WRUA Procurement Committee が評価プロセスを文書化し、Management Committee の採択のために提出する
	工事業者との契約交渉と契約	・WRUA Procurement Committee が契約書を作成する ・契約は WRUA Management Committee が実施する
建設段階	工事実施中の監督管理	・WRUA Monitoring Committee が実施する
	工事の検査	・WRUA Monitoring Committee が実施す
	完成検査と支払	・WRUA Financial Committee が実施する
運用段階	運用と維持管理	・WRUA Monitoring Committee が実施する

出典：WDC マニュアルをもとに JICA プロジェクト・チームが作成

2.6 パイロット事業の開始後の活動

2.6.1 維持管理体制とそのためのトレーニングの実施

アクセス道路は、盛土によって行うこととしており、崩れたりする可能性がある。また、カルバート部も土砂により閉塞する可能性がある。

以上のように、設置された構造物は定期的な観察が必要であり、特に軽度の破損が起こった状態で適切な補修を行っていくことが、構造物の長期的な機能を担保していくうえで必要である。さらには、コミュニティメンバーの長期的なコミットメントも必

要となる。そのため、WRUA モニタリング委員会メンバーや WRUA 参加のコミュニティ組織がそうしたモニタリングや補修を実施できるように、必要な技術的訓練を行う。さらに、組織作り等について、他流域における先行事例から学べるような流域間コミュニケーションのネットワークづくりを支援する。

2.6.2 モニタリング・評価

パイロット事業実施に当たり、主要な行事はプロジェクト・チームが WRMA と協力して実施を支援するほか、現地における進捗については、スーパーバイザーを常駐させてモニタリングを行う。文章や写真、ビデオなどで確実に記録しておく。提供した支援のための材料や支援時の記録、スーパーバイザーからの記録・報告をもとに、活動状況を分析し、課題を抽出する。これらの材料をもとに、WRMA および WRUA の中心メンバーとも意見交換を行い、有効なフィードバックを図る。

学校での実施は、校舎は学校、道路は WRUA、トイレも WRUA が所有し、管理することを考える。

2.6.3 事例・教訓集作成及びマニュアル作成

計画・調査・設計・調達・建設・運用の各段階においてプロジェクト・チームが検討した手順と内容は、活動マニュアルの骨子となるものである。ここに、上記のモニタリング・評価の結果を加えて、マニュアルを取りまとめる。さらに、計画時の想定と実際の成果を比較検討し、その原因と対応策の検討を加えて、事例教訓集として取りまとめる。

REPUBLIC OF KENYA
PROJECT ON CAPACITY DEVELOPMENT
FOR
EFFECTIVE FLOOD MANAGEMENT IN FLOOD PRONE AREA

SELECTION PROCESS AND IMPLEMENTATION PLAN OF THE PILOT PROJECT AT LUMI RIVER BASIN

- DRAFT -

June 2013

NEWJEC

Republic of Kenya
Project on Capacity Development for Effective Flood Management in Flood Prone Area

Selection Process and Implementation Plan of the Pilot Project
at Lumi River Basin
-Draft-

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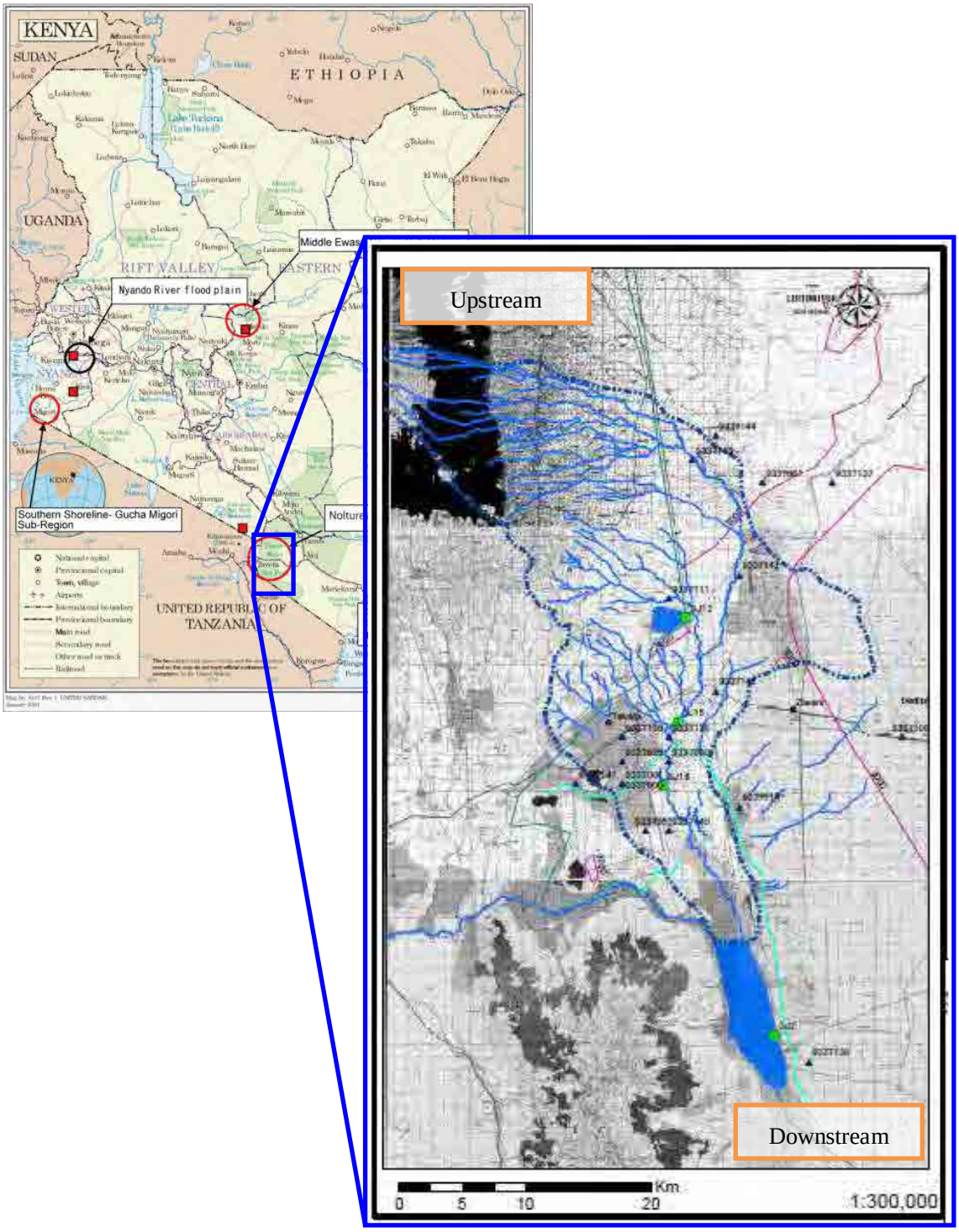
1. OUTLINE OF LUMI RIVER BASIN

Lumi River Basin is within the border of Kenya and Tanzania in the southern part of the Republic of Kenya and it is located in the south-east part of Mt. Kilimanjaro.



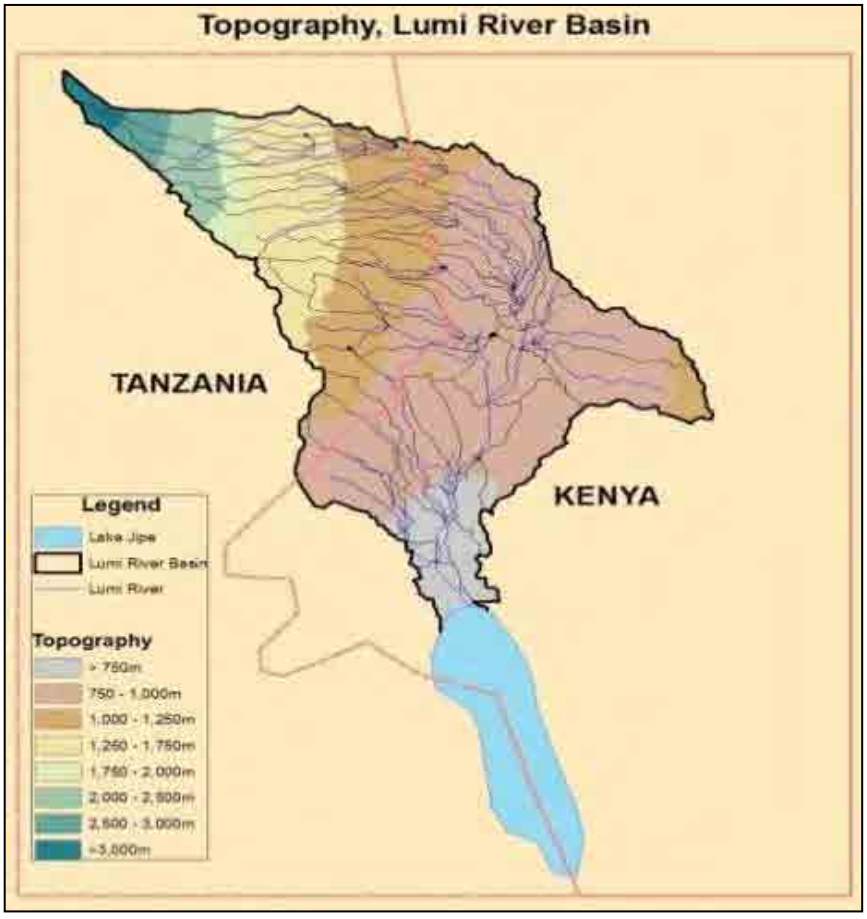
Location of Lumi River Basin

1.1 NATURAL CONDITIONS

1.1.1 Topography and Soil

(1) Topography

Catchment area of Lumi River is about 590km2 (of which 75% of the area is in Kenya), and the total length of the river is approximately 71km flowing from north to south. The width of the river is about 20km (east to west) in the widest place. Lumi River originates from Mt. Kilimanjaro and it flows towards south direction via Taveta District in the easten part of Kenya. Then, Lumi River flows into Lake Jipe and again flows into Luvu River within the territory of Tanzania. There are many springs within the river basin and the water flows into Lumi River from those springs. Major springs are Kiboboto spring, Madala spring, Njoro spring and Sambeki spring[1].

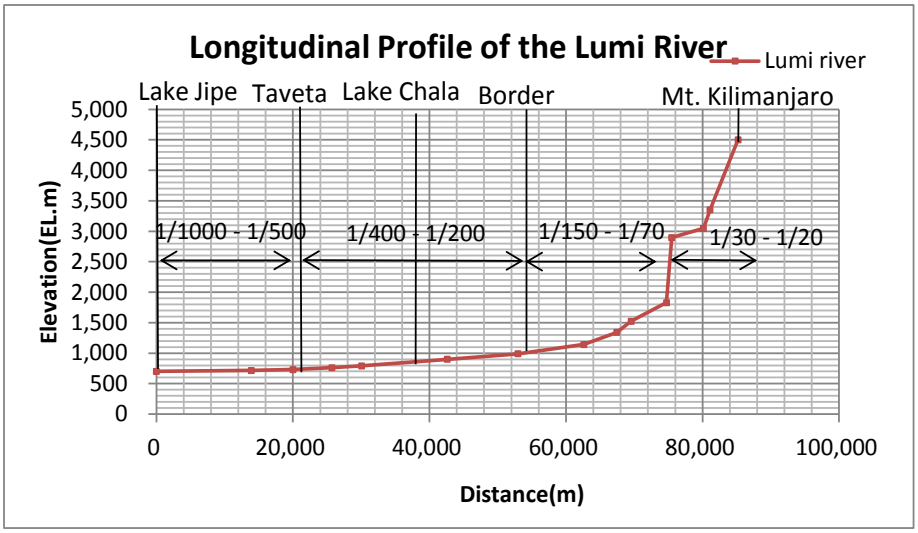


Source : WRMA, Action Plan on The Development and Implementation of a Flood Management Plan for Lumi River

Figure 1.1.1 Elevation Distribution of Lumi River Basin

[1] NWCPC, Study on Causes and Effects of Floods in Nyanza and Western provinces Tana basin and Taita Taveta District, Draft study Report (May 2006)

In the Lumi River Basin, the elevation of the upstream area within the border in Tanzania varies approximately from 4,500m to 1,000m, especially in the area colored in green to greenish yellow, the river stream shows a steep slope topography. After flowing into the Kenyan territory, the elevation of middle stream varies from 1,000m to 750m. In the downstream, the river flows into Lake Jipe at the elevation of 750m. It is known from the spread of the river basin that the topography of these areas seems to be generally flat.



Prepared by JICA Project Team based on 1/50,000 Topo Map

Figure 1.1.2 Cross Section of River Stream

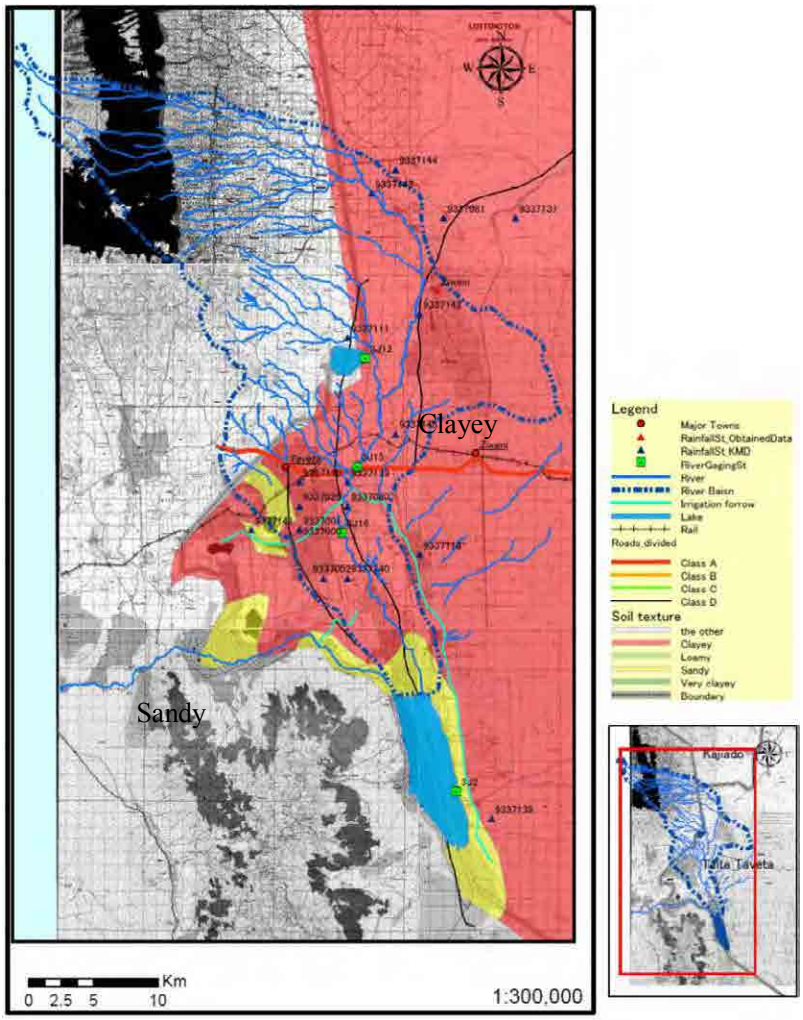
Photo 1.1.1 Mt. Kilimanjaro

Photo 1.1.2 Lake Challa

Photo 1.1.3 Lake Jipe

(2) Soil

Soil Distribution Map of the Lumi River Basin is as per Figure 1.1.3 soil covers all through the river basin, and sandy soil is distributed around the inflow areas of Lake Jipe and Luvu River.



Source: Prepared by JICA Project Team based on Kenya Soil Survey (KSS) in 1982 and revised in 1997.

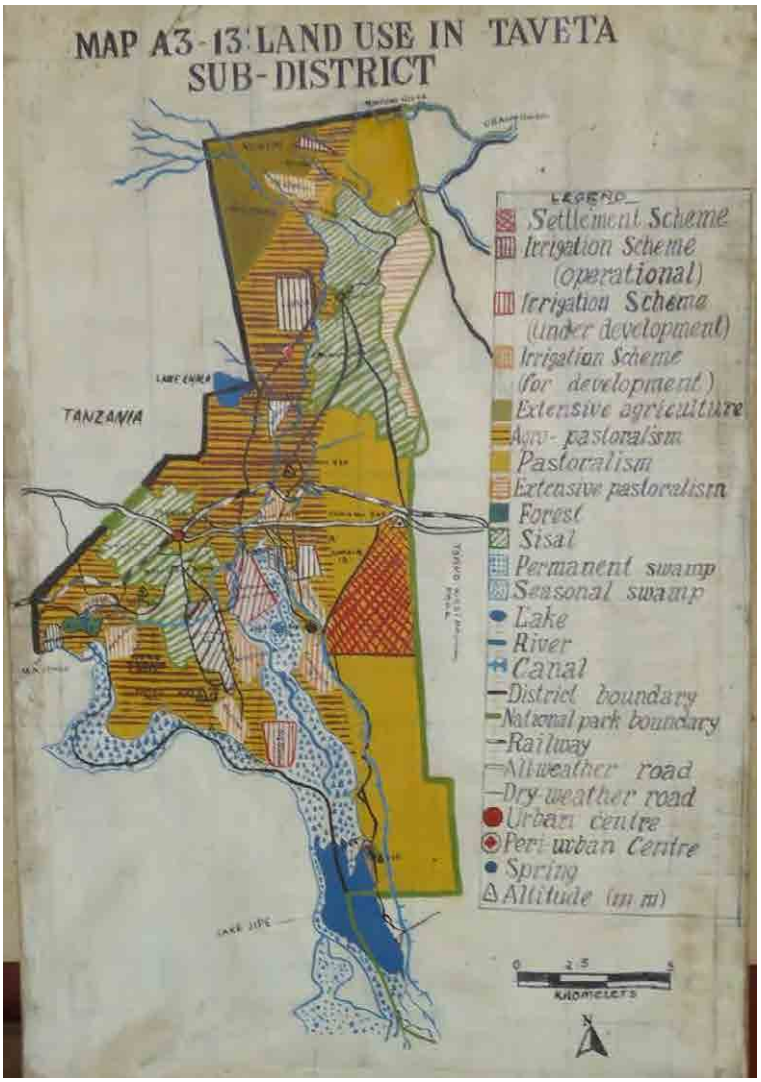
Figure 1.1.3 Soil Distribution Map (Soil texture)

Besides, according to the NWCPC report, description of the situation is different, the flood of Lumi River Basin is reported to be caused by the clayey sediment and silt deposited in the course of transportation of earth and sand by flowing water. Mountainous and hilly areas are covered with moderately thick and breakable clayey loam and the land is fertile and well drained. Therefore, the area is suitable for agriculture. In the inclined or low land, soil is composed of sandy and clayey soil. However, these areas are also suitable for agriculture. Floodplain is wetland of clayey soil containing sodium and natrium.

1.1.2 Vegetation and Land Use

Land use characteristic in Lumi River Basin is shown in Figure 1.1.4. As shown in Figure 1.1.4, the river basin is generally utilized as agricultural land and cattle camp. In the vicinity of left bank of middle stream of Lumi River and at the east-south side of Taveta Town, sisal is grown. Low land nearby Lake Jipe is a wetland.

Judging from Figure 1.1.5 satellite Image, there is few vegetation area confirmed in the middle stream and west side, and it is understood that these areas are clayey soil exposed land. Therefore, it is inferred that the flowing out of earth and sand are caused by rainfall.



Source : WRMA

Figure 1.1.4 Land Use in Lumi River Basin

Source : Prepared by JICA Project Team based on Google Earth Image Data of October 31, 2012

Figure 1.1.5 Satellite Image of Lumi River Basin

1.1.3 Hydrology and Meteorology

(1) Rainfall and Water Level Measurement

(a) Observation Station

Lists of the rainfall gauging stations of KMD and WRMA within Lumi River basin and its vicinity are shown in Daily Rainfall Data

Figure 1.1.7 shows the result of daily rainfall measurement at the rainfall gauging station of Ziwani which is under jurisdiction of WRMA from September 1, 2010 to March 12, 2012. (There are some missing data.) The maximum daily rainfall recorded at Ziwani rainfall gauging station during about two years was 95mm/day recorded on November 24,

2011.

Table 1.1.1 and Table 1.1.2 of the data in these tables, the daily rainfall data obtained at Ziwani gauging station of WRMA is shown by color. Locations of each gauging station are shown in Figure 1.1.6. Rainfall gauging stations are indicated in triangle shape (▲), while the water level gauging stations are shown in box-shape(■). Further, those rainfall gauging stations which have already obtained the data and the gauging stations under jurisdiction of WRMA and KMD are colored in red, green and blue, respectively. Similarly, for water level gauging stations, red color means the data obtained, and the water level gauging stations in the river basin are shown in green color.

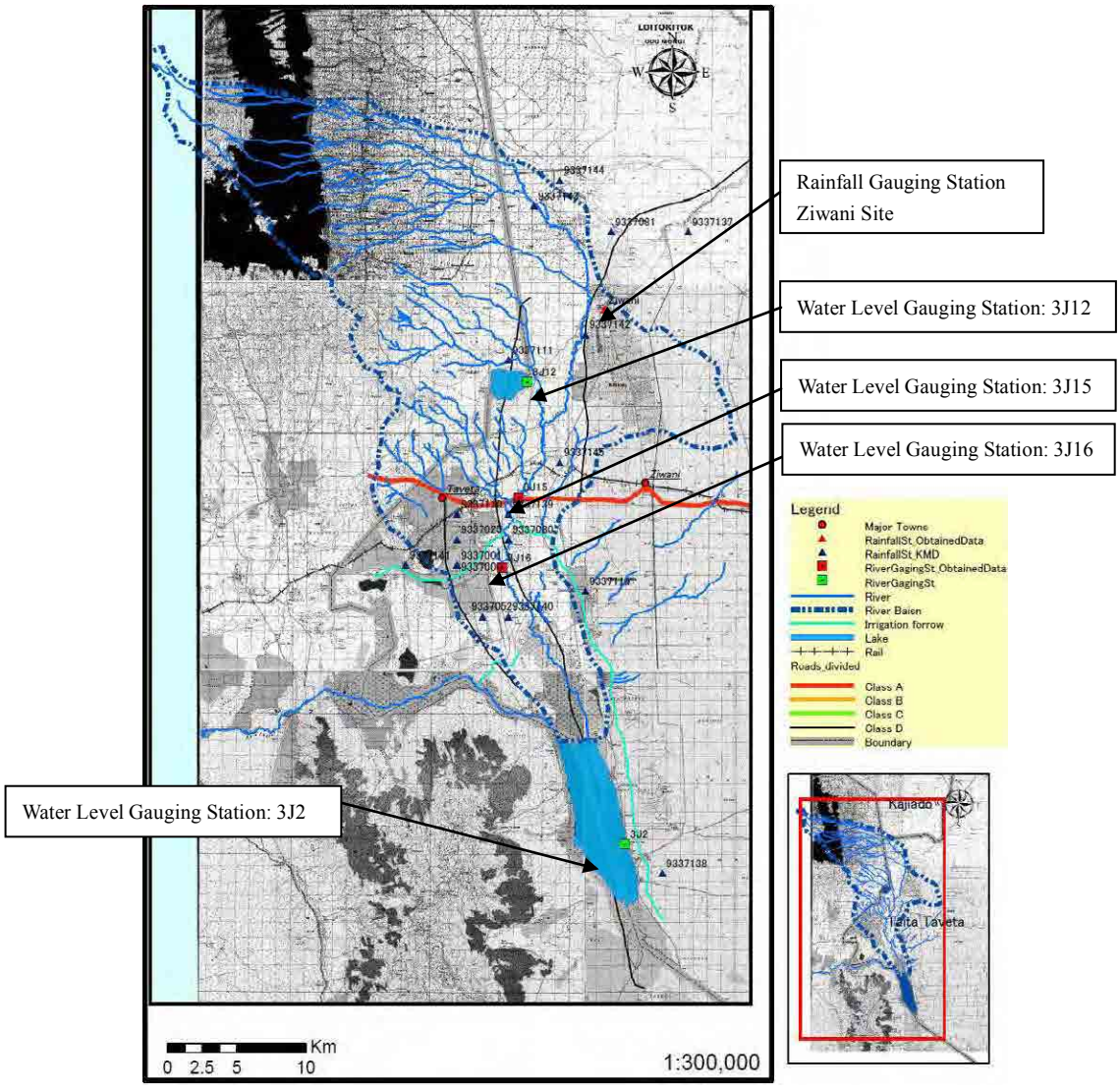


Figure 1.1.6 Location Map of Rainfall and Water Level Gauging Stations in Lumi River Basin

(b) Daily Rainfall Data

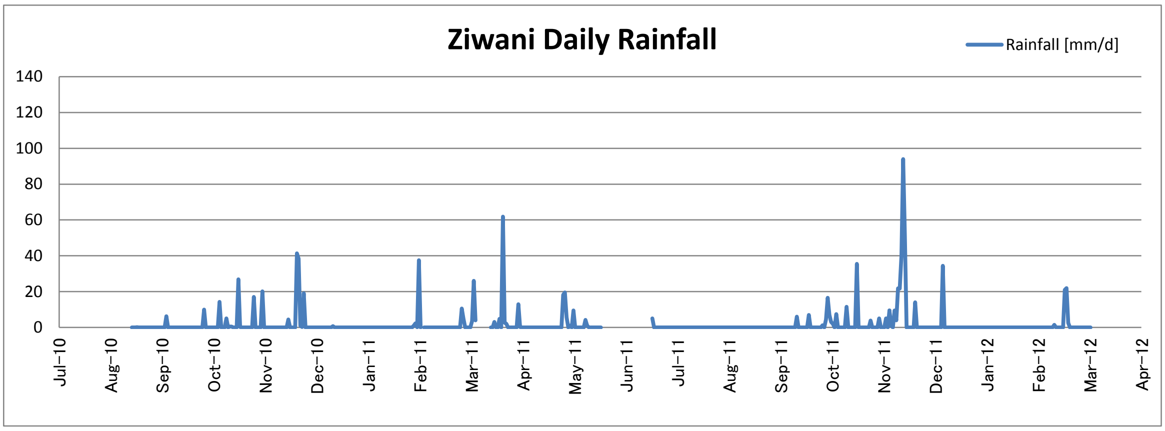
Figure 1.1.7 shows the result of daily rainfall measurement at the rainfall gauging station of Ziwani which is under jurisdiction of WRMA from September 1, 2010 to March 12, 2012. (There are some missing data.) The maximum daily rainfall recorded at Ziwani rainfall gauging station during about two years was 95mm/day recorded on November 24, 2011.

Table 1.1.1 List of KMD Rainfall Gauging Station within Lumi River Basin and its Vicinity

Station Number	Station Name	Year_Opened	Year_Closed
9337000	TAVETA_DISTRICT_OFFICE	1905	1971
9337001	TAVETA_HOMER_BROS_LTD	1926	1945
9337025	TAVETA_SISAL_ESTATE_LTD_	1938	1963
9337052	AGRICULTURAL_SECTION_TAVETA	1946	1949
9337080	TAVETA_NJORO_KUBWA	1954	1969
9337081	TAVETA_ZIWANI_SISAL_ESTATE	1941	_
9337109	TSAVO_NAT__PARK_MBUYUNI_GATE	1971	_
9337110	TAVETA_WATER_DEVELOPMENT_STATION	1968	_
9337111	TAVETA__LAKE_CHALA	1970	_
9337114	JIPE_SISAL_ESTATE	1971	_
9337137	ZIWANI_GAME_POST	1975	_
9337138	LAKE_JIPE_GAME_S_CAMP	1975	_
9337139	KIMALA_NGUI_S_FARM	1980	_
9337140	KIWALWA_MALARIA_FIELD_STATION	1980	_
9337141	KITOBO_IRRIGATION_SCHEME	1980	_
9337142	CHALA_FARMER_S_CO_OP__SOCIETY	1980	_
9337143	CHUMUINI_CHOKAA_PRI__SCHOOL	1980	_
9337144	NJUKINI_FARMER_S_CO_OP__SOCIETY	1980	_
9337145	TIMBILA_PRIMARY_SCHOOL	1981	_

Table 1.1.2 List of WRMA Rainfall Gauging Station within Lumi River Basin and its Vicinity

	Y	X	AltitudeMeter	FullMet_Auto_Manual		Daily/Hourly/Both	Operational	Start_Year	End_Year	SROin
	-3.398	37.677		Manual	3.398	37.677	Daily Manual	Yes__	Daily	N_A	Yes Lo
	-3.389	37.672	794	Manual	3.389	37.672	Daily 794 Manual	Yes__	Daily2011	N_A	Yes Lo
p	-3.474	37.755	748	Manual	3.474	37.755	Daily 748 Manual	Yes__	Daily2008	N_A	Yes Lo
mp	-3.296	37.733	911	Manual	3.296	37.733	Daily 911 Manual	Yes__	Daily2008	N_A	Yes Lo
	-3.351	37.754	851	Manual	3.351	37.754	Daily 851 Manual	Yes__	Daily2009	N_A	Yes Lo
mp	-3.187	37.724	1014	Manual	3.187	37.724	Daily 1014 Manual	Yes__	Daily2008	N_A	Yes Lo
ce	-3.629	37.776	728	Manual	3.629	37.776	Daily 728 Manual	Yes__	Daily2008	N_A	Yes Lo
	-3.437	37.639	739	Manual	3.437	37.639	Daily 739 Manual	Yes__	Daily2008	N_A	Yes Lo
mp	-3.472	37.699	736	Manual	3.472	37.699	Daily 736 Manual	Yes__	Daily2008	N_A	Yes Lo
	-3.267	37.762		Manual		Daily	Yes__	2010	N_A	NL_Lo



Source：Prepared by JICA Project Team based on the record of daily rainfall from September 1, 2010 to March 12, 2012

(There are some missing data.)

Figure 1.1.7 Daily Rainfall at Ziwani Site

(c) Water Level Observation Data

There are four water level gauging stations within the river basin as shown in the following table. Water level gauging stations 3J15 and 3J16 are located in the downstream of Lumi River, and 3J15 is located at the northem part of Taveta Town, while 3J16 is located at the southern part. The remaining two stations are located at Lake Challa and Lake Jipe. (Refer to Fig. 1.1.8.)

Table 1.1.3 Water Level Gauging Stations in Lumi River Basin

Catchment Area	River Basin/ Sub Catchment	River Name	Manual/ Auto/ Both	National/ MU/IMU/ Special	Daily/ Hourly/ Both	Start Year	End Year	SRO in charge	End Year	SRO in charge
Lumi ACA 3J15	ACA Lumi 3J15 Taveta	Lumi ACA	Manual Taveta	IMU Lumi	Daily	2009	N/A	NL (Loitokitok) 2009	N/A	2009 NL (Loitokitok) NL (L
Lumi ACA 3J16	ACA Lumi 3J16 Taveta	Lumi ACA	Manual Taveta	IMU Lumi	Daily	2007	N/A	NL (Loitokitok) 2007	N/A	2007 NL (Loitokitok) NL (L
Lake Challa ACA 3J12	ACA Lake Challa 3J12 Taveta	Lake Challa ACA	Manual Taveta	National	Daily	2008	N/A	NL (Loitokitok) 2008	N/A	2008 NL (Loitokitok) NL (L
Lake Jipe ACA 3J2	ACA Lake Jipe 3J2 Taveta	Lake Jipe ACA	Manual Taveta	National	Daily	2007	N/A	NL (Loitokitok) 2007	N/A	2007 NL (Loitokitok) NL (L

Water Level Gauging Station No.: 3J15
Measure water level of Lumi River.

Water Level Gauging Station No.: 3J16
Measure water level of Lumi River. Install device under the pier.

Water Level Gauging Station No.: 3J2
Water level gauging station inside Safari Camp for measurement of water level of Lake Jipe

Water Level Gauging Station No.: 3J12
Measure water level of Lake Challa.

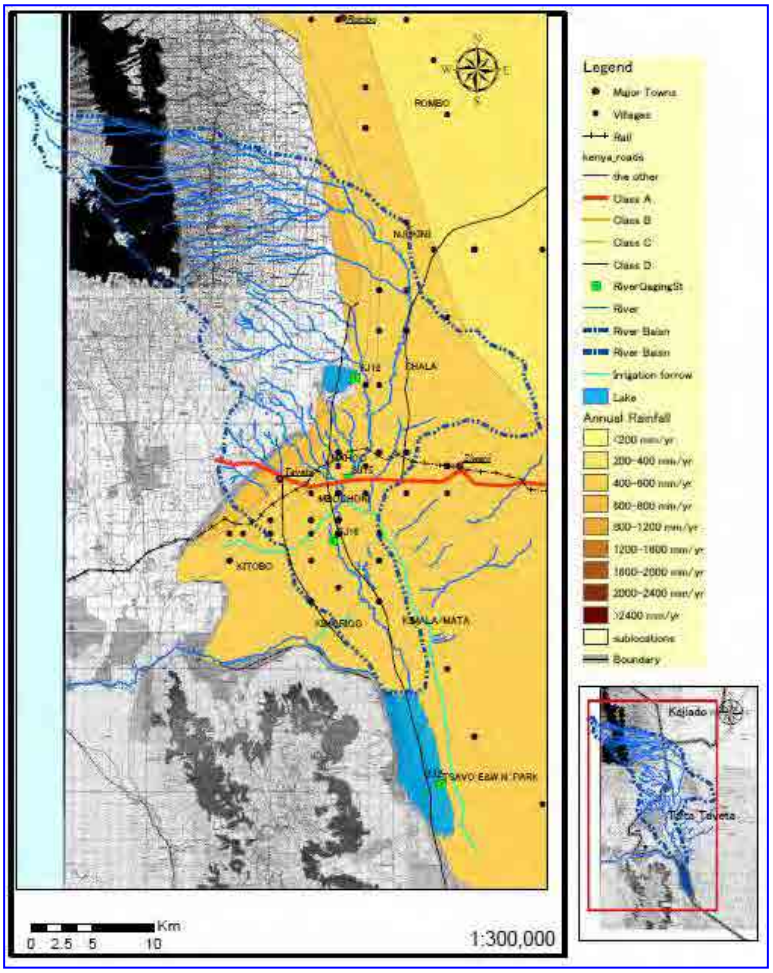
Automatic measurement is not done at each water level gauging station, but the visual observation is carried out twice a day, i.e. in the morning and in the evening. Therefore, the river discharge at the time of flood is said to be inaccurate although the conversion is done from water level data to river discharge data.

(2) Feature of Rainfall

(a) Annual Rainfall

Figure 1.1.8 shows the distribution map of the annual rainfall in Lumi River Basin. The annual rainfall ranges from 400 to 600mm in approximately 70% of the catchment area within the territory of Kenya. As the rainfall in Tanzanian side is hard to be known from this rainfall distribution map, the annual rainfall in the upstream near the headstream can't be confirmed. However, it is understood that the annual rainfall in the upstream side along the border is rather high, i.e. 600 to 800mm.

According to the NWCPC report (2006), the average annual rainfall in Lumi River Basin is reported to be about 800mm/year, while the average annual evaporation volume is 1,930mm/year.

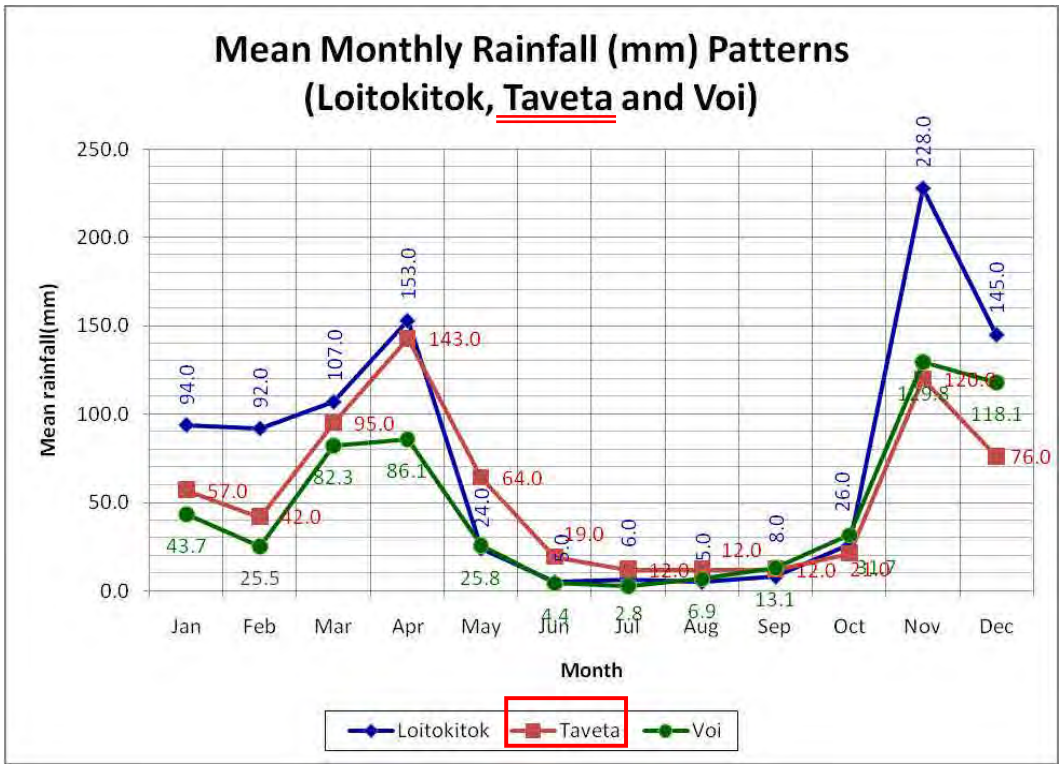


Source : Prepared by JICA Project Team based on the data of National Water Master Plan, JICA

Figure 1.1.8 Distribution Map of Annual Rainfall in Lumi River Basin

(b) Monthly Rainfall

There are two rainy seasons in Lumi River Basin, i.e. the heavy rainy season from March to May and the light rainy season from November to December. As shown in Figure 1.1.9. Average Monthly Rainfall, Taveta within the river basin records the highest rainfall in April and November through the year. In the Month of April rainfall is recorded to be the highest, it is 143mm/month



Source: WRMA, Action Plan on The Development and Implementation of a Flood Management Plan for Lumi River

Figure 1.1.9 Average Monthly Rainfall（Taveta）

(3) Correlation between Rainfall and River Flow

The daily rainfall at Zawani station and the water level observed at 3J15 and 3J16 stations are presented in Figure 1.1.10. There are observation records for about 3 years at 3J15 and for about 4 years at 3J16, however, there are many missing periods. Verification of correlation between observed water level and daily rainfall is rather difficult as the observation records are so limited. However, as it is shown in the following figure, it seems that there is a correlation between observed water level and rainfall. As the water level shows not a high value against the maximum rainfall of 95mm/day indicated in blue circle, there seems to be a problem on the observation accuracy.

In addition, according to the NWCPC report [2], the discharge in dry season of Lumi River is $0.3m^3/s$.

[2] NWCPC, Study on Causes and Effects on Floods in Nyanza and Western provinces Tana basin and Taita Taveta District, Draft study Report (May 2006)

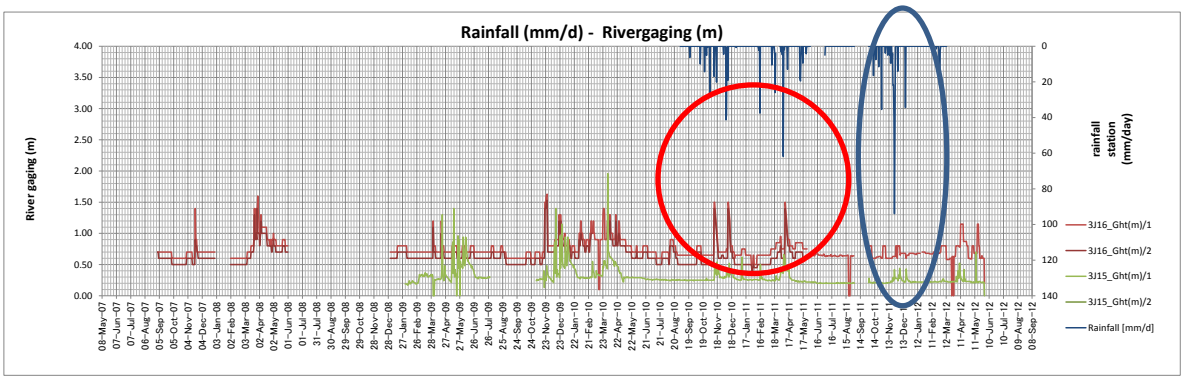


Figure 1.1.10 Correlation between Observed Water Level and Daily Rainfall

1.2 SOCIO-ECONOMIC CONDITIONS

1.2.1 Administration

Administration division of the Republic of Kenya as of March 2013 is shown below.

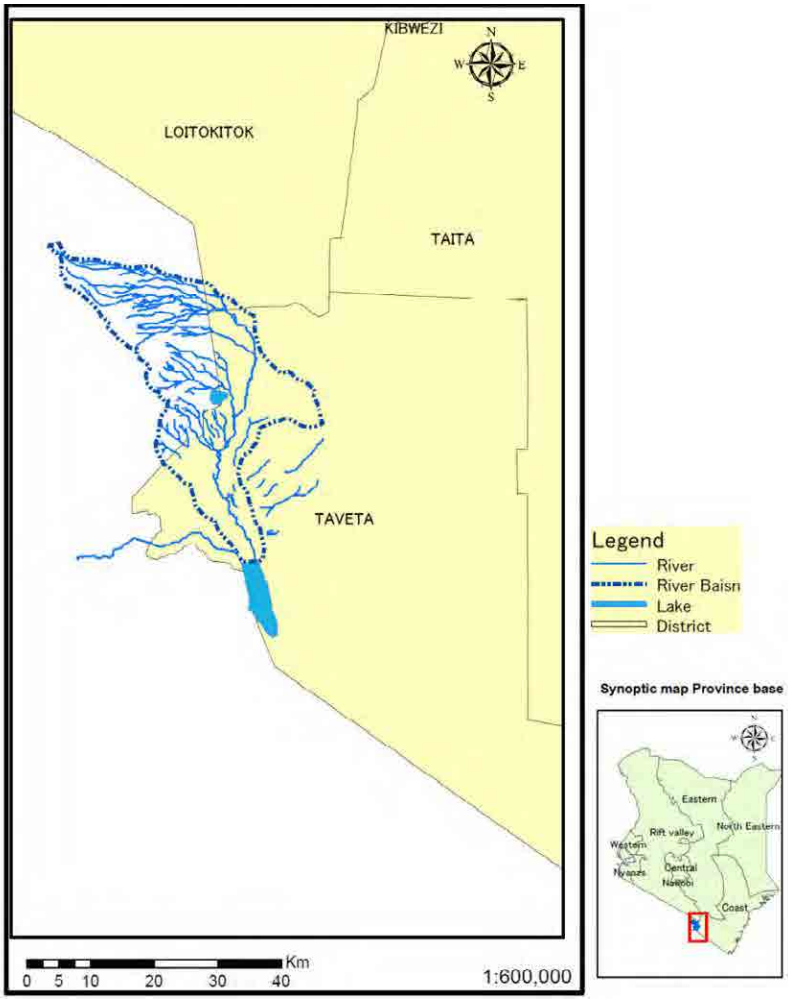
Table 1.2.1 Administrative Division in Republic of Kenya

Administration Unit	Ruler
Province	Province commissioner
District	District commissioner
Division	Chief
Location	Chief
Sub location	Assistant Chief
Community Unit	Leader
Village	Elder

In the administration system in Kenya, local governments (Province – District – Division – Location – Sub-location) are organized under President's office. The smallest administrative unit is Sub-location. Besides, although it is not an administrative organization, there is a village as a unit of rural community. Chieftains of the respective organizations are called "Province Commissioner" for Province, "District Commissioner" for District, "Chief" for Division and Location, "Assistant Chief" for Sub Location and "Elder" for Village.

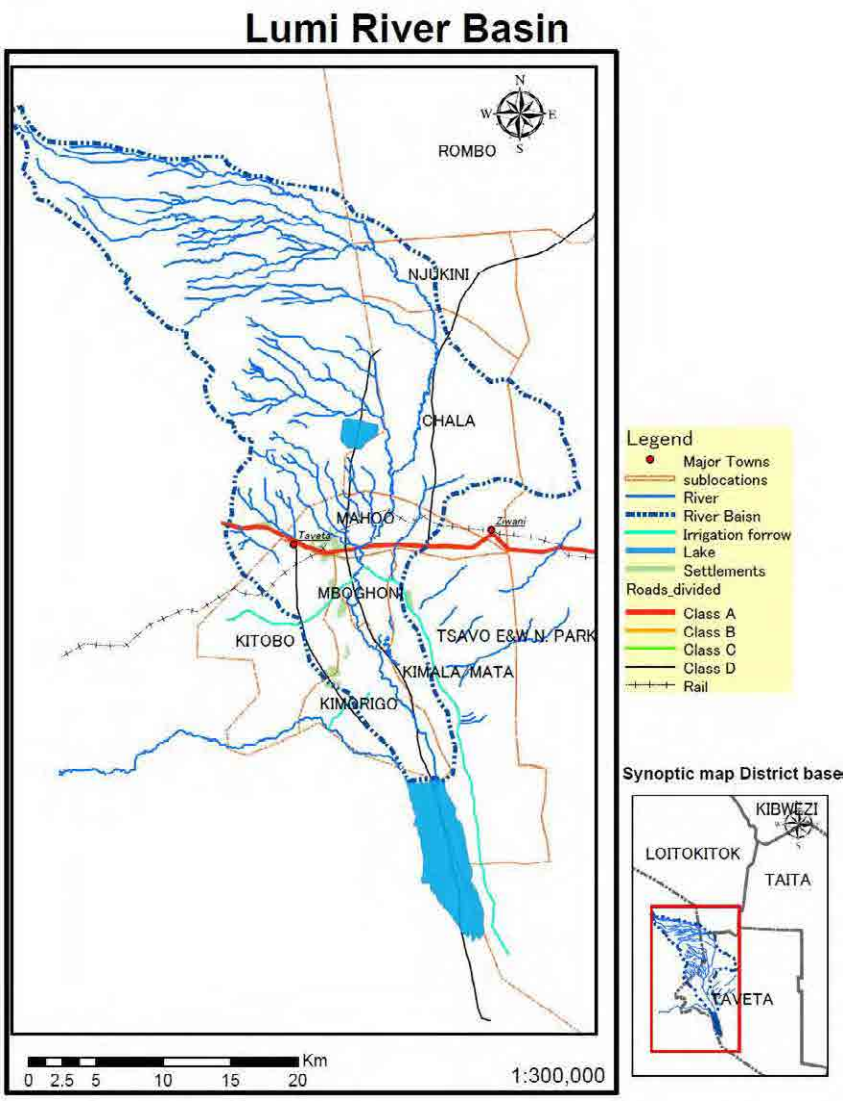
Lumi River Basin is included in Taveta District, Coast Province as shown in the following figure. (Until 2007, the area was a part of Taita-Taveta District, and the present Taveta District corresponds nearly to the former Taveta division of Taita-Taveta District. Taveta District is composed of 7 Sub Locations such as Njukini, Chala, Mahoo, Kitobo, Mboghoni, Kimorigo and Kimala/Mata. That is to say Lumi River Basin is belonging to 7 Sub Locations and a part of Tsavo National Park Division. Locations of Lumi River Basin and Sub Locations are

referred to the following figure.



Source：Prepared by JICA Project Team based on ILRI and GIS data.(District division after 2007)

Figure 1.2.1 Relation of Locations of Taveta District and Lumi River Basin



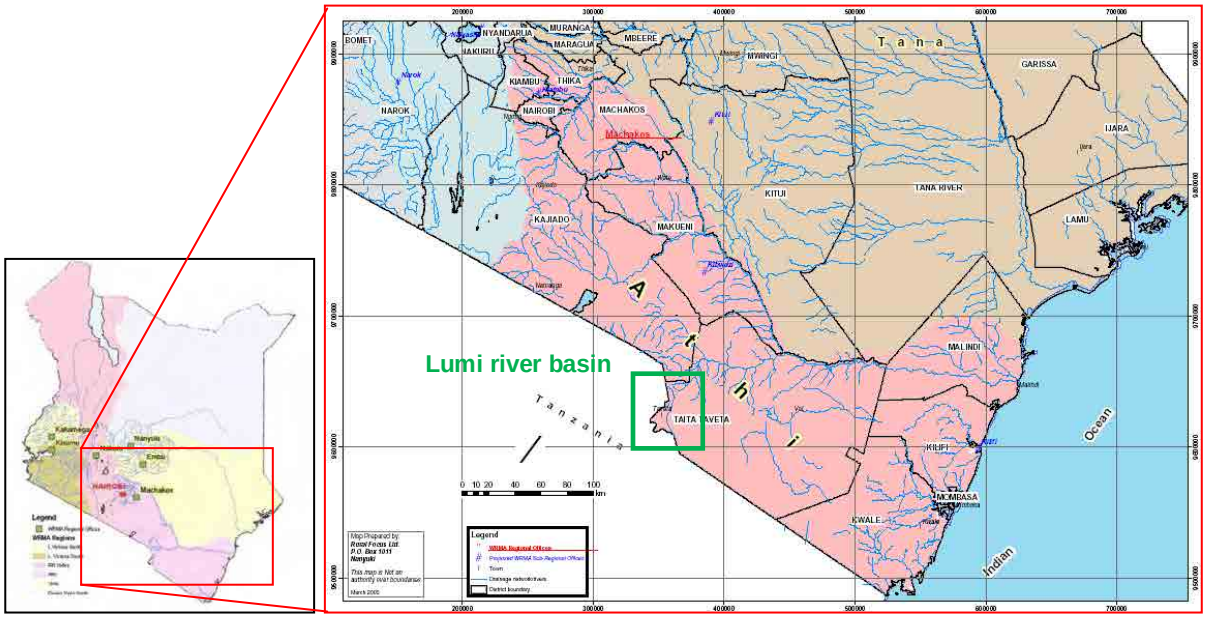
Source: Prepared by JICA Project Team based on National Water Master Plan, JICA

Figure 1.2.2 Locations of Lumi River Basin and nearby Sub Locations

Relation between the controlled area by WRMA (Water Resource Management Authority) in charge of water resource related administration and Lumi River Basin is shown below.

As set forth in the present Water Act (2002), WRMA divides the country in 6 catchment areas and the regional offices are established at each area. Catchment called "Athi Catchment Area" includes Lumi River Basin. Athi Catchment Area is composed of five sub-regional offices, such as "Upper Athi", "Nairobi", "Middle Athi", "Nolturesh-Lumi" and "Coastal Athi".

Lumi River Basin belongs to the control area of "Nolturesh-Lumi Sub-Regional Office".



Source：Athi Water Catchment Area Catchment Management Strategy (June, 2009)

Figure 1.2.3 Athi Catchment

Photo 1.2.1 WRMA Loitokitok Sub-regional Office

1.2.2 Population

Table 1.2.2 shows the population census data of 2009 which includes the data of densely populated Taveta District within Lumi River Basin. According to this data, the population density in Bomani Location in Taveta District is 400 persons or little less per km2 to 600 persons or little less per km2. Number of households records high in this area. In Mjimi Sub location, the population density per km2 is quite high, i.e. approximately 3,000. However, this location is outside of Lumi River Basin.

Table 1.2.2 Population Census Data of 2009 in Taveta District

Province	District	Division	Location	Sublocation	Male	Female	Total	Households	Area in Sq.	Population Density
COAST	TAVETA	BOMENI	BOMANI	MAHOO	1578	1618	3196	813	7.28	438.75
				MALUKILORITI	753	785	1538	358	12.3	125.03
				MBOGHONI	4241	4141	8382	2384	14.25	588.36
				NJORO	1254	1146	2400	609	6.62	362.79
			KIMORIGO	ELDORO	2212	2111	4323	967	26.46	163.36
				KIMORIGO	1055	884	1939	418	37.41	51.83
			KITOBO	KITOBO	1994	1807	3801	839	33.81	112.42
				MRABANI	1234	969	2203	510	57.27	38.46
			NGARASHI	LESESIA	591	564	1155	217	9.31	124.01
				MJINI	4613	4369	8982	2544	2.89	3108.5
		CHALLA	CHALLA	CHALLA	2661	2345	5006	1243	106.9	46.83
				MAHANDAKINI	1550	1416	2966	567	28.35	104.64
				NAKRUTO	628	633	1261	263	14.51	86.89
			NJUKINI	CHUMVINI	1483	1397	2880	543	11.92	241.66
				LUMI	1260	1183	2443	510	26.25	93.06
				NJUKINI	2477	2293	4770	989	33.94	140.52
		JIPE	JIPE	KIMALA	1855	1753	3608	911	12.61	286.16
				MATA	2413	2136	4549	1088	166.81	27.27
			TIMBILA	MSENGONI	555	594	1149	288	8.04	142.83
				NDILINDAU	498	456	954	213	9.19	103.78
		NATIONAL PARK	NATIONAL PARK	TSAVO WEST	114	46	160	84	2875.74	0.06

Source: Kenya National Bureau of Statistic, Census 2009

1.2.3 Industry

According to Taveta District Development Plan (2008-2012), the most active industry in Lumi River Basin is the agriculture. The following table shows the production of crops in Taveta District. The production weight is shown by the number of 90kg bags and the amount (Sh) is shown calculated by multiplying the unit price per kg to the total production weight.

Table 1.2.3 Status of Harvest of Crops in Taveta District

(Weight, Amount: Year 2008)

Crop	Total Achieved Production 90 Kg Bags	Farmgate price Sh/ Kg	Sh
Maize	27,297	20	545,940
Rice	1,184	70	82,880
Sorghum	1,135	40	45,400
Millet	599	70	41,895
Beans	3,384	70	236,880
Cowpeas	1,185	70	82,964
Pegion Peas	329	70	23,016
Green Grams	870	70	60,900
Cassava	376	40	15,024
Sweet Potatoes	318	50	15,883
Arrow Roots	178	50	8,880
Cotton	1,026	26	26,676
Sunflower	738	18	13,284
Ground nuts	217	80	17,344

Source: WRMA (Total amount is calculated by JICA Project Team)

About 14 kinds of crops are produced in Taveta District such as Maize, Rice, Beans, Potatoes, Cotton, etc. Out of these crops, the most productive one is the principal food, Maize in terms

of weight and amount. Following Maize, Beans、Cowpeas、Rice、Sorghum、Cotton are actively produced.

Major stock farm products are milking cow, cow for meet, woolly, goat and poultry. Apiary business is run at the dry region. Besides, fishery is active at Lake Jipe and Lake Challa from the view point of food security and job creation. Annual fish catch reaches approximately 9 tons, and tilapia and fresh-water catfish are the major fish kinds.

Taveta District is also an area of production of sisal. However, there are no treatment facility of material and the factory processing the sisal into craft products.

Lumi River Basin is a supply area of fruits like banana, etc. and vegetables, too. Therefore, as there is a potential for processing agricultural products, the economic growth in future is expected.

Within the river basin, there is Tsavo West National Park and it is located at the gateway of Serengeti National Park. Therefore, there are tourist facilities such as lodge around Lake Jipe.

Photo 1.2.2 Rice Field in the Downstream Area of Lumi River

Photo 1.2.3 Fisherman nearby Lake Jipe

1.3 DEVELOPMENT PLAN

1.3.1 Vision 2030

According to "Vision 2030", there is the following development plan.

"Strengthening of Irrigation Facility":

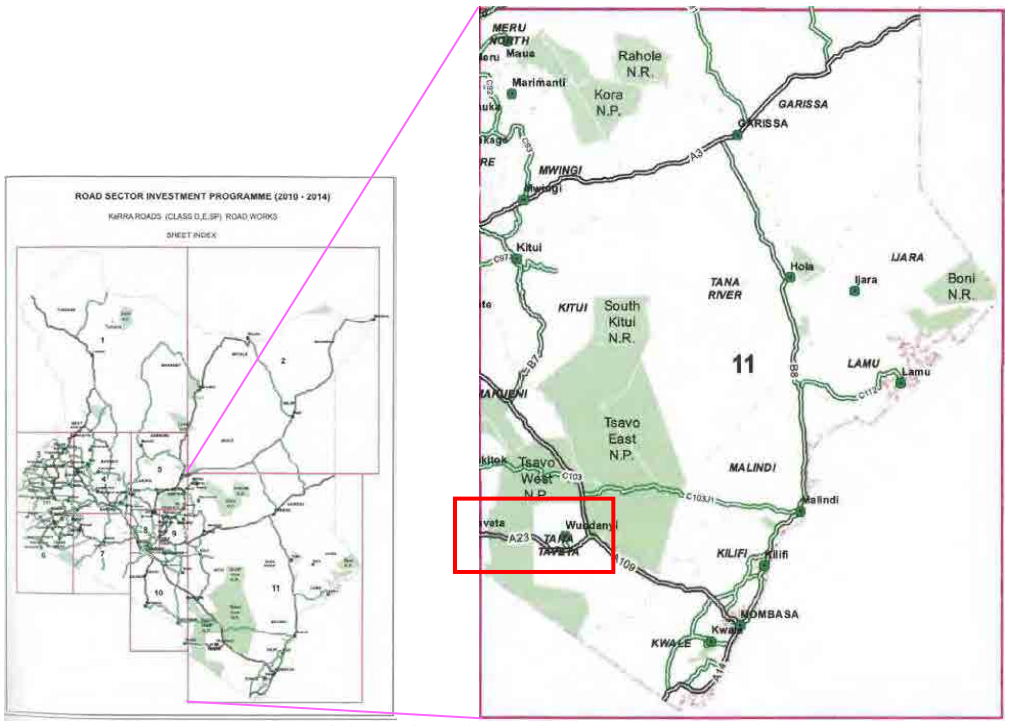
Currently, there is an irrigation strengthening project in Tana Delta as the flagship project. This project is proposed to be disseminated to the other regions including Taita-Taveta.

1.3.2 Taveta District Development Plan (2008-2012)

According to the Taveta District Development Plan which is the development plan in Taveta District, there is the following development plan.

(1) Improvement of Weak Road and Logistics Infrastructure

Under the present circumstances appropriate budget is not secured. Accordingly, maintenance is not properly done. Damages caused by flood are also problematic. For the meantime, accessibility is planned to be improved up to 65%. Especially the accessibility of A23-Mwatate-Taveta Road shown in the following figure shall be strengthened, the flood damage of Taveta District shall be reduced, and the airport shall be rehabilitated.



Source : Ministry of Roads, Road Sector Investment Programme 2010 – 2024 (May 2011)

Figure 1.3.1 Road Plan Map

1.3.3 Athi Water catchment Area Catchment Management Strategy (2009)

According to the "Athi Water catchment Area Catchment Management Strategy" which is the management plan prepared by WRMA for Athi Water Catchment, there is the following river basin management strategy.

(1) Surface Water/Flood Mitigation

To achieve the objective, the conservation of surface water is promoted in conjunction of micro (household level) with macro (province level).

- Construct a large reservoir type dam to store water for household use, irrigation, livestock farming, industry and power generation,
- Secure water resource for water supply and small scale irrigation in the rural area by rehabilitating middle to small scale dams and ponds having sedimentation and/or damage,
- Promote detailed investigation and economic analysis for the site suitable for constructing dam which would contribute largely to the water supply and the reduction of flood,
- Promote rain water harvesting by storage tank of rain water and pond in the rural area, and
- Make effort for flood management in the river basins of Sabaki, Lumi and Voi.

(2) Enhancing Capacity to Regulate Storage Infrastructure Development

WRMA will not construct reservoir dam by itself, however, WRMA is partly responsible for design and construction. Training of the regional office staff is required for capacity building on design and construction management of reservoir facility including reduction of disaster and rescue.

2. ANALYSIS OF FLOOD CHARACTERISTICS

2.1 OVERALL CONDITION ON FLOODS IN THE LUMI RIVER BASIN

2.1.1 Records of Flood Damages

Records of flood damages in the Lumi River Basin are shown in Figure 2.1.1. Especially, near river mouth area such as Kimorigo sub-location, KImala Mata sub-location and Kitobo sub-location suffered heavy damages from flood from the Lumi River. The longitudinal slope of the Lumi River is steep in the mountainous area of Mt. Kilimanjaro within the border of the United Republic of Tanzania. When the river flows into the territory of the Republic of Kenya, the stream has gentle gradient. (Figure 2.1.1). The section from the Lake Jipe to Taveta Town is about 1/1000 to 1/500 and the velocity in the section is low so that flood water is extended for a long period of time at the lower basin.

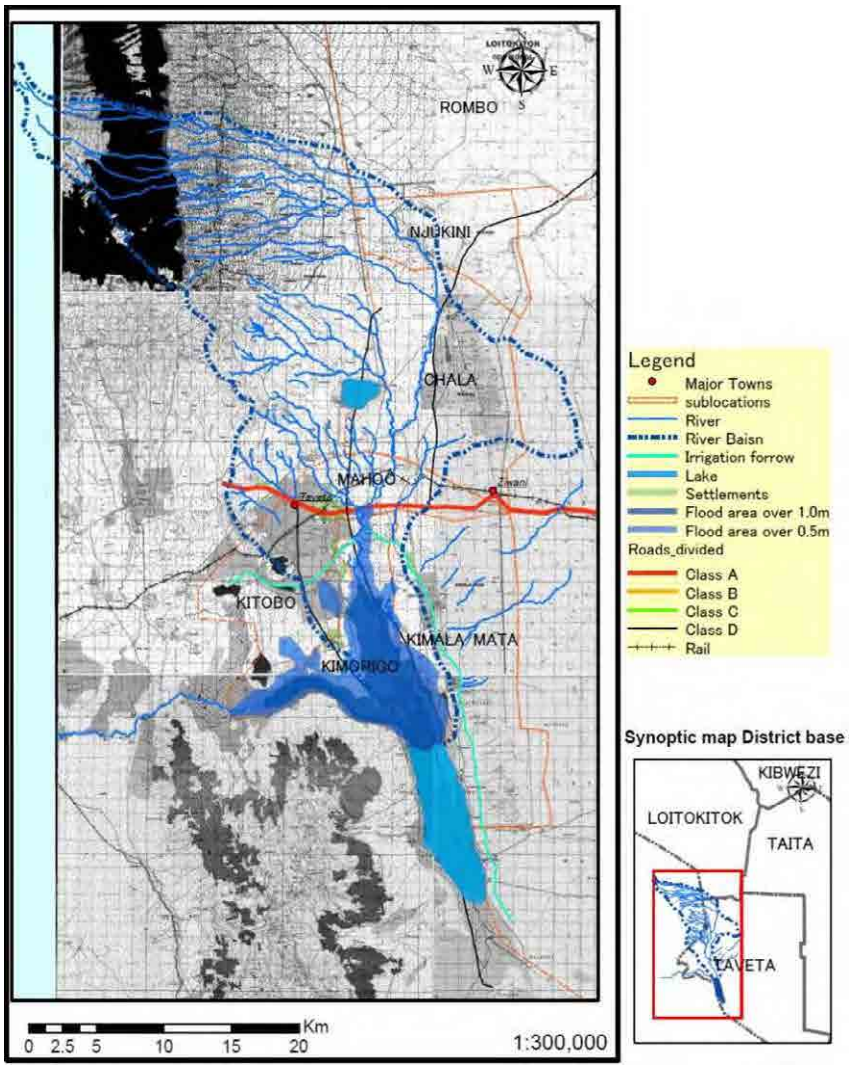


Figure 2.1.1 Records of Flood Damage in the Lumi River Basin

In the lower Lumi River Basin suffers damage from flood frequently and it has major adverse effects on agricultural products, infrastructures, houses, lives and properties, land use, local economy and etc. Moreover it is caused a delay of development. Since flood damage is extremely important problem for people who live in the lower Lumi River Basin, they put priority on issues of flood management in the Sub-Catchment Management Plan.

According to information that is provided by WRMA, numeric character data of floods which was occurred in an ordinary year and 2009 in the lower Lumi River Basin is shown in the Table-2.1.1. It indicates that approximately 80km2 was inundated in 2009 that was four times larger area and the number of victims and duration of the evacuation was two times larger and longer than an ordinary year.

Table 2.1.1 Overview of Flood in the Lower Lumi River Basin

(Ordinary year and 2009)

	The flooding situation in an ordinary year	The flooding situation In an extreme year (2009)
Flood area	22.5 km^2	79.8 km^2
Depth of water	0.3 m	0.9 m
No of evacuee	700	1600
Evacuation duration	1 month	2 month
No of floods in a year	1	2

Source : The table is created by JICA Project Team based on information provided by WRMA

Overview of recent flood damages in the lower Lumi River Basin is shown in Table 2.1.2. As described above, estimated flood damage in 2009 is approximately 30,000,000 Ksh and it is larger than an ordinary year. On the other hand, number of people who were affected by flood in 2009 is shown to be lower than an ordinary year. Thus there is a possibility that WRMA could not collect and understand actual data and information of flood damage in the basin.

Table 2.1.2 Overview of Annual Flood Damage in the Lumi River Basin

Year	No of People affected	No of People dead	Estimated Damages cost (Kshs)
2012	464	0	5,530,000
2011	105	1	1,350,000
2010	110	0	1,700,000
2009	29	4	30,300,000
TOTAL	708	5	38,880,000

Source: ACTION PLAN ON THE DEVELOPMENT AND IMPLEMENTATION OF A FLOOD MANAGEMENT PLAN FOR LUMI RIVER Training Program: Capacity Development for Flood Risk Management with IFAS (A)July 9th to August 8th 2012

Table 2.1.3 presents estimated flood damage cost and inundated area of agriculture sector in the Lumi River Basin from the year of 2001 to 2011. Irrigation facilities of Kitobo suffered a great deal of damage on cost and area of farming land

Table 2.1.3 Agricultural Estimated Damage in the Lumi River Basin (2001-2011)

	Name of Irrigation scheme	Area (HA)	Damage Cost
1	Kasokoni	5.3	430,000
2	Block C	12	235,000
3	Ngutini	4.9	780,000
4	Marondo	1.8	3,000,000
5	Msengoni	6.2	230,000
6	Kamleza	6.1	1,200,000
7	Kitobo	21	13,900,000
8	Rekeke/Lumi (Grogan canal)	8.9	2,100,000
9	Kimondia	8.1	730,000
10	Kimala	3.5	650,000
	Total		23,255,000

Source: District Irrigation Office - Taveta

2.1.2 Flood Conditin Inquiring From Relevant Communities

The principal points having flood damages in the Lumi river basin are Kimorigo, Kiwalwa, Eldoro, Riata Marabani, Rekeke, Kimala, Ndilidau, Njoro, Bahati, Mata-Jipe and Kitobo etc. The results of inquiring survey on the communities concerning the flooding situations in these points are shown in the following table.

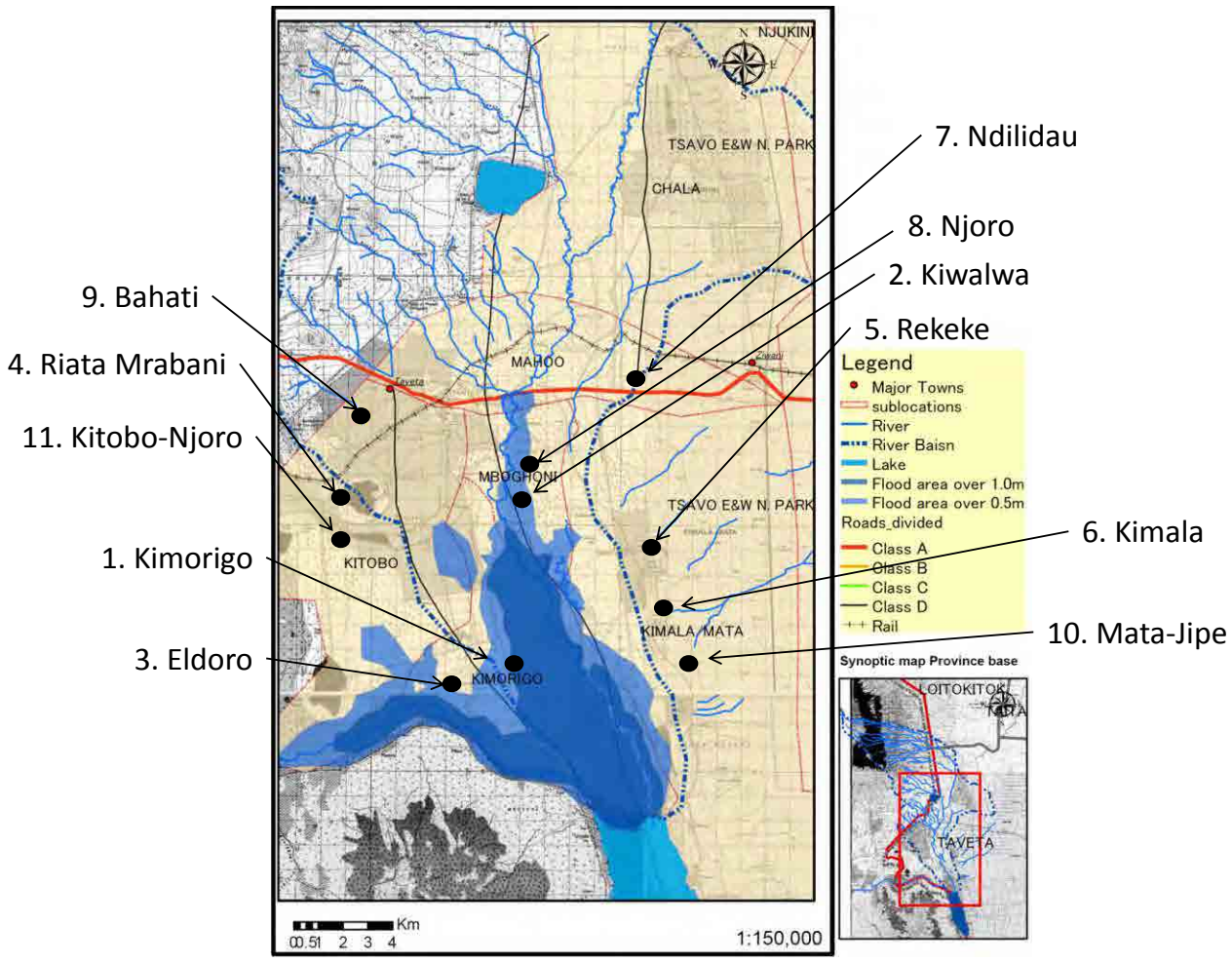


Figure 2.1.2 Location Map of Principal Community in Downstream Area

Table 2.1.4 Communities in Lumi River Basin and Each Flood Situation

No	Community	Water depth (cm)	Duration Time	Frequency	Direct Affected Population by Flood	Population	Direct Affected Population by Flood /Population
1	Kimorigo	120	2 months	2 times in a year	1939	1,939	1.00
2	Kiwalwa	40	3 week	2 times in a year	4500	7,082	0.64
3	Elodro	120	2 months	2 times in a year	300	4,323	0.07
4	Riata-mrabani	60	8 hours	2 times in a year	200	2,203	0.09
5	Rekeke	60	5-6 hours	2 times in a year	200	1300	0.15
6	Kimala	60	5 hours	2 times in a year	950	1,608	0.59
7	Ndilau	60	8 hours	2 times in a year	500	954	0.52
8	Njoro	45	2 hours	2 times in a year	1000	2,400	0.42
9	Bahati	40	3 hours	2 times in a year	800	1,550	0.52
10	Mata-Jipe	60	6 hours	2 times in a year	3000	4,549	0.66
11	Kitobo-Njoro	60	8 hours	2 times in a year	500	3,801	0.13

Source: JICA project team survey by inquiring to communities

Widespread and long term inundation around the river mouse caused by outflow from the Lumi river or dyke break bring the severe damages to especially “Kimorigo” or “Eldoro”

communities located in inundation area western side of the Lumi river, and there occurred the inundation with 120cm depth and 2 months duration.

According to the figure described above, “Rekeke” or “Kimala” communities are located around the downstream tributaries and small streams towards Lake Jipe directly and they are absolutely different with the phenomenon of flooding around the Lumi River.

It can be speculated that the flow velocity is high because the inundation duration is comparatively short as around several hours.

In addition, although the depth is 60cm around, the dangerousness of inundation caused by erosion or corrosion is high because of high energy of flow led by high velocity. And then, the evacuation will be difficult even the water depth is shallow.

Also, following features can be pointed out by inundation points.

- Although the population of Kimorigo community is smaller than Kiwala or Eldoro, the number of affected people ratio in community population is very high.
- The number of affected people of Kiwala or Mata-Jipe is numerous because their population is large.

According to this, the damage situations and flood type in each community by project team’s inquiring survey on the communities are shown below.

(1) Kimorigo

- Water depth is 120cm, duration is 2 month when floods occurrs.
  ..... (Inundation caused by overflow and dyke break from the Lumi River)
- Flow from river water and from upstream even when there is no rainfall in Kimorigo area.
  ..... (Inundation caused by overflow and dyke break from the Lumi River)
- Waters and sediments flow into the houses
  ..... (Inundation caused by overflow and dyke break from the Lumi River)
- Small livestock such as goats, sheep, chicken and rabbits swept away
  ..... (Inundation caused by overflow and dyke break from the Lumi River)
- The murram roads are inundated with flood water cutting off the villages from travelling.
  ..... (Inundation caused by overflow and dyke break from the Lumi River)
- The farms are flooded sweeping away the food crops
  ..... (Inundation caused by overflow and dyke break from the Lumi River)
- During very heavy flows Abori Primary School is closed
  ..... (Inundation caused by overflow and dyke break from the Lumi River)
- Some mud houses are swept away
  ..... (Inundation caused by overflow and dyke break from the Lumi River)
- Some of the farmlands have been turned into permanent swamps
  ..... (Inundation caused by overflow and dyke break from the Lumi River)

(2) Kiwalwa

- Flood waters flows into the farmlands and sweeps the crops away
  .....(Inundation caused by overflow and dyke break from the Lumi River)
- Sediment flows into the houses and deposited inside
  .....(Inundation caused by overflow and dyke break from the Lumi River)
- Access roads are affected by the flood waters interfering with transportation of produce to the market.....(Inundation caused by overflow and dyke break from the Lumi River)
- Pollution of spring water
  .....(Inundation caused by overflow and dyke break from the Lumi River)

(3) Elodro

- Some of the farmlands have been turned into permanent swamps
  .....(Inundation caused by overflow and dyke break from the Lumi River)
- During periods of very heavy flooding school work is interfered with at Eldoro Primary School.....(Inundation caused by overflow and dyke break from the Lumi River)
- The flood waters sweep away the food crops
  .....(Inundation caused by overflow and dyke break from the Lumi River)

(4) Riata-mrabani

- Flooding from the slopes of Mt. Kilimanjaro ..... (Flash flood)
- Destruction of infrastructure like roads and the railway..... (Flash flood)
- Flood water gets into the houses with sediments..... (Flash flood)
- Very serious gulley erosion leading to loss of farmlands ..... (Flash flood)

(5) Rekeke

- Flood waters from Tsavo West ..... (Flash flood)
- Destruction of infrastructure such as the bridge on the road ..... (Flash flood)
- Death of one villager in 2009 ..... (Flash flood)
- Destruction of houses in Rekeke ..... (Flash flood)
- Sediment flow inside the houses ..... (Flash flood)
- Small livestock such as goats, sheep, chicken and rabbits swept away..... (Flash flood)
- Very serious erosion that increases the sizes of the gulleys and reduces the size of the residents farmlands at the same time ..... (Flash flood)

(6) Kimala

- Flood waters mainly from the Tsavo West..... (Flash flood)
- Leads to destruction of infrastructure like bridges ..... (Flash flood)
- Houses are inundated with flood water..... (Flash flood)
- Houses are inundated with flood water..... (Flash flood)

(7) Ndilau

- Flash flooding from the side of Tsavo West National Parks .....(Flash flood)
- Heavy soil erosion has led to the formation of very big gulleys hence loss of farmlands .....(Soil and sediment run off)
- It has caused the destruction of the road to Voi and Lake Jipe.....(Soil and sediment run off)
- The flood flows also cause the destruction of houses .....(Flash flood)
- Destruction of farmland and the sweeping away of crops .....(Flash flood)
- 1 person was killed while trying to cross the big gulleys during the flood.....(Flash flood)

(8) Njoro

- Flood waters cause the pollution of the springs ..... (Inundation caused by overflow and dyke break from the Lumi River)
- Sweeping away the crops in the farmlands ..... (Inundation caused by overflow and dyke break from the Lumi River)
- Destruction of the house ..... (Inundation caused by overflow and dyke break from the Lumi River)

(9) Bahati

- Flash flooding from the side of Tsavo National Park.....(Flash flood)
- Destruction of the houses.....(Flash flood)
- Sweeping away of the livestock..... (Flash flood)

(10) Mata-jipe

- Flash flooding from the side of Tsavo West National Park.....(Flash flood)
- Destruction of houses.....(Flash flood)
- Sweeping away of Livestock and other domestic animals.....(Flash flood)
- Sweeping away of the crops in the farms.....(Flash flood)
- Serious gulley erosion leading to the loss of farmland .....(Flash flood)

(11) Kitobo-Njoro

- Flash flooding from the mountain on the upper side but then the flood waters settle near the Kitobo Spring.....(Flash flood)
- Leads to the pollution of the spring waters .....(Flash flood)
- Land surrounding the Kitobo springs made unsuitable for agriculture.....(Flash flood)
- Serious gulley erosion leading to the loss of farmlands.....(Flash flood)

2.1.3 Existing Structures along the River

There are flood control and water use facilities in the Lumi River Basin such as Canal-A, Canal-B, Canal-C and Grogan-canal.

As shown in following figures, Canal-A (approx. 12km), Canal-B (approx. –km) and Canal-C (approx. 17km) flow parallel on the western side of the Lower Lumi River and these three canal merge into one at the north side of the Lake Jipe and then the canal connects the Ruvu River which flow from the Lake Jipe. These canals were constructed in 1930's during the colonial period and they have functions of drainage and irrigation.

According to the report of NWCPC, embankments (Height: 1.5m, Length: 10km) along the Canal-C were built in 1973. In conjunction with construction of embankments, two irrigation canals were dredged. However, due to sediment discharge and inappropriate maintenance of the channels, capacity of flow has been reduced and part of embankment got collapsed when flood had occurred. Since then canals doesn't fulfill a function. Especially flood in 1987 and 1997, farmers destroyed dykes in order to intake agricultural water for farmland between the Lumi River and dyke and currently part of embankment is dysfunctional.

Part of embankment of Canal-C (approx. 700m) is broken at this moment, flooding water in the Lower Lumi River can't run through the Canal-C and spread across area of the Canal-B and the Canal-A. We infer that these canals which can't fulfill a function may have caused frequent flood damage in the western low-lying area of the Lower Lumi River Basin.

On the other hand, part of the Grogan Canal was renovated at the initiative of WRMA in 2012, it is function effectively on irrigation purpose and WRUA is maintaining the canal and its facilities properly. Hence, MWI, WRMA, DC, WRUA and etc. become their primary focus on projects of renovation on the Canal-A, Canal-B and Canal-C and mitigation of flood damages.

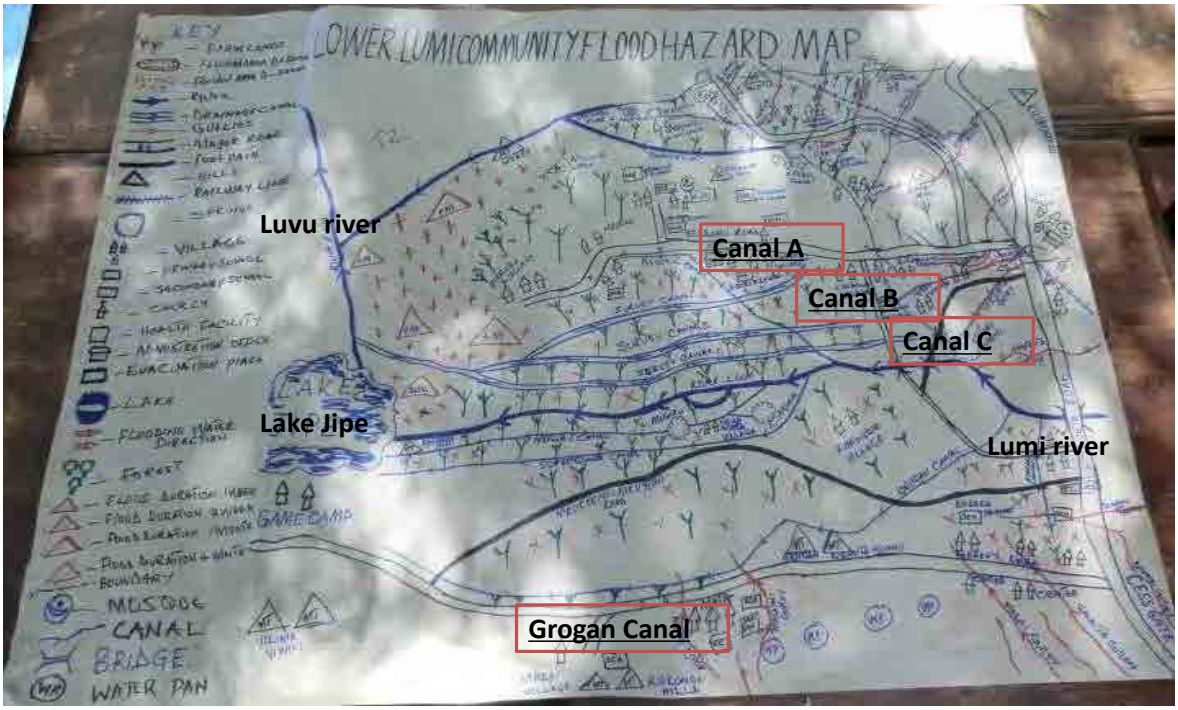


Figure 2.1.3 Location of Canals

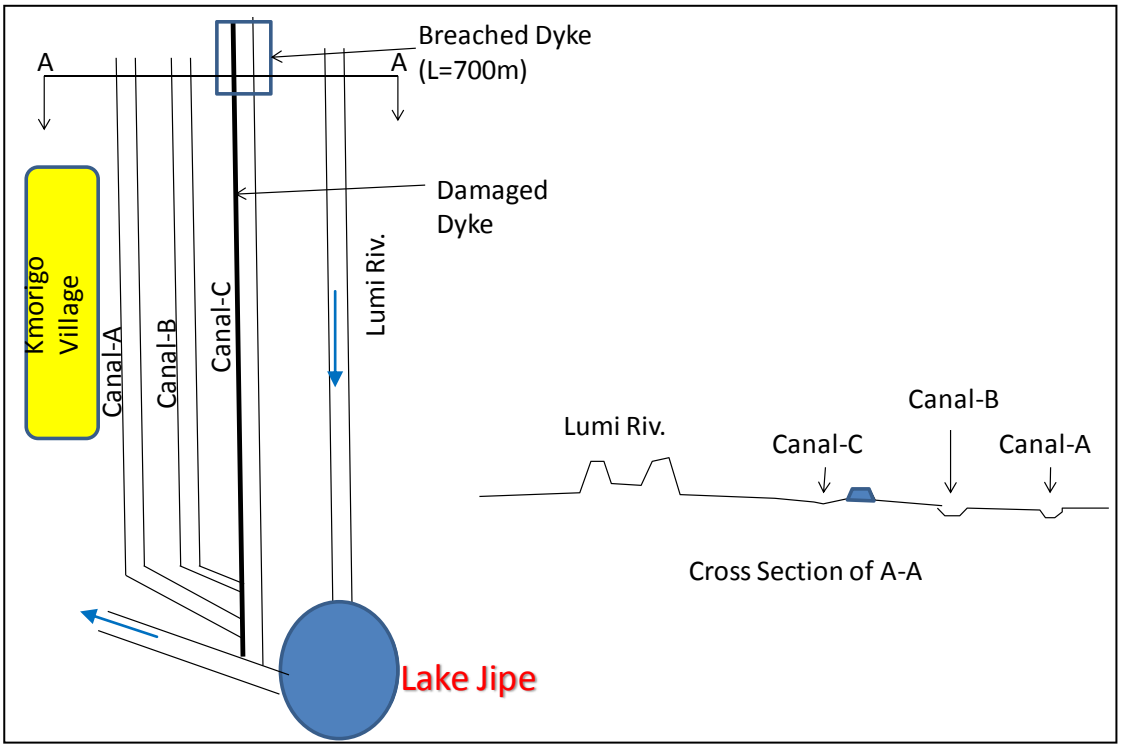


Figure 2.1.4 Cross-section Diagram of the Lumi River and Canals

Photo 2.1.1 Embankment of the Canal-C

Photo 2.1.2 Broken Point of the Embankment Canal-C

Photo 2.1.3 Canal-A around Kimorigo Village

Photo 2.1.4 A Point of Artificially-destroyed Embankment
(take agricultural water from Lumi R. of the left side on the photo and supply to the right side)

2.2 FLOOD CHARACTERISTICS AND SITUATION OF DAMAGES IN THE LUMI RIVER BASIN

2.2.1 Concept of Flood Characteristics and Situation of Damages in the Lumi River Basin

There are three types of flood characteristics in the Lumi River Basin as described below;

Mark	Flood Type	Area
A	Soil and sediment run off	Upper and middle river basin
B	Widespread and long-running inundation which is caused by overflow and dyke break from the Lumi River	Low-lying area at the lower river basin)
C	Flash flood	Branches of the Lower Lumi River and small streams flow in the Lake Jipe

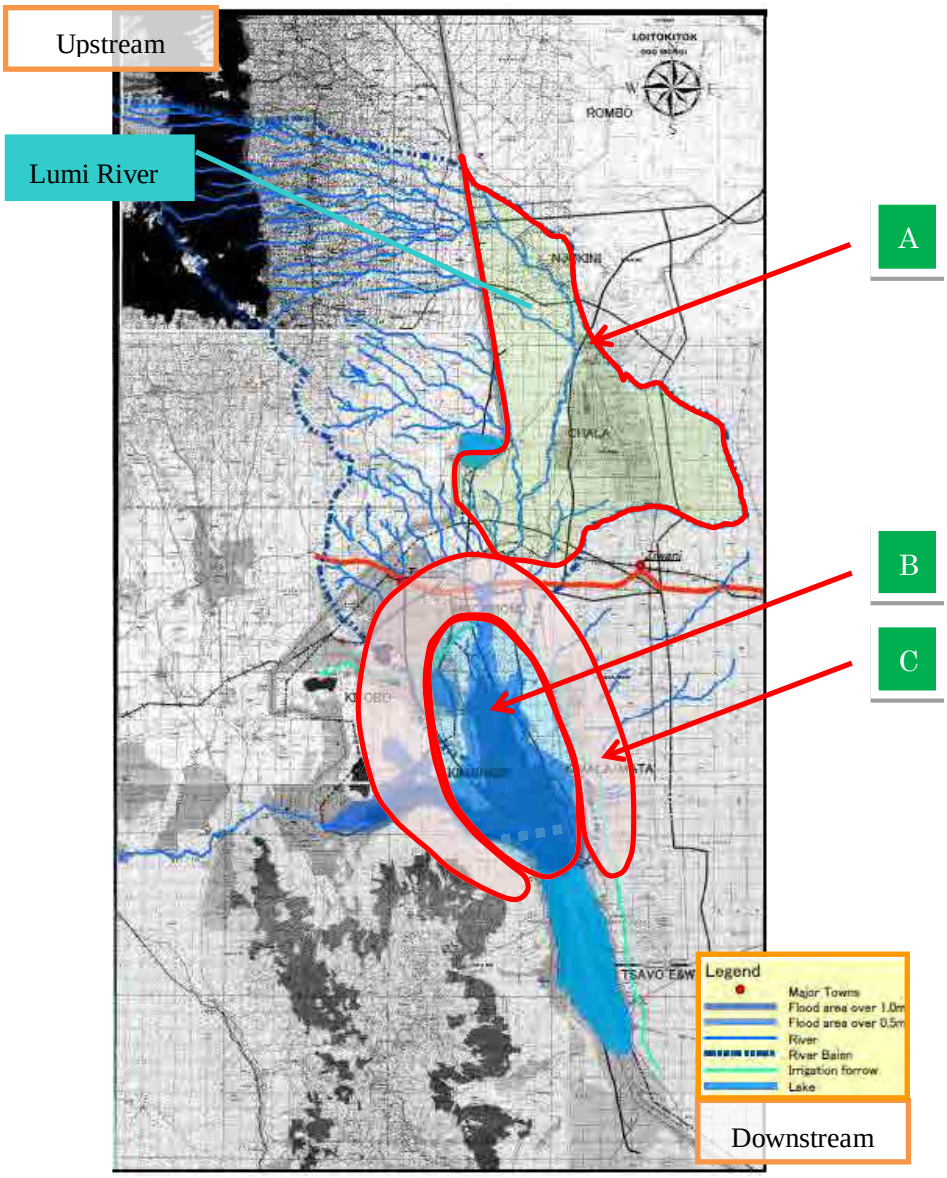
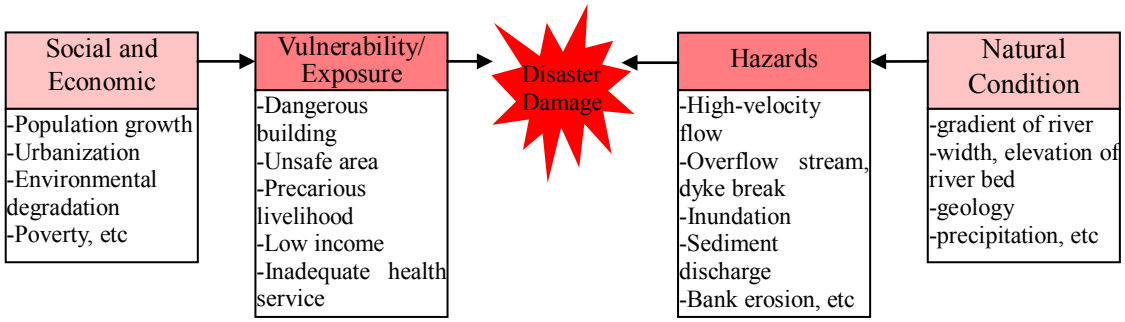


Figure 2.2.1 Records of Flood Damage and Classification of Flood Characteristics in the Lumi River Basin

Flood damage has a close relationship with natural condition and Socio-economic condition in a local area. Natural condition defines types of Hazards in a river basin and Socio-economic condition defines vulnerabilities and exposures. Moreover, it could be said that disaster (flood) damage is defined from both aspects. Characteristics of flood damage are analyzed using information of last chapter (Natural condition and Socio-economic condition) about each flood characteristics of A), B) and C) as above-mentioned.



Source: Revised by JICA Project Team, based on material of "Community and Development assistant of Disaster Prevention, Mr. Mikio Ishiwatari (1997)

Figure 2.2.2 Mechanism of Flood Damage

2.2.2 Flood Characteristics in the Upper and Middle Lumi River Basin (A)

Flood characteristics in the upper and middle Lumi River Basin which are analyzed from the aspects of natural, Socio-economic conditions are shown below.

(1) Flood Characteristics from Natural Conditions

There is heavy rainfall around the mountain-side of Mt. Kilimanjaro and those areas have a sharp inclination of 1/30 – 1/20. Because of high flow velocity and most of area doesn't cover with forest and vegetation, it is more likely to erode clay soil and a large amount of soil is supplied to the downstream.

- Sediment discharge is causing aggradation of river bed levels in the lower river basin that is gentle slope and low flow velocity.
- In addition, flash floods occur at the Lumi River's Tributaries.
- Most of upper and middle of the Lumi River Basin is located in the territory of the United Republic of Tanzania and mountain area of Kilimanjaro and the area has a high precipitation.

Natural Conditions that are described in the Chapter-1 and Hazards in this area are shown as next table.

Table 2.2.1 Natural Conditions and Hazards in the Upper and Middle Lumi River Basin

Natural Conditions	Hazards
Heavy rains in the mountain area Geography: A sharp inclination (1/30 -1/20)	Soil Erosion High velocity and tractive force High peak discharge
Large area of bare lands	Soil erosion Sediment run-off

(2) Characteristics of Flood Damage from Socio-economic conditions

Relationship between conditions on Social and Economic and Vulnerability/ Exposure to Natural disasters in the upper and middle Lumi River Basin are shown below.

There are stockbreeders and fish farmers in the area. The area extends across border of Kenya and Tanzania. In order to analyze flood characteristics of the Lumi River Basin, data of metrological, hydrological, geological and land use in the upstream area are required. However, most of upper and middle river basin is located in the territory of the Tanzania, sharing information between the government of Kenya and Tanzania is not established at this moment.

Table 2.2.2 Conditions on Social and Economic and Vulnerability/ Exposure in the Upper and Middle Lumi River Basin

Socio-economic conditions	Vulnerability/ Exposure
Population is 10,000. Density of population 50~150 person/km	Density of population is low. Vulnerability is small.
Stockbreeding	Make it difficult to protect livestock and breed
Culture fishery in the Lake Chala	Lose/ threaten fish former's livelihood
Highway and trunk route	Structural vulnerability of roads and bridges
The basin is located in International River Basin (Kenya and Tanzania)	Difficult to collect data of metrological, hydrological and etc from the Tanzania

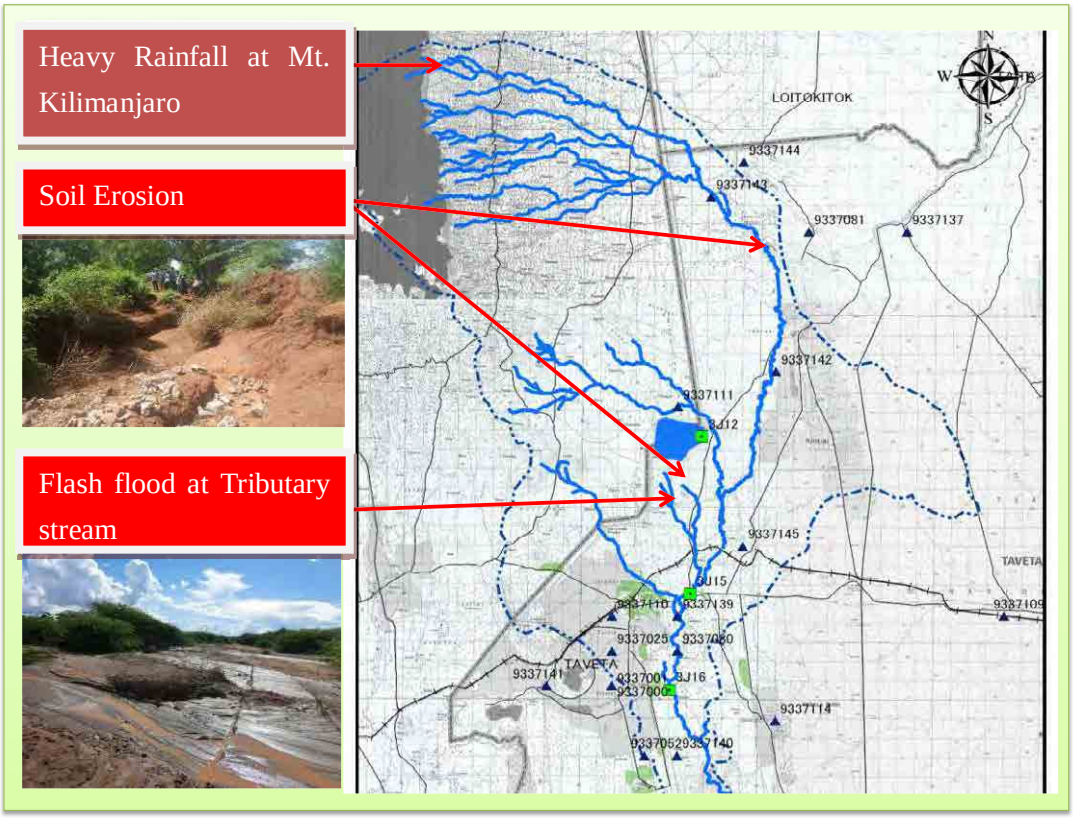


Figure 2.2.3 Flood Characteristics in the Upper and the Middle Area of Lower Lumi River

(3) Flood Damage Mechanism

Around upstream to middle stream, sediment outflow has occurred with farmland erosion caused by furious rainfall and high velocity sheet flow. However, in this area, raising livestock is also prosperous, and then the impact from sediment outflow is not so severe.

2.2.3 Flood Characteristics of Low-lying Area in the Lower Lumi River Basin (B)

Flood Characteristics of low-lying area in the lower Lumi River Basin which are analyzed from the aspects of natural, Socio-economic conditions are shown below.

(1) Flood Characteristics from Natural Conditions

- Low-lying area is inundated by flood water of over flow and dyke break from the Lumi River due to lack of flow capacity.
- The lack of flow capacity is caused by narrowness, high bedded and gentle slope of the Lumi River. Aggradation of river bed levels is generated by discharged sediment. Moreover gentle slope (1/1000 – 1/500) of river profile is causing low flow velocity. (Reference on Photo which was taken near the mouth of the Lumi River)
- Drainage canals (Canal-A, -B and –C) which are located in the inundation area don't have enough flow capacity and part of embankment along the canals is broken; hence these canals don't fulfill their function of existed facilities.
- Inundation is prolonged at the low-lying area because gradient of land features is gentle (1/1000 – 1/500).
- In addition, due to rising water level of the Lake Jipe, flooding water has nowhere to go

Photo 2.2.1 Near the Mouth of the Lumi River
(the River is narrow and water level is higher than farming land)

Natural Conditions that are described in the last chapter and Natural Risks (Hazards) in this area are shown in Table 2.2.3.

Table 2.2.3 Natural Conditions and Hazards in the Lower Lumi River Basin

Natural Conditions	Hazards
Gentle river bed slope and flat landscape	Interrupt the flow of water through the downstream
Discharge large amounts of sediment Narrow river	Aggradation of river bed, there is the threat of levee breach. Small capacity of river flow

(2) Characteristics of Flood Damage from Socio-economic conditions

Due to long term inundation, highly-populated area has impacts of flooding including damages to properties and farmlands, destruction of crops, no-access of springs water (muddy after flooding), non-functioning of infrastructures facilities (severed road, physically impossible to commute to school, flooding in hospitals and etc.) and loss of livestock.

- Part of bank along the canals is broken by local farmers in order to take agricultural water.
- 20,000 households were inundated and 60,000 residents were evacuated in Kimorigho location at the floods of year 2007 -2008.
- Refugees who are evacuated from floods are forced to displace for two months.

Relationship between “Socio-economic conditions” and “vulnerability/ exposure” in this area are shown in Table 2.2.4.

Table 2.2.4 Conditions on Social and Economic and Vulnerability/ Exposure in the Lower Lumi River Basin

Socio-economic conditions	Vulnerability/ Exposure
Highly-populated residential area (population density of 600 people per square kilometer)	A number of refugees who might be affected by flood
Agriculture and stockbreeding have been prosperous in this area	Agricultural production stoppage, Protection of livestock, difficulty of breeding, affect the residents' livelihood
Part of bank is broken by local farmers in order to take agricultural water.	Creation an adverse impact on surrounding area
Unpaved community road	Roads are severed by floods
Tourist facilities locate near the Lake Jipe	Due to inundation and severed roads, stoppage of a service for tourists

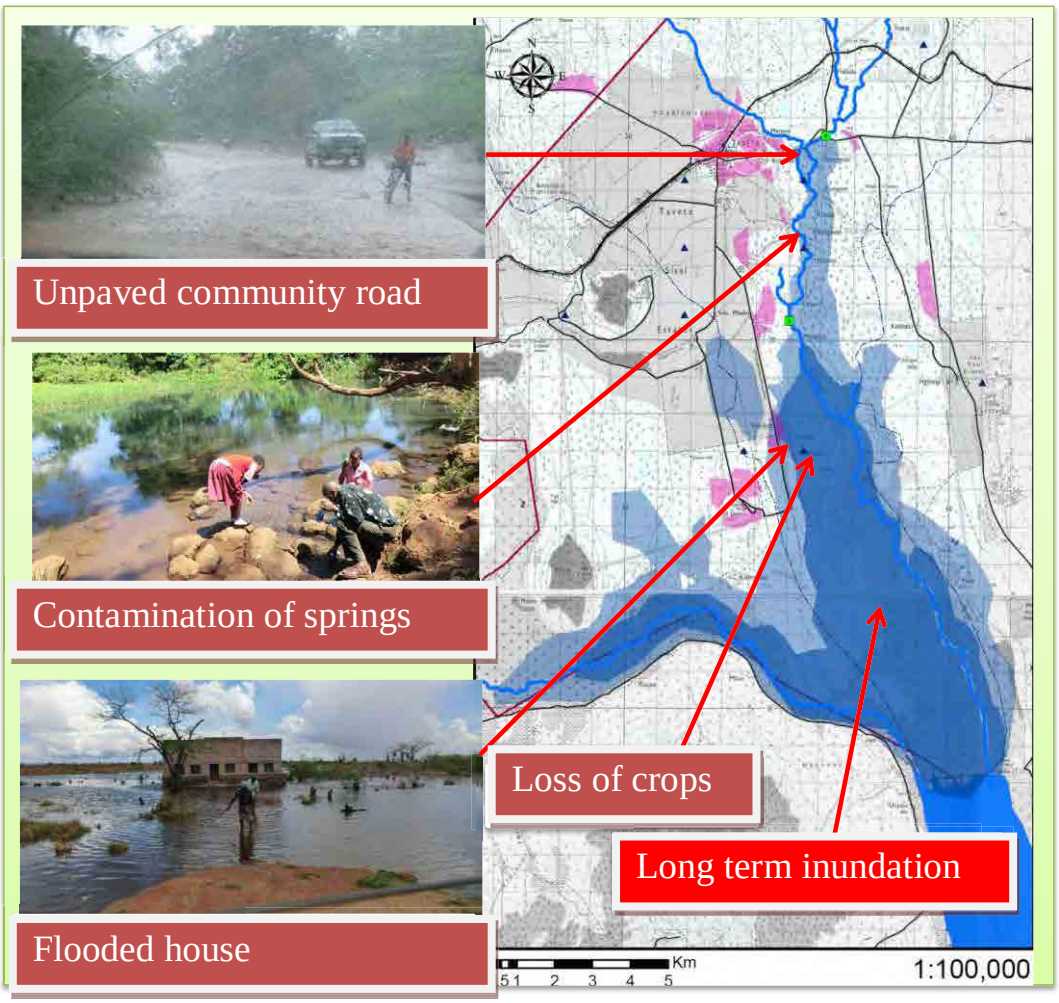


Figure 2.2.4 Flood Characteristics in the Low-lying Area of Lower Lumi River

(3) Flood Damage Mechanism

The Lumi River is a raised up river, and then flood water diffuse to low lying drainage basin by outflow or dyke break from lower Lumi main stream. Submersion is prolonged because relevant area is a flat plain and hard to drain.

There are various damages such as destruction of houses made from mud, loss of agricultural products, pollution of spring for daily life, weakening of unpaved roads and submersion of social infrastructures like a hospital and death of livestock. In addition, there is a damage forced residents to evacuate long term because the area is wholly submerged and unavailability of houses to stay.

2.2.4 Flood Characteristics near the Lumi River's Tributaries (C)

Flood Characteristics near the Lumi River's Tributaries which are analyzed from the aspects of natural, Socio-economic conditions are shown below.

(1) Flood Characteristics from Natural Conditions

Due to short-term torrential rainfall, flash floods sometimes occur near Lumi River's Tributaries including the area of Tsavo West National Park and hilly district. In addition, Due to clay soil, rain water doesn't seep underground and surface run-off occurs

Natural Conditions that are described in the Chapter-1 and Natural Risks (Hazards) in this area are shown in Table 2.2.5

Table 2.2.5 Natural Conditions and Hazards near the Lumi River's Tributaries

Natural Conditions	Hazards
Short-term torrential rainfall at hilly district	Arrival time of flood is short. High peak discharge Steam erosion occurs

(2) Characteristics of Flood Damage from Socio-economic conditions

Infrastructures such as roads and bridges, houses, household goods and livestock suffer damage from flash flood that hit rural communities in flat area. Additionally, flash floods lead to damage that irrigation channels are severed.

"Socio-economic conditions" and "vulnerability and exposure" in this area are shown in Table 2.2.6.

Table 2.2.6 Conditions on Social and Economic and Vulnerability/ Exposure near the Lumi River's Tributaries

Socio-economic conditions	Vulnerability/ Exposure
Village is on flat land Population is approximately 18,000	- Flash food from hill attack villages - Affected people by flash flood is approximately 7,000. (Rekeke 200, Kimala 950, Mata-Jipe 3,000) - Long term inundation does not occur
Irrigated agriculture has been prosperous in this area	Damage on irrigation channel has an influence on farmers' livelihood
The highway between Taveta and Mwatate serve an important function of logistics.	A temporary halt and/or stagnation in logistics due to inundation
Tourist facilities locate near the Lake Jipe	Stoppage and halt of service for tourists, due to inundation and severed road network
There is a gully erosion in front of the health clinic	Emergency rescue is not able to be provided during flooding
Unpaved road	Vulnerable by soil erosion and precipitation

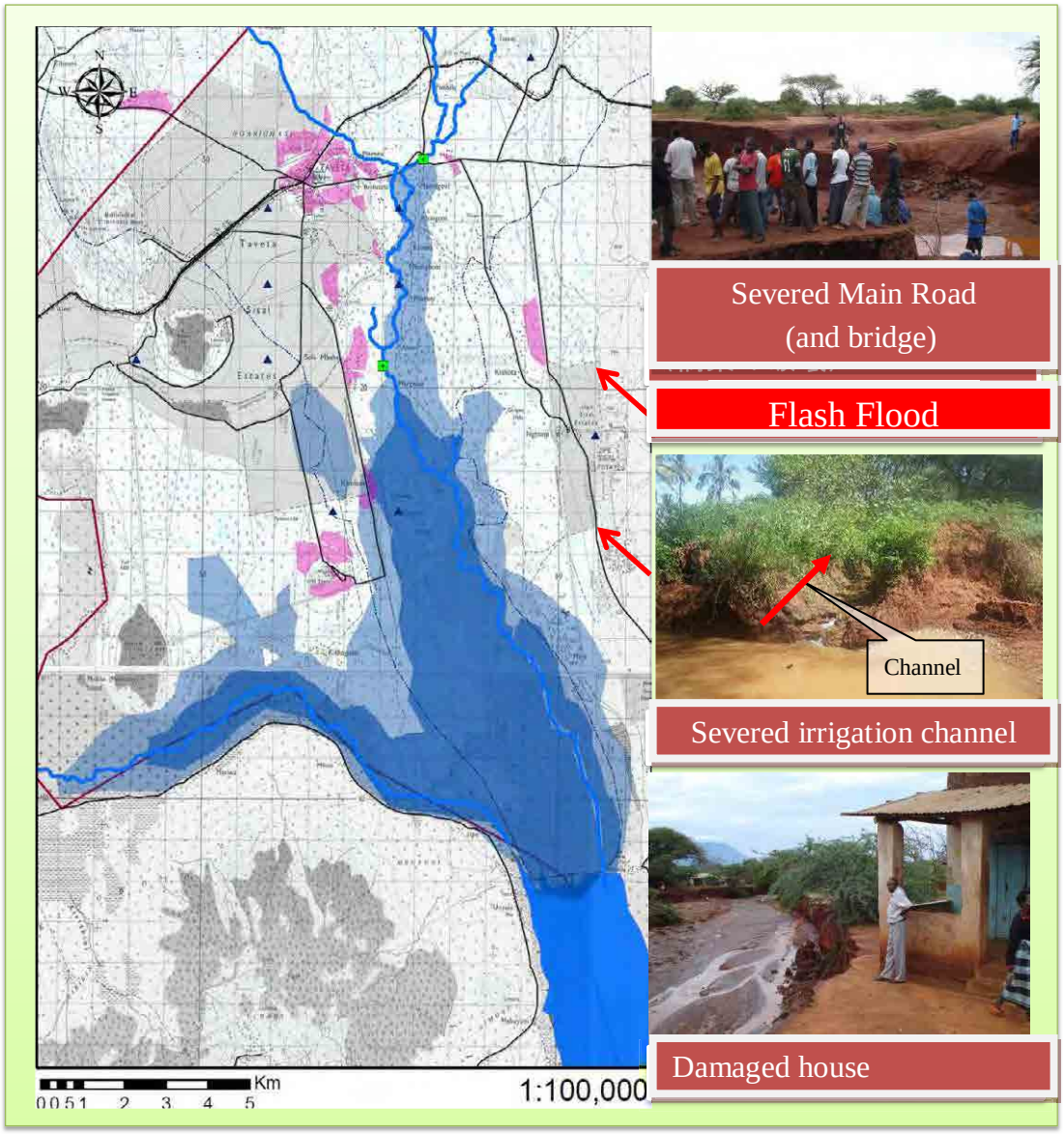


Figure 2.2.5 Flood Characteristics near the Lumi River's Tributaries

(3) Flood Damage Mechanism

Flash flood around downstream, upper to middle stream and tributary is caused by concentrated rainfall and occurrence of flood with large peak flow in short term in a small river course of seasonal stream.

In the course of down flow, flood water flow down with bank erosion. There are some cases that flood water makes a new river course by overflowing from current river course, and then some roads or bridges crossing the river are broken, and also houses or farmlands have damages.

2.3 ANALYSIS ON FLOOD DAMAGE AND COUNTERMEASURE

2.3.1 Analysis on Flood Damage and Countermeasure for Earth and Soil Flown Out Area in the Upstream of Lumi River Basin

(1) Summary of Damage and Measures

Based on the field survey done by this time, flood damage in the upstream of Lumi River was analyzed using by logic tree.

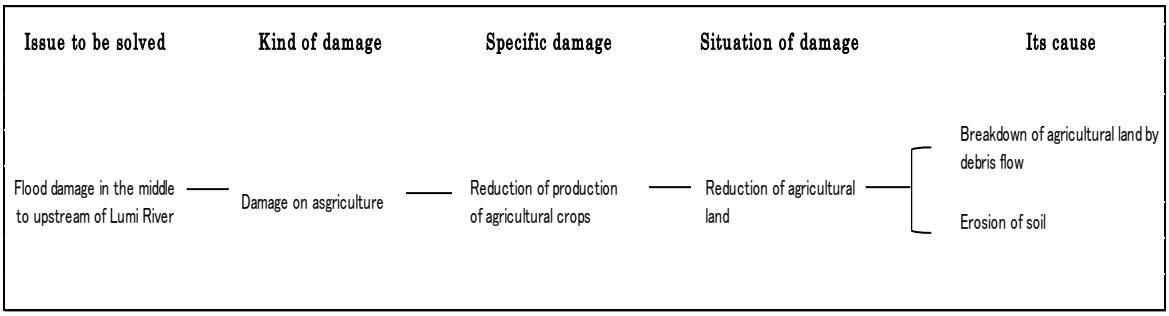


Figure 2.3.1 Analysis on Problem Tree

Damage on agriculture is occurred in the middle to upstream of Lumi River. Damage on agriculture is mainly caused by debris flow and soil erosion.

To derive the countermeasures, objective tree analysis was carried out. The result is shown on the following figure. Issues to be solved are placed on the left side and the measures are specifically presented therefrom.

Irrigation canal broken down by flash flood from lateral face

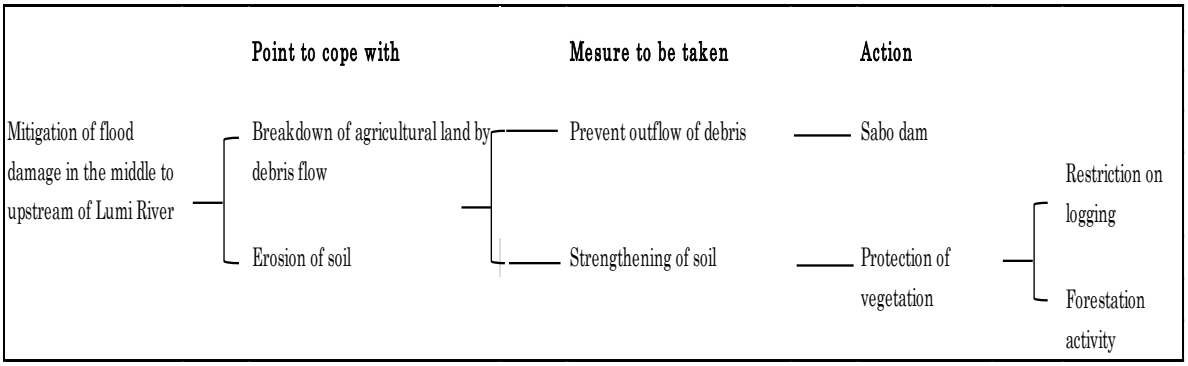


Figure 2.3.2 Analysis on Objective Tree

Many flash floods occur during rainy season in the middle to upstream of Lumi River. Flash flood brings about a lot of damages inducing debris flow. To prevent flowing out of debris flow, Check dam is considered as a countermeasure. On the other hand, damage on soil erosion becomes a serious issue. Flowing out of earth and soil causes irrigation pond to be buried by soil erosion, and this induces another issue to lose the primary function of the irrigation pond. To cope with this issue, strengthening of soil by restriction of logging, forestation activity, etc. is considered effective.

Check Dam
(Example of Nzoia River)

2.3.2 Analysis on Flood Damage and Countermeasure in the Long-term Inundated Area of the Downstream of Lumi River

(1) Summary of Damage and Measures

Based on the result of field survey by this time, analysis was carried out on the area where damage occurred by the long-term inundation of the downstream of Lumi River using by logic tree.

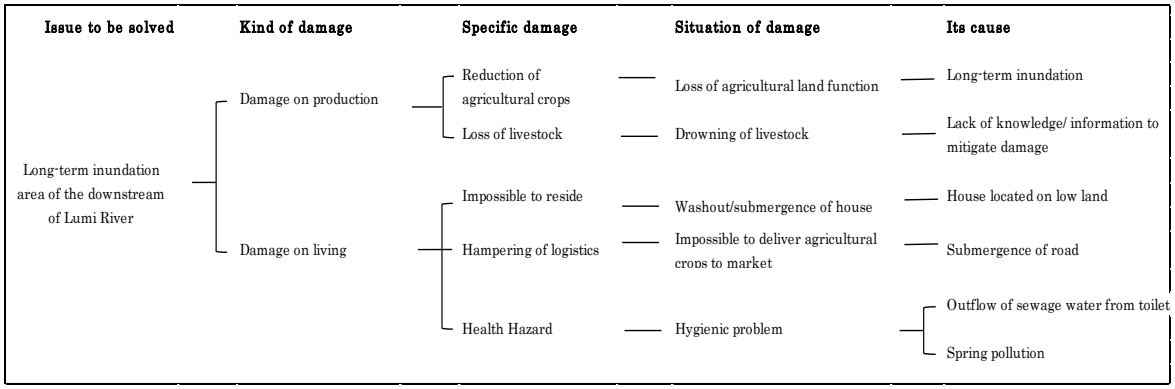


Figure 2.3.3 Analysis on Problem Tree

Long-term inundation brings about damage and loss of agricultural land and livestock in this area. Besides, houses and infrastructures are largely damaged and submersion of houses and road under water also occurred. This gives an impact to the life and living of the residents.

To derive the countermeasure, objective tree

Condition at the time of flooding

analysis was carried out. The result of analysis is shown on the following figure. Issues to be solved are placed on the left side and the measures are specifically presented therefrom.

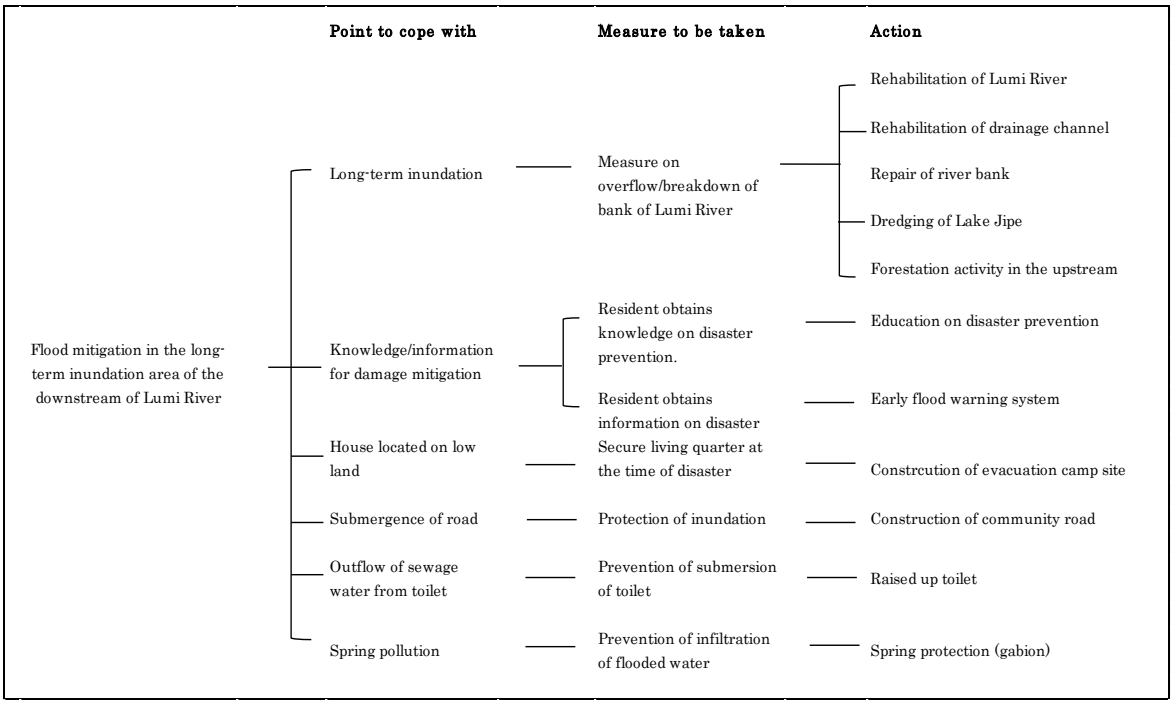


Figure 2.3.4 Analysis on Objective Tree

Inundation in this area has various impacts such as pollution of drinking water by interfusion of flooded water to the spring, damage to houses and living of the residents. For instance, severed road by inundation will make students go to school and agricultural products to deliver to the market impossible. In addition, as the access to the hospital becomes impossible, another issue will occur where by the resident cannot have medical service. Furthermore, as the residents have little knowledge and information to reduce damages, the damages becomes larger such as to drown livestock. To reduce the flood damage, it is considered an effective mean that the residents acquire knowledge and information on disaster prevention and devise countermeasure by themselves. As countermeasures, education on disaster


Road Bridge rushed out
Place : Rengesa


Damp ground where the bank of Canal-C has been washed out

prevention at school, early flood warning system, etc. are considered. Further, to force an end of inundation from Lumi River, the countermeasures such as widening of and improvement by dredging, etc. of Lumi River, improvement of the existing drainage canal in low-lying area and dredging of Lake Jipe to improve the storage capacity are considered. There are three major existing drainage canals of Canal A, Canal B and Canal C. It is considered to reduce the flood damages largely by heighten the flow capacity of these Canal A, Canal B and Canal C by way of dredging and improvement. Especially, though the bank of Canal C is partly broken down at present, it is one of the options to rehabilitate the bank.

Land elevation after inundation of house
Place : Rengesa

Evacuation camp site
Place : Kimorigo

Besides, there are many residents forced to evacuate in the long-term inundation area of the downstream of Lumi River because the inundation is prolonged, the houses are impossible to reside and the houses are washed out. Assurance of living quarter is important for victims of flood, therefore, construction of evaluation camp is considered as a countermeasure. There is an existing place being utilized as evacuation camp site, however, the facility is not well constructed. Therefore, it is considered appropriate to improve the existing evacuation camp. Countermeasure method to be considered for this area is summarized below.

Table 2.3.1 Countermeasure Method to be considered in the Downstream of Lumi River and Long Term Inundation Area

Serial No.	Countermeasure Method to be considered	Remarks
L-W1	Improvement of Lumi River	Implement at the place where the overflow occurs frequently in the downstream of Lumi River.
L-W2	Improvement of Drainage	Dredging of the existing Canal A/B/C.
L-W3	Repair of Bank	Repair the bank of gateway of Canal C which is broken down.
L-W4	Dredging of Lake Jipe	Remove earth and soil deposited to increase the reservoir capacity of Lake Jipe.
L-W5	Forestation Activity in upstream	Activity to promote plantation and forestation.
L-W6	Education on Disaster prevention	Educate the residents on how to reduce the current flood damage by themselves
L-W7	Early Flood Warning System	Deliver information to the downstream area after gathering and analyzing information on flood such as rainfall, etc. in the upstream of Lumi River Basin.
L-W8	Construction of Evacuation Camp	There is an existing camp site in the downstream of Lumi River. Expand the evacuation camp facility.
L-W9	Development of Community	Raising elevation of Community Road in the long term inundation area of

	Road	the downstream of Lumi River.
L-W10	Raised up toilet	Implementation of raising elevation and guidance.
L-W11	Spring protection (gabion)	Construction of gabion near by springs

2.3.3 Tributary Area in the Downstream of Lumi River

(1) Summary of Damage and Measures

Based on the result of field survey by this time, analysis was carried out on this area using by logic tree, too. Its result is shown in the following figure.

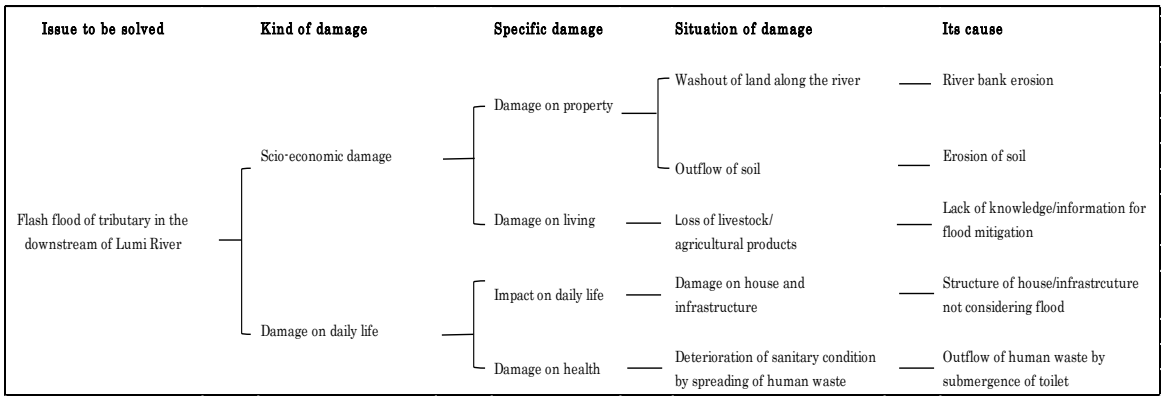


Figure 2.3.5 Analysis on Problem Tree

In the tributary of downstream of Lumi River, flood damages occur such as washout of land along the river, flowing out of soil, loss of livestock and agricultural products, damages on houses and infrastructures, deterioration of sanitary environment by spreading of human waste, etc. Major reasons of those are considered to be erosions of river bank and soil, lack of knowledge and information to reduce flood damages, structure of houses and infrastructure not considering floods, submersion of toilet, etc.

Wash out of land by bank erosion of seasonal river
Place: Rekeke

In the tributaries of the downstream of Lumi River and the small rivers directly flowing into Lake Jipe, the river bank is eroded by flash flood, and damages on agricultural land and housing lot are occurred by washout of land. It is supposed to be that the rainfall in the upstream swells the dry up river (seasonal river), where normally there is no water in the narrow river course, into flash flood with erosion of river bank. Besides, the area was covered by trees once. However, as the trees were logged as fuel wood materials, there are only scattered trees in the area at present. Therefore, if there is a heavy rain, the rainfall directly hits

the surface soil, and it results in washout of soil.

Damage to living is also large, for example, cribs such as chicken house, etc. are hit and submerged by flash flood, and livestock is drowned. Agricultural products are also lost by inundation. Breakage of houses and infrastructures, especially, transportation infrastructure such as roads and bridges by flood is remarkable in this area. This is largely because, in planning, design, construction, operation and maintenance of houses and infrastructures, floods are not considered and the people do not know the proper material and method.

Agricultural land of which the surface soil has been washed out by flood
Place : Kimala Irrigation Scheme

Damages on toilet often induce sanitary issues. Toilet in this area is mainly constructed by digging a hole on the ground and surrounded by wall and roof. These toilets are submerged under water at the time of flood and the human waste is flown out. Sanitary environment is deteriorated and this causes various waterborne diseases like Cholera, etc.

To derive the countermeasures, issues to be solved are placed from the left side and the measures are specifically presented.

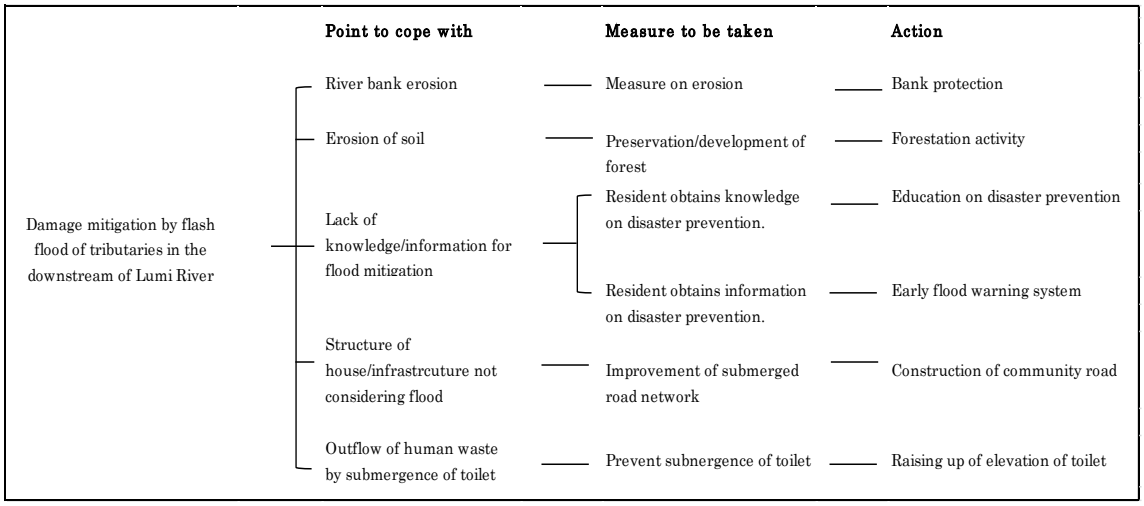


Figure 2.3.6 Analysis on Objective Tree

For countermeasure on washout of land along the river, construction of bank for protection from river bank erosion is considered as a short-term measure. However, since the maximum discharge at the time of flood is impossible to be estimated, adoption of these measures shall

be limited to the area where very important facility is built nearby the dry river.

For washout of soil, it is considered, as one of the methods, to reforest for the purpose of protection and development of forest and trees. In fact, it may not be difficult as the forestation activity is carried out in the downstream of Lumi River by the volunteer group organized by Red Cross of Kenya. Forestation requires time to heighten an effect, however, as an impact to the environment is quite small or few, it is ideal to promote as much as possible as a countermeasure to be adopted by the community level.

Forestatio by KRCS Volunteer Group
(Planting nursery tree)
Place : Rekeke

Regarding loss of livestocks and agricultural products, lack of knowledge and information to reduce damage by resident level becomes obstacles. For instance, chicken house is constructed directly on the ground though it is submerged every year by flood. Accordingly, chickens are easily drown by the inundation caused by flood. There is a possibility to reduce damages by raising elevation of chicken house not to be submerged under water like the south east Asian countries where many floods hit every year. It is quite important that the residents shall have such a knowledge for reduction of damage, and minimizing the flood damage will largely contribute to the recovery of living after flood damage.

Chicken House

Regarding damage on house and infrastrcucture, the structure not considereing the flood is considered problematic. Concrete bridge shown on the right photo crossess over the dry river and the water passess through the pipe culvert. However, the diameter and the number of pipe culvert seem to be rather small to cope with the discharge during flood. Method to estimate the discharge during flood is not established in Kenya. Therefore, especially the open channel of the bridge often does not secure enough cross section to discharge flood safely to the downstream. Countermeasure for these damages is to establish a calculation method of flood discharge in this area and to recommend the adoption of method to the parties concerned who construct the road and bridge. Further, the elevation of road surface is also often determined lower than the inundation level by the flood, therefore, it is considered necessary to install proper size of culvert and to raise the elevation of surface of the road.

Bridge with pipe culvert installed at
the dry up river crossing the road

Regarding deterioration of sanitary environment by overflowing of toilet, it is recommended to raise the elevation of toilet as implemented in Nyando River Basin. To raise the elevation of toilet has already been implemented in part of this area. Therefore, it is necessary to enlighten the resident's mind by introducing such an example.

Considering the above, countermeasure method to be considered is summarized below.

Washout of the concrete bridge of the same structure to the above by flash flood
Place : Rengesa

Table 2.3.2 Countermeasure Method to be considered in the Flash Flood Occurrence Area of Tributary in the downstream of Lumi River

Serial No.	Countermeasure Method to be considered	Remarks
L-E1	Bank Protection	Implementation of gully at the right place near Rekeke.
L-E2	Forestation Activity	Activity to promote plantation and forestation.
L-E3	Education on Disaster Prevention	Educate the residents on how to reduce by themselves the present flood damage.
L-E4	Early Flood Warning System	Supposing a system utilizing the simple measurement and communication method which is considered to be adopted by WRUA and WRMA.
L-E5	Construction of Community Road	Raising elevation of community road in the soil and river bank erosion areas of the downstream of Lumi River.
L-E6	Raised up Toilet	Implementation of raising elevation and guidance.

2.4 SELECTION OF FLOOD DAMAGE TO BE PREVENT PREFERENTIALLY

2.4.1 The Result of Workshop for Flood Damage Analysis by Community

In Lumi River Basin, the workshop was held to analyze the problems in Lower Lumi sub catchment with WRUA members, WRMA-SRO staff and JICA project team members on Nov. 2nd, 2012

As a result of analysis, the causes of flood are pointed out as bellow.

Table 2.4.1 Analysis for the causes of flood by interviewing to WRUA Members

Theme	Causes	Principal Influence from Flooding
Floods (Upstream)	Rainfall around the Mt. Kilimanjaro slope	Flash Floods
	Sediment flow from Mountain slope	
Floods (Downstream)	Rise of east side Wadi river apart from the Lumi river	Flash Floods around tributary
	Sediment flow around upstream →Raised bed river	Flooding by long term inundation
	Bank erosion →Newly generation of river course	River course diversion

Concerning flood damages, following analysis was done and was indicated the priority order lead by WRUA members

Table 2.4.2 Damage Analysis and Priority Order Determined by WRUA Members

Priority order determined by WRUA members	Item	Primary Damage	Secondary Damage
①	Soil erosion (Middle stream)	- Sediment outflow to downstream	- Raised up the river bed (Lumi river、Lane Jipe)
	Soil erosion (Downstream)	- Destruction of farmland	
②	Submersion	- Submersion and destruction of houses - Farmland damage	- Evacuation - Suspending educational activities - Income decreasing - Food shortage
③	Polluted water resource	- Pollution of springs	- Water shortage - Drought
④	Damage of infrastructures	- Cutting roads between (Eldoro and Taveta / Taveta and Kitobo / Taveta and Jipe) - School	- Unable to get commodities - Unable to transport
⑤	Lives	- Livestock - Human (Rare case)	

2.4.2 Selection of Flood Damage to be prioritized

The flood damages in Lumi river basin is principally classified 3 types such as A) Soil and sediment run off (Upper and middle river basin), B) Widespread and long-running inundation which is caused by overflow and dyke break from the Lumi River (Low-lying area at the lower river basin) and C) Flash flood (Branches of the Lower Lumi River and small streams flow in the Lake Jipe).

Based on the evaluation of flood damages by communities previously described, each impact from flood damages are evaluated from the viewpoints of social impacts as “Number of affected people and houses” or economic impacts as “Losses of merchandise, agriculture, transportation and sightseeing industry”, and are shown in the following table.

Table 2.4.3 Selection of The Flood Damages should be Corresponding Preferentially

Flood type	Social impacts		Economic impact				Priority order
	Number of affected people	Number of affected houses	Merchandise	Agriculture	Transportation	Sight-seeing industry	
A) Soil and sediment run off	Low	Low	Low	**High**	Mid	Mid	Low
B) Widespread and long-running inundation which is caused by overflow and dyke break from the Lumi River	**High**	**High**	Low	**High**	**High**	**High**	High
C) Flash flood	Mid	Mid	Mid	Mid	**High**	**High**	Slightly high

In the 3 types of flood damages, it shows that the damage by "A) Soil and sediment run off" has strongest impacts socio-economically, and next is the damage by flash flood along tributaries. The damage by "Soil and sediment run off" in upstream to midstream has impacts to agriculture but the impacts to socio-economic matters is not so high, and then the priority is low. The measure to reduce the soil erosion and sediment outflow should implement in long term perspective because it takes long time to be given the effects.

3. SELECTING PROCESS OF PILOT PROJECTS

3.1 VIEW POINT OF EVALUATION

In this chapter, the project team selects a pilot project. As shown in last chapter, the most prioritized flood damage is inundation in the urban area of Isiolo and bank erosion that can affect transportation infrastructure. A structural countermeasure is selected based on information of the last chapter, as a pilot project.

Evaluation consists of Relevance with PCDEFM Project and 5 Five Criteria: Relevance, Effectiveness, Efficiency, Impact and Sustainability.

The point of relevance with PCDEFM includes "Possibility of it being implemented by WRUA", "Term" and "Budget" of the countermeasure. The item "Possibility of it being implemented by WRUA" evaluates whether WRUA and community can be the main actor of the countermeasure and whether the countermeasure can be incorporated into the SCMP. "Term" means whether the countermeasure finalizes within 3-5 years that is expiration year of SCMP and within CDEFM project term. "Budget" considers whether budget of the countermeasure can be less than 5 million yen that is the highest amount of WSTF fund to contribute for WRUAS so far and that is also maximum budget for a pilot project of CDEFM project.

The project team defined 5 criteria as the description on following table, and then evaluated the countermeasures by marking "A", "B" and "C" according to these 5 Items.

Table 3.1.1 Definition of 5 Items for Pilot Project Selection

1	Relevance	Requirements from the stakeholders, Needs of target area Dimension of economic damage and human suffering.
2	Effectiveness	Degree of damage mitigation (Number of beneficiary, Reduction of submergence period, area and number of affected people)
3	Efficiency	Cost effectiveness (It is evaluated by estimated qualitative dimension and degree of damage mitigation)
4	Impact	Spreading effect within a same basin or to other areas Indirect effects
5	Sustainability	Sustainability of maintenance and project effects (On the assumption of pilot project completion according to the design.)

*The project team defined these 5 items for the purpose of this study according to "DAC's evaluation 5 items"

3.2 EVALUATION MATRIX

Table 3.2.1 Evaluation Study on Countermeasure against Long Term Inundation from Lumi River / Downstream Area (1)

No.		L-W1			L-W2			L-W3		
Target Area		**Downstream of Lumi River**			**West side of downstream of Lumi River (Canal A/B/C)**			**West side of downstream of Lumi River (Canal C)**		
Countermeasure (Project)		**Channel Improvement of Lumi River**			**Drainage Channel Improvement**			**Repair of existing embankment**		
Outline		It is a work to widen of the river and to dredge raised river bed.			It is to remove accumulated sedimentation. Flow capacity can be recovered.			It is repair work of existing embankment (canal C). Overflow stream from Lumi River can be minimized.		
Image										
Evaluation items										
Relevance with PCDEFM Project	**Possibility to operate the project by WRUA**	Even if the main actor is WRUA, they can implement the small-scale project through the SCMP and WSTF fund. However, such small scale drainage doesn't have suitable effect.	C	1	Even if the main actor is WRUA, they can implement the small-scale project through the SCMP and WSTF fund. However, such small scale drainage doesn't have suitable effect.	C	1	Even if the main actor is WRUA, they can implement the small-scale project through the SCMP and WSTF fund. However, such small scale drainage doesn't have suitable effect.	C	1
	Project Term	More than 1 year planning is required. It cannot be implemented within term of PCDEFM Project	C	1	More than 1 year is required. It cannot be implemented within term of PCDEFM Project	C	1	Few months are required for the implementation. There is a possibility to implement within term of PCDEM project, depending on the scale.	B	2
	Project Budget	A large amount of budget is required. Neither SCMP (WSTF fund) nor PCDEFM project cover	C	1	A large amount of budget is required. Neither SCMP (WSTF fund) nor PCDEFM project cover	C	1	A large amount of budget is required. Neither SCMP (WSTF fund) nor PCDEFM project cover	C	1
Relevance with PCDEFM Project・Total			3			3			4	
Evaluation by Five Criteria	**Relevance**	Flood damage is huge in this area. Residents and stakeholder highly request to improve the actual situation. Lack of flow capacity of Lumi river is the main factor. Excavation and widening of the river channel is effective and necessary.	A	3	Flood damage is huge in this area. Residents and stakeholder highly request to improve the actual situation. Sediment deposition is one of main factors. To recover flow capacity of the drainage channel is effective and necessary.	A	3	Flood damage is huge in this area. Residents and stakeholder highly request to improve the actual situation. To bank up overflow from Lumi river and to lead to Canal C is effective and necessary.	A	3
	Effectiveness	It contributes considerably to reduction of long term inundation from Lumi River.	A	3	It contributes considerably to reduction of long term inundation from Lumi River.	A	3	It contributes considerably to reduction of long term inundation from Lumi River.	A	3
	Efficiency	Both cost and effectiveness are medium scale.	B	2	Cost is extensive, and damage reduction is also huge.	A	3	Both cost and effectiveness are medium scale.	B	2
	Impact	Spreading effect is small. (The construction requires respective design and plan according to flood characteristics, climate and geological formation of the site.)	C	1	Spreading effect is small. (The construction requires respective design and plan according to flood characteristics, climate and geological formation of the site.)	C	1	It is difficult to spread structural works itself. However, maintenance system that is already operated by WRUA in this community can be spread.	B	2
	Sustainability	Continuous maintenance is necessary. If WRUA implements this project with WSTF fund, additional maintenance cost should be considered.	C	1	Continuous maintenance is necessary. If WRUA implements this project with WSTF fund, additional maintenance cost should be considered.	C	1	Continuous maintenance is necessary. Fortunately, WRUA members at this community already operate maintenance system of irrigation facilities voluntary. Sustainability is highly expected.	B	2
Evaluation by Five Criteria・Total			10			11			12	
Main Actor of the Project		Taveta County/MWI/NWCPC			Taveta County/MWI/NWCPC			Taveta County/MWI/NWCPC		
Public assistance (Government Level) Mutual support (Community Level) Self-help (Personal Level)		Public Assistance			Public Assistance			Public Assistance		
Comment		Each stage such as planning, design, and construction need long term. Maintenance cost is more expensive than other countermeasures. Relevance with PCDEFM project is low.			Each stage such as planning, design, and construction need long term. Total construction cost is more expensive than other countermeasures. .Relevance with PCDEFM project is low.			Repair of broken part of Canal C is relatively simple and short term. Immediate result is expected.		

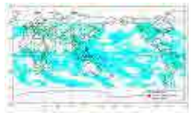
A(3 point): Excellent / B(2 point): Good / C(1 point): Poor

Table 3.2.2 Evaluation Study on Countermeasure against Long Term Inundation from Lumi River / Downstream Area (2)

No.		L-W4			L-W5			L-W6		
Target Area		**Long term inundated area / Downstream of Lumi River**			**Long term inundated area / Downstream of Lumi River**			**Long term inundated area / Downstream of Lumi River**		
Countermeasure (Project)		**Dredging of Lake Jipe**			**Forestation Activity at Upstream**			**Education on Disaster prevention**		
Outline		It is a work to recover flow capacity. It is effective to remove sedimentation at the area between Lumi River and Lake Jipe.			It is to protect and recover vegetation in the upstream of the mountain. Its storage effect will rise.			It is educational activity to give information to reduce damage from flood and raise awareness of disaster prevention.		
Image										
Evaluation items										
Relevance with PCDEFM Project	**Possibility to operate the project by WRUA**	It is not a WRUA-scale project, but government-scale. Community cannot implement this countermeasure.	C	1	It can be operated by WRUA and incorporated into the SCMP.	A	3	It can be operated by WRUA and incorporated into the SCMP.	A	3
	Project Term	More than 1 year planning is required. It cannot be implemented within term of PCDEFM Project	C	1	If seeding is acquired, preparation term is short. However, growth of a plant requires a long term.	B	2	It can be implemented with short term preparation.	A	3
	Project Budget	A large amount of budget is required. Neither SCMP (WSTF fund) nor PCDEFM project cover	C	1	A certain amount of budged is required to purchase effective amount of seedling.	B	2	Budget can be relatively low.	A	3
Relevance with PCDEFM Project･Total			3			7			9	
Evaluation by Five Criteria	**Relevance**	Stakeholders also recognize the issue of sediment deposition at Lake Jipe. This can be more effective if L-W2 and W3 are implemented at the same time.	A	3	Volunteer groups already practice forestation activity at downstream. Collaboration with them is expected.	A	3	WRMA has a high request of enforcement of community. In addition, some damage can prevent if people have knowledge on flood management. So it importance is high.	A	3
	Effectiveness	It contributes considerably to reduction of long term inundation.	A	3	If this countermeasure implement at appropriate scale, sedimentation from upstream would reduce.	B	2	It is expected certain effect against number of educated people. Their knowledge on disaster prevention can implement wherever and whenever they need. Its effect can be spread.	B	2
	Efficiency	Large scale construction is necessary, but effect is extensive.	B	2	Both cost and effectiveness are medium scale.	B	2	It can give knowledge on disaster prevention to a large number of people at the same time. Cost is low. Effectiveness is high when the knowledge is rooted.	A	3
	Impact	Spreading effect is small. (The construction requires respective design and plan according to flood characteristics, climate and geological formation of the site.)	C	1	Application in other area is not difficult. In addition, it contributes environmental conservation.	B	2	Knowledge can hand down from beneficiary to their family and friends. It can expand widely.	A	3
	Sustainability	Continuous dredging is necessary. Additional cost is high.	C	1	Once main actor is aware the importance, activity can continue. Maintenance is complicate. It takes time to grow up.	B	2	Local people such as school teacher and community leader can be a lecturer. So educational activity sustain. In addition, integration into curriculum is important.	A	3
Evaluation by Five Criteria･Total			10			11			14	
Main Actor of the Project		Taveta County/MWI/NWCPC			WRUA etc.			Ministry of Education/ Taveta County Educational Officer/ Teachers / WRUA		
Public assistance (Government Level) **Mutual support (Community Level)** **Self-help (Personal Level)**		Public Assistance			Mutual Support			Mutual Support･Public Assistance		
Comment		Each process such as planning, design, and construction need long term. Large scale dredging is required for extensive effect. Dredging should be continued semi-permanently. Sustainability is low. .			Preparation can be short term. Evaluation is high on all items. It contributes to reduce global warming.			Preparation can be short term. Community based activity relates with concept of PCDEFM project.		

A(3 point): Excellent / B(2 point): Good / C(1 point): Poor

Table 3.2.3 Evaluation Study on Countermeasure against Long Term Inundation from Lumi River / Downstream Area (3)

No.		L-W7			L-W8			L-W9		
Target Area		**Long term inundation area / Downstream of Lumi River**			**Long term inundation area / Downstream of Lumi River**			**Long term inundation area / Downstream of Lumi River**		
Countermeasure (Project)		**Early Warning System（IFAS/GFAS）**			**Environmental Improvement of Evacuation Camp**			**Development of Community Road**		
Outline		It is a system to transmit flood information based on satellite information (IFAS/GFAS). People can prepare for the flood.			It is to enhance and improve existing evacuation Camp during flood.			It means to construct a culvert or rise up community road in order to prevent its incapability by flood.		
Image										
Evaluation items										
Relevance with PCDEFM Project	**Possibility to operate the project by WRUA**	It is difficult to implement only WRUA's capacity. However, it can be executed with cooperation between WRMA and WRUA.	B	2	Even if the main actor is WRUA, they can implement the small-scale project through the SCMP and WSTF fund.	B	2	Even if the main actor is WRUA, they can implement the small-scale project through the SCMP and WSTF fund.	B	2
	Project Term	It can be implemented with short term preparation.	A	3	Few months are required for the implementation. There is a possibility to implement within term of PCDEM project, depending on the scale.	B	2	Design and construction can be few months. However, negotiation with road administration could take long time. It is impossible to implement within PCDEF project.	C	1
	Project Budget	Budget can be relatively low.	A	3	Budget scale is medium. It is not impossible to implement with WSTF fund or budget of PCDEFM project.	B	2	Budget scale is medium. It is not impossible to implement with WSTF fund or budget of PCDEFM project.	B	2
Relevance with PCDEFM Project･Total			8			6			5	
Evaluation by Five Criteria	**Relevance**	IFAS/GFAS is not common yet in Kenya, but lack of information on disaster prevention is recognized. It's beneficial that residents know the information as soon as possible during flood.	B	2	Flood damage is huge in this area. Residents and stakeholder highly request to improve the actual situation.	A	3	Community road is inundated during flood. It disturbs evacuation, communication in the community and communing to school. Residents request highly, Raised up road is required.	A	3
	Effectiveness	Warning information can be transmitted extensively. However, if people don't know how to react against flood, this countermeasure doesn't make sense. Its effect becomes higher when it implement with education on disaster prevention.	B	2	There are existing evacuation centers in this area. Application is effective and in demand.	A	3	Flood damage in this community is surely reduced.	B	2
	Efficiency	This can give good effect extensively with low cost.	A	3	Both cost and effectiveness are medium scale.	B	2	Both cost and effectiveness are medium scale.	B	2
	Impact	Once observation system is established in WRUA, application at other river basin is not difficult. However, in the viewpoint of IFAS/GFAS function, effective area is limited.	B	2	Spreading effect is small. (The construction requires respective design and plan according to flood characteristics, climate and geological formation of the site.)	B	2	Almost all community have small scale road. Construction of such kind of road is not difficult. Application at other area is expected.	B	2
	Sustainability	Once the system is established, sustainability is high.	A	3	Maintenance cost is not so expensive. However, maintenance system should be established.	B	2	Maintenance cost is not so expensive. However, maintenance system should be established.	B	2
Evaluation by Five Criteria･Total			12			12			11	
Main Actor of the Project		WRMA/KMD/Kenya National Disaster Operation Center/Ministry of Special Program			Taveta County/ Kenya National Disaster Operation Center/Ministry of Special Program			Taveta County/KeRRA/WRUA		
Public assistance Mutual support Self-help		Public Assistance			Public Assistance			Mutual Support		
Comment		Preparation can be short time. In addition, there is a staff who participated IFAS/GFAS training in WRMA HQ. His knowledge can utilize for this project.			Planning, design and construction process can be short time. Request from community is considerably high.			Each process of planning, design and construction could take long time.		

A(3 point): Excellent / B(2 point): Good / C(1 point): Poor

Table 3.2.4 Evaluation Study on Countermeasure against Long Term Inundation from Lumi River / Downstream Area (4)

No.		L-W10			L-W11		
Target Area		**Long term inundation area / Downstream of Lumi River**			**Long term inundation area / Downstream of Lumi River**		
Countermeasure (Project)		**Raised of toilet**			**Spring protection (gabion)**		
Outline		It is to rise up toilet to prevent water flow from come into the toilet and drain sewage.			It is to install gabion to protect springs for prevention of infiltration of flooded water.		
Image							
Evaluation items							
Relevance with PCDEFM Project	**Possibility to operate the project by WRUA**	It can be operated by WRUA and incorporated into the SCMP.	A	3	Even if the main actor is WRUA, they can implement the small-scale project through the SCMP and WSTF fund.	B	2
	Project Term	Few months are required for the implementation. There is a possibility to implement within term of PCDEM project, depending on the scale.	B	2	Few months are required for the implementation. There is a possibility to implement within term of PCDEM project, depending on the scale.	B	2
	Project Budget	Budget scale is medium. It is not impossible to implement with WSTF fund or budget of PCDEFM project.	B	2	Budget scale is medium. It is not impossible to implement with WSTF fund or budget of PCDEFM project.	B	2
Relevance with PCDEFM Project・Total			7			6	
Evaluation by Five Criteria	**Relevance**	Overflowed sewage from toilet cause expansion of infectious disease. Raised up toilet prevents to overflow. People's demand is high.	A	3	Residents use spring water for daily life water and drinking water. Demand exists, but other donor and WRUA already implement the projects.	B	2
	Effectiveness	It is assumed to reduce infectious disease.	B	2	Spring protection contributes towards securing drinking water in emergency.	B	2
	Efficiency	One raised up toilet is moderate price. However, a large number of toilets should be developed for reduction of infectious disease.	B	2	It is not large scale construction and certain effect is expected.	B	2
	Impact	It is relatively simplified measure. So application in other area is not difficult.	A	3	Installation of small gabion is not difficult to implement and spread to other areas.	B	2
	Sustainability	Maintenance cost is not so expensive. However, maintenance system should be established.	B	2	Maintenance cost is not so expensive. However, maintenance system should be established.	B	2
Evaluation by Five Criteria・Total			12			10	
Main Actor of the Project		WRUA, etc			WRMA/WRUA		
Public assistance (Government Level) Mutual support (Community Level) Self-help (Personal Level)		Self help			Mutual Support		
Comment		Preparation is short term. All evaluation items show good score. Collaboration with Ministry of Public health is effective.			All items are scored B. Spring protection project is already implemented in Kubwa Springs by UNDP and in Kitobo area by WSTF.		

A(3 point): Excellent / B(2 point): Good / C(1 point): Poor

Table 3.2.5 Evaluation Study on Countermeasure against Flash Flood from Tributary River / Downstream Area (1)

No.		L-E1			L-E2			L-E3		
Target Area		Tributary Stream Area / Downstream of Lumi River			Tributary Stream Area / Downstream of Lumi River			Tributary Stream Area / Downstream of Lumi River		
Countermeasure (Project)		Bank Protection			Forestation Activity at Upstream of Tributary River			Education on Disaster prevention		
Outline		It is a structure to prevent riverbank erosion.			It is to protect and recover vegetation in the upstream of the mountain. Its storage effect will rise.			It is educational training to mitigate the impact of flood and to improve livelihood.It can reduce damage from flood and raise awareness of disaster prevention.		
Image										
Evaluation items										
Relevance with PCDEFM Project	Possibility to operate the project by WRUA	Even if the main actor is WRUA, they can implement the small-scale project through the SCMP and WSTF fund.	B	2	It can be operated by WRUA and incorporated into the SCMP.	A	3	It can be operated by WRUA and incorporated into the SCMP.	A	3
	Project Term	Few months are required for the implementation. There is a possibility to implement within term of PCDEM project, depending on the scale. Study on appropriate installation location takes time.	C	1	If seeding is acquired, preparation term is short. However, growth of a plant requires a long term.	B	2	It can be implemented with short term preparation.	A	3
	Project Budget	Budget scale is medium. It is not impossible to implement with WSTF fund or budget of PCDEFM project.	B	2	A certain amount of budged is required to purchase effective amount of seedling.	B	2	Budget can be relatively low.	A	3
Relevance with PCDEFM Project・Total			5			7			9	
Evaluation by Five Criteria	Relevance	There are tributary and seasonal river in this area. Bank erosion is remarkable during rainy season, Any countermeasure is implemented. Stakeholders highly request provision. Bank protection works as bridge and road protection. It is effective and necessary..	A	3	Volunteer groups already practice forestation activity at downstream. Collaboration with them is expected.	A	3	WRMA has a high request of enforcement of community. In addition, some damage can prevent if people have knowledge on flood management. So it importance is high.	A	3
	Effectiveness	There are a lot of tributary and seasonal river in this area. The effect of one bank protection is limited.	B	2	If this countermeasure implement at appropriate scale, sedimentation from upstream would reduce.	B	2	It is expected certain effect against number of educated people. Their knowledge on disaster prevention can implement wherever and whenever they need. Its effect can be spread.	B	2
	Efficiency	Construction cost is not expensive, but effectiveness is low. (Existing bank protection in this area is broken.)	B	1	Both cost and effectiveness are medium scale.	B	2	It can give knowledge on disaster prevention to a large number of people at the same time. Cost is low. Effectiveness is high when the knowledge is rooted.	A	3
	Impact	Spreading effect is small. (The construction requires respective design and plan according to flood characteristics, climate and geological formation of the site.)	C	1	Application in other area is not difficult. In addition, it contributes environmental conservation.	B	2	Knowledge can hand down from beneficiary to their family and friends. It can expand widely.	A	3
	Sustainability	Maintenance cost is not so expensive. However, maintenance system should be established.	B	2	Once main actor is aware the importance, activity can continue. Maintenance is complicate. It takes time to grow up.	B	2	Local people such as school teacher and community leader can be a lecturer. So educational activity sustain. In addition, integration into curriculum is important.	A	3
Evaluation by Five Criteria・Total			9			11			14	
Main Actor of the Project		Taveta County/MWI			WRUA/KRCS etc.			Ministry of Education/Taveta County Educational Officer/ Teachers/WRUA		
Public assistance (Government Level) Mutual support (Community Level) Self-help (Personal Level)		Public Assistance			Mutual Support			Mutual Support・Public Assistance		
Comment		Planning, design and construction process can be long term. General construction of bank protection is not suitable to characteristics of Lumi river. Bank protection that is constructed by KeRRA is already broken.			Volunteer group in this area is already practiced this activity. Community participation is not difficult in this case. Sustainability is expected.			Preparation takes short time. Community's resilience can be improved. KRCS volunteers already practiced training on livelihood improvement. Collaboration with them is effective.		

A(3 point): Excellent / B (2 point) : Good / C (1 point) : Poor

Table 3.2.6 Evaluation Study on Countermeasure against Flash Flood from Tributary River / Downstream Area (2)

No.		L-E4			L-E5			L-E6		
Target Area		**Tributary Stream Area / Downstream of Lumi River**			**Tributary Stream Area / Downstream of Lumi River**			**Tributary Stream Area / Downstream of Lumi River**		
Countermeasure (Project)		**Early Warning System**			**Development of Community Road**			**Rised-up Toilet**		
Outline		It is a system to transmit flood information based on hydrological data from upstream to downstream. People can prepare for the flood.			It means to construct a culvert or rise up community road in order to prevent its incapability by flood.			It is to rise up toilet to prevent water flow from come into the toilet and drain sewage.		
Image										
Evaluation items										
Relevance with PCDEFM Project	**Possibility to operate the project by WRUA**	It can be operated by WRUA and incorporated into the SCMP.	A	3	Even if the main actor is WRUA, they can implement the small-scale project through the SCMP and WSTF fund.	B	2	It can be operated by WRUA and incorporated into the SCMP.	A	3
	Project Term	It can be implemented immediately with simple system. It is necessary to store the data to manage the system.	A	3	Design and construction can be few months. However, negotiation with road administration could take long time. It is impossible to implement within PCDEF project.	C	1	Few months are required for the implementation. There is a possibility to implement within term of PCDEM project, depending on the scale.	B	2
	Project Budget	Budget can be relatively low.	A	3	Budget scale is medium. It is not impossible to implement with WSTF fund or budget of PCDEFM project.	B	2	Budget scale is medium. It is not impossible to implement with WSTF fund or budget of PCDEFM project.	B	2
Relevance with PCDEFM Project･Total			9			5			7	
Evaluation by Five Criteria	**Relevance**	EWS is not common yet in Kenya, but lack of information on disaster prevention is recognized. It's beneficial that residents know the information as soon as possible during flood, because flow speed is fast and damage is huge.	B	2	Community road is inundated during flood. It disturbs evacuation, communication in the community and communing to school. Residents request highly, Raised up road is required.	A	3	Overflowed sewage from toilet cause expansion of infectious disease. Raised up toilet prevents to overflow. People's demand is high.	A	3
	Effectiveness	Warning information can be transmitted extensively. However, if people don't know how to react against flood, this countermeasure doesn't make sense. Its effect becomes higher when it implement with education on disaster prevention.	B	2	Flood damage in this community is surely reduced.	B	2	It is assumed to reduce infectious disease.	B	2
	Efficiency	This can give good effect extensively with low cost.	A	3	Both cost and effectiveness are medium scale.	B	2	One raised up toilet is moderate price. However, a large number of toilets should be developed for reduction of infectious disease.	B	2
	Impact	Application in other area is relatively easy. Supplemental effect such as activation of communication between upstream and downstream community is considered.	A	3	Almost all community have small scale road. Construction of such kind of road is not difficult. Application at other area is expected.	B	2	It is relatively simplified measure. So application in other area is not difficult.	A	3
	Sustainability	If it is low cost equipment and simple communication system, maintenance is not difficult.	A	3	Maintenance cost is not so expensive. However, maintenance system should be established.	B	2	Maintenance cost is not so expensive. However, maintenance system should be established.	B	2
Evaluation by Five Criteria･Total			13			11			12	
Main Actor of the Project		WRUA etc.			WRUA･Taveta County etc.			WRUA etc.		
Public assistance (Government Level) Mutual support (Community Level) Self-help (Personal Level)		Mutual Support			Public Assistance			Self-Help		
Comment		Observation by simple equipment is effective in this area. Preparation can be short time. Development of their ownership is expected from system operation and maintenance.			Each stage such as planning, design, and construction need long term. Relevance with PCDEFM project is low.			Preparation is short term. All evaluation items show good score. Collaboration with Ministry of Public health is effective.		

A(3 point): Excellent / B(2 point): Good / C(1 point): Poor

3.3 EVALUATION ON 5 CRITERIA

As 1st stage of the selection, evaluation on 5 criteria is focused. High scored countermeasures are selected. As 2nd stage, those extracted candidates are screened by relevance with PCDEFM Project on next section.

First of all, general remarks of structural candidates on 5 criteria that is targeted as pilot project is described following.

(L-W1) Channel Improvement of Lumi River

Large scale construction and continuous maintenance is required for certain level of effect. Evaluation of impact and sustainability is relatively low.

..... Total Score on 5 criteria : 10

(L-W2) Drainage Channel Improvement

Improvement of Canal A/B/C is assumed in this case. Spreading effect and maintenance are difficult tasks. However, demands from residents are considerably high. It is considered that flood damage at downstream could improve drastically.

.....Total Score on 5 criteria : 11

(L-W3) Repair of existing embankment

Damaged embankment at Canal C is assumed. Even if it is large scale construction, cost and scale is smaller than L-W2. Request from stakeholders is high. Technically, flood damage can reduce extensively. The possibility of implementation is considered on next section.. ..... Total Score on 5 criteria : 12

(L-W4) Dredging of Lake Jipe

A certain effect is expected. Even if dredging is implemented once, sedimentation becomes depositing again. Dredging on a regular basis is necessary. Sustainability and cost effectiveness including maintenance cost scored low. Continuous dredging is inevitable unless fundamental countermeasure of sediment discharge is implemented. It is not considered as effective countermeasure.

..... Total Score on 5 criteria : 10

(L-W8) Environmental Improvement of Evacuation Camp

Request from stakeholders is considerably high. There are 2 existing evacuation camps in the area. 1500 – 2000 residents utilize during evacuation. Number of beneficiary is large. The possibility of implementation is considered on next section.

..... Total Score on 5 criteria : 12

(L-W9) (L-E5) Development of Community Road

Each community has small scale road in their community and has same problem. This countermeasure can be spread to those communities. The possibility of implementation is considered on next section ..... Total Score on 5 criteria : 11

(L-E1) Bank Protection

Request from stakeholders is high. Effectiveness, efficiency, impact and sustainability are relatively low. There are a lot of tributary and seasonal river in this area. Study for appropriate site takes long term. ..... Total Score on 5 criteria : 9

(L-W10) (L-E6) Raised-up Toilet

All evaluation items on 5 criteria scored high. Raised-up toilet is already implemented at Nyando river basin. The possibility of implementation is considered on next section.

..... Total Score on 5 criteria : 12

(L-W11) Spring Protection (Gabion)

All evaluation items on 5 criteria scored B. Spring protection projects are already implemented by UNDP and WSTF at Lumi river basin. It is assumed that impkementation structre is already exsists. Therefore, the possibility of implementation is not considered on next section. ..... Total Score on 5 criteria : 10

Table 3.3.1 shows total score of all countermeasures from last section. Blue column indicates that its evaluation is more than 11 point. 5 structural candidates in blue column progress to second stage of evaluation

Table 3.3.1 Evaluation List of 5 Criteria

Structural/ Non-structural	No.	Countermeasure	Score
Structural Measure	L-W3	Repair of existing embankment / Long term inundation area	12
	L-W10	Raised-up Toilet / Long term inundation area	12
	L-E6	Raised-up Toilet / Tributary Stream Area	12
	L-W8	Environmental Improvement of Evacuation Camp / Long term inundation area	12
	L-W9	Development of Community Road / Long term inundation area	11
	L-W2	Drainage Channel Improvement / Long term inundation area	11
	L-E5	Development of Community Road / Tributary Stream Area	11
	L-W4	Dredging of Lake Jipe / Long term inundation area	10
	L-W1	Channel Improvement of Lumi River / Long term inundation area	10
	L-W11	Spring protection (gabion)	10
	L-E1	Bank Protection / Tributary Stream Area	9
Non-structural Measure	L-W6	Education on Disaster Prevention / Long term inundation area	14
	L-E3	Education on Disaster Prevention / Tributary Stream Area	14
	L-E4	Early Warning System / Tributary Stream Area	13
	L-W7	Early Warning System / Long term inundation area	13

	L-W5	Forestation Activity (upstream) / Long term inundation area	11
	L-E2	Forestation Activity / Tributary Stream Area	11

3.4 EVALUATION ON RELEVANCE WITH PCDEFM PROJECT

As 2nd stage of the selection, relevance with PCDEFM project is estimated between the extracted countermeasures in last section.

Those candidates evaluated from point of view of "Possibility Possibility to be implemented by WRUA", "Term (expiration term of SCMP)" and "Budget (maximum amount of WSTF fund at this moment)". In addition, budget (5 million yen) and term of PCDEFM project and technical perspective is also considered.

Above all, 7 structural measures; (L-W3) Repair of existing embankment, (L-W10) (L-E6) Raised-up Toilet, (L-W8) Environmental Improvement of Evacuation Camp, (L-W9)(L-E5) Development of Community Road and (L-W2)Drainage Channel Improvement featured below.

(L-W2) Drainage Channel Improvement

Improvement of all facilities of Canal A/B/C needs large scale construction. WRUA can't implement. And also term and cost is exceeds PCDEFM project scale. It is difficult to implement as a pilot project.

..... Total Score on Relevance with PCDEFM Project : 3

(L-W3) Repair of existing embankment

Existing embankment means Canal C. Part of the canal is destroyed. WRUA members in this area are very active and independent. They already operate maintenance system for irrigation facilities. Demand of residents is high. However, the cost is higher than budget. It is difficult to implement.

..... Total Score on Relevance with PCDEFM Project : 4

(L-W8) Environmental Improvement of Evacuation Camp

There are some existing evacuation camps in the long term inundation area of downstream of Lumi River. Request from local stakeholders is very high. Evaluation on 5 criteria scored a good result. And also possibility to be implemented by WRUA is high.

..... Total Score on Relevance with PCDEFM Project : 6

(L-W9) (L-E5) Development of Community Road

Community road means small scale road in a community. Construction term and cost are in range of PCDEFM project. However, it is assumed that negotiation and coordination

can take long time. It is difficult to implement as a pilot project.

..... Total Score on Relevance with PCDEFM Project：5

(L-W10) (L-E6) Raised-up Toilet

All items of evaluation on 5 criteria and relevance with PCDEFM project are higher than other structural measures. Term and cost is appropriate for the project.

Total Score on Relevance with PCDEFM Project：7 点 Table 3.4.1 shows comparison of relevance with PCDEFM project between 13 countermeasures that is selected on last section.

Table 3.4.1 Evaluation List of Relevance with PCDEFM Project

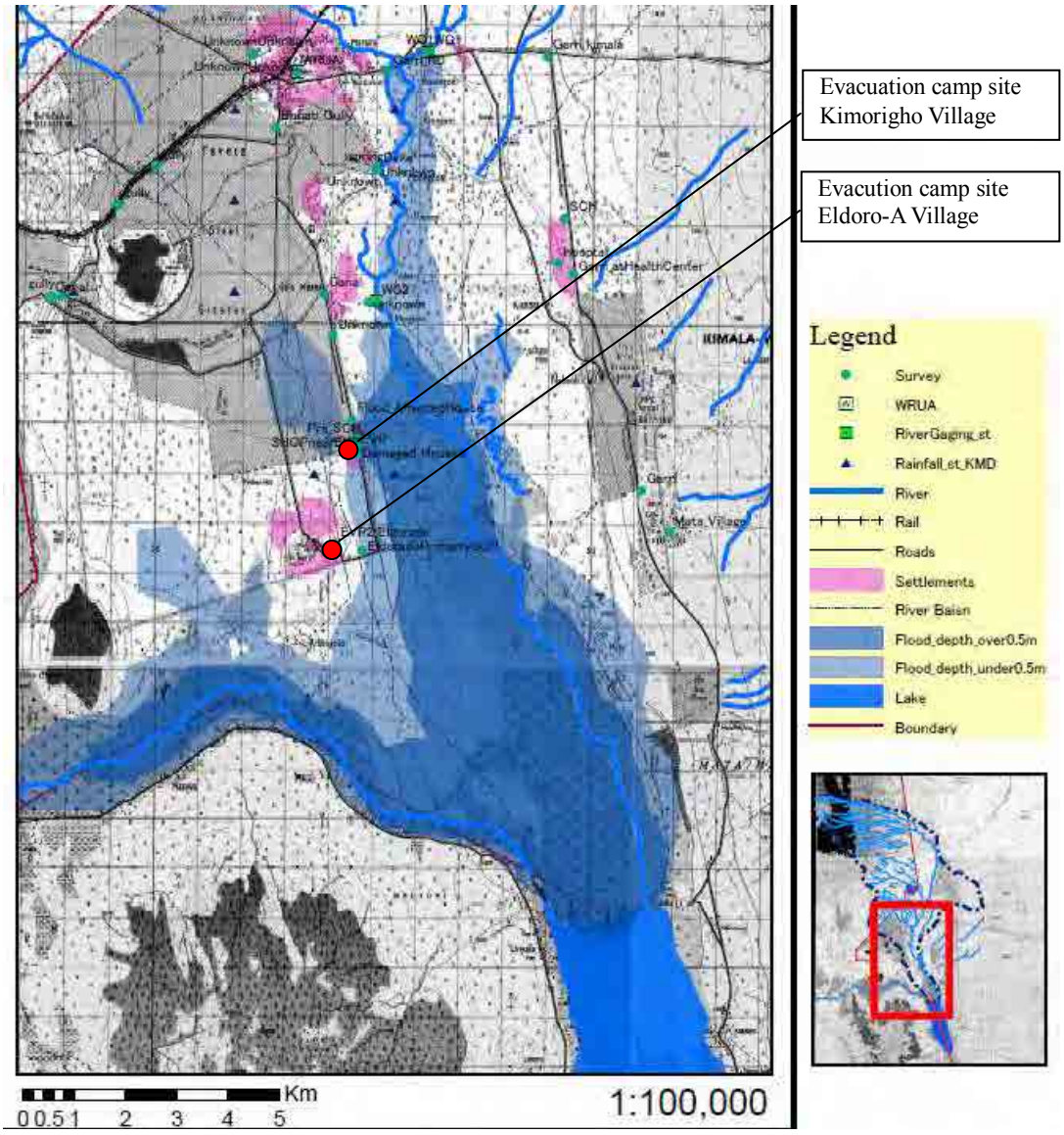
Structural/ Non-structural	No.	Countermeasure	Score
Structural Measure	L-W10	Raised-up Toilet / Long term inundation area	7
	L-E6	Raised-up Toilet / Tributary Stream Area	7
	L-W8	Environmental Improvement of Evacuation Camp / Long term inundation area	6
	L-W11	Spring protection (gabion)	6
	L-W9	Development of Community Road/ Long term inundation area	5
	L-E5	Development of Community Road / Tributary Stream Area	5
	L-E1	Bank Protection / Tributary Stream Area	5
	L-W3	Repair of existing embankment / Long term inundation area	4
	L-W2	Drainage Channel Improvement / Long term inundation area	3
	L-W4	Dredging of Lake Jipe / Long term inundation area	3
	L-W1	Channel Improvement of Lumi River / Long term inundation area	3
Non-structural Measure	L-W6	Education on Disaster Prevention / Long term inundation area	9
	L-E3	Education on Disaster Prevention / Tributary Stream Area	9
	L-E4	Early Warning System / Tributary Stream Area	9
	L-W7	Early Warning System (IFAS/GFAS) / Long term inundation area	8
	L-W5	Forestation Activity (upstream) / Long term inundation area	7
	L-E2	Forestation Activity / Tributary Stream Area	7

Concerning term and cost, only 3 measures (L-W10)(L-E6)(L-W8) of 7 structural measures have possibility as a pilot project. In addition, based on the study of JICA project team, there are two existing evacuation camps in the long term inundation area of downstream of Lumi River. However it is appeared that those evacuation camps doesn't have essential facilities to live as toilets and etc. For those reasons, (L-W8) Environmental Improvement of Evacuation Camp including (L-W10)(L-E6) Raised-up Toilet in long term inundation area is selected as a pilot project in the Lumi River Basin.

4. IMPLEMENTATION PLAN OF PILOT PROJECT

4.1 CONCEPTUAL DESIGN OF PILOT PROJECT

As shown in the preceding Chapter, it was judged optimum, as the selected pilot project, to construct toilet at the empty lot located in the slightly highland of the existing evacuation camp site. These evacuation camp sites are located at Kimorigho Village and Eldoro-A Village of Kimorigho Sub Location in Kimorigho Location in the Sub-basin of Lumi River. Location of two camp sites is as shown on Figure 4.1.1



Source : JICA Project Team

Figure 4.1.1 Location of Existing Evacuation Camp Sites in the Sub River Basin of Lower Lumi River

Evacuation camp site in Kimorigho Village is just an empty land at present as shown in the right side photo. In case the whole area is inundated, most of approximately 2,000 residents in this area shall be evacuated to this camp. However, there is no toilet in this camp site. Therefore, evacuees are forced to have extremely difficult living conditions in case the evacuation is prolonged. On the other hand, Abori Elementary School is located near the camp and this school is not utilized as the evacuation site at present. Since the inundation level here is not so deep in case of the ordinary flood, local residents intend to utilize this school as the evacuation site by constructing circle levee surrounding the compound of the school.

Evacuation Camp Site of Kimorigho Village

Another evacuation camp is located at Eldoro-A Village. This camp site is also an empty place at present as shown in the right side photo. It is estimated that about 1,500 residents in this area will suffer from the flood damage and these people will evacuate to this camp. There is an elementary school, called Eldoro near this place and the residents intend to utilize this school as the evacuation camp as the same as Abori Elementary School.

Evacuation Camp Site of Eldoro-A Village

Therefore, out of these evacuation camps and schools, the appropriate site shall be selected considering the inundation condition during flood, restriction of land use and issues for maintenance and management. Though the site is determined through discussions with the local residents and community, toilet of which the elevation is raised not to inflow the sewage and outflow of human waste respectively, are to be constructed as basic facility.

Conceptual design drawings of toilet is presented in the following pages. Regarding the elevation to be raised will be finally determined after the locations of these facilities have been fixed. These conceptual drawings were extracted from the similar project, i.e. Nyando Project funded by JICA.

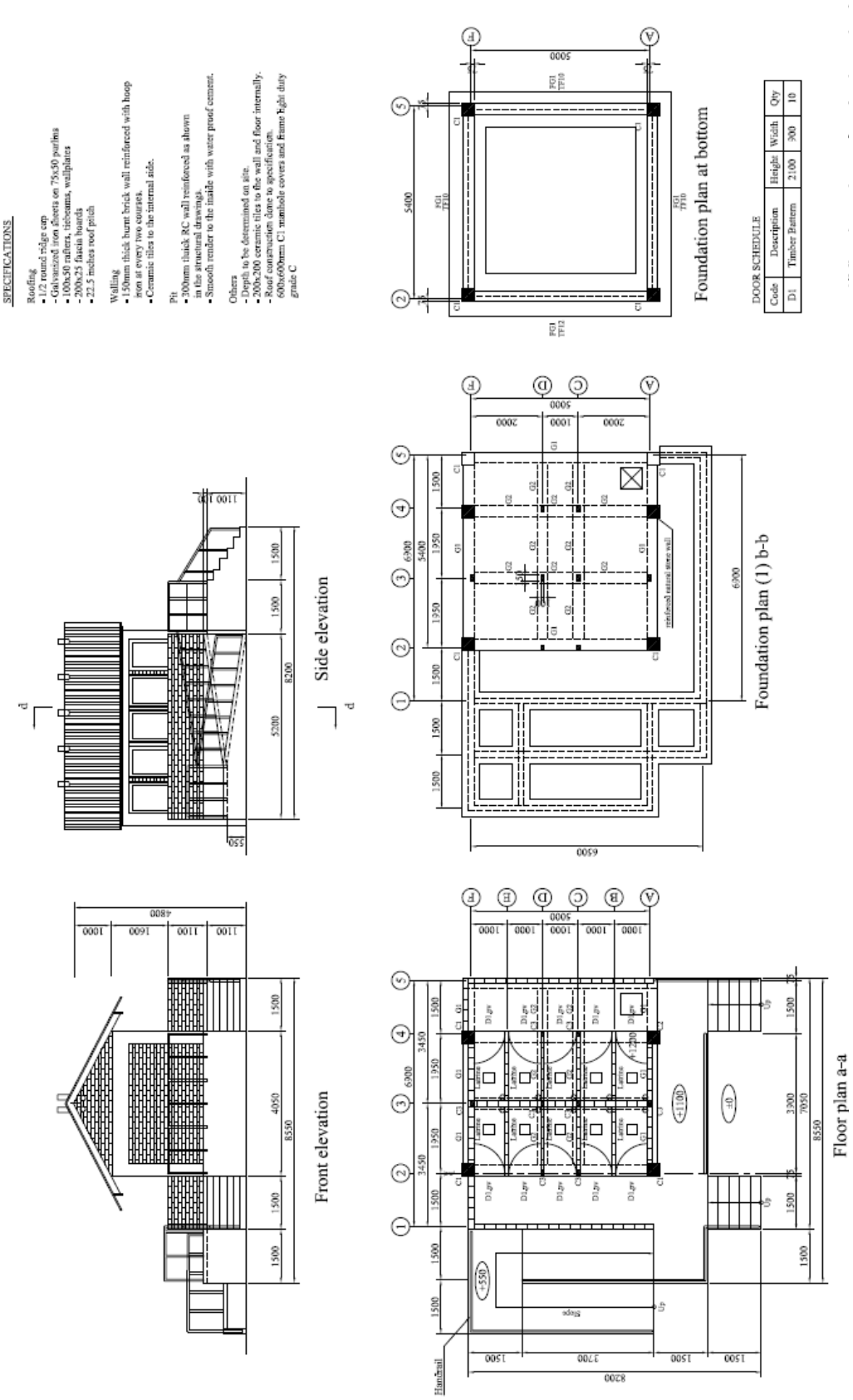


Figure 4.1.2 Conceptual Design Drawing of Toilet (Extract of Nyando Project)

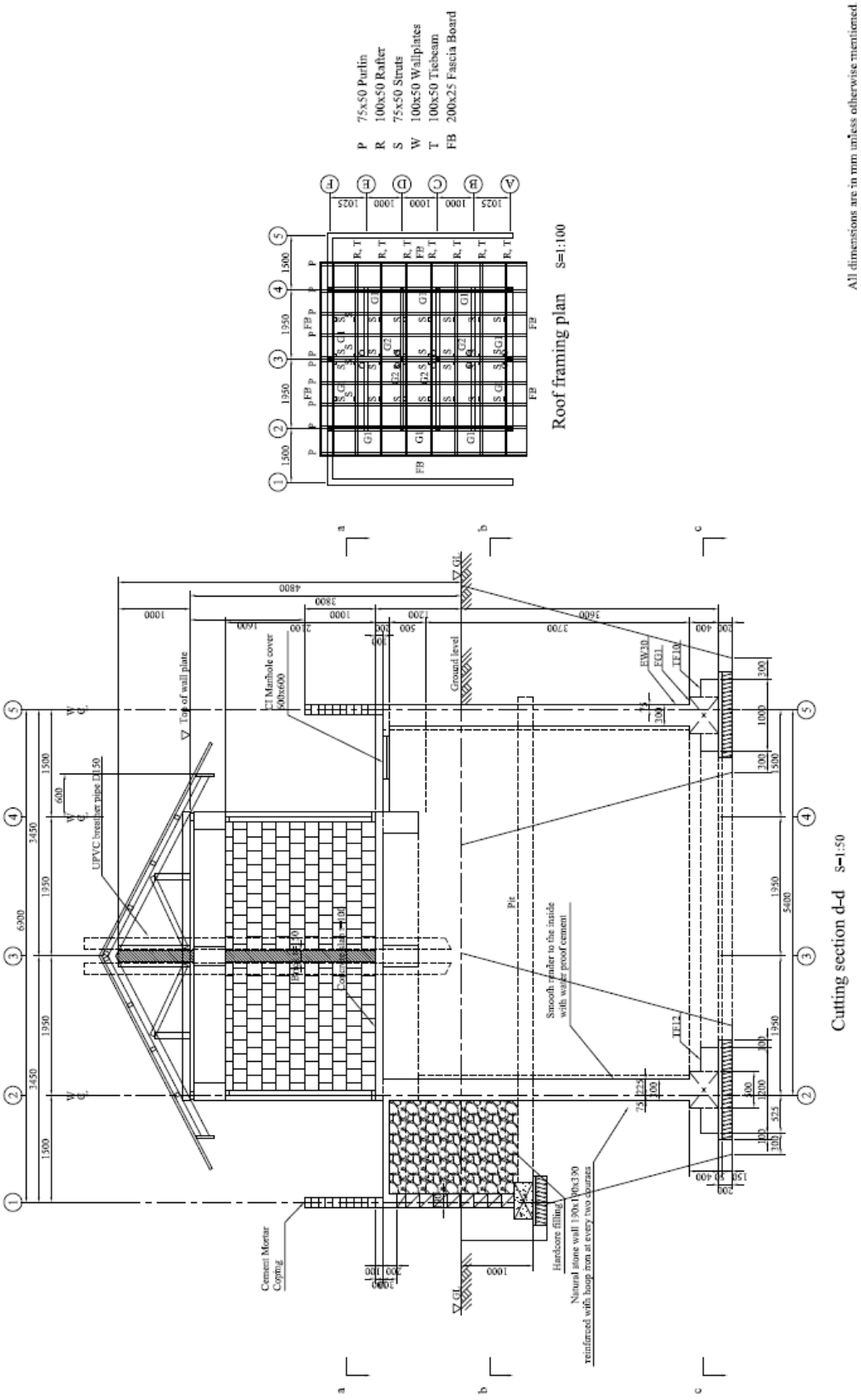
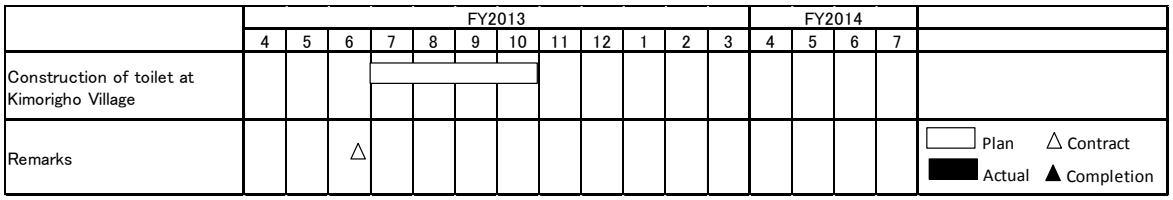


Figure 4.1.3 Conceptual Design Drawing of Toilet (Extract of Nyando Project)

4.2 TENTATIVE TIME SCHEDULE AND COST ESTIMATES OF PILOT PROJECT

Tentative time schedule of Pilot Project is shown on Figure 4.2.1. The contract is scheduled to be signed in the middle of June, 2013, and the works will commence in July, 2013 and end in the end of October, 2013 for a period of approximately four months.



Source : JICA Project Team

Figure 4.2.1 Tentative Time Schedule of Pilot Project

The budget for similar facilities in the JICA Study for Nyando River basin conducted in 2009 was as follows.

Toilet (10 units) : Approx. 1,200,000 KSH

Increase rate of the consumer's price in Kenya is as shown on Table 4.2.1. The increase rate is roughly about 10%.

Table 4.2.1 Increase Rate of the consumer's Price in Kenya

	FY 2009	FY 2010	FY 2011
Increase rate of the consumer's price (%)	10.6	3.7	12.0

Source : Japan External Trade Organization (JETRO)

Making some allowances on the increase rate of the consumer's price in 2012 and supposing the increase rate in 2013 to be 15%, the budget required for the project is estimated respectively as follows.

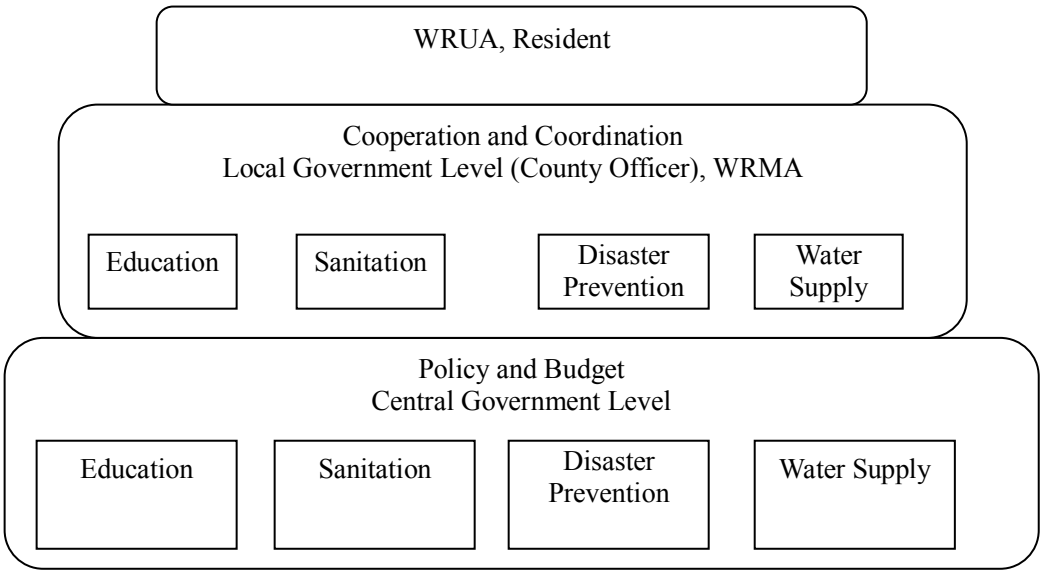
Toilet : $1{,}200{,}000 \times 1.106 \times 1.037 \times 1.120 \times 1.150 = 1{,}780{,}000$ KSH

The above amount is the direct construction cost not including consulting services fee.

4.3 ORGANIZATION OF PROJECT IMPLEMENTATION AND MAINTENANCE FOR PILOT PROJECT

(1) Stakeholder

In the construction project of toilet for evacuees in empty land and school, various government organizations will involve in the project, for example, disaster countermeasures sector like Ministry of Special Program, water sector like Ministry of Water and Irrigation, sanitary sector like Ministry of Public health and education sector like ministry of Education. Further, the county officer of the local government coordinating with these central government agencies will also involve as stakeholder. WRUA and WRMA are required to coordinate with these stakeholders and to secure the budget from the sectors concerned, if necessary.



Source : JICA Project Team

Figure 4.3.1 Cooperation and Coordination of Stakeholder of Administration Side

There are other stakeholders such as land owner and school, community leader and residents, etc. other than the government agencies, and the coordination among them is important. Receiving support from WRMA, WRUA shall make an effort to secure ability to coordinate with these stakeholders in the implementation stage of the Pilot Project.

Table 4.3.1 Assumable Stakeholder for Pilot Project

Stakeholder	Role
Lower Lumi WRUA Leaders	Leader of WRUA which is the community organization focusing on the water resource and flood management in the sub-basin and responsible for coordination in WRUA and with external organizations, especially coordination with WRMA.
Lower Lumi WRUA members	Coordination between WRUA and Community
Community Leaders/ Village Elders	Coordination of community residents and call a meeting
Community members and residents	People actually suffering from flood damages in beneficially/community
Land Owner (Agricultural Finance Corporation: AFC)	Owner of the land which is used as the evacuation camp
Principal and teachers of the elementary school	Principal and teacher of the elementary school near the evacuation camp, and WRUA considers the elementary school to be an evacuation camp.
County Governor	Top of the local government county. County is the main body for the local government administration after March, 2013.
District Commissioner	Chieftain of the local government unit, District, however, by the introduction of new local government organization, District will be disappeared from the local government unit after three years transition period.
County/ District Water Officer	Officer in charge of water dispatched from the central government
County/ District Education Officer	Officer in charge of education dispatched from the central government
County/ District Planning Officer	Officer in charge of planning dispatched from the central government
County/ District Public Health Officer	Officer in charge of sanitation dispatched from the central government

Source : JICA Project Team

(2) Project Implementation Organization

Out of the above stakeholders, WRUA which is the direct beneficially and the community organization focusing on the water resource and flood management in the area is the main body for implementation of the project. To appoint WRUA as the implementation body of the project, it becomes possible to disseminate the similar project securing the fund from WSTF in the future.

Management committees are organized such Management Committees are; Procurement Sub-Committee, Finance Sub-Committee and Monitoring Sub-Committee within MRUA, and the roles of each committee are as explained below.

Management Committee	**Management Committee** is responsible for overall management and project management for construction activities. And also it will monitor whether the fund provided is properly settled or not, whether it is used for the intended purpose or not and whether the outcome is appropriate to the money spent or not.

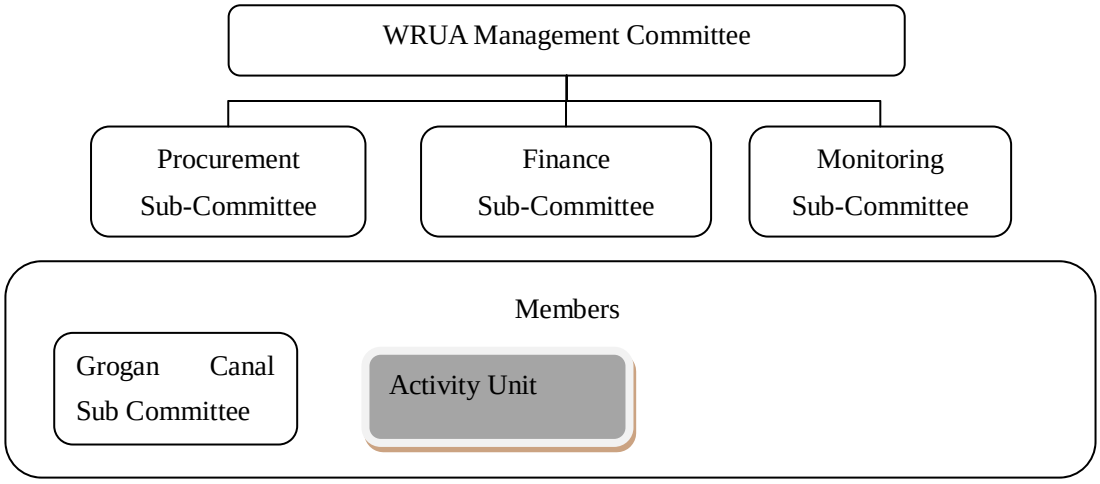
Procurement Sub Committee	**Procurement Sub Committee** is responsible for selection of the contractor for goods and services, and request/receipt for the cost proposal from more than 3 firms. The Contractor for goods and services are selected based on the price and amount. Quality and volume of the materials are, once procured, checked and stored.
Finance Sub-Committee	**Finance Sub-Committee** is responsible for all the financial transactions, and it is reported independently in the general assembly about how the fund is used. And also this sub-committee is responsible for delivering the present information to the public using website.
Monitoring Sub-Committee	**Monitoring Sub-Committee** is responsible for monitoring quality and value of the works/activities done and materials provided, and whether the fund is properly used or not. Also responsible for checking quality of materials provided and delivery to the shops. This Sub-Committee also monitors the shops. Independent report is submitted to the general assembly and the Sub-committee is obliged to confirm whether the information provided by other committees can be disclosed to the public or not.

In this pilot project, it is a basic principle to make good use of the existing committees.

However, it is proposed that the Activity Unit is established for maintenance and management of toilet within WRUA and the framework is to be studied that the residents themselves who are the member of the unit will be the main body for maintenance and management. The reason is that the area covered by WRUA is extensive. And it is considered difficult that the management of WRUA will directly involve in operation, maintenance and management.

To establish these organizations, the committee organized under Lower Lumi WRUA for the operation and maintenance of Grogan Canal can be referred as a good example. Besides, though it is not the maintenance and management of the facility, Flood Management Sub-Committee is established in Lower Gucha Migori WRUA in the same sub-basin, and the flood management related activity is done such as flood warning and construction and management of the evacuation camp.

Therefore, by careful examination of Good Example and exchanging information among WRUAs, the organization can be established without major confusions, if consensus could be obtained from Lower Lumi WRUA side.



Source : Additionally prepared by JICA Project Team based on WDC Toolkit

Figure 4.3.2 Project Implementation Organization inside WRUA for Pilot Project (Draft)

(3) Maintenance Management Organization

Toilet in Kenya will soon be full tank if people use it every day, because there is no custom to clear up the human waste in the toilet. Therefore, it is ideal to use the toilet only at the time of evacuation from the flood.

(4) Consideration of Dissemination and Expansion of Pilot Project

To disseminate and spread the structural measure implemented as the pilot project by the community level to the nationwide, it is necessary to pay attention to the following two points. One is a consideration of WDC process and the other one is the preparation of case example, lessons learned and manual.

a) Consideration of WDC Process

In a process to implement the pilot project, it is necessary to consider consistency with WDC process as the similar project shall be disseminated and expanded utilizing WDC scheme in the future.

In WDC process, various works shall be done generally in stages such as planning, feasibility study, design, legal approval, procurement, construction and operation. These works shall be jointly carried out by WRUA and WRMA. Therefore, it is also necessary to conduct the works, not only to be done by JICA Project Team, but jointly by WRUA and WRMA in the implementation stage of the pilot project. For this purpose, establishment of joint working team composed of the activity unit established inside WRUA, officer in charge of WRMA-SRO and JICA Project Team is necessary.

Table 4.3.2 Draft Demarcation of Role between WRUA and WRMA for Implementation of Structural Measure

Stage	Work Item	Demarcation of Role between WRUA and WRMA (Draft)
Legal Approval Stage	Land use, etc.	-Negotiation with land owner is mainly done by WRUA. -Negotiation with administration side is mainly done by WRMA.
Procurement Stage	Shortlisting of bidder (Selection of bidders to be invited for bid)	-WRMA-SRO obtains long list prepared by MWI. -WRMA-SRO and WRUA Procurement Committee will jointly prepare the shortlist from the long list based on the criteria established. -Approval of the shortlist by WRUA Management Committee
	Bidding	-Bidding documents are prepared jointly by WRMA-SRO and WRUA Procurement Committee (Specifications, drawings, bill of quantities, etc.) -WRUA Procurement Committee will send invitation to bid to the shortlisted bidders.
	Bid Evaluation	-WRUA Procurement Committee will prepare for bid open and evaluation. -WRUA Procurement Committee will open the bid and evaluation will be done together with WRMA-SRO. -WRUA Procurement Committee will prepare the evaluation report and submit it to Management Committee for approval.
	Contract negotiation with successful bidder and contracting	-Prepare contract documents by WRUA Procurement Committee -Contracting process by WRUA Management Committee
Construction Stage	Project management during construction	-Carryed out by WRUA Monitoring Committee
	Inspection of construction works	-To be done by WRUA Monitoring Committee
	Inspection upon completion and payment	-To be done by WRUA Financial Committee
Operation Stage	Operation/ maintenance management	-To be done by WRUA Monitoring Committee and Project Implementation Unit

Source：Additionally prepared by JICA Project Team based on WDC Manual

b) Preparation of case example, lessons learned and manual

In the respective stages of the pilot project, supposing the case examples are summarized after completion of the project as good examples to be a reference in the future and bad examples to be referred as lessons learned, recording in a form of documents, photos and videos is important.

Based on the result of study done by the project team in the respective stages of planning, study, design, procurement, construction and operation, technical standards adopted in each stage of the study shall be summarized and the manual will eventually be prepared accordingly. For this purpose, the criteria for judgment shall clearly be documented.

(5) Monitoring and Assessment

For implementation of the pilot project, though it is related to the preparation of lessons learned from case examples and manual, monitoring shall be done with proper contents and frequencies, and the assessment shall be carried out.

4.4 MEANING AND PURPOSE OF IMPLEMENTATION OF PILOT PROJECT

Meaning and purpose to develop raised-up toilet as activatepart of environmental improvement of evacuation camp in Lumi River Basin as a pilot project is following:

(1) From the viewpoint of implementation of structural measure

- It is expected that WRUA recognizes the importance to improve evacuation structure and environment of evacuation camp, because fundamental resolution of long term inundation takes long time.
- There are some evacuation camp sites in the area. Each site needs to develop raised-up toilet. WRUA is expected to develop the same raised-up toilets at those sites.
- It is expected that discussion of evacuation system between stakeholders become to activate.
- It is expected that WRUA understand that raised-up toilet is one of necessary projects for evacuation camp and water supply facilities and material storage are also required.

(2) From the viewpoint of implementation of structural measure by WRUA

- WRUA has not implemented structural measure yet.
- It t is expected to make sure to functionthat procurement system of WDC manual function and add missing system to the manual.
- It is not easy thateasy for the WRUA to applyies procurement system to other project based on experience of one pilot project only. Therefore, JICA project team expects theat WRUA to implements the same project by the same process over and over again in Lumi River Basin.
- WRUA is expected to acquire actual experience and capacity to apply large scale project.

(3) Maintenance

Continuous maintenance after construction is necessary. When WRUA establish maintenance structure, good practice in other river basin should be applied. Those experiences are effective to implement other structural measure

付属資料 3-22

MOU-Procurement-Com-Lumi

MEMORANDUM OF UNDERSTANDING (MOU) OF PCDEFM PROCUREMENT COMMITTEE FOR THE LOWER LUMI PILOT PROJECT OF THE PROJECT ON CAPACITY DEVELOPMENT FOR EFFECTIVE FLOOD MANAGEMENT IN FLOOD PRONE AREAS

Whereas Japan International Cooperation Agency (hereinafter referred to as "JICA") under Technical Cooperation have partnered with Ministry of Water and Irrigation (currently referred to as Ministry of Environment, Water and Natural Resources) to undertake the Project on Capacity Development for Effective Flood Management in Flood Prone Areas. The Ministry is represented by Water Resources Management Authority (hereinafter referred to as "WRMA") has a mandate to manage floods within the Republic of Kenya.

Whereas WRMA has formulated Water Resource Users Associations (WRUAs) in all the river basins to help in water resources management at sub –catchment level. Based on the aforementioned, WRMA and WSTF have developed a WRUA Development Cycle (WDC) Manual which is instrumental in implementation of flood management activities in the Pilot Project sites.

Now therefore, in considerations of roles and responsibilities of parties to the project and mutual support, the parties herein understand as follows;

1. Objective

The objective of the PCDEFM Procurement Committee is;

- To follow the necessary process of procurement for the implementation of community based flood management activities conducted by the JICA Project Team in cooperation with WRUA and WRMA based on the WRUA Development Cycle (WDC) Manual;
- To get opinions for preparing long-list of contractors, shortlisting contractors, preparing bidding documents, bid opening and evaluation and preparation of contract documents;
- To obtain good examples and problems through the actual procurement process of the WDC Manual and feedback to it.

2. Member

Membership of this PCDEFM Procurement Committee for Lower Lumi Pilot Project is

as follows:

- Lower Lumi WRUA Procurement Sub Committee members
- WRMA Nol Turesh Lumi Sub Regional Manager
- WRMA HQ, Deputy Technical Coordination Manager, Flood Management [Chair]
- WRMA HQ, Assistant Technical Coordination Manager, Flood Management/ Water Conservation
- WRMA HQ, Assistant Technical Coordination Manager, Community Development
- JICA Project Team, Chief Advisor
- JICA Project Team, Team Leader
- JICA Project Team, Pilot Project Supervisor in Lumi River Basin
- Prof. George Krhoda, Nairobi University (as an outside advisor)

3. Function and Rules

Function and rules of the PCDEFM Procurement Committee shall basically follow the constitution of WRUA Procurement Sub Committee.

4. Cost

Necessary cost for holding the PCDEFM Procurement Committee except the cost for WRMA officers shall be covered by the JICA Project Team.

5. Secretariat

The secretariat of the PCDEFM Procurement Committee is jointly acted by;

- WRMA HQ, Flood Management Unit
- JICA Project Team

Eng. Wilfred Matagaro
Head, Flood Management Unit
Water Resources Management Authority
Date:

Eng. Katsuro Kondo
Chief Advisor
JICA Project Team
Date:

Mr. Canute Mwakamba
Regional Manager, Athi Regional Office
Water Resources Management Authority
Date:

Mr. Hideki Sawa
Team Leader
JICA Project Team
Date:

Mr. Kimeu Musau
Sub Regional Manger, Nol Turesh- Lumi Sub Regional Office
Water Resources Management Authority
Date:

Ms. Mini Mary NGALUMA
Chairlady
Lower Lumi Water Resource Users Association
Date:

付属資料 3-23

Minutes-Procurement-Com-Lumi

MINUTES OF MEETING

OF

THE FIRST PCDEFM PROCUREMENT COMMITTEE MEETING

FOR

THE LOWER LUMI PILOT PROJECT

The first PCDEFM Procurement Committee Meeting for the Lower Lumi Pilot Project was held at WRMA HQ in Nairobi on 20th September 2013. Attendance list is shown in **Attachment 1**.

1. The attendants built consensus upon the following.

Eng. Kimanga of the WRMA HQ FMU made the opening remarks by explaining the purpose of the meeting and built the consensus upon the following among the attendants;

1) Carry out the shortlisting of the contractors who submitted Documents for evaluation based on a predetermined evaluation criteria;

2) To educate/train WRUA Procurement Sub Committee on the Procurement procedure, its meaning and selection process of Procurement Sub Committee meeting;

3) To address administrative issues of a project including procurement, supervision and post construction monitoring and evaluation. This includes educating key stakeholders on the separation of roles during the Project implementation;

4) Select the contractors to be invited to Bid for the Riverbank Protection works.

2. Functions of WRUA Procurement Sub Committee

Ms. Diego, ATCM, Community Development WRMA HQ, took the participants through to the explanation of the functions of WRUA Procurement committee. It was important for the WRUA procurement committee to understand the meaning of procurement, its purpose and how members of the Procurement committee are selected. The most important step in procurement is to identify the kind of service you want, where to get it, how and when to get it. Timeline and quality are key to procurement process.

3. Shortlisting of the contractors for the Lower Lumi Pilot Project

The Lower Lumi Procurement Sub Committee then carried out the shortlisting of the contractors who had submitted the documents for prequalification. The shortlisting was done by using predetermined evaluation criteria. Six (6) contractors were evaluated. Project Supervisor gave the overview of the evaluation and each committee member was given the evaluation sheet and paired with a WRMA staff to carry out the evaluation. Each evaluator carried out the evaluation and awarded as had been predetermined. The marks for each contractor was summed and averaged to get the final mark for ranking the contractor. During the evaluation the contractors had to have submitted the following three (3) documents otherwise they were subsequently disqualified:

1) Certificate of Incorporation

R.K

2) Tax Compliance Certificate from Kenya Revenue Authority

3) Registration as a contractor by an approved authority such as National Construction Authority

Subsequent to the confirmation of submission the above documents the contractor was evaluated on the other criteria. The following three (3) contractors were selected for the second stage of procurement and will be invited to bid.

1) Franji Electricals and General Supplies Limited

2) Arc Civil Contractors

3) Reenah (K) Ltd

Detailed evaluation report for the shortlisting of contractors for the Lower Lumi Pilot Project is shown in **Attachment 2**.

Attachment list

- Attachment 1: Attendance List
- Attachment 2: Evaluation Report for the Shortlisting of Contractors for Environmental Improvement of Evacuation Camp

WRMA HQ Nairobi, 20th September 2013

Eng. Wilfred Mataqaro

Head, Flood Management Unit

Water Resources Management Authority

Eng. Katsuro Kondo

Chief Advisor

JICA Project Team

Mr. Kimeu Musau

Sub-Regional Manager, Nolturesh Lumi Sub regional Office

Water Resources Management Authority

Mr. Hideki Sawa

Team Leader

JICA Project Team

Ms. Beatrice Kaazi

Chairperson, Procurement Sub Committee

Lower Lumi Water Resources Users Association

Attachment 1: Attendance List

Attachment 2: Evaluation Report for the Shortlisting of Contractors for Environmental Improvement of Evacuation Camp

EVALUATION REPORT FOR THE SHORTLISTING OF CONTRACTORS FOR ENVIRONMENTAL IMPROVEMENT OF EVACUATION CAMP

1. BACKGROUND

The Project on Capacity Development for Effective Flood Management in Flood Prone Areas in the Republic of Kenya is a Technical Cooperation Project between Japan International Cooperation Agency (JICA) and the Government of Kenya.

The Project consists of non-structural measures and structural measures. The pilot project structural measures identified as priority is the Environmental Improvement of Evacuation Camp in Eldoro Primary School. It is located in Kimorigo Location in Taveta District.

In order to select contractors for the above works, it is therefore in need to follow a WDC process of the selection of contractors. The WDC process envisages involving the WRUA Procurement Sub Committee in advertisement for prequalification and subsequent application by various construction firms. The JICA Project Team, WRMA and WRUA Procurement Sub Committee should examine methodology, evaluation, construction procedures and bid quotation.

2 Process of Shortlisting Contractors

2.1 List of Eligible Contractors

The JICA Project Team obtained a long list of eligible contractors from the District Water Office in Taveta. The list was prepared by the District Procurement Office for Taveta. The list was also confirmed by the WRMA Nolturesh Lumi Sub regional Office. It contained a total of 22 contractors. List of Eligible contractors is shown in **Attachment I**.

2.2 Distribution of letters of Expression of Interest(EoI) to contractors

On 10th September 2013 the Project Team with WRMA sent letters requesting for Expression of Interest (EoI) to the twenty two (22) contractors. The deadline for the submission of the documents was on 17th September 2013

The minimum requirements for submissions included; similar past experience in building works and road works including status and class of company, information of financial status, experience of similar works in the last three years and the personnel capacity complete with CVs for consideration for bidding process. Sample of EoI letter is shown in **Attachment II**.

2.3 Submission of EoI Documents

The Expression of Interest Documents was to be submitted to the Nolturesh Lumi Sub regional Office in Loitokitok by 17th September, 2013 by 12.00 pm. The following Two (2) Contractors submitted their documents on 16th September 2013:

1) Reenah (K) Limited
2) Arc Civil Contractors

The remaining contractors shown below submitted their documents on 17th September 2013:

1) Franji Electricals and General Supplies Limited
2) Jafena Enterprises Limited

3) Better World Services
4) Limasi Contractors Limited

2.4 Evaluation of the short listing Documents

The process of evaluation for short listing is as follows:

1) Contact the authorized representatives of the companies that submitted short listing documents;
2) Confirm the existence of the firms and determine their physical addresses and locations;
3) Contact the WRUA Procurement committee on the evaluation for short listing of the contractors who submitted their Documents.

3 Methodology

3.1 Objectives of Shortlisting

A prequalification procedure is, in principle, required for selecting potential contractors. The objectives of shortlisting are:

- To ensure that invitation to bid are extended only to technically and financially qualified bidder, and to prevent unqualified bidders from winning the bid as result of superficial evaluation
- To enable prospective bidders, who may be insufficiently qualified on their own, to avoid the expense of bidding; to give an incentive for these potential bidders to form a joint venture that may give them a better chance of success; and
- To limit the number of bidders, in advance, to a manageable size for the Employer in conducting bidding procedure and evaluation, when a large number of bidders are expected to participate.

3.2 Evaluation Criteria for Shortlisting

The shortlisting procedure must be conducted strictly in order to secure quality in the procurement.

3.2.1 Stage-1

The WRUA Procurement Sub Committee was given guidance on the procurement process. The guidance emphasizes on the need to clearly understand the meaning of procurement and how to develop an evaluation criteria in order to identify the most qualified contractor for the Environmental Improvement of Evacuation Camps. The WRUA Procurement Sub Committee was given guidance on the stages involved in evaluation to avoid awarding contractors to the lowest bidder who otherwise has no technical capacity.

3.2.2 Stage-2

The following evaluation criteria were drawn up by the discussion among participants.

(1) Company Profile (Mark = 15)
Filled in full and correctly including name of company, address and name of contact

person.
Full mark 15 points, Partial 10 points

(2) Submission of Documents (Mark = 25)

- Certificate of incorporation(5 marks) Non submission (0)
- Class of Registration (Class A. B.C.D.E 5marks), (Class F.G.H 3marks), Non submission (0)
- Kenya Revenue Authority (KRA) certificate of compliance (5marks) Non submission (0)
- Submission of Business Experience records (3 years 5marks)(1-2 years 3marks)
- Submission of staff CVs (Full submission 5marks) (Partial submission 3marks)

(3) Financial Position (Mark = 5)
Full submission of the two requirements 5 marks, partial submission 3marks

- Audited Accounts for the last three (3) years
- Bank statements

(4) Experience and Capacity (Mark = 35)

1) General experience
   - Successful project experience of similar works of contact price not less than 5 million Kshs for the last three (3) years (Mark = 5)
   - Have experience in similar work in Kenya (Mark = 5)
   - Have undertaken contracts equal to or exceeding project as a major contractor or subcontractor (Mark = 5)

2) Personnel
   - Site Manager (Mark = 5)
   - Surveyor (Mark = 5)
   - Artisans (Mark = 5)
   - Storekeeper (Mark = 5)

Total Score 80

4 Evaluation Results

4.1 Evaluated Firms

The following six firms were evaluated

1) Reenah (K) Limited
2) Arc Civil Contractors
3) Franji Electricals and General Supplies Limited
4) Jafena Enterprises Limited
5) Better World Services Ltd
6) Limasi Contractors Limited

4.2 Evaluation

The evaluation was done together with WRUA Procurement Sub Committee on the basis of marking system explained in 3.2 above. One member of WRUA Procurement Sub Committee and one officer of WRMA made an evaluation group. Each evaluation group evaluated each company and gave marks to the company.

However, on further discussion, it was judged important to consider the most critical evaluation criteria. As a result of the discussion, the status of the company was considered the most critical if the company was to undertake public works. On further review any company that did not submit the first three documents shown in 3.3.2(2), namely certificate of incorporation, class of registration and Kenya Revenue Authority (KRA) certificate of compliance was automatically disqualified from the subsequent evaluation. But, all the six companies had submitted the required documentation and thus were subjected the second part of the evaluation.

Evaluation checklist for each company by each evaluation group is shown in **Attachment IV** and the summary of evaluation by each evaluator is shown in **Attachment V**.

The points were then summed and the average for each company was calculated. The result of calculating the average points is shown in **Attachment III.**

Then it was agreed among participants that those companies whose total score were above 60 points should be shortlisted for the final stage for bidding. Therefore, the following three (3) companies were shortlisted in the first level evaluation;

1) Franji Electricals and General Supplies Limited
2) Arc Civil Contractors
3) Reenah (K) Ltd

4.3 Approval of the Evaluation results

The WRUA Procurement Sub Committee and WRMA Sub –Regional Office assisted by JICA Project Team prepared this evaluation report on short listing of contractors for bidding for Environmental Improvement of Evacuation Camp. The report will be reviewed and approved by WRUA Management Committee.

5 Lessons learnt

During the evaluation for short listing certain observations were made from the WRUA Procurement committee. The observations made were:

1) It was the first time for the WRUA Procurement Sub Committee to carry out this kind of evaluation and they should utilize it during other WSTF projects. It was a good kind of capacity development for the committee.
2) For proper transfer of knowledge to the entire community, youths should be included in the Procurement Sub Committee and other Sub-Committees within the WRUA set up.
3) It seemed to be difficult for some WRUA Procurement Sub Committee members to understand and use the evaluation criteria and the methodology.

4) The WDC manual is not very clear on certain matters regarding the procurement; such matters like evaluation criteria for Specific projects should be included in the WDC manual.

5) The number of shortlisted companies should be more than three (3), because the possibility that two of them will not submit the final bidding is relatively higher than the case that four (4) or five (5) companies will be selected as shortlisted companies.

Attachment List

Attachment I: List of Eligible Contractors

Attachment II: EOI sample letter

Attachment III: Evaluation Result

Attachment IV: Evaluation Checklist

Attachment V: Summary of Evaluation by Each Evaluator

Attachment I

List of Eligible Contractors

27 August 2013

List of Eligible Prequalified Contractors in Taita Taveta County

No	Name of Contractor	Address	Contractor No	Remarks
1	Katemi General Agencies	P.O. Box 604 Voi	TVT/19/01/2012-2013	Eligible for the whole county
2	Franji Electricals And General Supplies Limited	P.O.Box 434 Taveta	TVT/19/02/2012-2013	"
3	Jyan Construction Services	P.O.Box 42758 Mombasa	TVT/19/03/2012-2013	"
4	Maskuji Contractors Limited	P.O.Box 109 Taveta	TVT/19/04/2012-2013	"
5	Kachero general supplies and contractors limited	P.O.Box 149 Taveta	TVT/19/05/2012-2013	"
6	Arc civil contractors	P.O.Box 56321 Nairobi	TVT/19/06/2012-2013	"
7	Njaka-Njenga (EA) limited	P.O.Box 42426 Mombasa	TVT/19/07/2012-2013	"
8	Mumbe construction	P.O.Box 122 Taveta	TVT/19/08/2012-2013	"
9	Check point general supplies	P.O.Box 72 Taveta	TVT/19/09/2012-2013	"
10	Coast wide enterprises	P.O.Box 2213 Mombasa	TVT/19/10/2012-2013	"
11	Msuya general supplies limited	P.O.Box 72 Taveta	TVT/19/11/2012-2013	"
12	Mjomba Agencies Limited	P.O.Box 420 Taveta	TVT/19/12/2012-2013	"
13	Shakababu Engineering	P.O.Box 87469 Mombasa	TVT/19/13/2012-2013	"
14	Better World Services Limited	P.O.Box 151 Taveta	TVT/19/14/2012-2013	"
15	Market View Investment Limited	P.O.Box 348 Taveta	TVT/19/15/2012-2013	"
16	Mwanzo Taveta General and Hardware	P.O.Box 51 Taveta	TVT/19/16/2012-2013	"
17	Jipe Contractors Limited	P.O.Box 231 Taveta	TVT/19/17/2012-2013	"
18	Reemh (K) Limited	P.O.Box 42381 Taveta	TVT/1918/2012-2013	"
19	Jovete Investments Limited	P.O.Box 72 Taveta	TVT/19/19/2012-2013	"
20	Limasi Contractors Limited	P.O.Box 311 Taveta	TVT/19/20/2012-2013	"
21	Jafena Enterprises Limited	P.O.Box 202 Taveta	TVT/19/21/2012-2013	"
22	Lumazo Company Limited	P.O.Box 48 Taveta	TVT/19/22/2012-2013	"

Benson Mbede
District Water Officer
Taveta.

District Water Officer
Taita Taveta District
P.O. Box 10-80302
Mombasa

Attachment II

EOI sample letter

Project on Capacity Development for Effective Flood Management in Flood Prone Areas
Technical Cooperation Project Between the Government of Kenya and Japan International Cooperation Agency

Water Resource Management Authority
NHIF Building, 9th Floor, Off Ngong Road
P.O. Box 45250-00100 Nairobi Kenya
Tel: +254-20-2732291, 27290489
Fax: +254-20-2729050

NEWJEC Inc.
International Operations
5-7, Kameido 1-chome, Koto-ku
Tokyo 136-0071, JAPAN
Tel: +81-3-5626-7408 Fax: +81-3-5628-7205
Mobile: +254-704-296-784 (Kenya), +81-80-2480-5354 (Japan)

Date: September 10, 2013

ARC CIVIL CONTRACTORS
P.O.BOX 56321 NAIROBI

Attn: Managing Director,

Subject: Request for Expression of Interest in Environmental Improvement of Evacuation Camp

Dear Sir,

The Project on capacity Development for Effective Flood Management in Flood Prone areas is a Technical Cooperation Project between the Government of Kenya and Japan International Cooperation Agency.

The Project intends to carry out an Environmental Improvement of Evacuation Camp at Eldoro Primary School in Kimorigo Location of Taveta District

The Contractors who have had similar past experience in building works and road construction works are encouraged to submit their Expression of Interest (EOI) including status and class of company, information of financial status, experience of similar works in the last three years and the personnel capacity complete with CVs for consideration for bidding process.

The documents should be submitted to Water Resources Management Authority Nolturesh Lumi Office, Loitokitok on or before September 17, 2013 at 12:00 a.m. EAT.

Thank you very much for your kind cooperation.

Best Regards,

Hideki Sawa

[By]: Mr. Kimeu MUSAU
ATCM,
Nolturesh Lumi Sub- Region
Water Resources Management Authority (WRMA)

Mr. Hideki SAWA
Team Leader
JICA Project Team
NEWJEC Inc.

Attachment III

Evaluation Result

Evaluation Result

PROJECT ON CAPACITY DEVELOPMENT FOR EFFECTIVE FLOOD MANAGEMENT IN FLOOD PRONE AREAS
EVALUATION FOR SHORTLISTING OF CONTRACTORS

	Bidders	Average Mark	Rank			Evaluators
1	Franji Electricals and General Supplies Limited	65.8	2	Passed	1	Mini Mary Ngaluma
2	Arc Civil Contractors	63.6	3	Passed	2	George Albert Kenyatta
3	Better World Services Ltd	54.4	6		3	Benson Mwamburi
4	Reenah (K) Ltd	68.2	1	Passed	4	Fredy Reuna
5	Limasi Contractors Limited	58	4		5	Beatrace Kazi
6	Jafena Enterprises Limited	57.8	5			

			Evaluator 1						Evaluator 2						Evaluator 3						Evaluator 4						Evaluator 5					
		Marks	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
	Company Profile	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	10	15	15	15	15	15	15	15	15	15	15	15	15	15
	Totality in Submission Of Documents	25	23	18	23	21	16	16	18	18	23	23	18	23	18	16	16	23	18	16	23	16	16	23	16	23	16	16	16	21	16	16
	Financial Position	5	3	3	3	5	3	3	3	3	3	5	3	3	3	3	3	5	3	3	3	3	3	5	3	3	3	3	3	5	3	3
	Experience and Capacity	35	33	29	29	33	31	19	33	33	21	33	35	33	9	15	7	11	11	11	35	35	12	21	31	21	31	32	19	32	13	21
	Total	**80**	**74**	**65**	**70**	**74**	**65**	**53**	**69**	**69**	**62**	**76**	**71**	**74**	**45**	**49**	**41**	**54**	**42**	**45**	**76**	**69**	**46**	**64**	**65**	**62**	**65**	**66**	**53**	**73**	**47**	**55**

	Qualified Bidders	
1	Reenah (K) Ltd	1
2	Franji Electricals and General Supplies Limited	2
3	Arc Civil Contractors	3

Attachment IV

Evaluation Checklist

Fredy Rono

THE PROJECT ON CAPACITY DEMENT IN FLOOD PRONE

NAGEMENT IN FLOOD PRONE

Stage 1					
Name of Company :	RENAH (2013			7-09-2013	
Address of Company :	P.O Box				
Name of Contact Person :	M/s Ren				
Description	R	Present	Absent	arks	Present / Absent
Submission of Documents	Totality in Submission of	✓			✓
	General Information of A	✓			✓
	Financial Statement	✓			✓
	List of Similar Work Expe	✓			✓
Contents	R	Pass	Fail	erks	Pass / Fail
Corporation Nature	Class of Registered Con	✓			✓
	Qualified applicants be ju registered under laws of	✓			✓
Financial Position	Submission of Business I	✓			✓
	The firm for the past thre	✓			✓
	Soundness of Financial F Sheet and profit and loss				
General Experience	Successful Project Exper three Similar works of co million(KSh5,000,000) in	C= 1	Total score= 5	C= 1	Total score= 5
	Have experience in Simil	C= 1	Total score= 5	C= 1	Total score= 5
	Have undertaken contrac a major contractor or sub	C= 1	Total score= 5	C= 1	Total score= 5
Personnel Capacity	Experinece of the Site M	C= 1	Total score= 3	C= 1	Total score= 3
	Experience of Surveyor	C=1	Total score= 1	C=1	Total score= 1
	Skilled Artisans	C=1	Total score= 1	C=1	Total score= 1
	Storekeeper	C=1	Total score= 1	C=1	Total score= 1
			21	e Score	21
Legal Compliance	Firm is not proscribed by Government of Japan	Yes			Yes

Attachment V

Summary of Evaluation by Each Evaluator

RK

	Company Profile	Submision Of Documents	Financial Position	Experience and Capacity	Total
Franji Electricals	15	10 + 3+5+5	3	33	74
Arc Civil Contractors	15	5 + 3+5+5	3	29	65
Better World Services Ltd	15	10 + 3+5+5	3	29	65
Reenah K Ltd	15	10 + 3+5+5	5	33	74
Limasi Contractors	15	5 + 3+5+3	3	31	70
Jafena Enterprises Ltd	15	5 + 3+5+3	3	19	53

KIMEU MUSYU 20/9/2013
WRMA

MIMI MARY NTHUMA 20/9/2013
LOWER LUMI WRUA

	Company Profile	Submision Of Documents	Financial Position	Experience and Capacity	Total	Aver Score	[illegible]
Franji Electricals	15	5+3+5+5	3	33	69	[illegible]	2
Arc Civil Contractors	15	5+3+5+5	3	33	69	63.2	3
Better World Services Ltd	15	10+3+5+5	3	21	62	[illegible]	4
Reenah K Ltd	15	10+3+5+5	5	33	76	68	1
Limasi Contractors	15	5+3+5+5	3	35	71	58.4	4
Jafena Enterprises Ltd	15	10+3+5+5	3	33	74	[illegible]	[illegible]

Kanyatta George Albert – WRUA Lower Lumi 20th Sept 2013.

[signature]

28/9/2013

Benson Mwamburi
Lower Tana WRUA

	Company Profile	Submision Of Documents	Financial Position	Experience and Capacity	Total
Franji Electricals	15	5+3+5+1 5	3	9	45
Arc Civil Contractors	15	5+3+5+1 3	3	15	44
Better World Services Ltd	15	5+3+5+1 2	3	7	41
Reenah K Ltd	15	10+3+5+1 5	5	11	53
Limasi Contractors	10	5+3+5+1 5	3	11	39
Jafena Enterprises Ltd	15	5+3+5+1 3	3	11	45

	Company Profile	Submision Of Documents	Financial Position	Experience and Capacity	Total
Franji Electricals	15	10+3+515	3	35	76
Arc Civil Contractors	15	5+3+513	3	35	69
Better World Services Ltd	15	10 5+3+513	3	12	43
Reenah K Ltd	15	10+3+515	5	21	64
Limasi Contractors	15	5+3+513	3	31	65
Jafena Enterprises Ltd	15	10+3+515	3	21	62

Fredy Reuna Emanuel

Emanuel

Lower Lumi Wrua Secretary

20.09.2013

BK

20/9/13

	Company Profile	Submision Of Documents	Financial Position	Experience and Capacity	Total
Franji Electricals	15	5+ 3+5+3	3	31	62
Arc Civil Contractors	15	5+ 3+5+3+3	3	32	69
Better World Services Ltd	15	5+ 3+5+3	3	19	53
Reenah K Ltd	15	10+ 3+5+3	5	32	73
Limasi Contractors	15	5+ 3+5+3	3	13	47
Jafena Enterprises Ltd	15	5+ 3+5+3	3	21	55

The 1st 3 No. who scored 60+ marks will be invited to bid / tender

1. Reenah Ltd 65
2. Franji Electricals 85.2
3. Arch Civil Contractors 63.2

LOWER LUMI RUIN

BEATRACE KAZI Beatrace

付属資料 3-24

MOU-Environmental improvement of evacuation camp-Lumi

MEMORANDUM OF UNDERSTANDING
FOR
THE PROJECT FOR CAPACITY DEVELOPMENT FOR EFFECTIVE FLOOD MANAGEMENT IN FLOOD PRONE AREAS
WRMA NOLTURESH-LUMI SUB-REGION OFFICE, LOWER LUMI WRUA AND JICA PROJECT TEAM
UNDER
ENVIRONMENTAL IMPROVEMENT OF EVACUATION CAMP

Whereas Japan International Cooperation Agency (hereinafter referred to as "JICA") under Technical Cooperation have partnered with Ministry of Water and Irrigation (currently referred to as Ministry of Environment, Water and Natural Resources) to undertake the Project on Capacity Development for Effective Flood Management in Flood Prone areas. The Ministry is represented by Water Resources Management Authority (hereinafter referred to as "WRMA") has a mandate to manage floods within the Republic of Kenya.

Whereas WRMA has formulated Water Resource Users Associations (WRUAs) in all the river basins to help in water resources management at sub–catchment level. Based on the aforementioned, WRMA and WSTF have developed a WRUA Development Cycle (WDC) Manual which is instrumental in implementation of flood management activities in the Pilot Project sites.

Now therefore, in considerations of roles and responsibilities of parties to the project and mutual support, the parties herein understand as follows;

1. Environmental Improvement of Evacuation Camp in Eldoro Primary School shall be conducted as the Pilot Project in the Project on Capacity Development for Effective Flood Management in Flood Prone areas;
2. WRMA to take responsibilities regarding legal matters concerning the Project, such matters are not limited to, land use, approval from Kenya Rural Roads Authority, National Environment Management Authority, District Education Office, Public Health Office ;
3. Based on WDC manual, Lower Lumi WRUA and the community members to contribute to Project implementation at a minimum of 15% of the budget. Such contribution may be in the form of labour and materials/services ;
4. Lower Lumi WRUA and the school community through the School Management Committee (SMC) have accepted to contribute to the Project implementation by the following, but not limited to collection of suitable soil and packing sand bags to be used in improvement of access road;
5. Lower Lumi WRUA to negotiate with the School Management Committee of Eldoro Primary School to allow for access to the Project site. The Lower Lumi WRUA and the School SMC shall also negotiate on the use of the school as an Evacuation Camp during future flooding episodes;

6. The property rights shall be transferred to Lower Lumi WRUA from JICA Project Team after completion of the Project through WRMA;
7. The ordinary maintenance shall be done by the school community and the operation for the evacuation camp during floods shall be done by the Lower Lumi WRUA;
8. JICA Project Team to sign contract agreement for construction works for environmental improvement of evacuation camp with the qualified contractor. All payments to contractor will be done directly from JICA Project Team to the contractor. The WRUA management committee will be witness to documentations for request of payment from contractor;

Whereas WRMA, Lower Lumi WRUA, the School Community and the JICA Project Team agreed to honour the MOU in respect to the Pilot Project on Environmental improvement of evacuation camp works whose duration is within 2-3 months.

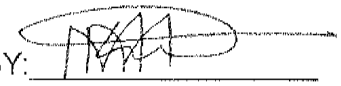
WRMA, Lower WRUA, the School community (SMC) and JICA Project Team mutually agreed that:

This Memorandum of understanding will form part of the contract for Environmental Improvement of Evacuations Camp works between JICA Project Team and the Contractor.

In witness whereof the parties here to have caused this Memorandum of Understanding to be effective as at the day the parties signed herein:

Attachment List:

- Attachment 1: Presentation Materials including Drawings
- Attachment 2: Attendance List

SIGNED BY: 

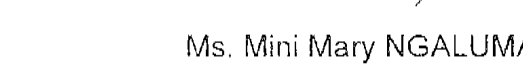
Mr. Kimeu MUSAU

Assistant Technical Coordination Manager

WRMA Nolturesh Lumi Sub – Regional Office

P.O. Box, 53-002-9 Loitokitok , Kenya

Date:

SIGNED BY: 

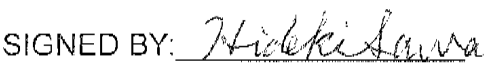
Ms. Mini Mary NGALUMA

Chairlady

Lower Lumi Water Resource Users Association (WRUA)

P.O. Box , Taveta, Kenya

Date:

SIGNED BY: 

Mr. Hideki SAWA

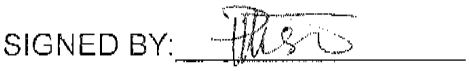
Team Leader

JICA Project Team/ NEWJEC Inc.

3-20 Honjo-Higashi 2-Chome, Kita-ku'

OSAKA, 531-0074, JAPAN

Date:

SIGNED BY: 

Mr. Peter Mutuku

Chairman
School Management Committee

P.O. Box ,Taveta, Kenya

Date:

Attachment 1

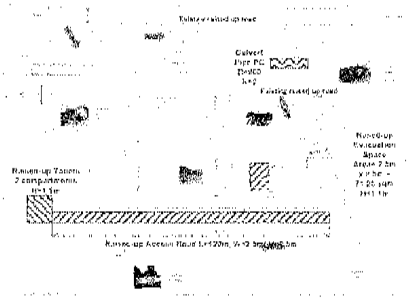
WATER RESOURCES MANAGEMENT AUTHORITY
JAPAN INTERNATIONAL COOPERATION AGENCY

Environmental Improvement of Evacuation Camp in Eldoro Primary School for the Pilot Project in Lower Lumi Sub Catchment

4 September 2013
Loitokitok Sub Regional Office.
Water Resources Management Authority (WRMA)

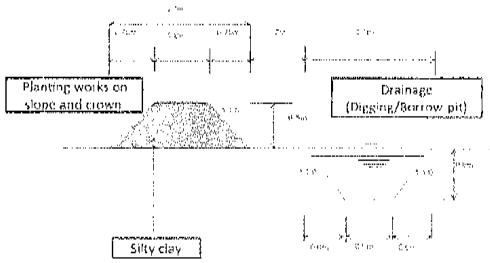
Basic Design of the Environmental Improvement of Evacuation Camp

Schematic Plan view of Eldoro Primary School



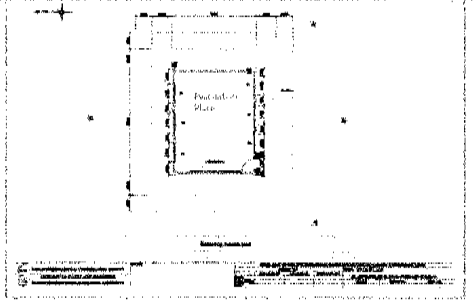
Basic Design of the Environmental Improvement of Evacuation Camp

Raised-up Access Road



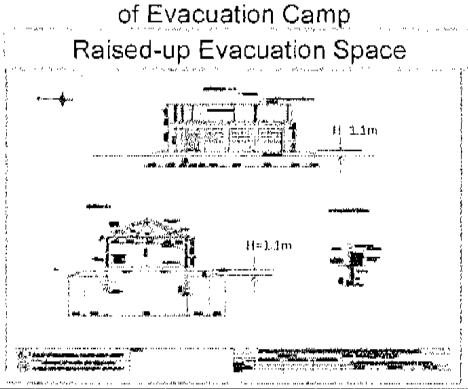
Basic Design of the Environmental Improvement of Evacuation Camp

Raised-up Evacuation Space



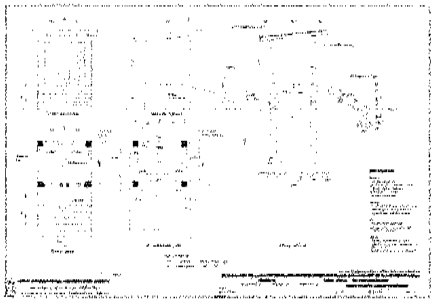
Basic Design of the Environmental Improvement of Evacuation Camp

Raised-up Evacuation Space



Basic Design of the Environmental Improvement of Evacuation Camp

Raised up toilet

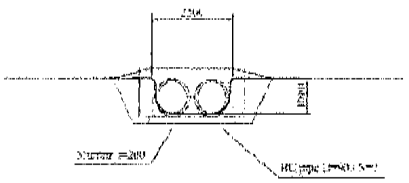


Pm

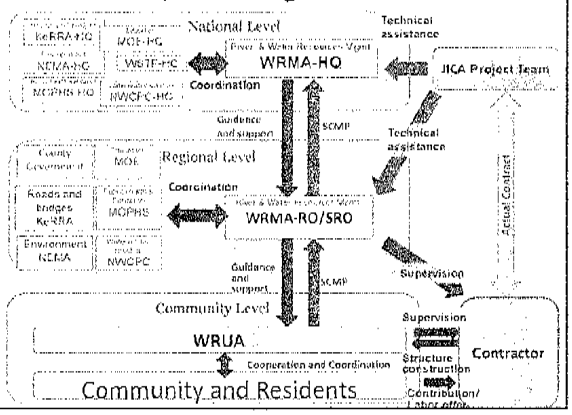
Basic Design of the Environmental Improvement of Evacuation Camp

Culvert

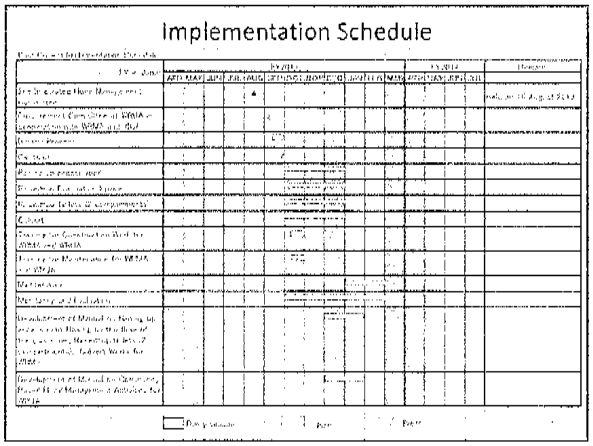
Elevation



Implementing Structure



Implementation Schedule



付属資料 3-25

Lumi パイロット事業契約報告

添付資料-1

2013 年 11 月 25 日

㈱ニュージェック

現地再委託契約の締結に関する報告書

1）案件名：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関発プロジェクト(第2年次)

2）再委託契約名：Construction of Evacuation Facilities in Eldoro Primary School

3）再委託契約業者名：FRANJI ELECTRICALS & GENERAL SUPPLIES LTD

- 担当者名　：Mr. Franji Njihia Chege, Director,
- 住所　：PO BOX 434 TAVETA KENYA
- 電話番号　：0725-936-355
- e-mail　：chegefranji53@yahoo.com

4）再委託契約履行期間：契約締結日より 3 カ月

5）再委託契約金額：KSh 4,970,000.00-

BOQ を使用しているが、契約自体は一括契約とする。

（工事数量による価格調整なし）

6）再委託業務の概要

タベタタウン南方、エルドロ小学校に地盤を嵩上げした避難所、嵩上げトイレ、洪水流を流下させるためのカルバート、一般道路からのアクセス道路を含む洪水時の避難場所の整備事業を実施する。ただし、アクセス道路については、材料となる土の採取と運搬をここで報告する再委託契約にて実施し、工事実施は、別途委託を計画中であるローカル NGO の指導のもと、地域住民がコミュニティ貢献として土のう工法により施工する。

7）選定方法

現地再委託先の選定には、貴機構が平成 18 年 6 月に制定した「コンサルタント等契約における現地再委託契約手続きガイドライン」に基づいて、指名競争入札方式とした。以下にその経緯を述べる。

1）地方行政機関（タベタ地区水事務所 District Water Office, Taveta District: DWO）より、登録している工事業者から 22 社の工事業者を推薦してもらい、リストを作成した（DWO 推薦の業者リストは添付資料①参照）。

2）上記リストの全業者にレターを出し、事業への関心を聴取。

3) 6 業者が関心表明を提出。この 6 業者をロングリストとして 2013 年 9 月 20 日、WRUA、WRMA、プロジェクトチームで調達委員会を開催し、関心表明とともに提出された法人登録関係資料、実績関係資料、取り組み体制等の資料を評価。結果、下記の 3 社を指名先（ショートリスト）として選定した。

業者名	住所／電話番号
1) Franji Electricals and General Supplies Limited	P.O. Box 434, Taveta/ TEL.0725-936355
2) Arc Civil Contractors	P.O. Box 56321, Taveta / TEL.0703-497436
3) Reenah (K) Ltd.	P.O. Box 42381, Taveta/ TEL.0722-210591

10 月 24 日、これら 3 社の指定業者に対して仕様書、指示書を含む入札図書を配布することを通知し、10 月 31 日 11:00 までに入札書類を提出するように指示した。入札の日程は以下の通りである。

10 月 25 日	8:00～15:00	業者に入札図書配布
10 月 31 日	11:00	入札書類提出締切
10 月 31 日	11:05～15:00	開札・評価

4）10 月 31 日、WRUA 調達サブ委員会議長、WRMA サブ地域事務所長（代理マイナ氏)、プロジェクト業務主任、プロジェクト現地スーパーバイザーの立会のもと、入札会を開催。指名 3 社全てが応札。書類を確認したところ、応札 3 社の札はいずれも入札図書に対し responsible であって有効、また、会社の法人登録、実績から本事業を実施する能力があると判断された。

5）入札結果は以下のとおりであった。

	業者名	応札価格(Ksh)	順位
1	Reenah (K) Ltd.	5,295,441.76	2
2	Arc Civil Contractors	5,789,514.88	3
3	Franji Electricals and General Supplies Limited	4,970,000.00	1

開札後、上記 3 社の応札価格を計算チェックした。その結果、Arc Civil 社と Franji 社の計算に間違いがあり修正したが、順位に変動はなく、Franji 社を契約ネゴに招聘した。

	業者名	応札価格(Ksh) 修正後	順位
1	Reenah (K) Ltd.	5,295,441.76	2
2	Arc Civil Contractors	5,780,432.08	3
3	Franji Electricals and General Supplies Limited	4,970,069.49	1

6) 最低価格落札者 Franji 社と、10 月 31 日 14 時から契約交渉を実施。事業に対し、コミュニティ貢献によるインプット（アクセス道路の土のうの提供と土のう工法による施工）が存在すること、小学校が現場であるため安全に配慮すること、また、降雨・出水の際は安全を優先し事業を中断する（プロジェクトマネージャ判断により）ことがあり、それに応じ契約期間は延長されるが金銭保証はなされないこと、等を説明。最低価格落札者はこれに同意。WRUA、WRMA、プロジェクトチーム（主任）に最低価格落札者代表を加えた 4 名でミニッツを作成し、上記説明事項と Franji 社を契約相手とすることを確認した。

7) 以上を持って、プロジェクト業務主任と Franji 社代表の間で 2013 年 11 月 18 日付で契約を取り交わした。

以上

添付：

① DWO 推薦業者リスト
② 指名業者（ショートリスト）選定結果
③ 入札書類提出記録
④ 開札記録
⑤ 応札価格チェック結果

27 August 2013

List of Eligible Prequalified Contractors in Taita Taveta County

No	Name of Contractor	Address	Contractor No	Remarks
1	Katemi General Agencies	P.O. Box 604 Voi	TVT/19/01/2012-2013	Eligible for the whole county
2	Franji Electricals And General Supplies Limited	P.O.Box 434 Taveta	TVT/19/02/2012-2013	"
3	Jyan Construction Services	P.O.Box 42758 Mombasa	TVT/19/03/2012-2013	"
4	Maskuji Contractors Limited	P.O.Box 109 Taveta	TVT/19/04/2012-2013	"
5	Kachero general supplies and contractors limited	P.O.Box 149 Taveta	TVT/19/05/2012-2013	"
6	Arc civil contractors	P.O.Box 56321 Nairobi	TVT/19/06/2012-2013	"
7	Njaka-Njenga (EA) limited	P.O.Box 42426 Mombasa	TVT/19/07/2012-2013	"
8	Mumbe construction	P.O.Box 122 Taveta	TVT/19/08/2012-2013	"
9	Check point general supplies	P.O.Box 72 Taveta	TVT/19/09/2012-2013	"
10	Coast wide enterprises	P.O.Box 2213 Mombasa	TVT/19/10/2012-2013	"
11	Msuya general supplies limited	P.O.Box 72 Taveta	TVT/19/11/2012-2013	"
12	Mjomba Agencies Limited	P.O.Box 420 Taveta	TVT/19/12/2012-2013	"
13	Shakababu Engineering	P.O.Box 87469 Mombasa	TVT/19/13/2012-2013	"
14	Better World Services Limited	P.O.Box 151 Taveta	TVT/19/14/2012-2013	"
15	Market View Investment Limited	P.O.Box 348 Taveta	TVT/19/15/2012-2013	"
16	Mwanzo Taveta General and Hardware	P.O.Box 51 Taveta	TVT/19/16/2012-2013	"
17	Jipe Contractors Limited	P.O.Box 231 Taveta	TVT/19/17/2012-2013	"
18	Reemh (K) Limited	P.O.Box 42381 Taveta	TVT/1918/2012-2013	"
19	Joveta Investments Limited	P.O.Box 72 Taveta	TVT/19/19/2012-2013	"
20	Limasi Contractors Limited	P.O.Box 311 Taveta	TVT/19/20/2012-2013	"
21	Jafena Enterprises Limited	P.O.Box 202 Taveta	TVT/19/21/2012-2013	"
22	Lumazo Company Limited	P.O.Box 48 Taveta	TVT/19/22/2012-2013	"

Benson Mbede
District Water Officer
Taveta.

District Water Officer
Taita Taveta District
P.O. Box 10-80302
Taveta

Evaluation Result

PROJECT ON CAPACITY DEVELOPMENT FOR EFFECTIVE FLOOD MANAGEMENT IN FLOOD PRONE AREAS
EVALUATION FOR SHORTLISTING OF CONTRACTORS

	Bidders	Average Mark	Rank			Evalantors
1	Franji Electricals and General Supplies Limited	65.8	2	Passed	1	Mini Mary Ngaluma
2	Arc Civil Contractors	63.6	3	Passed	2	George Albert Kenyatta
3	Better World Services Ltd	54.4	6		3	Benson Mwamburi
4	Reenah (K) Ltd	68.2	1	Passed	4	Fredy Reuna
5	Limasi Contractors Limited	58	4		5	Beatrace Kazi
6	Jafena Enterprises Limited	57.8	5			

		Evaluator 1						Evaluator 2					
	Marks	1	2	3	4	5	6	1	2	3	4	5	6
Company Profile	15	15	15	15	15	15	15	15	15	15	15	15	15
Totality in Submission Of Documents	25	23	18	23	21	16	16	18	18	23	23	18	23
Financial Position	5	3	3	3	5	3	3	3	3	3	5	3	3
Experience and Capacity	35	33	29	29	33	31	19	33	33	21	33	35	33
Total	**80**	**74**	**65**	**70**	**74**	**65**	**53**	**69**	**69**	**62**	**76**	**71**	**74**

	Evaluator 3						Evaluator 4						Evaluator 5					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Company Profile	15	15	15	15	10	15	15	15	15	15	15	15	15	15	15	15	15	15
Totality in Submission Of Documents	18	16	16	23	18	16	23	16	16	23	16	23	16	16	16	21	16	16
Financial Position	3	3	3	5	3	3	3	3	3	5	3	3	3	3	3	5	3	3
Experience and Capacity	9	15	7	11	11	11	35	35	12	21	31	21	31	32	19	32	13	21
Total	**45**	**49**	**41**	**54**	**42**	**45**	**76**	**69**	**46**	**64**	**65**	**62**	**65**	**66**	**53**	**73**	**47**	**55**

	Qualified Bidders	
1	Reenah (K) Ltd	1
2	Franji Electricals and General Supplies Limited	2
3	Arc Civil Contractors	3

THE PROJECT ON CAPACITY DEVELOPMENT FOR EFFECTIVE FLOOD MANAGEMENT IN FLOOD PRONE AREAS

Record of Opening of Bid Documents for: Construction of Evacuation Facilities

No.	Company Name	Name of Representative	Tender Price (KShs)
1	REENAH (K) LTD	BAZIL MWADIME	5,295,441.76
2	ARC CIVIL CONTRACTORS	WILLIAM OMUCHE1 .	5,789,514.80
3	FRANJI ELECTRICALS & GENERAL SUPPLIES LTD	FRANCIS NJITHIA CHEGE	4,970,000

Date: October 31, 2013

Beatrice

Chairperson Procurement Committee
Lower Lumi WRUA

JICA Project Supervisor
Lower Lumi Project Site

Project Counter Partner
WRMA Nolturesh Lumi
Sub-Region

THE PROJECT ON CAPACITY DEVELOPMENT FOR EFFECTIVE FLOOD MANAGEMENT IN FLOOD PRONE AREAS Attachment 2-4

Record of Evaluation of Bid Documents for: Construction of Evacuation Facilities Date: October, 31, 2013

No.	Company Name	Form of Tender	Form			Company data	Registration	completeness	Tender Price (Kshs)	Lowest
			Form1	Form 2	Form 4					
1	RRENAH (K)LTD	✓	✓	✓	✓	✓	✓	✓Accepted Not Accepted	5,295,44476	
2	Arc Civil Contractors	✓	✓	✓	✓	✓ Audited Report missing	✓	✓Accepted Not Accepted	5,780 [illegible]08	
3	FRANJI Electricals General Supplies Ltd.	✓	✓	✓	✓	Power of Attorney Missing	✓	✓Accepted Not Accepted	4,970.06949	✓

Chairperson Proc. Com`tee Lower Lumi WRUA Name: Beatrace Kazi	JICA Project Supervisor Taveta Project Site Robert Owaga	Project C/P WRMA Nolturesh Lumi sub-Region Joseph Maina	Team Leader JICA Project Hideki Sawa	JICA-Kenya Office Meri Fukai

PRICED BILL OF QUANTITIES FOR THE PROCUREMENT OF WORKS FOR CONSTRUCTION OF EVACUATION FACILITIES											
						Franji Electricals		Arc Civil Contractor		Reenah(k) Ltd	
				Unit	Quanity	Unit Cost (Kshs)	Amount(Kshs)	Unit Cost (Kshs)	Amount(Kshs)	Unit Cost (Kshs)	Amount(Kshs)
1	**Exploitation and Transportation of Soil for Foundation of Evacuation Place and Raised Road**										
1.1	Soil Exploitation and Transportation			Cu.m	320.00	557.90	178,528.00	363.00	116,160.00	1,400.00	448,000.00
2	**Toilet (2 Compartments)**										
2.1	**Earthworks**										
	2.1.1	Common Excavation A	h : 3.0 m - 4.5m	Cu.m	356.00	90.25	32,129.00	363.00	129,228.00	800.00	284,800.00
	2.1.2	Back filling	Sandy material	Cu.m	305.00	140.05	42,715.25	435.00	132,675.00	500.00	152,500.00
	2.1.3	Embankment	Sandy material	Cu.m	2.00	140.05	280.10	4,350.00	8,700.00	500.00	1,000.00
	2.1.4	Back filling	Hardcore filling, Rubble stone bed	Cu.m	5.00	1,637.75	8,188.75	4,350.00	21,750.00	1,000.00	5,000.00
2.2	**Concrete works**								-		-
	2.2.1	Concrete Class 20/20 (1:2:4)		Cu.m	28.00	6,425.65	179,918.20	14,500.00	406,000.00	12,000.00	336,000.00
	2.2.2	Formwork	H < 3.5 m	Sq.m	127.00	1,923.10	244,233.70	580.00	73,660.00	400.00	50,800.00
	2.2.3	Reinforcing bar	Material and Installation	Kg	2,420.00	132.00	319,440.00	218.00	527,560.00	170.00	411,400.00
2.3	**Architectural works**										
	2.3.1	Brick	Bricks t = 150 mm with er-ber	Sq.m	13.00	1,941.40	25,238.20	464.00	6,032.00	1,000.00	13,000.00
	2.3.2	Plastering	Floor t=30mm	Sq.m	12.00	325.40	3,904.80	363.00	4,356.00	400.00	4,800.00
	2.3.3	Plastering	Interior t=20mm	Sq.m	2.00	228.50	457.00	435.00	870.00	400.00	800.00
	2.3.4	Plastering	Exterior t=25mm	Sq.m	17.00	350.90	5,965.30	435.00	7,395.00	400.00	6,800.00
	2.3.5	Plastering	Wainscot t=30mm h=1,300	Sq.m	8.00	257.50	2,060.00	435.00	3,480.00	400.00	3,200.00
	2.3.6	Door	Wooden made	Sq.m	2.00	9,446.75	18,893.50	9,425.00	18,850.00	5,000.00	10,000.00
	2.3.7	Painting	Oil paint for wooden structure	Sq.m	11.00	64.55	710.05	435.00	4,785.00	300.00	3,300.00
	2.3.8	Painting	Oil paint for steel structure	Sq.m	2.00	85.50	171.00	435.00	870.00	300.00	600.00
	2.3.9	Painting	Emulsion paint for interior	Sq.m	2.00	48.25	96.50	435.00	870.00	240.00	480.00
	2.3.10	Wooden Structual	Wooden Truss	Sq.m	1.00	3,562.10	3,562.10	1,813.00	1,813.00	10,000.00	10,000.00
	2.3.11	Steel hand rail		Lin.m	3.00	220.45	661.35	870.00	2,610.00	1,600.00	4,800.00
	2.3.12	Roofing	Pre-painted corrugated galvanized sheet	Sq.m	11.00	537.75	5,915.25	1,885.00	20,735.00	1,200.00	13,200.00
	Total						**894,540.05**		**1,372,239**		**1,312,480**
	Total Amount for Exploitation and Transportation of Soil and Toilet works						**1,073,068.05**		**1,488,399.00**		**1,760,480**

3	**Evacuation Space**										
3.1	Earthworks										
	3.1.1	Common Excavation	h < 1.5 m	Cu.m	30.00	92.25	2,767.50	290.00	8,700.00	800.00	24,000.00
	3.1.2	Back filling type A	Well Compacted Soil	Cu.m	175.56	140.05	24,587.18	580.00	101,824.80	500.00	87,780.00
	3.1.3	Back filling typeB	Hardcore filling, Rubble stone bed	Cu.m	51.11	1,637.75	83,705.40	4,350.00	222,328.50	1,000.00	51,110.00
	3.1.4	Stone Masonry on Foundation		Sq.m	85.00	1,941.35	165,014.75	1,740.00	147,900.00	1,000.00	85,000.00
3.2	Concrete works										
	3.2.1	Concrete Class 20/20 (1:2:4)		Cu.m	20.00	6,425.65	128,513.00	14,500.00	290,000.00	12,000.00	240,000.00
	3.2.2	Concrete Class 2Q(1:3:6)	Levelling Concrete	Cu.m	1.50	6,708.95	10,063.43	12,325.00	18,487.50	12,000.00	18,000.00
	3.2.3	Formwork	H< 3.5	Sq.m	302.00	1,923.00	580,746.00		-	400.00	120,800.00
	3.2.4	Reinforcing bar	Material and Installation	Kg	2,850.00	132.20	376,770.00	218.00	621,300.00	170.00	484,500.00
3.3	Architectural works										
	3.3.1	Concrete Blocks	Bricks t = 150 mm with re-ber	Sq.m	110.00	1,941.40	213,554.00	1,740.00	191,400.00	1,200.00	132,000.00
	3.3.2	Plastering	Floor t=30mm	Sq.m	71.25	325.40	23,184.75	363.00	25,863.75	400.00	28,500.00
	3.3.3	Plastering	Skirting h =100 mm	Sq.m	2.00	228.45	456.90	725.00	1,450.00	400.00	800.00
	3.3.4	Plastering	Interior t=20mm	Sq.m	69.00	228.45	15,763.05	435.00	30,015.00	400.00	27,600.00
	3.3.5	Plastering	Keying	Sq.m	15.00	128.30	1,924.50	435.00	6,525.00	400.00	6,000.00
	3.3.6	Plastering	Wainscot t=30mm h=600	Sq.m	6.30	257.50	1,622.25	435.00	2,740.50	400.00	2,520.00
	3.3.7	Plastering	Lintel t=30mm	Sq.m	10.50	228.45	2,398.73	435.00	4,567.50	400.00	4,200.00
	3.3.8	Door	Wooden Door	Nos	1.00	9,377.00	9,377.00	9,425.00	9,425.00	18,000.00	18,000.00
	3.3.9	Window	Steel Casement	Nos	6.00	5,795.05	34,770.30	11,600.00	69,600.00	8,000.00	48,000.00
	3.3.10	Window Glasses	t=5 mm	Nos	108.00	158.00	17,064.00	653.00	70,524.00	200.00	21,600.00
	3.3.11	Painting	Oil paint for steel Structure	Sq.m	2.60	85.50	222.30	290.00	754.00	300.00	780.00
	3.3.12	Painting	Oil paint for wooden Structure	Sq.m	14.82	64.55	956.63	290.00	4,297.80	300.00	4,446.00
	3.3.13	Painting	Emulsion paint for interior	Sq.m	69.00	48.25	3,329.25	435.00	30,015.00	240.00	16,560.00
	3.3.14	Wooden Structual	Wooden Truss	Cu.m	27.00	4,895.20	132,170.40	1,740.00	46,980.00	12,900.00	348,300.00
	3.3.15	Roof Gutter	Prepainted sheet 150x100x180	Lin.m	20.00	97.65	1,953.00	1,160.00	23,200.00	600.00	12,000.00
	3.3.16	Roofing	Prepainted ciorrugated galvanised sheet	Sq.m	168.00	537.65	90,325.20	1,885.00	316,680.00	1,200.00	201,600.00
	3.3.17	Down Spout	PVC pipe	Lin.m	10.00	148.00	1,480.00	174.00	1,740.00	300.00	3,000.00
		Total Amount for Evacuation Space					1,922,719.51		2,246,318.35		1,987,096.00

4	**Culvert**										
4.1	**Earthworks**										
	4.1.1	Excavation	Sandy material	Cu.m	88.85	600.55	53,358.87	580.00	51,533.00	800.00	71,080.00
	4.1.2	Murraming Gravel mat	Sandy material	Cu.m	0.60	600.55	360.33	580.00	348.00	500.00	300.00
	4.1.3	Backfiling		Cu.m	19.00	600.55	11,410.45	435.00	8,265.00	500.00	9,500.00
4.2	**Concrete Works**										
	4.2.1	Pipe installation	D=900m L=1.0 m	No	20.00	9,635.65	192,713.00	21,750.00	435,000.00	10,000.00	200,000.00
	4.2.2	Concrete Bedding	20/20 (1:2:4)	Cu.m	30.00	23,236.35	697,090.50	17,400.00	522,000.00	12,000.00	360,000.00
	4.2.3	Formwork	H<3.5m	Sq	36.85	1,923.00	70,862.55	580.00	21,373.00	400.00	14,740.00
	4.2.4	Reinforcement	Bar arrangement	Kg	748.00	284.10	212,506.80	261.00	195,228.00	170.00	127,160.00
	4.2.5	Headwall	Concrete 15/20(1:3:6)	Cu.m	1.86	17,465.65	32,486.11	5,075.00	9,439.50	12,000.00	22,320.00
	4.2.6	Apron	Concrete 15/20(1:3:6)	Cu.m	1.03	17,443.20	17,966.50	5,075.00	5,227.25	12,000.00	12,360.00
		Total					1,288,755.10		1,248,413.75		817,460.00
Total (KSH)							**4,284,542.66**		**4,983,131.10**		**4,565,036.00**
16% VAT							**685,526.83**		**797,300.98**		**730,405.76**
Grand Total							**4,970,069.49**		**5,780,432.08**		**5,295,441.76**
Submitted Bid Price							**4,970,000.00**		**5,789,514.88**		**5,295,441.76**
							Franji		**Arc**		**Reenah**

付属資料 3-26

Exchange Visit to Nyando and LOGUMI

The Project on Capacity Development

for

Effective Flood Management in Flood Prone Areas

Exchange Visit to Nyando River Basin

and

Lower Gucha Migori Sub-Catchment

April 2013

Japan International Cooperation Agency

NEWJEC Inc.

1. Objective

- To exchange the knowledge and experiences already in place in Nyando River basin and three piloted WRUAs;
- To learn good practices in flood management in the Nyando River basin; and
- To enable the WRUAs with the three pilot project to have a perspective and ideas on what is to be formulated in the effective community based flood management plans in the three pilot areas.

2. Overall Itinerary

Place	Activity	Time	
		Arrival (Start)	Departure (End)
24/03/ 2013 Sunday			
Kisumu	WRUAs to move from their places to Kisumu by a chartered car(mini bus) Stay in **Kisumu**	8:00(Lumi and Isiolo) 14:00(LOGUMI)	17:00
25/03/ 2013 Monday			
WRMA SRO Kisumu	Orientation meeting at WRMA SRO	09:30	10:00
Mowlem village	Meet with Rae Primary School management observe the borehole and evacuation centre	10:45	12:05
Rae Village	Observe the small culverts constructed in Rae village	12:15	12:30
Kamuga Village	Meet with Kamuga CFMO and school teachers and observe lesson on flood education programme and observe structures in the schools	12:45	14:05
Ahero	Lunch	14:35	16:00
Kokwaro village	Observe raised road and evacuation centre at Kokwaro constructed under the master plan (30 min)	16:45	17:55
Vunduba Hotel	Dinner	19:45	21:15
Vunduba Hall	Projection of Evacuation Drill Video for participants to observe	21:25	22:15
26/03/ 2013 Tuesday			
Kamagaga village	Observe the evacuation centre, flood hazard map signboard, small directional signboard and footbridge	10:30	11:45
Achuodho village	Presentation and discussion in the evacuation centre	12:30	14:30
Ahero	Lunch	15:00	16:00
On road traveling to Lower Gucha Migori 3 hours drive Participants except LOGUMI WRUA to stay in **Kisii**		16:30	19:00
27/03/ 2013 Wednesday			
LOGUMI WRUA Office at	Explanation of community based flood observation and early warning system by LOGUMI WRUA	11:00	12:00

Wathonger			
ditto	Explanation of community based flood hazard mapping by Mr. Joshua, Secretary of LOGUMI WRUA and Mr. Boit, WRMA LVS RO	12:00	13:00
Kabuto and Nyora village	Observation of flood affected areas	13:15	15:45
LOGUMI WRUA Office at Wathonger	Lunch	16:00	17:00
	Move to Kisii	16:00	18:00
	Stay in Kisii		
28/03/ 2013 Thursday			
Gucha Migori River at Wathonger	Explanation of flood water discharge observation by using ADCP and demonstration of flood water discharge observation by using ADCP by WRMA LVS RO	09:45	11:15
LOGUMI WRUA Office at Wathonger	Explanation and discussion on ADCP by Eng. Thooko	11:20	11:50
LOGUMI WRUA Office at Wathonger	Plenary discussion on the Nyando and LOGUMI Visit (good practices) moderated by Prof. Onyando	11:50	12:50
LOGUMI WRUA Office at Wathonger	Lunch	13:00	14:00
Move to Kisii		15:30	17:00
Stay in Kisii			
29/03/ 2013 Friday			
On road traveling from Kisii to Nairobi		07:30	14:00
On road traveling from Kisii to Taveta		07:30	18:00
On road traveling from Kisii to Isiolo		07:30	18:00

3. Participating Organization during the site visits

i. Ministry of Water and Irrigation (one person);
ii. WRMA Headquarters (Four persons);
iii. WRMA Regional Offices (Athi, Ewaso Ng'iro, Lake Victoria South) (one person per each Regional Office);
iv. WRMA Sub-regional Offices (Nolturesh-Loitoktok, Isiolo, Kisii and Kisumu) (1 to 2 persons per each Sub-regional Office);
v. WRUA from three pilot project areas (Lower Lumi, Isiolo and LOGUMI WRUAs) (two persons per WRUA safe for LOGUMI WRUA that had seven persons participating);
vi. Project Team (Five persons); and
vii. GIZ (One person).

4. Other Organizations involved in accompanying or receiving the team

i. WRMA Sub-regional Office that accompanied the team to Nyando River Basin;
ii. Nyamasaria WINAM WRUA (Two persons accompanied the team during day 1 visit);
iii. River Nyando WRUA (Three persons accompanied the team during day 1 and day 2

visit);

iv. Kano Plains WRUA (One person accompanied the team during day 2 visit);

v. Rae Primary School Management Committee (Received the Team at Rae Kanyaika Primary School);

vi. Mowlem CFMO (Received the Team at Rae Kanyaika Primary School);

vii. Rae Kanyaika CFMO (Received the Team at Rae Kanyaika Village);

viii. Ofunyu Primary School Management Committee (Received the Team at Ofunyu Primary School);

ix. Kamuga CFMO (Received the Team at Ofunyu Primary School in Kamuga Village);

x. Kokwaro CBO (Received the Team at Kokwaro Village);

xi. Kamagaga CFMO (Received the Team at Kamagaga Village); and

xii. Achuodho CFMO (Received the Team at Achuodho Village).

6. Major Findings

6.1 Nyando River Basin

i. The Nyando River Basin is heavily affected by floods that adversely affect the community that live within the basin. The Nyando Project on flood management has led to reduced human suffering and casuality during floods as a result of both structural and non-structural measures that have been undertaken in the basin;

ii. The education programme on Flood Management is still being undertaken in some of the school where the Nyando Project was undertaken that has led to high level of sensitization on flood management among pupils in school;

iii. The raised toilets, evacuations centre and borehole plays an important role in the area because they enable communities to access these structures in spite of the floods in the area. There are community members who have raised the foundations of their toilets in their homes as modeled by toilets constructed in the Nyando Project;

iv. Community members through the CFMOs are operating and maintaining the various structures constructed within the Nyando basin;

v. The CFMO members in most areas still have dependence mentality and this is due to their reluctance in joining WRUAs that will enable the CFMOs to access funds through the WRUA to implement the various CAPs items that they developed. The CFMOs still depend on the external help rather than reach out and release the enormous potential that is within the basin including joining the WRUA; and

vi. There are gaps that need to be abridged between WRUA and CFMOs. WRMA is yet to make a follow up in strengthening the communities under the Nyando Project and this

can be attributed to the Nyando Project Implementation strategy wherein the Project entry point was CFMO rather than WRUAs wherein WRMA is able to interact with directly. One of the way forward as per the discussion was to eliminated the gaps, whereby WRMA-LVSC Kisumu Sub-regional Office indicated that they will make a follow up, harmonize the activities of the CFMOs and the WRUAs and ensure that the CFMOs join the respective WRUA and work together as a team.

6.1 Lower Gucha Migori Sub-catchment

i. The LOGUMI WRUA are actively involved in flood management in the sub-catchment and they have established a flood management committee that is charged with flood management within the WRUA;

ii. The LOGUMI WRUA have a well established communication channels within the various committees within the LOGUMI WRUA that enables them to effectively develop various tools for example the early warning hydrograph; and

iii. The LOGUMI WRUA members are sensitized on the issue of flood management and this has led for the WRUA to develop three flood hazard maps within the sub-catchment;

7. Meetings

7.1 Meeting at Rae Kanyaika Primary School in Mowlem Village

The meeting took place on 25th March 2013 at Rae Kanyaika Primary School and it was attended by the Project Visiting Team, Head Teacher, Deputy Head Teacher, Teacher that was involved in the education Programme on Flood Management, parent teacher association (PTA) chairperson, and members of the Mowlem CFMO.

Participants make comments during the visit at Rae School

The following salient issues were discussed:

- ✓ Flooding condition: The villages near the school are affected by floods including the school and in 2006 the school was inundated for three to five days and the community members evacuated to the inundated school because the flood depth was better than in the homes. The raised evacuation centre, toilets and borehole plays an important role in area because even when the school gets inundated the structures in the school are not affected because the structures are above the flood inundation depths;

- ✓ Cooperation between the School, Mowlem CFMO and Nyando Project: It was evident that there was a close working relationship between the CFMO and the School. It was also evident the cooperation began from the onset of the Nyando Project with the School allowing the evacuation centre, toilets and borehole to be constructed in the school for mutual benefit of the school and the community;
- ✓ Education Programme on flood management: The Education Programme on flood management was undertaken in the school and at the request of one of the participants from the Project visiting Team, two pupils made a simple presentation on the causes of floods and effect of floods in the area. The teacher also explained that they were trained on infusing flood management subject into the regular school curriculum subjects like Science, Social Studies even English;

Pupils of Rae Primary School make a presentation

- ✓ Operation and Maintenance (O&M) of the Structures: The Head Teacher pointed out that the Nyando Project incorporated the school teachers into the O&M committees of various structures and that the teachers were also trained on O&M. The teachers and the CFMOs through cooperation are therefore both involved in O&M of various structures.
- ✓ Mowlem CFMO: Mowlem CFMO started as a CBO that was registered with Ministry of Social Services. Mowlem Community were organized and participated in the CAP development that led to the CBO being transformed to CFMO. Mowlem CFMO has held two separate elections and the current office bearers are not the same with the ones that were office bearers during the Nyando Project. The CFMO works closely with the school management in the management of various facilities.

7.2 Meeting at Rae Kanyaika Village

The meeting took place on 25th March 2013 at Rae Kanyaika Primary School and it was attended by the Project Visiting Team, and chairperson of the Rae Kanyaika CFMO.

The following salient issues were discussed:

- ✓ Operation and Maintenance of the Structures: The CFMO Chairperson pointed out the difficulties the CFMO faces in maintaining culverts within the village. O&M of culverts is voluntary and lacks any incentives for the community members to be involved in the maintenance.

Explanations on small culverts

Vandalized culvert slab pavement

- ✓ Vandalism: Rae Kanyaika CFMO chairperson pointed out that vandalism was a big problem in the village. He stated that the slab pavement on one culvert was vandalized by a community member. He also pointed out that all the signboards installed in the village had been vandalized.

7.3 Meeting at Ofunyu Primary School in Kamuga Village

The meeting took place on 25th March 2013 at Ofunyu Primary School and it was attended by the Project Visiting Team, Head Teacher, Deputy Head Teacher, Teacher that was involved in the education Programme on Flood Management, parent teacher association (PTA) chairperson, and members of the Kamuga CFMO.

The following salient issues were discussed:

- ✓ Cooperation between the School, Kamuga CFMO and Nyando Project: It was evident there was cooperation between the school and CFMO at the onset of the Nyando Project with the School allowing the evacuation centre, toilets and borehole to be constructed in the school for mutual benefit of the school and the community. Though it appeared that there were gaps emerging in their relationship. The Head Teacher pointed out that the keys to the evacuation centre are with the CFMO chairman that makes it difficult for the school to use the facility when there are no evacuees. The Kamuga CFMO and Ofunyu School both mutually agreed to join Nyamasaria Winam WRUA.

Question and answer session

- ✓ Education Programme on flood management: The Education Programme on flood management was undertaken in the school. The Project visiting Team witnessed a flood management subject being infused into social studies lesson. The class seven pupils were engaged by their teacher in a question answer session on issues related to flood management.
- ✓ Operation and Maintenance (O&M) of the Structures: The CFMO members pointed out that they had established O&M committees of various structures. The community members use the borehole for their domestic use and are charged two Kenya Shillings per twenty litre gallon. The CFMO members have managed to undertake repair works of the borehole whenever there is a breach to any of the borehole parts.

7.4 Meeting at Kokwaro Village

The meeting took place on 25th March 2013 at Kokwaro village and it was attended by the Project Visiting Team and Kokwaro CBO.

The following salient issues were discussed:

- ✓ Flooding condition: The village is affected by floods that cut off the various roads that link the village. The major cause of floods is the heavy siltation of R. Miriu that leads

to flooding in the village anytime it rains in the upstream;

- ✓ Operation and Maintenance of the Structures: The evacuation centre is used as a nursery school that has help increase the enrolment of pupils in the area. The Kokwaro CBO on their own finds it difficult to maintain the centre due to heavy infestation of bats in the evacuation centre ceiling board. The evacuation centre is also constructed in a raised place within the village and therefore its foundation is not raised. O&M of the raised road is poorly undertaken in the village with most parts of the roads having been breached by community members who point out the raised road acts as a dyke and thereby leading to homes that hitherto had not experienced inundation during floods to be inundated and thereby making these communities to break some parts of the road to allow ease flow of water.

Kokwaro evacuation centre

- ✓ Kokwaro CBO: Kokwaro joined Kano Plains WRUA and through the WRUA they have written a proposal to desilt R. Miriu to WSTF and they are currently waiting for a feedback from WSTF.

7.5 Meeting at Kamagaga Village

The meeting took place on 26th March 2013 at Kamagaga evacuation centre and it was attended by the Project Visiting Team and members of the Kamagaga CFMO.

The following salient issues were discussed:

- ✓ Evacuation Centre: The evacuation centre accommodates three hundred people but affected persons are more than six hundred persons. The neighbouring villages also desire to have an evacuation centre and Kamagaga CFMO discussed with this village on the ways of raising funds for an evacuation centre like proposal writing. The CFMO has raised money from the evacuation centre through hiring of the facilities for other social functions and educational seminars but still the CFMO feels that they should be assisted in erecting a fence around the evacuation centre.

Meeting at Kamagaga Evacuation Centre

- ✓ Raised toilets: The CFMO pointed out that the two compartment toilet vis-à-vis the six hundred persons that evacuated at the place was overstretched. The CFMO has

not ventured or even written a proposal to any organization on toilet expansion.

- ✓ Footbridge: The CFMO pointed out that the footbridge was of great assistance to the pupils that cross the water channel in order to access Kigoche School and this has led to increased enrolment at the school.
- ✓ Operation and Maintenance of the Structures: Kamagaga CFMO members engage in O&M of structures within their village. The chairperson pointed out that some members only enjoy the benefit of the structures but cannot be involved in the maintenance of these structures unless there is a financial incentives promised to them.

7.6 Meeting at Achuodho Primary School in Achuodho Village

The meeting took place on 26th March 2013 at Achuodho Primary School and it was attended by the Project Visiting Team and members of the Achuodho CFMO.

The following salient issues were discussed:

Plenary discussion held at Achuodho evacuation centre

- ✓ Operation and Maintenance of the Structures: The CFMO Chairperson pointed out the difficulties the CFMO faces in maintaining structures within the village. O&M of borehole is voluntary and lacks any incentives for the community members to be involved in the maintenance. The community members only pay two shillings per twenty litre gallon when there is water scarcity in the area. The evacuation centre is used as a nursery school when there are no floods and the fees charged on pupils is minimal that carters only for nursery school teacher and cannot be used for maintenance purposes.
- ✓ Achuodho CFMO: Achuodho CFMO members had met and unanimously agreed to join the WRUA. The only challenge the CFMO was facing was identifying the right WRUA wherein Achuodho village lies in its jurisdiction. The Nyando WRUA pointed out that Achuodho village is located within Kano Plains jurisdiction.

8. Good Practices in flood management in Nyando River Basin

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 obsereved in the video 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 at the 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 stagnant paradigm has been that floods or any other disaster can only be handled by government or KRCS. Nyando case reveals that flood management can 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 easily be done by community 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 constructed 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. This kind of 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.

9 Way forward after the Nyando excursion visit

i. Establish the steps and processes involved in implementing education programme on flood management that are idiosyncratic to the respective pilot project area;

ii. Develop manual for the good practices in Nyando River Basin and how these good practices can be replicated in the pilot project areas;

iii. Develop construction model for flood prone areas wherein the foundations are raised above the flood depths. This model is thereafter shared with other government agencies, Ministries, Stakeholders and school as appropriate model in flood prone areas; and

iv. Community Sensitization and awareness of the advantages of raising the foundations using locally available materials for the houses that they construct in their homes.

10. Exchange Visit to Lower Gucha Migori SC

10.1 Day 1

Target for Day 1: a) Explanation by LOGUMI WRUA how they developed a community based early warning system using a simple community developed hydrograph. b) Training on community based flood hazard mapping. c) Visit the two most affected villages i.e. Kabuto and Nyora villages.

Observations:

1) The LOGUMI WRUA gave a graphic description on how they developed the community based hydrograph, the WRUA faced when developing the hydrograph and the advantages of the community developed hydrograph;
2) WRMA-LVSC RO Staff explained the processes and steps involved in community flood hazard mapping. He also elaborated on the advantages of community flood hazard map to WRMA and to the community; and
3) The Project visiting Team observed the former channel of R. Gucha Migori at KUDISA which is an acronym that implies Kuja Disaster, the evacuation places within the two places, the school that was relocated as a result of flood disaster and the difficulties the community members face when trying to access the Kabuto Health Facility.

Conclusion: The target for day one activities was realized. It also emerged that the place where community members seek refuge are also vulnerable to flooding and also due to the nature of the buildings within the school the evacuation places are also vulnerable to outbreak of diseases and epidemics.

10.2 Day 2

Target for Day 2: a) Explanation of flood water discharge observation by using ADCP and

demonstration of flood water discharge observation by using ADCP and thereafter plenary discussion based on the above mentioned explanation. b) Discussion excursion visit to Nyando River Basin.

Observations:

1) WRMA-LVSC RO Staff explained to the Project visiting Team how ADCP is used in determining high flows and discharge. He also explained the rating curve and its purpose. Thereafter he gave a practical demonstration on how to use ADCP;
2) During the plenary discussion various questions were asked, herein is a summary of the questions asked: how can the data that WRMA have be shared with WRUA in order for the WRUA to improve on their hydrograph and on importance of imparting simple monitoring techniques to the WRUA members and the possibility of engaging ADCP in areas like Isiolo; and
3) The plenary discussion on the excursion visit to Nyando and exchange programme to LOGUMI SC revealed that there are good practices that are worth emulating and being replicated in the three pilot project area but also that there were very good example from LOGUMI WRUA that other WRUA from Lower Lumi and Isiolo stated that they are going to replicate them in their area. The table below is a summary of the points noted during the discussions.

Point of Discussion	Comments
1. Findings and good practices in LOGUMI	✓ The awareness on flood management is high; ✓ LOGUMI WRUA are Self driven(take initiatives); ✓ There is good governance (there is flood management structure developed within the WRUA). LOGUMI WRUA have integrated flood management committee to the WRUA; ✓ The LOGUMI WRUA have an established office that they have rented and they are paying rent regularly; ✓ The LOGUMI WRUA on their own have developed three community flood hazard maps; ✓ LOGUMI WRUA members are passionate and action oriented that has made them turn around vulnerability into opportunity; ✓ LOGUMI WRUA have good communication skills; ✓ LOGUMI WRUA is all inclusive in terms of the youth, the aged, women and the views are well

	represented; ✓ LOGUMI WRUA have incorporated flood management activities into their SCMP
2. Experiences from Isiolo and Lower Lumi and reflection to them	Isiolo WRUA observations ✓ There is effective team work within LOGUMI WRUA; ✓ WRMA has well developed infrastructure for data collection in LOGUMI SC and LOGUMI WRUA can use this data; ✓ LOGUMI WRUA are proactive and they can easily maintain structures within their SC; ✓ Isiolo area suffer from shortage of water while LOGUMI suffer from volumous overflow of water and the Isiolo WRUA can learn how LOGUMI manages their SC Lower Lumi Observations ✓ Impressed with management skills of LOGUMI and Lower Lumi aims at taking up all the good practices that they have observed in LOGUMI SC
3. Way forward	✓ Review of the community flood hazard map; ✓ Networking and collaborating with other stakeholders; ✓ Irrigation Project by NIB, that implies that Irrigation Water Users Association are going to be established and therefore there is need to strengthen WRUA and how to work together with WUAs; ✓ Infusing Flood Management Subject into School curriculum; ✓ Data collection i.e. WRUA being involved in collecting hydrological data within the SC; Challenges ✓ Representation of the WRUA based on flood prone areas or geographical coverage of the SC? Need to ensure that LOGUMI WRUA sensitizes the whole SC
4. Next Step	✓ WRMA Sub-regional office to write a concept

	note that entails networking and collaboration of stakeholders within the LOGUMI SC and how to implement the LOGUMI SCMP; ✓ Collect the secondary data and written materials on disaster management in the respective SCs

9 PHOTO ALBUM

9.1 Excursion visit to Nyando and Exchange Programme

Place : WRMA-LVSC Kisumu SRO
Description :Orientation meeting during the Nyando River Basin excursion visit. Project Team leader explains the forms distributed to participants

Place : Evacuation Centre at Rae Primary
Description : Explanation of the education programme on flood management by a school teacher who participated in the programme

Place : Rae Kanyaika Primary School
Description :Project visiting Team observe the raised toilet

Place : Ofunyu Primary in Kamuga Village
Description :The Head Teacher explains the various structures constructed at the Ofunyu School

Place : Ofunyu Primary in Kamuga Village
Description : Project visiting Team observe the raised borehole

Place : Ofunyu Primary in Kamuga Village
Description : A simple rain gauge developed by school pupils

		
Place : Kokwaro Village Description :The damaged road infrastructure that makes accessibility difficult		Place : Kokwaro Village Description :Raised road at Kokwaro to enhance accessibility during floods
		
Place : Vunduba Hotel Description :Project visiting Team observe an evacuation drill video		Place : Kamagaga Village Description : Project visiting Team observe and listen to explanation on the community flood hazard map that is pasted on a signboard
		
Place : Kamagaga Village Description : Project visiting Team observe and listen to explanation on the footbridge		Place : Achuodho Village Description :Plenary discussion at Achuodho village on integrated flood management in Nyando River Basin

9.2 Exchange Programme to LOGUMI SC

			
Place : LOGUMI WRUA Office Description :LOGUMI WRUA Secretary explains the community developed early warning system in LOGUMI SC		Place : LOGUMI WRUA Office Description :WRMA-LVSC RO Staff explains the community flood hazard map	
			
Place : KUDISA Area Description : Project visiting Team observe and listen to explanation on the former R. Gucha Migori channel		Place : R. Gucha Migori at Kabutoarea Description :Debris deposited in the area including heavy wooden logs that raises the riverbed levels	
			
Place : Kabuto Village Description : Project visiting Team observe Kabuto Health Centre from a distance after finding difficulty in accessing the facility due to poor road conditions		Place :Nyora Primary School in Nyora Village Description : Project visiting Team listen to the school teacher's explanations on the challenges the Nyora Primary School face during floods	

		
Place : Kabuto Village Description : Some of the Project visiting Team opts to use canoe to crossover to Nyora village		Place : Wath Onger Bridge Description : WRMA staff and local community members set up the place for explanation on how to use ADCP
		
Place : Wath Onger Bridge Description : WRMA-LVSC RO staff explains how to use ADCP		Place : Wath Onger Bridge Description : WRMA-LVSC RO staff practically demonstrates how ADCP is used
		
Place : LOGUMI WRUA Office Description :Plenary discussion on how to use ADCP and how the data therein can be used in flood management		Place : LOGUMI WRUA Office Description :One of the participants explains the good practice he noted during the exchange programme during the final plenary discussion

付属資料 3-27

Minutes of Forum on Flood Management and Community based flood Early Warning System

MINUTES OF MEETING
OF
THE FORUM
ON
FLOOD MANAGEMENT AND
COMMUNITY BASED FLOOD EARLY WARNING SYSTEM
FOR
THE PROJECT ON CAPACITY DEVELOPMENT FOR EFFECTIVE FLOOD MANAGEMENT IN FLOOD PRONE AREA
IN
THE REPUBLIC OF KENYA
HELD ON 24TH AND 25TH JUNE 2014
AT
GREENPARK HOTEL IN TAVETA
AGREED UPON BETWEEN
WATER RESOURCES MANAGEMENT AUTHORITY (WRMA)
AND
JICA PROJECT TEAM

Nairobi, 26th June 2014

Eng. John P. Olum Chief Executive Office Water Resources Management Authority	Mr. Katsuro Kondo Chief Advisor JICA Project Team
Eng. Wilfred Matagaro Deputy Technical Coordination Manager (Flood Management) Water Resources Management Authority	Mr. Hideki Sawa Team Leader JICA Project Team

The Forum on Flood Management and Community Based Flood Early Warning System (hereinafter referred to as the "Taveta IFM Forum") on the Project on Capacity Development for Effective Flood Management in Flood Prone Area in the Republic of Kenya (hereinafter referred to as "the Project") was held on 24th and 25th June 2014. Attendance list is shown in **Attachment 1**. As the result of the discussions, the attendees confirmed the following issues:

Day 1: 24th June 2014

The morning session began at 8:30 am with self-introductions by each participant.

1. Opening Remarks Eng. P. Olum, CEO/ Eng. Kinyua, TM WRMA HQ

The CEO in his opening remarks acknowledged and appreciated the Taveta, Isiolo, Meru and Migori county governments' representatives for attending the IFM Forum. He called upon the WRMA staffs to always recognize the importance of county governments in development.

He further pointed out that Flood Management was an integral part of Water Resource Management. He further explained that Integrated Flood Management (IFM) had been incorporated in WRMA Strategic Plan 2012-2017. He added that WRMA was currently in the process of reviewing the Catchment Management Strategies (CMSs) and that flood management had been incorporated in the CMSs. He added that WRMA intends to strengthen the department of Flood Management. He pointed out that county governments should also be actively involved in Flood Management in their respective counties.

He further elaborated that the Project had constructed structures for flood management and that these structures should be properly maintained. He therefore reiterated the cooperation between WRUA, WRMA and County governments as an important factor for successful implementation of flood management. He stated that WRMA had fostered a close relationship with Kenya Red Cross Society (KRCS) which he emphasized that the relationship should be nurtured and strengthened and that the county governments in flood prone areas should be part of this effective flood management relationship.

In his conclusion the CEO extended his warm gratitude and appreciation to Government of Japan for their continuous assistance in flood management in the country. He therefore stated that on behalf of the Government of Kenya (GOK), WRMA Board and WRMA appreciated the efforts of JICA. He finalized his speech by stating that he hoped that JICA will continue to assist Kenya in Flood Management especially in the mainstreaming of integrated flood management.

2. Opening Remarks Taita-Taveta County Government

The Chief Officer for Water in Taveta County represented the Governor. In her opening remarks, she stated that through the Taveta County government more structural measures were going to be constructed in Taveta. She further stated that she was going to share the report with the Taveta County Executive to strengthen flood management component in Taveta. She stated the Taveta County government was ready and it was going to cooperate fully in effective flood management with WRMA.

She concluded her remarks by stating that her office was already in a working relationship with the WRUAs in Taveta and that the relationship between WRUA and Taveta County government in flood management was going to be strengthened.

3. Opening Remarks Meru County Government

Mary Muthoni, a Water Quality Officer with Meru County government represented the Meru Governor. In her brief opening remarks she stated that the Meru County government was going to cooperate fully with WRMA in flood management.

4. Opening Remarks JICA Project Team

Eng Kondo, Chief Advisor of the JICA Project Team in his opening remarks pointed out that Japan Government started cooperation with Government of Kenya nine years ago. He thereafter explained the background of JICA assisted flood management projects in Kenya. He stated the Nyando Project proved that it was possible for community based flood management. He thereafter explained the current Project, the scope of engagement and objectives of the PCDEFM.

He concluded his opening remarks by stating that WRMA and WRUA institutional framework on flood management had been strengthened. He appreciated the effort of WRMA in appointing Flood Management Officer all across the country especially in flood prone areas. He finalized his opening remarks by explaining that effective flood management demanded an integrated approach that involves all the key stakeholders.

5. Opening Remarks WRMA Board Director

Hon. Johnstone Mwalulu the WRMA Board Director in his opening remarks stated that he was born and raised in Taveta and that his home was the area that was heavily affected by floods. He explained to the participants that the pain the inhabitants of Taveta have gone through as a result of floods.

He sincerely appreciated the effort of JICA in flood management in Taveta. He stated that it was important that flood management should be institutionalized. He stated that for effective flood management there must be cooperation between all the stakeholders. He pointed out that as a member of the WRMA Board he was going to request WRMA to strengthen the flood management department. He thereafter declared the Taveta IFM Forum opened.

6. Situation report of community based FEWS installation from the pilot project areas Isiolo WRUA

Mr. Karimba, chairman of Isiolo WRUA, made a presentation on the situation report on FEWS for Isiolo SC. He explained that he had worked in the Ministry of Water before he retired. He explained that Isiolo WRUA was established in 1997 due to water scarcity problems in Isiolo. He thereafter explained the water conflicts in Isiolo County. He thereafter gave a summary of installed Community based Flood Early Warning System (CBFEWS) in Isiolo. He further explained to participants that there trainings that Isiolo WRUA had received on the CBFEWS.

He thereafter explained the purpose of inventory for the CBFEWS. He thereafter explained the challenges encountered in the operation of the CBFEWS. He pointed out that Isiolo County is yet to experience heavy floods and therefore few challenges had been noted.

He concluded his presentation by pointing out that it was important in flood management to consider construction of structures that can store flood water that it can be used during in the dry spell in Isiolo County he gave examples of structures as check dams, water pans.

The outline of the presentation by Mr. Karimba is shown in **Attachment 2**.

7. Situation report of community based FEWS installation from the pilot project areas Lower Gucha Migori WRUA

Mr. Joshua Ouma of LOGUMI WRUA in his presentation explained the background of floods in Lower Gucha Migori SC. He thereafter explained the genesis of CBFEWS in Gucha Migori River Basin. In the course of his presentation he pointed out the development of the hydrogragh that was developed by LOGUMI WRUA and thereafter used for flood warning. He further explained that LOGUMI WRUA members had been trained in the art of assembling CBFEW and the trained members had been involved in the installation of rain gauges in the upstream. He thereafter clarified to the participants the cooperation between upstream and downstream WRUA. He thereafter explained the installation of the CBFEWS in four places in Gucha Migori River Basin. He pointed out that because of the vastness of the river basin the WRUA were currently concerned with identifying the amount of rainfall in a particular upstream area and the subsequent impact in the downstream area of LOGUMI SC. He stated that it was important for the WRUA to also understand how long it takes for the water to floow from upstream to downstream after heavy downpour.

He concluded his presentation by explaining the Japan experience and how such experiences could be replicated in LOGUMI SC.

The outline of the presentation is shown in **Attachment 3**.

8. Situation report of CBFEWS installation from the pilot project areas Lower Lumi WRUA

Mr Fred Reuna of Lower Lumi WRUA in his presentation explained the training and installation of CBFEWS and the locations wherein CBFEWS had been installed. He further explained to the participants CBFEWS inventory. He also explained the record sheet and how the observers were filling in the data.

He concluded his presentation by explaining to the participants that the lesson learnt in CBFEWS and the challenges therein. He also clarified the way forwards for CBFEWS in Taveta.

The outline of the presentation is shown in **Attachment 4**.

9. Presentation of the recommendation for nationwide expansion of Community based FEWS in Kenya by Mr. Simon Mwangi, ATCM (FM), WRMA HQ

Mr. Simeon Mwangi ATCM Flood Management made a presentation wherein he explained that WRMA in principle and in practice works together with WRUA in data collection,

analysis and CBFEWS. He explained that the lesson learnt in CBFEWS was varied. He also explained to the participants the training sessions and installation of CBFEWS. He further explained the various CBFEWS experiences. He further pointed out that the lesson learnt from CBFEWS and proposed the way forward which was entirely based on the key role players in CBFEWS. He explained the importance of river basin approach that had its focus on flood management.

He also explained to the participants that it was imperative to note that there was a difference between CBFEWS and FEWS wherein he explained the difference between the two tools. He added that the two tools were not mutually exclusive to each other and that the two tools can be used together in a river basin. He clarified that WRMA was currently rolling out flood management including the CBFEWS in other new basins.

He concluded his presentation by inter-relating the bible verses Genesis. 9:11b and Hosea 4:6 and pointed out that biblical position was that floods should not affect man but when it does affect human beings it was as a result of lack of knowledge. He finalized his presentation by stating that that JICA Project Team had empowered WRMA and WRUA through capacity building in Flood Management and therefore it was up to them to manage floods.

The outline of the presentation is shown in **Attachment 5**.

10. Discussion on the recommendation for nationwide expansion of Community based FEWS in Kenya Republics Moderated by the Chair

There was a session of discussion after the presentations whereby the presenters were nominated as a penal. The discussions revolved around the presentations that had been made. Eng. Matagoro DTCM Flood Management moderated the sessions. He began the discussion sessions by explaining that the floods were indeed affecting the country with dire consequences thereafter. He explained to the participants that floods do not actual warn but rather it was human beings that develop the FEWS that they can use to warn themselves before occurrence of floods. The attendees therefore discussed the following:

- Mr. Gordon of Special Programmes observed that during Mr. Mwangi presentation two key issues emerged the coming up with accurate flood early warning system and also how the information the warning information is relayed to the general public. He observed that there was need for attitude change in the public domain especially how they respond to received FEW. He added that for effective flood management the FEWS in Pilot Project Area should be avenue to prepare and engage in self-help initiatives rather than wait for flood occurrence in order for the humanitarian organizations to provide relief to the affected communities.

- One observer pointed out that there was need for common sign or communication tool that indicates flood early warning he proposed that FEWS language that can be understood by all. It was agreed that it was important to setup the standard of early warning based on river level or amount of rainfall. Mr. Mwangi in his explanation clarified that for CBFEWS had led the community to come up with their own standards that was peculiar to their respective areas and that WRMA was in the process of developing technical standards for FEWS. He further clarified that the framework for flood management within the WRUA had been established. He added that currently lessons learnt are being extracted from the Pilot Project Areas. Mr Karimba pointed out

that there was need to sensitize community members in the upstream on the importance of CBFEWS and the important role that the observers play in early warning.

- LOGUMI WRUA Secretary explained that whistle blowing terminology did not mean that the WRUA uses whistle for early warning but rather the upstream WRUA activities in warning the downstream community was what he meant by whistle blower. He further stated that the flow of information was mainly through mobile phones. He explained that currently LOGUMI WRUA was working out on the timing based on the rainfall based early warning in the upstream and duration it takes to lead to river level rising and thereby leading them to send evacuation warning to the families in flood prone areas.

- Eng. Matagoro on his part pointed out the importance of understanding the processes involved in Flood Management. He stated that the approach to understand Flood Management was in progress and in the pilot areas the education programme.

- Need for Standardized communication system for CBFEWS. Mr. Mwangi acknowledged that the CBFEWS were in place and there were lesson learnt that were being extracted. Ms. Agatha the WRMA Regional Manager Athi stated that the uniqueness of each community and area needed to be taken into consideration and that each community must identify what works for them. Eng. Matagaro pointed out that the experience in Japan brought to fore the element of River Museum in Japan where archives are established that records everything that happens to the river and by the river. He added that this record is documented and therafter preserved in the museum for posterity. Eng. Matagaro further pointed out the need for operation centre in flood prone areas.

- Improvement of policy. Mr. Gordon stated that currently education sector was reviewing the school curriculum and that WRMA should reach out to education sector and influence the incorporation of Flood Management in school curriculum.

11. Presentation on evacuation centre Mr. Kimeu Musau, SRM, WRMA Loitokitok

Mr. Musau the Sub-regional Manager WRMA Loitokitok made his presentation evacuation centre management. During his presentation he gave the background of floods in Taveta. He thereafter explained the planning and designing of evacuation centre. He also explained how the site for construction of evacuation hall was agreed upon. He thereafter explained the designing of the evacuation hall. He also explained the procurement procedures for the contractor. He explained that there were delays experienced during construction which was as a result of heavy rains in the area. He also explained the operation and maintenance of the evacuation centre.

The outline of the presentation is shown in **Attachment 6**.

12. Discussion on evacuation centre Moderated by the Chair

Eng. Matagoro moderated the session and he explained to the participants that the community based project was important and that the same approach should be replicated in other flood prone areas. He emphasized the importance of O&M of structures by WRUA, School committee. He explained the importance of data collection before construction of flood management structures.

The participants held a discussion based on the presentation and the following issues were raised:

- Mr. Gordon pointed out that Mr. Musau should explain to the participants the issues of gender and privacy, counselling, stock piling of food and medicine at the evacuation hall. Mr. Musau pointed out that based on KRCS information that people who evacuate to evacuation halls were the aged, the sick, the disabled and women. He pointed out stockpiling had not been considered in the design stage of the evacuation hall.

- Mr. Nderu pointed out that there was need of clean water at evacuation places and wondered why there were no water harvesting system installed at the evacuation center. He also wanted to know why the toilet was constructed and not the bathroom which could have easily been coupled with the raised toilet. Mr. Musau stated that the school had a water tank, and that the Taveta Governor had also donated another water tank that will curtail the lack of clean water at the evacuation centre. One participant stated that the evacuation hall was small and therefore there was no need to prioritize roof water harvesting at the hall at the expense of the vast roof of the school classrooms. Mr. Gordon stated that the bathroom facility and security of the evacuation hall should be looked into.

- Occupancy of the evacuation hall and consideration of the disable. One participant stated that he had noted that the disability ramp was not constructed or even considered in the design of the evacuation hall. Mr. Musau stated that CBFEWS will enable early warning leading to the disabled to be moved to the evacuation hall early.

- Mr. Njiru of WRMA wanted to know if the construction of evacuation hall using locally available materials just implied the use of burnt bricks or other alternatives like curved stones that are easily available in some areas can be used for walling of evacuation hall. Mr Mwangi clarified that the locally available material that was cheap and easy to access are the one recommended and therefore if the curved stones are the ones that are easily accessible and cheap then the WRUA should consider using such material. He added that lower the cost of construction is lowered the easier it will be for replication in other places.

- Mr. Ngao pointed out that the concerns and issued raised in the Forum should be documented and be used during the replication to avoid repeating the same mistakes again in the new places.

- Eng Matagaro pointed that WRMA and WRUA capacity building had been undertaken under the Project and therefore there was need for those whose capacity had been built to take the initiatives to build the capacity of others in flood prone area. He pointed out that this current Project should be considered as an eye opener.

13. Site visit to community based FEWS and the evacuation centre and Opening Ceremony of Evacuation Centre Organized by JICA Project Team

During IFM Taveta Forum there was a site visit to CBFEWS, the raised toilet, evacuation hall and the raised road. During the site visit there was the launch of evacuation hall and the raised toilet.

The Head teacher stated that the school community was appreciative of the Project that led construction of evacuation hall, raised toilet, the raised road and the culvert. He stated that the school was ready to be involved in the O&M of the constructed structures.

Mr. Musau stated that Flood management had been infused in the school syllabus and that had led to sensitization of pupils in flood management. He clarified the importance of O&M.

Upper Lumi WRUA chair passed a vote of thanks he also pointed out the importance of effective evacuation. He explained the CBFEWs. He stated that it was important for community to put in practice what they have learnt. He explained Japan had inputted money for purposes of effective flood management and expected output was effective flood management by WRMA and WRUA.

Ms. Agatha, Regional Manager of WRMA Athi Catchment Area, pointed out that communities were empowered and not vulnerable anymore and that currently the affected communities were in charge of their destiny. She appreciated WRMA for mainstreaming flood management. She elaborated the cooperation with the county government for effective progress in Flood Management.

Taveta County Chief Officer for Water stated that the Taveta County appreciated the Japan Government. She appreciated JICA Project Team for successful implementation of the project. She appreciated infusion of Flood Management in school and clarified that it was a pointer of effective flood management in the future.

Ms. Fukai, representative of JICA Kenya Office, in her speech appreciated all the stakeholders that participated in the IFM Taveta Forum. She pointed out that hundreds of people in Kenya were affected by floods in 2013. She further emphasis the importance of Integrated Flood Management approach. She explained that Eldoro evacuation hall was a model school for Flood Management.

Mr. Mwalulu director of WRMA stated that the project had been handed to the community and that O&M was the community's responsibility. He added that the capacity of the community had been built in Flood Management and they should now take action in undertaking flood management activities within their areas. He explained the importance of WRUA in water resources management.

PTA chair appreciated the project and in particular the donou road technology that he participated in and can be replicated as a model of rural road construction in Taveta.

Day 2: 25th June 2014

13. Report on riverbank protection in Isiolo Mr. John Kinyuanjui, SRM, WRMA Isiolo

Mr. Kinyajui Sub-regional Manager WRMA Isiolo made a presentation on the report on riverbank protection in Isiolo. In his presentation he gave background information of the Isiolo River Catchment. He thereafter explained the climate, rainfall, topography in Isiolo. He explained the structural measures in Isiolo wherein he gave a background on the procurement of contractor, the purpose of the riverbank protection, the construction works of riverbank. He thereafter gave a comparative view of the pilot site before and after the construction of the gabion works. He also explained the role of community in O&M of the constructed structure which included on job training wherein the implements for O&M were distributed to the community. He explained that O&M manual had been developed though it was still in a draft form. He also explained the challenges experienced during the implementation of riverbank protection. He thereafter clarified the way forward on the implementation of structural measures.

The outline of the presentation is shown in **Attachment 7**.

14. Report on non-structural measures in Lower Gucha Migori Mr. Samuel Njihia, FMO, WRMA Kisii

Mr. Samuel Njihia Flood Management Officer WRMA-LVSC Gucha Migori Sub-regional Office made the presentation on report on non-structural measures in Lower Gucha Migori. During his presentation Mr. Njihia explained to the participants the development of LOGUMI WRUA SCMP.

He further explained the dispatch of Project Supervisor to Gucha Migori which marked a turnaround in flood management in LOGUMI SC. He also explained the assistance the Project Supervisor and WRMA gave towards development of the Community-based Flood Management Action Plan which was later incorporated in the revised SCMP.

He also explained the development of community flood hazard map in LOGUMI SC that led to replication in the other two pilot project areas. He also explained the community effort in flood early warning that led to development of the hydrograph by LOGUMI WRUA. He thereafter explained the CBFEWS in Gucha Migori. He further explained that the lesson learnt extracted from Nyando excursion visit had led LOGUMI WRUA to influence the World Vision to alter the planned toilet and constructed raised toilet that is ideal for flood prone areas. He thereafter explained the disaster management training that was undertaken by KRCS. He explained the education programme on flood management that was undertaken by KRCS which involved training of teachers and thereafter training of pupils. He showed the participants the output of flood hazard map for Sere School that was drawn by pupils.

He further explained to the participants that the capacity building of WRMA Staffs and WRUA member included training in Japan. He thereafter explained the IFMC and the benefits that have been accrued as a result of establishing the IFMC. He also explained the collaboration between the Migori County Government and the LOGUMI WRUA. He explained the installation of CBFEWS. He further explained the establishment of Flood Management Unit at WRMA Kisii SRO.

He concluded his presentation by explaining to the participants the 3rd Stage training that involved WRMA staffs training the LOGUMI WRUA on Flood Management, he shared the photo album for the 3rd stage training. He finalized his presentation by explaining the sentiments of LOGUMI WRUA Chairperson wherein she pointed out the importance of non-structural measures in flood management.

The outline of the presentation is shown in **Attachment 8**.

15. Presentation of draft manuals for structural measures against flood such as "Preparation of evacuation centre" and "Riverbank protection". Mr. Joseph Maina, FMO, WRMA Loitokitok

Mr. Joseph Maina Flood Management Officer WRMA Loitokitok made the presentation on draft manauals for structural measures against floods. In his presentation Mr. Maina explained the coverage of catchment covered by WRMA Loitokitok.

He also explained that the manuals developed were not for use by WRMA only but by all stakeholders. He thereafter explained to the participants how to make a gabion wall, the process of construction of the gabion, he thereafter explained the operation and maintenance of the gabions, and he also explained the observations to be conducted after high water levels.

He thereafter explained how to make evacuation road by Do-nou technology, wherein he pointed that the Do-nou had been approved by Rural Road Authority. He thereafter explained the equipment and material needed for Do-nou. He thereafter explained the process of construction of Do-nou road, he thereafter explained the O&M of the raised road. He thereafter explained the evacuation centre design, he explained construction process for the evacuation centre. He explained the site survey and clearance and thereafter what to do and how to do for every step of construction. He concluded his presentation by pointing out that the manuals were in place and should be used while the implementing structural measures.

The outline of the presentation is shown in **Attachment 9**

16. Presentation of draft manuals for non-structural measures against flood such as "Community based FEWS", "Education for disaster prevention", "Community based flood hazard map" and "Evacuation drill". Ms. Phoebe Orina, CDO, WRMA HQ

Ms. Phoebe Orina Community Development Officer (CDO) WRMA HQ began her presentation by pointing out the importance of non-structural measures in flood management. She explained the background of the WRUA Development Cycle module. She also clarified that WDC module had been revised and Flood Management had been incorporated. She thereafter explained the procurement procedures wherein she explained the role of WRUA and WRMA in procurement of the services to be rendered. She showed the participants a sample of the prequalified contractors list from Isiolo and a sample of evaluation criteria.

She thereafter explained the manual for evacuation drill for flood prone areas wherein she explained the outline of the manual evacuation drill. She thereafter explained the manual on flood disaster education. She thereafter gave the outline of the manual on flood disaster education. She thereafter explained the manual on community-based flood hazard map. She

explained the purpose and objectives of Community Flood Hazard Map, she thereafter explained the outline of the manual of Community based flood hazard map.

The outline of the presentation is shown in **Attachment 10**

17. Discussion on the draft manuals of structural measures, Moderated by the Chair

Mr. Simeon Mwangi ATCM Flood management moderated the session. The participants held a discussion based on the presentations and the following issues were raised:

- Eng Dienya pointed out that there was need for improvement of manuals for structural measures especially on evacuation hall construction where a step on dump proves was omitted but yet an important process in the construction. On the donou road he pointed out that there was need to have slopes by the sides and if possible sodding by grass should be done. Chief officer for Water Taveta County pointed out that the arrangement of the sandbags in the donou road construction needed proper arrangement that glues the sandbag together to avoid them from being washed away. She also wanted to know in places where there were no murram if the normal soil could be used. Slope embankment of the do nou road should be planted with grass. Mr. Njiru pointed out that there were places where stones were readily available and cheap compared to the burnt bricks and wondered in such situation if the stones can be used for walling or just burnt bricks. He also requested for development of generic manuals that can be used without reference to a place. Mr. Maina responded by stating that the arrangement of the sandbags was catered for in the manual. In places where there are no murram, then normal soil can be used. He also explained that the use of bricks or stones depends on the availability of the either material should be used but importance of use of locally available material. He added that the manual provided for the covering of the sandbags that are on the edge. He also stated that consideration of the physically challenged will be considered in the manual

- Community attitude change from reactionary to proactive is being achieved within the WRUA set-up and the community. One participant stated that structural measures like raised toilet should have a ramp for physically challenged to access the toilets. One participant pointed out that SCMP development was always done at different levels and wondered how the flood management can be incorporated where the SCMP had already been developed. Another participant wanted to know whether issuance of completion certificate considered the line ministry. Ms. Phoebe pointed out that issues of such certificate considered the line ministries.

- One participant wanted to know the effectiveness of information early waning shared to the chief in the night and how that information is shared to the public at night. WDC had been revised and flood should be incorporated, areas with SCMPs developed money will be allocated for revision. Completion certificate is issued in collaboration with line ministries. Mr. Mwangi stated that attitude change was in process especially in WRUA but the sensitization should be carried out to the community. One participant stated that the community can use megaphone to reach out to community. Another participant from LOGUMI WRUA shared the experience in LOGUMI SC where CFMOs had been established and that makes it easy for flow of early warning information in the CFMOs.

- Mr Mwangi emphasized on the locally available materials and gave example of interlocking bricks. He also explained the importance of documentation. He stated that

Japan river museum is a good example of documentation for posterity. Development of manuals was a good start of documentation.

18. Discussion on plan for flood management expansion to the 12 flood prone areas (moderated by WRMA FMU, Chair)

Discussion on Plan for Flood Management expansion to the 12 flood prone areas was moderated by Mr. Musau and the following salient issues were discussed

Generic Flood Prone Catchment

- Catchment delineation by July 2014;
- Catchment Description-River system, topography, by July 2014;
- WRUA Inventory - Status (e.g. stage of registration), Capacity Building, SCMP development etc. by August 2014;
- Data Collection and analysis - Baseline Survey, Flood characteristics, developing an inventory for the Hydrometric Network(Determine optimum number of stations in the SC)causes, effects to be done in October, November, December 2014;
- Capacity assessment, stakeholder analysis and their roles within the area -Formation of IFMC for coordination of Flood Management activities by February 2015;
- Sensitization/Orientation for the IFMC - From February 2015(Quarterly);
- Drafting of IFMP should done from January 2015
- Fabrication and installation of FEWS - Automation of FEWS- Correlate it with existing stations to understand implication based on real time data - From June 2015
- Details of collected data e.g. pollution, sediment load etc.
- Identify Funding Sources - GOK,COUNTY Governments, WRMA, NGOs, CBOs, CDF,NBI, Bilateral Cooperation by June 2014
- Capacity Building for WRMA Staffs shall be a continuous exercise;
- Development of DSS - Catchment Modeling by January 2015.

19. Discussion on future activities for WRUAs (moderated by JICA Project Team)

The Chair/Moderator: Mr. Clement Ngida

Secretary: Mr. Joshua Ouma

The Chair began discussion by imploring each WRUA to look at the activities they have embarked on thus far and what new activities are required.

WRUA general comments:

- Taking flood hazard maps to the respective areas and displaying them at the required areas in the community. The WRUA has the mandate to teach each community member including school children.

- Fred Reuna stated that protecting Njoro Kubwa springs by adding dykes inside and outside as well as putting a perimeter wall around the springs.

- Addition of evacuation centers to cater for the high number of people displaced.

- The numbers of FEWS in Lumi are few. There are other gullies which dump their flood waters into the river

- Improving the effectiveness of the Flood Early Warning Communication System to avoid loss of life.

- It was noted that an analysis of partnerships with regards to FEWS with local radio stations can help add effectiveness. The Chair stated that relaying information through radio is sometimes problematic given that some radio stations want proof of scientific info before relaying warning over the radio which may delay evacuation efforts.

- The upper Lumi observer stated that the effectiveness of the communication system is working well given that most of the floods come at mid-night onwards and people don't listen to the radio then.

- LOGUMI WRUA member stated that formation of Community flood management organisations in areas which are flood prone will be able to help add effectiveness to the communication system.

- LOGUMI WRUA stated that the evacuation center at Eldoro Primary lacks some essential things such as:

  (i) Prevention of communicable diseases e.g. nets for preventing Malaria,
  (ii) Lack of proper ventilation,
  (iii) Lack of consideration of the disabled
  (iv) Lack of second exit door. WRUA should be involved during the design period.

- Private sector partnership was regarded as a viable option for improving communications of FEWS through e.g. group text

- Ms. Phoebe (CDO) stated that the envisioned IFMC committees comprising of WRUA members would be able to help address these pertinent issues.

- LOGUMI WRUA secretary stated that FEWS communication system should be integrated into the training for all members to help improve the response capacity of the WRUAs. The chair confirmed that during the Nyando project, there was training carried out which helped the community respond faster.

- The chair also stated that there are catchments which are especially large and there should closer coordination relationship between WRMA, MET department & WRUA where it may involve data sharing to help the effectiveness of the response time.

- The Upper Lumi WRUA chair sated that there should inclusion of WRUA during cross-border discussions for trans-boundary water management since there are issues that arise out of irresponsible water use.

- WRUA should be gazetted to allow for the management of its official work. It was agreed that constitutionally within the Water Act, WRMA is mandated to facilitate formation of WRUAs but there is no provision of within the Act as it stands. The MOU signed between WRMA & WRMA to be looked at.

Self - Help and innovation

- Lower LUMI chair stated that locally available evacuation structures such as granaries, which are usually raised, could be used during floods to shelter during the flood season. Nzyuko noted that WRMA is advising community members to raise all household structures that are being built.

- The Chair as well as members noted that this was a good idea since it can help save lives like in the case of Bangladesh where people build raised sections within their house to prevent against flooding.

Up-stream WRUA LUMI:

- There was an outline of activities that upper Lumi has engaged in since inception. The chair noted that there are issues such as protection of Mzima Springs through tree planting around the area to avoid drying up of the stream.

- Floods will not damage downstream if there are enough measures taken e.g. Dam construction upstream, building of dykes e.g. like those during Colonel Grogan era. The County representative noted that building of dykes and canal draining and planting of trees around Mzima springs have also been included in the county plans for this year.

Upper Isiolo WRUA:

- Water conflict resolution has been enacted to avoid communities from clashing in Isiolo.

- It was noted that there should be close collaboration community flood management officer and the WRMA Flood Management Officer.

- The WRUA chair noted that there should be construction of dams and check dams to harness the flash flood waters.

- It was noted that there have been conservation projects in Isiolo with volunteers working on protection of springs allow for water production.

- WRMA should strengthen the bond between upstream and downstream WRUAS. The WRUA upstream should be educated on soil conservation to avoid soil erosion and degradation.

- Wildlife interference with protection of natural resources.
- It was highlighted that WRUA is the biggest beneficiary and without coordination between upstream WRUAs and those in the downstream.
- Mr. Nzyuko noted that there is need for proper discussions looking into strengthening the tie between WRMA & WRUA especially around revenue collection and allocation to facilitate effectiveness and livelihood.
- Millicent noted that reviewing of SCMPs is a key process moving forward since it will allow for partnership with counties, as well as bring in factors such as livelihoods and climate change.

LOGUMI WRUA

- Integration of flood management with livelihoods to allow for motivation of WRUA members
- Wetlands and reparian zone protection to reduce surface run-off and siltation of our rivers.
- The chair noted that due to the nature of floods, the area needs more rain gauges to help efficient monitoring.
- There is need for building of evacuation centers and footbridges given the magnitude of floods in Lower Gucha Migori.

20. Closing Remarks Mr. Alexender Nzyko DTCM, WRMA HQ

Mr. Nzyko made the closing remarks. He appreciated all the participants for attending the Forum despite their busy schedule. He stated that the Forum was a milestone in flood management in the country because various issues had been raised discussed and a way forward developed. He thereafter declared the meeting closed.

Attachment List

Attachment 1: Attendance List

Attachment 2: Situation report of community based FEWS installation from the pilot project areas Isiolo WRUA

Attachment 3: Situation report of community based FEWS installation from the pilot project areas Lower Gucha Migori WRUA

Attachment 4: Situation report of CBFEWS installation from the pilot project areas Lower Lumi WRUA

Attachment 5: Presentation of the recommendation for nationwide expansion of Community based FEWS in Kenya by Mr. Simon Mwangi, ATCM (FM), WRMA HQ

Attachment 6: Presentation on evacuation centre Mr. Kimeu Musau, SRM, WRMA Loitokitok

Attachment 7: Report on riverbank protection in Isiolo Mr. John Kinyuanjui, SRM, WRMA Isiolo

Attachment 8: Report on non-structural measures in Lower Gucha Migori Mr. Samuel Njihia, FMO, WRMA Kisii

Attachment 9: Presentation of draft manuals for structural measures against flood such as "Preparation of evacuation centre" and "Riverbank protection". Mr. Joseph Maina, FMO, WRMA Loitokitok

Attachment 10: Presentation of draft manuals for non-structural measures against flood such as "Community based FEWS", "Education for disaster prevention", "Community based flood hazard map" and "Evacuation drill". Ms. Phoebe Orina, CDO, WRMA HQ

(End)

Attachment One

Attendance List

Attachment Two

Situation report of community based FEWS installation from the pilot project areas Isiolo WRUA

WATER RESOUCES MANAGEMENT AUTHORITY

JAPAN INTERNATIONAL COOPERATION AGENCY

SITUATION REPORT ON COMMUNITY FEWS INSTALLATION ISIOLO PILOT PROJECT SITE

June 24, 2014

Presented

by

Mr. Felix Karimba

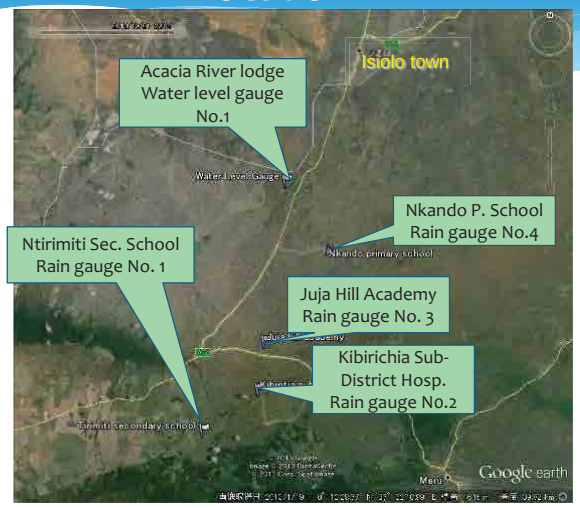
Isiolo WRUA- Chairman

Project on Capacity Development For Effective Flood Management In Flood Prone Areas In the Republic of Kenya

Summary of Installed FEWS

Installed Item	Installation point	Situation
Water level gauge1	At Acacia River lodge (Isiolo WRUA Chairman's house) Altittude 1,474m	Installed (Feb. 2014)
Rain gauge1	Ntirimiti Secondary school (Altitude 2,516m)	Installed (Oct. 2013)
Rain gauge 2	Kibirichia Sub district hospital (Altitude 2,313m)	Installed (Oct. 2013)
Rain gauge 3	Juja Hill Academy (Altitude 2,020m)	Installed (Feb. 2014)
Rain gauge 4	Nkando primary school (Altitude 1,538 m)	Installed (Feb. 2014)

Location

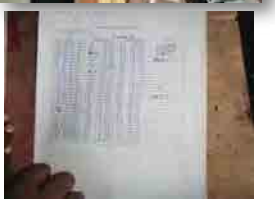


Trainings for FEWS observers

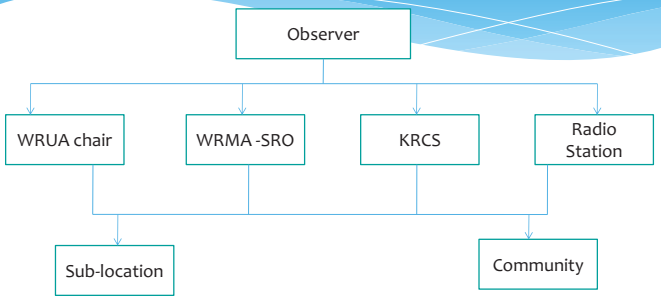
The observers for the Flood Early Warning System were trained on how to assemble both the monitor and the gauge.

With the assistance of KRCS, the observers were trained on how to take and keep records .

A tool set for the maintenance of the FEWS was given to Isiolo WRUA.



Flood warning information dissemination diagram



Inventory of FEWS

- **Objectives for the inventory:**
- To get exact reference location for each FEWS, i.e GPS, administrative area and altitude,
- To observe the FEWS observers progress on data recording,
- To share the challenges observer experiences,
- To observe the effectiveness of the information dissemination diagram,
- To observe the physical condition of the FEWS facilities.

Sample inventory sheet for FEWS

					remarks
Name of Station			Ntirimiti Day Sec. School		
Location	Adress	County	Meru		
		District	Buuri		
		Location	Kibirichia		
		Sublocation	Maroroa		
		Village	Kibirichia		
	Name of River	branch river	West Maroroa		
		main river	Isiolo		
	GPS	X	00° 13' 49"		
		Y	037° 28' 51"		
	Elevation		1513 m		
Installed Month and Year (MM/YYYY)			Oct-13		
Observer	represent	name			
		tel			
		e mail			
	person in charge (if any)	name	Mutwiri K Gitonga		
		tel	0704 20 69 44		
		e mail			
	observer(if any)	name	Mutwiri K Gitonga		
		tel	as above		
Name of WRUA			TAROO		
WRUA	Chairman	name	Felix Kariimba		
		tel	0722727959		
		e-mail	felixkariimba@yahoo.com		
	secretary	name	David Mwiti		
		tel	0720406304		
		e-mail	Davidmwiti09@gmail.com		
	Others (if any)	name	Gocyline Gakii		
		tel	0726255571		
		e-mail	gakiicyline@gmail.com		
WRMA	RO (in charge)	name	Mr. Timothy Multe		
		tel	0724 85 76 16		
		e-mail	timmulte@yahoo.com		
	HRM	name	Mr. John Kinyanjui		
		tel	0722 10 06 67		
		e-mail	mainkinyanjui@gmail.com		
	FWO(or in charge)	name	Mr. Abraham Gitonga		
		tel	0717 76 45 40		
		e-mail	gitonga6@yahoo.com		

condition of device

facility	type (rain/river)	Rain	
	power	Electricity	
	battery for back up	None	
	large sound buzzer	Good	
	LED display	Good	
	overall condition		
container	type(plastic/metal)	Plastic	
	damage by weathering	Fair	
	overall condition	Good	
monitor	recording paper (note)	Available	
	manual is prepared?	Yes	
	well recorded?	Yes	
	contact person lest is show? Yes		

Challenges on operation of FEWS

- There is no clear plan on how to subsidise the power bill for FEWS monitor,
- In dissemination of information on Flood, the observers may run out of airtime in their mobile phones,
- Lack of motivation to observers,
- Continuous training of the observers ,

Way forward

- Installation of solar panel as alternative power supply to FEWS monitors.
- Continuous training for the observers to limit the burden on relying on only a few trained ones.
- Inclusion of motivation package to observers.

Thank You for Listening

Attachment Three

Situation report of community based FEWS installation from the pilot project areas Lower Gucha Migori WRUA

WATER RESOUCES MANAGEMENT AUTHORITY

JAPAN INTERNATIONAL COOPERATION AGENCY

Community Based Flood Early Warning System

24th June, 2014

Presented by
Joshua Ouma Ojwang'
LOGUMI WRUA Secretary

Project on Capacity Development For Effective Flood Management In Flood Prone Areas In the Republic of Kenya

Background of Floods in Lower Gucha Migori Sub-Catchment

Floods in Lower Gucha Migori Sub-catchment are not a new phenomenal but have been on increase in intensity, frequency and impact over time. Based on oral tradition from the senior citizens in the area the history of heavy flood in Lower Gucha Migori is as follows:1947, 1957, 1961, 1963, 1985, 1997-1998, 2006, 2011 and 2012.

Floods affects Nyora Village leading to evacuation of the affected families

Background of Floods Contd.

During flooding there are heavy losses experienced by community members leading to stagnancy in development. Infrastructure damage is vast with disruption of transport networks which negatively impact economic growth in the area, inaccessible health and school facilities etc.

Evacuees walk long distance to collect relief aid because of lack of evacuation centre in the area wherein relief can be brought to.

Damage of transport infrstructure leading to difficult accessibility

Evacuees take a long walk back of about 10KM to the evacuation place after collecting relief aid

What necessitated the development of a hydrograph for purposes of flood early warning

The history of floods clearly indicates that floods have been, are with and will always be in Lower Gucha Migori and thus a need community to come up with coping mechanism.

One of the coping mechanism that WRUA was able to come up with flood early warning that enhances early evacuation. There is River Gauge Station installed in Wath Onger and using data from this station WRUA is able to attain the foreknowledge of possible occurrence of floods.

Automated River Gauging Station at Wath Onger

The manual River Gauging Station at Wath Onger that WRUA also monitor

Record of data from RGS

The community developed hydrograph for flood early warning

Processes involved during the development of the hydrograph:

- LOGUMI WRUA established a proactive flood management committee;
- LOGUMI WRUA established a working rapport with the WRMA assigned RGS metre reader;
- LOGUMI WRUA established a coordination mechanism between various flood management committee members;
- LOGUMI WRUA assigned one of its member to regularly monitor the river levels by reading and recording the levels at RGS;

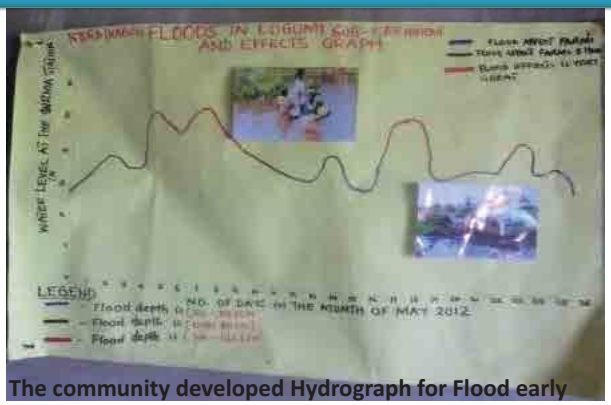
WRUA flood management committee member during flood assessment patrols

Hydrograph for flood early warning Contd.

- After the floods the LOGUMI WRUA flood management committee held a meeting and discussed the river water levels vis-à-vis the flood depths in various parts of affected area;
- LOGUMI WRUA assigned the Secretary to harmonize the river levels vis-à-vis the floods in the affected area
- The Secretary developed a graph that took into consideration the relationship of the two variables the river levels per each day and the flood depth experienced in various places that were affected by floods;
- LOGUMI WRUA called for a general meeting whereby the graph was discussed and improved upon; and
- LOGUMI WRUA adopted the graph as a hydrograph for flood early warning that can be used by WRUA's flood management committee in preparation and response incase of flood occurrence.

LOGUMI WRUA members in a meeting

Example of the community developed hydrograph



The community developed Hydrograph for Flood early warning drawn by LOGUMI WRUA at 24 June, 2012

Merits of the community developed hydrograph in flood management

✓Makes the community to be proactive rather than reactive in flood management,

✓It triggers early evacuation that minimizes the human suffering that is experienced during turbulent evacuation during the flood occurrence,

✓Assists the WRUA to negotiate with relevant evacuation places that will minimize the disruptions of day to day business,

✓WRUA can effectively discuss with relevant agencies and organizations in preparation phase before floods, and

✓Effective planning that enables easy zoning and dispatching flood management committee members to various sites that are affected.

Current status of Community-based FEWS

- LOGUMI WRUA have been trained on how to develop community based River Gauge Gadget that monitors the rising of the river levels and once it reaches a flood threshold depth the alarm rings and the observer is able to warn the community members in the flood plains to evacuate.

Installed river gauge gadget at Wath Onger R. Gucha Migori

Installed sensor and alarm for the river gauge gadget at Wath Onger in the observer's house

Current status of Community-based FEWS Contd.

LOGUMI WRUA have been trained on how to manufacture community based rain gauge and accompaniment of accessories including sensors that monitors the amount of the rainfall and once it reaches a threshold set for heavy rains the alarm rings and the observer is able to warn the community members in the flood plains to evacuate. The rains in the downstream that leads to floods are from Lwanda hills that leads to flash flooding. The speed onset is very high that the community based FEWS cannot be effective for early warning.

Training of WRUA staff on CBFEWS

Cooperation between Upstream and Downstream WRUA

There are heavy flooding in LOGUMI SC though the rains that mainly causes floods in the downstream originate in the upstream.

Therefore there is need for close cooperation and coordination between upstream, midstream and downstream including the WRUAs. The Gucha Migori River Basin IFMC has played a key role. It is in the spirit of cooperation that led to three members from upstream WRUAs to participate in one week LOGUMI WRUA Flood Management Training held in Migori.

It is through cooperation that the rain gauge gadgets have been installed in the upstream area of Kisii and Transmara.

Upstream WRUAs site visit to LOGUMI SC on 26th Feb. 2014

Google Earth Map on the locations of installation of CBFEWS

Installation of Community-based FEWS in the Upstream.

Two rain gauges have been installed in the upstream parts of Kisii and Transmara sub-counties. In Kisii the rain gauge and sensor was installed Kiang'ong'i Secondary School and a teacher who is also Middle Gucha WRUA member is in charge but the school and the WRUA assigned Mr. Omusa school watchman as an observer.

Installation of CBFEWS upstream of Gucha system

There is a communication link established between LOGUMI WRUA and Middle Gucha WRUA. In case of the heavy rains that trigger alarm the observer informs the teacher in charge, informs WRMA FMO and informs LOGUMI WRUA Secretary.

WRMA officer CDO ensures communication link between Middle Gucha and LOGUMI WRUAs is established

Installation of Community-based FEWS in the Upstream Contd.

In Transmara Sub-county the rain gauge was installed at Emuria Dikiri Secondary School and a geography teacher was assigned as the person in charge at school level while Upper Mogor WRUA Secretary was assigned as person in charge at WRUA level and as an observer assisting the school watchman.

Identified site for CBFEWS in Transmara Sub-county

There is a communication link established between LOGUMI WRUA and Upper Magor WRUA. Wherein during heavy rains that trigger alarm the observer informs the teacher in charge, informs WRMA FMO and informs LOGUMI WRUA Secretary.

WRUA staffs distribute manual on CBFEWS that has guide on communication channel

Installation of Community-based FEWS in the Downstream.

In LOGUMI SC. R. Ongeche a tributary of R. Gucha Migori plays an important role in flooding in the LOGUMI SC. The heavy rains in the upstream raises the water levels but sometimes the high levels of the river are retained within the river channel but heavy rainfall in Ongeche triggers the increase of the high levels of the R. Gucha Migori leading to heavy overflow that leads to river bursting the banks and overflowing to the homes within the floodplains.

R. Ongeche that has its source in Tanzania

There is a communication link established between LOGUMI WRUA and Ongeche WRUA.

When it rains heavily the river overflows over this bridge

Photo Album of Installation of Community-based FEWS.

Training on CBFEWS

Installation of CBFEWS

Community involvement during Installation

Installed River Gauge CBFEWS

Explanation by WRUA member how River Gauge sensor works for CBFEWS

Explanation by WRUA members on how to use CBFEWS manuals

Photo Album of Installation of Community-based FEWS.

Meeting with School committee and Middle Gucha WRUA

Explanation to student and Middle Gucha WRUA on CBFEWS

Installation of the CBFEWS

Involvement of the students in the installation of CBFEWS

Installed Rain Gauge for CBFEWS

Installed Rain Gauge sensor for CBFEWS

Photo Album of Installation of Community-based FEWS.

Training of students on CBFEWS

Training of teachers on CBFEWS

Training of Upper Magor WRUA on CBFEWS

Installation process of rain gauge for CBFEWS

Installed rain gauge for CBFEWS

Installed rain gauge sensor for CBFEWS

Photo Album of Installation of Community-based FEWS.

WRUA and WRMA staff assemble CBFEWS

Pupils participate in the installation of CBFEWS

Training of Ongeche WRUA on CBFEWS

Installation of rain gauge gadget for CBFEWS

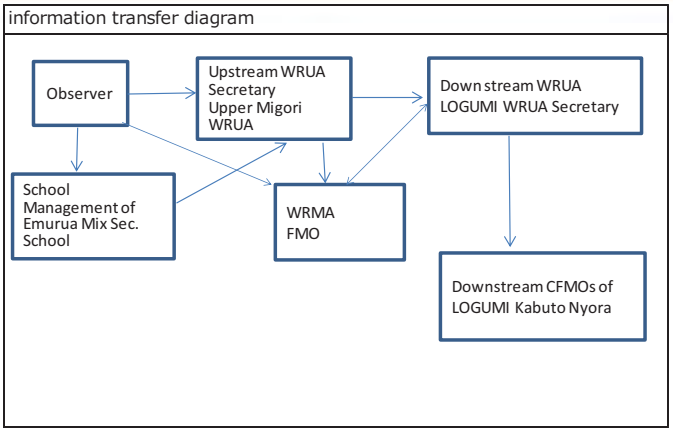
LOGUMI WRUA share the CBFEWS manual with Ongeche WRUA as WRMA SRM observes

Installed rain gauge sensor for CBFEWS and distribution of solar system

Observation of the Commuity driven FEWS in Gucha Migori.

	Observer			
Name of Station			Emuria Dikiri Rain Gauge	remarks
Location	Adress	County	Bomet	
		District (Sub County)	Emuria Dikiri	
		Location		
		Sublocation		
		Village		
	Name of River	branch river		
		main river	Migori (Migori)	
	GPS	X(Longitude)	35 6.08/"0"E	
		Y (Latitude)	1 1.02/"0"S	
	Elevation	Elevation	1886.4	
	Installed Month and Year (MM/YYYY)		May-14	
Observer	Name of observer's institution (if any)		Emuria Dikiri Sec. School	
	represent	name	Upper Magor WRUA	
		tel		
		e mail		
	person in charge (if any)	name	Cosmas Rotich	Secretary Upper Magor WRUA
		tel	0720492486	
		e mail		
	observer(if any)	name	Isaiah KipKurui Rono	School geography teacher
		tel	0717267921	
WRUA	Name of WRUA			
	Chairman	name	Ruth Nanjala	
		tel	0725961366	
		e-mail	logumiwrua@yahoo.com	
	secretary	name	Joshua Ouma	
		tel	0727073930	
		e-mail	joshuaouma2013best@yahoo.com	
	Others (if any)	name	Symon Awidhi	
		tel	0722424542	
		e-mail	symonawidhi@gmail.com	
WRMA	Name of RO		WRMA-LVSC	
	Officer in RO (in charge)	name	Patrick Khiso	
		tel	0734270445	
		e-mail	patkhisa@yahoo.com	
	Name of SRO		Southern Shoreline Gucha Migori	
	SRM	name	Josphat Mwongongo	
		tel	0721251826	
		e-mail		
	FMO(or officer in charge)	name	Samuel Njihia	
		tel	0736462866	
		e-mail	samuelnjihia24@yahoo.com	

Observation of the Community driven FEWS in Gucha Migori.



Observation of the Community driven FEWS in Gucha Migori.

PART D Actual Operation Record

(1) Record of Heavy Rain and Issuing Alert for Rain Gauge

No.	Date (DD/MM/YYYY)	Observation time (HH:MM)	Rainfall (mm)	Reaction	Flood occurrence and situation
1	08/06/2014	15:30	40MM	Send SMS to FMO Kisii	Heavy rainfall in Emuria Dikiri but did not lead to floods in LOGUMI SC
2	12/06/2014	17:00	60MM	Send SMS to FMO Kisii	Heavy rainfall in Emuria Dikiri but did not lead to floods in LOGUMI SC but River levels rose
3	16/06'2014	13:00	60-90MM	Send SMS to FMO Kisii	Heavy rainfall in Emuria Dikiri for over three hours but did not lead to floods in LOGUMI SC but River levels rose
4					
5					
6					

Lesson Learnt during installation of Community-based FEWS.

During the installation it was noted that R. Riana system is an important tributary to R. Gucha and therefore there was need for a rain gauge and gadget to be installed at Iterio Secondary as per the request of Upper Riana WRUA.

The installed solar system for purposes of supplying power to the sensor also acts as an incentive to the observers because they use the solar and battery for lighting and charging their mobile phones.

The site for installation with electricity solar system was not installed but the school requested that they be given the car battery that the school will be charging on regular basis to act as standby power source in case of electricity power blackout. The disposable Alkaline battery was also distributed

Lesson Learnt during installation of Community-based FEWS Contd.

The River Gauge for Community based Flood early warning is the most effective in LOGUMI SC because the river level that ultimately will cause floods is known by LOGUMI WRUA members and therefore when the alarm rings the danger of floods is inevitable.

The rain gauge installed plays a key role because anytime the alarm is triggered in the upstream, LOGUMI WRUA members including the observers become keen on constant observation not only for the alarm but constantly survey the river and it is noted that after such alarm from upstream the river level will periodically rise especially after eight hours of the warning from upstream.

Lesson Learnt during installation of Community-based FEWS Contd.

LOGUMI WRUA Flood Management committee is currently studying the relation between the time of the warning from the upstream and the rise of the river levels and also on the amount of rainfall recorded in the upstream and the level of the river level. And also the area of the whistle blower for rainfall amount warning and the impact of the rain from that area to R. Gucha Migori and this will help note which areas' rainfall hugely contribute to flooding in LOGUMI SC and therefore help LOGUMI WRUA and the WRUA from that area in cooperating in flood mitigations effort in the upstream.

Annex Japan Experience and how it can be replicated in LOGUMI SC.

The Project for Capacity Development for Effective Flood Management facilitated WRMA and WRUA members to visit Japan on a training mission in effective flood management. During the visit the following highlights were noted:

1) Effective Data System Management and information sharing for example Arakawa River Management System;
2) Cooperation and coordination between the Central Government, Prefecture (County) Government and the Community e.g. Fuji River Management;
3) Historical data management: Japan has river museums which has information of various events including floods of several centuries
4) Effective Structural and Non-structural Measures

The Experience in Japan: A view of Effective Flood Management Contd.

5) Effective River Basin based Flood Management Plans for example river Yodo;
6) Modern Technology in the management of the river basin that gives real time data and state of art monitoring equipment; and
7) Developed and well managed operation centres that manages floods e.g. Arakawa Disaster Management Centre

The Great Lessons that can be replicated in Gucha Migori River Basin in Particular LOGUMI SC

Use of skeleton triangle structures to control river bank erosion this is applicable in LOGUMI SC. To execute this bamboo reeds should be planted in the wetlands and riparian areas this will also help in riverbank protection and restoration of the depleted wetlands and thereafter the bomboo will be harvested and used for construction of skelton triangle structures.

Example of skelton triangle structures in Japan

Planting of bamboo trees to protect the riverbanks

The Great Lessons that can be replicated in Gucha Migori River Basin in Particular LOGUMI SC Contd.

Single river bank embankment can be applied at new deviation point of the river.

Current status of damaged riverbank at R. Gucha Migori

Implementation of river management by case example of shingen rule can be applied by mobilizing communities to form WRUAs and creating CFMOs in the sub catchment to implement flood activities

The Great Lessons that can be replicated in Gucha Migori River Basin in Particular LOGUMI SC Contd.

Kaeru caravan (rescue drills) for disaster education amongst children can be adopted and the characters modified to suit local scenarios with fish character in flood prone areas to be introduced among school going children. During Evacuation Drill in LOGUMI SC the use of locally available resources to transport the injured was used.

A stretcher made from locally available material to carry or ferry an injured or sick person during disaster

Role play flood evacuation at Kabuto School

During the education programme on Disaster teachers training the concept of Kaeru caravan was shared. In Kabuto school during implementation of flood management education programme the pupils had a role play on evacuation and such rescue drills can be incorporated in such role plays.

The Great Lessons that can be replicated in Gucha Migori River Basin in Particular LOGUMI SC Contd.

Manmade Manriki forest to control floods is applicable and it takes a long time for the trees to grow; tree planting is the mandate of Kenya Forest Service and can be done in collaboration with KFS and through water catchment conservation in macalder, Got Kachola; and

Mobilize WRUAs in the Kisii highlands to conserve the upper catchment.

Forest conserved and shrine constructed in the forest to ensure that the forest is conserved

The Legio Maria and other African Traditional Churches often have shrines in the forests in hilly areas and such shrine can used ensure that the forest is conserved

Arakawa Disaster Operation Centre

This is an advanced disaster operation centre that manages R. Arakawa disasters including flooding. The centre is equiped with state of art equipment whereby river water levels can be monitored electronically and information disseminated to relevant stakeholders through digital TV, Internet, radio etc

cooperation

Forum and committee in Japan

IFMC committee Meeting

Thank you for listening:

EROKAMANO(ASANTE)

Attachment Four

Situation report of community based FEWS installation from the pilot project areas Lower Lumi WRUA

WATER RESOURCES MANAGEMENT AUTHORITY

JAPAN INTERNATIONAL COOPERATION AGENCY

COMMUNITY BASED Flood Early Warning Systems

24Th June , 2014

Presented

by

Fredy Reuna

Lower Lumi WRUA Secretary

Project on Capacity Development
For Effective Flood Management
In Flood Prone Areas
In the Republic of Kenya

Summary of InstalledFEWS

Installed Item	Installation point	Situation
Water level gauge1	At 3 J15 WRMA RGS station Darajani, Taveta(Altitude 752.6 M)	Surveyed, Installed
Rain gauge1	Rekeke Village, Volunteer's Homestead (Altitude 743.7 m)	Installed
Rain gauge 2	Challa at homestead of Upper Lumi WRUA Chairman(Altitude 887.3m)	Installed

2

Location		District (Sub County)	*Taveta*	
		Location	*Chala*	
		Sublocation	*Chala*	
		Village	*Chala Chini*	
	Name of River	branch river		
		main river	*Lumi*	
	GPS	X(Longitude)	*37°44'21.49"*	
		Y (Latitude)	*3° 17'56.27"*	
	Elevation	Elevation	*892.1 m*	
	Installed Month and Year (MM/YYYY)		*Oct-13*	
Observer	Name of observer's institution (if any)		*N/A*	
	represent	name		
		tel		
		e mail		
	person in charge (if any)	name	Mr Rama Leshamta	*Chairman Upper Lumi WRUA*
		tel	0725397884	
		e mail		
	observer(if any)	name		
		tel		
WRUA	Name of WRUA			
	Chairman	name	*Mr Rama Leshamta*	
		tel	0725397884	
		e-mail	-	
	secretary	name	-	
		tel		
		e-mail	-	
	Others (if any)	name		
		tel		
		e-mail		
			Athi Catchment	

3

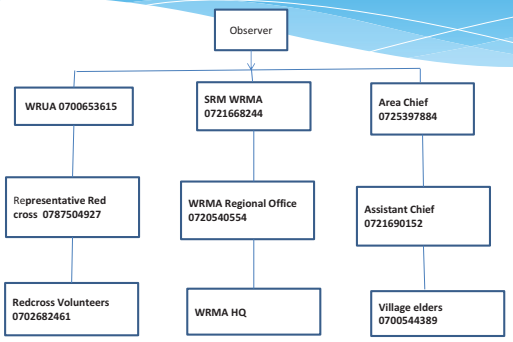
Trainings for FEWS observers

Training on assembly of the FEWS

Members of the WRUAS were trained on the and the monitoring of the FEWS. The Volunteer observers were also trained on the recording and communication networks for the FEWS by the KRCS. Tools were handed over to the Lower Lumi WRUA

4

Flood warning information dissemination diagram



5

Current Inventory of FEWS

Objectives for the inventory:

- To get exact reference location for each FEWS, i.e GPS, administrative area and altitude,
- To observe the FEWS observers progress on data recording,
- To share the challenges observer experiences,
- To observe the effectiveness of the information dissemination diagram,
- To observe the physical condition of the FEWS facilities.

6

Sample inventory sheet for FEWS

Name of Station			*Darajani*	remarks
Location	Adress	County	*Taita Taveta*	
		District (Sub County)	*Taveta*	
		Location	*Timbila*	
		Sublocation	*Msengeni*	
		Village	*Darajani*	
	Name of River	branch river		
		main river	*Lumi*	
	GPS	X(Longitude)	37°42'24.34" E	
		Y (Latitude)	3° 23'24.34" S	
	Elevation	Elevation	*758.9m*	
	Installed Month and Year (MM/YYYY)		*Oct-13*	
Observer	Name of observer's institution (if any)		*#*	
	represent	name		
		tel		
		e mail		
	person in charge (if any)	name	Mr Justine Mshigati	*Volunteer*
		tel	0711818715	
		e mail		
	observer(if any)	name		
		tel		
WRUA	Name of WRUA		Lower Lumi WRUA	
	Chairlady	name	*Mr Mini Mary Ngaluma*	
		tel	07239662509	
		e-mail		
	secretary	name	*Fredy Reuna*	
		tel	*0700653615*	
		e-mail		
	Others (if any)	name	*George Albert Kenyatta*	Vice Chairman
		tel	*0704897999*	
		e-mail		
WRMA	Name of RO		Athi Catchment Authority	
	Officer in RO (in charge)	name	Mr Canute Mwakamba	
		tel	072054054	
		e-mail	canutemwakamba@gmail .com	
	Name of SRO		*Nolturesh Lumi Sub Catchment*	
	SRM	name	Mr. Kimeu Musau	
		tel	0721668244	
		e-mail	kimeumus@yahoo.com	
	PMO(or officer in charge)	name	Mr. Joseph Maina	
		tel	0711232697	
		e-mail	josephmaina08@yahoo.com	

Sample inventory sheet for FEWS

	condition of device		
facility	type (rain/river)	*River guage*	
	power	*Yes*	
	battery for back up	*Yes*	
	large sound buzzer		
	LED display	*Yes*	
	overall condition	*Good*	
container	type(plastic/metal)	*Plasitc*	
	Damage by weathering	*No*	
	overall condition	*Good*	
monitor	recording paper (note)	*Yes*	
	manual is prepared?	*Yes*	
	well recorded?	*Yes*	
	contact person lest is show? *Yes*		

Sample of Record of Rainfall and flood alert by observer

No.	Date (DD/MM/YYYY)	Observation time (HH:MM)	Rainfall (mm)	Reaction	Flood occurrence and situation
1	08/11/2013	19:42	30	Warning and communication through the network	
2		21:37	60	Warning and communication through the network	
3	09/11/2013	07:16	60	Warning and communication through the network	
4	02/12/2013	07:00	30	Warning and communication through the network	
5	07/12/2013	22:52	30	Warning and communication through the network	
6		23:50	60	Warning and communication through the network	
7	08/12/2013	00:36	90	Warning and communication through the network	Flooding and damage in downstream areas like Kimorigo and Eldoro

Lesson Learnt

* The metallic container at one of the rain gauge sites in Challa was damaged by rust.
* The metallic containers should be painted to prevent the rusting.

Damaged Container

Replacement

Challenges on the operation of FEWS

* 1. Network Problem
  2. Mobile charging (Not every house hold is installed with electricity)
* 3. Interruption of electricity
* 4. Setting alarm standard is difficult(Level at which to give warning)
* 5. Repair of the devices when damaged can be difficult

Way Foward

* 1) Provision of batterries as back up in cases of power blackouts.
* 2) Training of more technicians for the repair of the equipment whe damaged.
* 3) motivation to the observers by providing air time for communication to the required stakeholders
* 4) Through careful observation the observers can determine which level of rain causes flooding and flood damages so at to the callibrate the equipment for the correct setting of the alarm.

Attachment Five

Presentation of the recommendation for nationwide expansion of Community based FEWS in Kenya

RECOMMENDATION FOR NATION WIDE EXPANSION OF COMMUNITY BASED FLOOD EARLY WARNING SYSTEM

Simon Mwangi – ATCM – FM

Water Resources Management Authority

LESSONS LEARNT
PLASTIC BUCKET IS TORN OUT

1 Plastic Bucket is damaged by ultra violet rays

PLASTIC BUCKET (NEW TYPE)

New Plastic Bucket (separation type) or tin Bucket

MOUSE BITE IN TWO A CABLE

>>>>> PVC pipe cover

BUZZER

Loud buzzer and LED Display are effective

Manufacturing can be done Locally

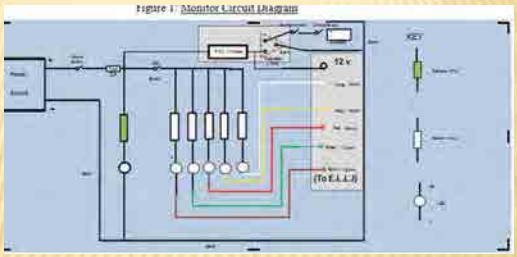
Rain Gauge and Water Level

- Trained in assembling, installation and operations

.

Installation of River Gauges

CIRCUIT DESIGN (RELAY)



RAIN GAUGE

WATER GAUGE

FOUND DURING OPERATION 1

- Solar panel and battery improve observer's motivation G I
  - Flash Light, mobile phone charger, animal's protection and etc.
- Install to existing river gauge is easy to understand of water level
- Vandalize protection is effective
- Cooperation with upper WRUA
  - After site visit from upper WRUA, they understand the flood situation and cooperative
  - it need one more rain gauge station

FOUND DURING OPERATION 2

- Setting alarm standard is difficult
- Announcement to public is problem
- Not easy to get artisans for maintenance near the installation site
- Lack of power backup (battery) is a problem when there is blackout
- Cooperation with upper WRUA
  - Cooperation with Tanzania is future challenge
- Information being transfered is 'not signed by the observer'

LESSON LEARNED AND WAY FORWARD

1 For observer

2 For WRUA

3 For WRMA

1 LESSON LEARNED OBSERVER

i. Observers are keen on observation

ii. However Keeping high motivation seems challenge

✓ Utilize battery for light, charging mobile phone

✓ Proper observation be prized

✓ Receive thankful from downstream resident

i.e. short visit to downstream

iii. training observer need to be done

OBSERVER LEAFLET

OBSERVER BACKUP POWER

2 LESSON LEARNED WRUA

i. WRUAs are the main actor

ii. WRUA in flood prone area shall organize Flood Management Sub-committee

iii. Cooperation with upper and downstream WRUAs

iv. Sensitization

v. Experienced WRUA members in 3 pilot project areas should keep on exchanging information

vi. Community based Flood Analysis using a modified hydrograph – LOGUMI WRUA

SENSITIZATION (POSTER AT SCHOOL)

LESSON LEARNED WRMA

i. Update Technical Standard (manual)

ii. Support manufacture of more rain and water gauges

iii. Technical support to WRUAs and observers

iv. Organize experienced WRUAs

v. Supply device and parts

vi. Establish maintenance and repair system

vii. Award excellent Observers and WRUAs annually

viii. Audit and data collection

INTEGRATED RIVER BASIN FLOOD MANAGEMENT – 12 NO RIVER BASINS FOR THE NEXT 36MONTHS

- Selected river basins

Athi	Lower Sabaki	+	Mbagathi
Tana	Lower Tana	+	Thiba
ENN	Ewaso Narok	+	Daua
RV	Molo	+	Ewaso Ngiro South
LVN	Sabwani Trib of Nzoia	+	Yala River Basins
LVS	Sondu	+	Tende/Kibuoni

'Neither Shall all flesh be cut off any more by the waters of a FLOOD'
Gen 9:11b

'My people are destroyed for lack f knowledge '
Hosea 4:6

Attachment Six

Presentation on evacuation centre

WATER RESOURCES MANAGEMENT AUTHORITY

JAPAN INTERNATIONAL COOPERATION AGENCY

REPORT ON CONSTRUCTION OF EVACUTION FACILITIES,

24Th June , 2014

Presented

by

Kimeu Musau
ATCM Nolturesh Lumi

Project on Capacity Development
For Effective Flood Management
In Flood Prone Areas
In the Republic of Kenya

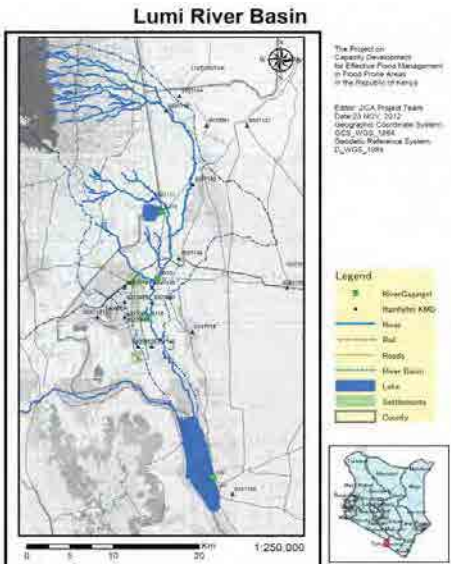
PRESENTATION OUTLINE

- Lumi River Basin
- Procurement and Implementation Process for the Construction of Evacuation Facilities
- Community Operation and Maintenance for Evacuation Facilities

NATURAL CONDITIONS

- Catchment area:590km2 (of which 75% is in Kenya)
- Total length of the river: 71km
- Lumi River originates from Mt. Kilimanjaro
- Many springs (Lumi, Challa, Njoro Kubwa, Kitobo, Madala, Njoro, Sambeki)
- Lakes Challa, Jipe, Salengwa.
- Elevation: 4,500m to 1,000m

OUTLINE OF LUMI RIVER BASIN



Planning and Design of Evacuation Centre

- The JICA Study team carried out investigations on the different coping mechanisms the people of Taveta used in during heavy flooding. One of the methods of coping was moving to an evacuation place in the higher grounds and staying till the flooding subsided in their homes. Organisations like the Kenya Red Cross Society (KRCS) and World Vision would then provide them with basic necessities like tent, food, portable water and medicine to use in the evacuation places.
- Kimorigo location was one of the areas worst affected by flooding within the Taveta Sub county. The local residents in Kimorigo used different places for evacuation during the flooding including:

Planning and Design of Evacuation Centre

a. The sports field at Eldoro Secondary School
b. Privately owned piece of land in Kimorigo sub location
c. Python hill area
d. Eldoro Primary School

Planning and Design of Evacuation Centre

- In all the areas there were no proper evacuation facilities such as shelter and toilet facilities. The community members relied on World Vision or KRCS to provide them with items for shelter and sanitation including tents and mobile toilets.
- The JICA Project Team in consultation with the different stakeholders agreed on the construction of an evacuation place as one of the measures for the mitigation of the flood effects in Kimorigho.
- In order to come up with the suitable location for the evacuation place the following criteria were examined:

Planning and Design of Evacuation Centre

a. The availability of land to be used in the construction of the evacuation place
b. The community who would utilise the evacuation place
c. How many people would be served by the facility
d. The distances to be covered by the evacuees from their homes to the evacuation place.
e. Basic site conditions

The criteria were applied to the evacuation places that were currently utilised by the community in Kimorigo.

1. *Eldoro Secondary School sports field*

The land could not be utilised because it was used as sports field by the school. The distance from the potential evacuees was also very long.

2. *Private Land In Kimorigo Location*

This was the main evacuation place for the community members in Kimorigo due to its close proximity to their homes. The area was also slightly raised compared to their homes. However the main problem was that the land was being disputed and was the subject of a court case and hence no structures could be constructed on it, it was therefore not feasible to put up a permanent evacuation facility in it.

3. *Python Hill*

This was also an evacuation place used by the community in periods of very heavy flooding because it was in a raised up area on a small hill. However it was not used very frequently and was located far away from the target community evacuees

4. *Eldoro primary School*

The School Management Committee accepted to donate land that could be used to construct the evacuation place. The school was also located close to the target community that would be evacuees and there was enough space for up to 300 evacuees. In addition the school already had some amenities that could also be utilised by the evacuees and was located in a slightly raised area compared to the homes of the community members. For these reasons it was decided that the evacuation centre would be constructed at Eldoro Primary School.

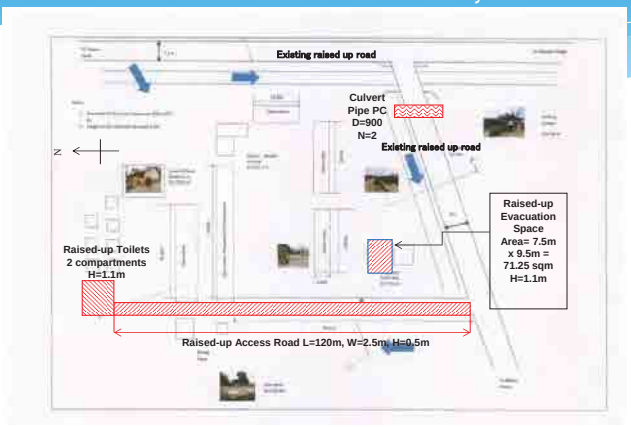
Design of Evacuation Place

- Designing **house plans in Kenya** requires building professionals to apply certain standards applicable when building in Kenya.
- The design for the evacuation place was made with the issue of the flood management in mind and so issues of flood proofing of the structures were considered.
- Flood-proofing is any measure - structural or nonstructural - intended to prevent damage from flooding to a building.
- Flood-proofing is not a cure for all flood problems. It is just one of the many available flood damage reduction tools.

- The interior floor level was set at 1.4m above the ground level to provide protection from flooding.
- The exterior floor level was set at 1.1m to prevent water flowing from the exterior floor area to the interior.
- The ceiling height was set at 2.775m above the floor level in the hall.
- The foundation is surrounded with surrounding of well compacted murram fill and an external covering of masonry works.
- Buildings will be rigid-framed structures using reinforced concrete. The foundation walls will be concrete blocks so as to resist soil pressure. The void below the raised floor will be filled with compacted excavated soil. The roof structure will be a wood-truss frame covered by galvanized corrugated steel sheets.
- Construction materials: Construction materials have been selected by considering locally available materials and methods, based on the Pilot Project.

Basic Design of the Environmental Improvement of Evacuation Camp

Schematic Plan view of Eldoro Primary School



As shown in the Schematic above, the structural measures undertaken in Lumi River Basin Included;

1)Evacuation Place
2)Raised Toilet
3)Culvert
4)Raised evacuation Road

The first 3 measures were procured from a registered contractor while the evacuation road was done by the community as part of community contribution

14

2. Procurement and Implementation Process for Construction of Evacuation Facilities-Eldoro Primary School.

Lower Lumi WRUA Procurement committee was involved in obtaining a long list of eligible contractors from the District procurement office;

With support from WRMA and JICA Project Team, the procurement committee short listed eligible contractors based on a criteria that was developed by the WRMA and JICA Project Team in consultation with WRUA;

Successful bidder was awarded the contract after thorough evaluation by the WRUA Procurement committee;

15

The implementation period for the Project for the Construction of Evacuation Facilities was scheduled to be completed in 90 days. However due to the commencement dates within the rainy season there were delays due to bad weather and flooding;

The WRUA monitoring and evaluation committee was involved in monitoring the Construction process for all the 3 contracted construction works.

The local community through the School Management Committee was also involved through the construction of the evacuation road

16

The Evacuation Facilities at Eldoro Primary School

Raised Evacuation Place

Raised Toilet

17

The Evacuation Facilities at Eldoro Primary School Cont'

Culvert

Evacuation Road

18

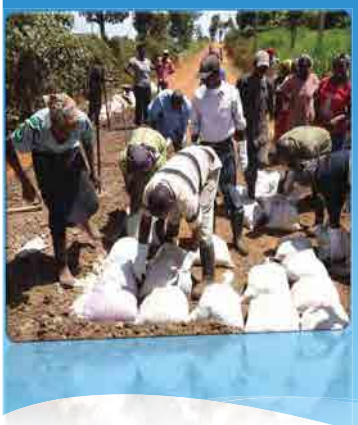
3. Community Training

The JICA Project Team provided community training for members of the School Community and Lower Lumi WRUA on the Construction of the Do-nou Road.

3 community and 3 WRUA members, JICA Staff and WRMA Staff undertook the training from the CORE NGO in Kiambu in January.

The trainees in turn conducted the training for the road construction to other community members.

The trainees were the supervisors and the lead in the road construction and will also assist in the maintenance.



Do-nou Training in Kiambu

WRUA and Community members participating in the construction of Do-nou road in Kiambu during the practical training in the field.

Thanks for Listening

Attachment Seven

Report on riverbank protection form Isiolo

WATER RESOUCES MANAGEMENT AUTHORITY

JAPAN INTERNATIONAL COOPERATION AGENCY

REPORT ON RIVER BANK PROTECTION STRUCTURE

June, 24 2014

Presented

by

John Kinyanjui

ATCM- Middle Ewaso N`giro

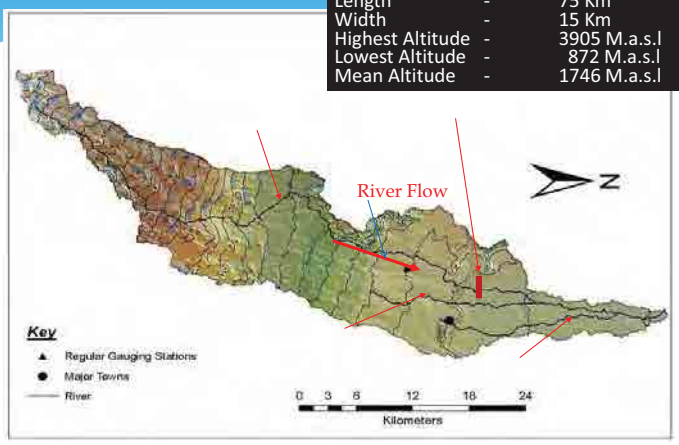
Project on Capacity Development
For Effective Flood Management
In Flood Prone Areas
In the Republic of Kenya

PRESENTATION OUTLINE

* Isiolo River Catchment
* Procurement and Implementation Process of River bank protection structure
* Community Operation and Maintenance for River bank protection structure
* Challenges and wayforward

1. Isiolo River Catchment

Area	-	683 Km2
Length	-	75 Km
Width	-	15 Km
Highest Altitude	-	3905 M.a.s.l
Lowest Altitude	-	872 M.a.s.l
Mean Altitude	-	1746 M.a.s.l



Rainfall

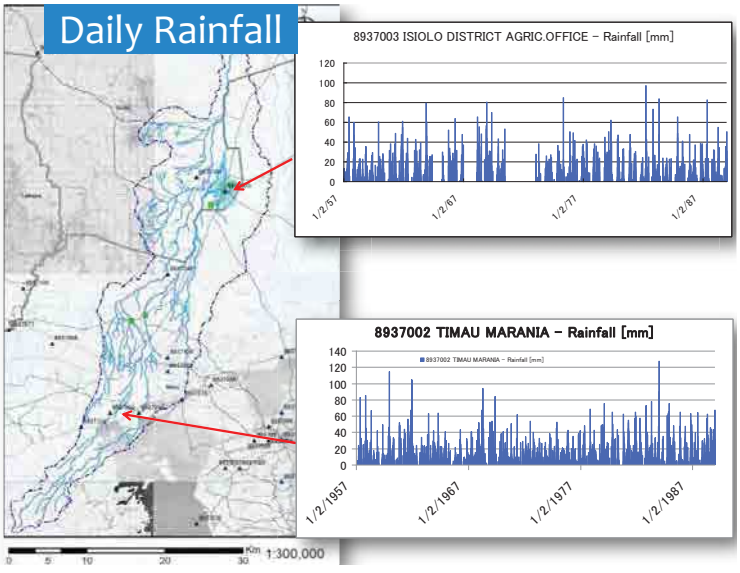
Mean Annual Rainfall ranges from 950 mm in the high altitude areas of Mt. Kenya to around 450 mm at the lowest point;

Bimodal with maximas in April and November;

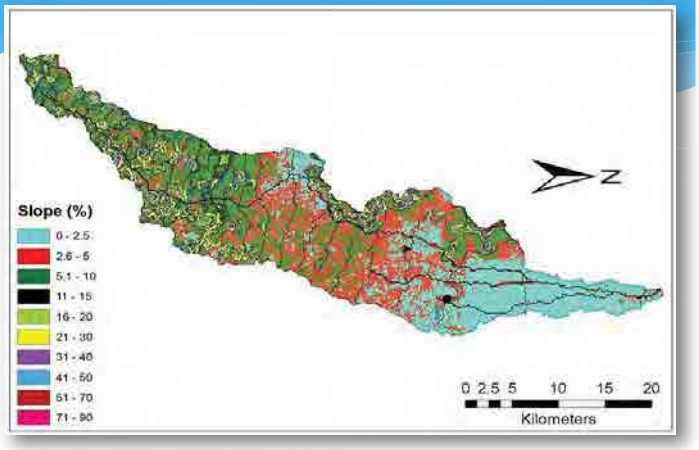
MAR approximately 600 – 650 mm within Isiolo town;

Increase in rainfall intensity (storms) of short duration;

Daily Rainfall



Topography



2. Procurement and Implementation Process for River Bank protection structure – Eastern Marania River.

Isiolo WRUA Procurement committee was involved in obtaining a long list of eligible contractors from the District procurement office;

With support from WRMA and JICA Project Team, the procurement committee short listed eligible contractors based on a criteria that was developed by the WRMA and JICA Project Team in consultation with WRUA;

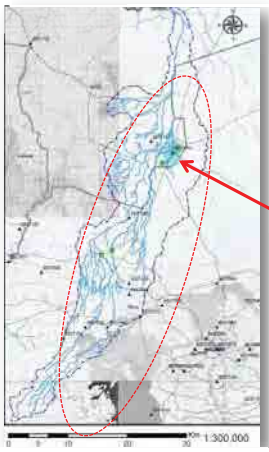
Successful bidder was awarded the contract after thorough evaluation by the WRUA Procurement committee;

The implementation period of River Bank Protection works by use of gabion mattress was 90 days ;

The WRUA monitoring and evaluation committee was involved in monitoring the Construction process against a checklist that was developed to understand the stages involved in Gabion works;

WRUA Monitoring and evaluation committee on site inspection during construction process

River bank Protection Works at Eastern Marania River



River Bank erosion before bank Protection

River Bank Protection using Gabion mattress

3. Community Operation and Maintenance Training

On site operation and maintenance was organised by WRMA and JICA Project Team in consultation with Isiolo WRUA.

The target group was the church community who are the direct beneficiary of the project.

Maintenance tools were handed over to the community for future repair works.

Manuals for Operation and Maintenance of River Bank Protection works

Manuals on how to make Gabion wall is under finalization.

The manual shall include;

-Preparation of maintenance tools;

-Instructions on how to use each maintenance tool;

- contacts addresses for support e.g WRUA monitoring committee, WRMA –SRO and Church Management.

Challenges experienced during implementation of structural measures

- Community participation during implementation of structural measures did not meet the threshold set by the WDC manual.
- The beneficiary community (church) had no idea on how to work with donors in implementation of donor funded project.
- The location/site of implementation of structural measure were neither near to beneficiary community nor the WRUA monitoring committee.
- In the design of the project, the component of community motivation was not captured.

Way forward

- Sensitization of the beneficiary community on the scope of contractor services and community participation before implementation of project activities.
- Motivation for the beneficiary community should be incorporated during the project design stage .
- Enhancement of community capacity development to articulate the benefits of self help and mutual help approaches in development.

Thank You for Listening

Attachment Eight

Report on non-structural measures in Lower Gucha Migori

WATER RESOUCES MANAGEMENT AUTHORITY

JAPAN INTERNATIONAL COOPERATION AGENCY

NON-STRUCTURAL MEASURES IN GUCHA MIGORI RIVER BASIN

25TH JUNE, 2014

PRESENTED BY
MR. SAMUEL NJIHIA
FLOOD MANAGEMENT OFFICER WRMA KISII

JICA Project Team

Project on Capacity Development
For Effective Flood Management
In Flood Prone Areas
In the Republic of Kenya

Sub-catchment Management Plan Development

- Upon receipt of the first tranche of funding under the WDC framework, LOGUMI WRUA developed a Sub-catchment Management Plan. This plan however did not incorporate flood management.

Assignment of JICA project Expert

- Assignment of project supervisor for Gucha Migori catchment by the Project on Capacity Development for Effective Flood Management in Flood Prone Areas marked a turning point in flood management initiatives for the basin.

Community Flood Management Action Plan.

- The LOGUMI WRUA with technical assistance of the Project Supervisor and WRMA staff developed a Community Flood Management Plan(CFMAP)
- This was then incorporated in the revised SCMP for LOGUMI WRUA that gave the WRUA leverage that they could use to get funding for flood management activities not only from WSTF but other donors .

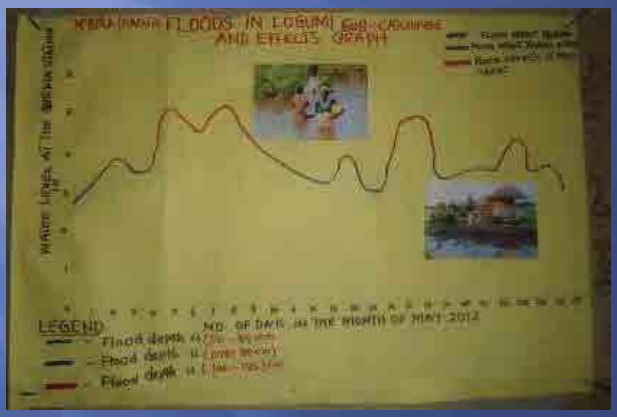
Development of community driven flood hazard map.

- In the Community-based Flood Management Plan one of the key item that LOGUMI WRUA needed was development of flood hazard map.
- The Project Team and WRMA took the initiatves and assisted LOGUMI WRUA to develop flood hazard map under the technical guidance and direction of the JICA Project Supervisor and WRMA team.
- This provided an opportunity for other WRUAs in pilot areas to replicate the same.

Hydrograph Development

- During flooding in LOGUMI SC one of the major problem is flood damage to the homes leading to loss of lives and properties.
- It was noted that if early warning is issued on time then the human loss and suffering will be reduced during flooding period.
- LOGUMI WRUA therefore in pursuit of community based early warning developed a hydrograph.
- Following the sustained effort of collecting flood information and correlating the same with river gauge heights at Wath Onger station the WRUA managed to develop a flood hydrograph.

Picture of the Hydrograph Developed



Community Based Flood Early Warning System(CBFEWS)

- Hydrograph development provided a window of opportunity for the JICA/WRMA team to provide assistance to WRUA to acquire capacity in CBFEWS.This eventually led to installation of both early warning rain gauge and river gauge.

- LOGUMI and Middle Gucha WRUA members at Wath Onger early warning river gauge station.

Nyando excursion Visit

- As part of the capacity development for the WRUA ,the LOGUMI members visited Nyando sub-catchment where among other lessons they were able to internalize the concept of development of raised toilets and with support from World Vision built a block at Nyora primary school.

Disaster Management Training

- The JICA/WRMA Project collaborated with Kenya Committee of Red Cross Society to conduct disaster management training for WRUA members and teachers in the hard hit flood prone schools.

- Left ,community members during the launch ,right LOGUMI chairlady addresses the meeting
- At Nyora primary school.

Disaster Management Training by KRCS

WRUA and community members attend the launch of disaster management Education in large numbers which pointed out the interest that they had for such training.

Launch of Community Disaster Management Training

- Left WRUA community members attend the meeting right WRMA Kisii Flood Management Officer addresses the gathering.

Education Programme for School Pupils on Disaster Management Training

- Trained a child in the way he should grow and when he grows up he will not depart from that path.
- KRCS trained teachers with assistance from JICA Project Team and WRMA and thereafter the teachers infused the subject of flood management to school curriculum.
- KRCS also trained the pupils on basic first aid and rescue drill with assistance from WRMA staff and WRUA member that witnessed such training in Japan

Education Programme for School Pupils on Disaster Management Training

WRMA Staff train teachers on flood management while WRUA member explains using powerpoint the Kaeru Caravan (Rescue Drill)

Education Programme for School Pupils on Disaster Management Training

Training of teachers attended by JICA Kenya staffs, Teacher infuses flood management into school syallabus while KRCS teach pupils on basic first aid

Flood Hazard Map for Sere Primary School developed by pupils

Visit to Isiolo

- In an effort to broaden further the knowledge and skills of the community in flood disaster management ,LOGUMI members visited Isiolo WRUA .This provided also an opportunity to share experiences and also witness how flood disaster education has shaped the approach towards flood management in other regions.

Training in Capacity Development for Effective Flood Management.

- The JICA/WRMA project has undertaken a training programme to capacity build WRMA staff and WRUA members in flood prone areas.
- As part of this initiative the Flood Management Officer for Gucha Migori catchment and the secretary for LOGUMI WRUA underwent a one month training in Kenya and Japan.

Training in Japan


Training in Japan


Training in Japan


Integrated Flood Management Committee

- The JICA/WRMA Project has so far been able to convene IFMC meetings in an initiative geared towards developing an Integrated Flood Management Plan. Development of IFMP is still on going
- This forum has been used to bring a closer working relationship with the various stakeholders in the basin.
- Additionally this forum has provided WRUAs in upper ,middle and lower zones of the Gucha Migori Basin with an avenue to cooperate in a well coordinated flood management effort.

IFMC Meeting


- Participants in an IFMP meeting for Gucha-Migori Basin.
- One of the major fruitful output of the IFMC is the cooperation between upstream and downstream that has led to installation of CBFEWS i.e. rain gauge and sensors in Kisii and Transmara

Collaboration with County Government

LOGUMI WRUA area of jurisdiction falls under Migori County.

JICA/WRMA team has therefore endeavored to link the WRUA to the county government, efforts which have resulted in closer collaborative working relations.

Installation of Community driven FEWS

- Installation of rain gauge at Kiongongi and Emuria Dikiri Secondary Schools that involved school students and teachers and WRUA members from downstream and upstream.

Establishment of Flood Management Unit at WRMA Kisii Sub-regional Office

- For effective management of floods in Southern Shoreline Gucha Migori which is a vast catchment demands collaboration and working together.
- WRMA-LVSC Kisii Sub-regional office therefoire established a flood management unit that is chair by the SRM and Flood Management Officer. One meeting has since been held.
- The fruitful output of the Flood Management Unit at Sub-regional level was the successful, well planned and properly executed 3rd stage Training that entailed the training of LOGUMI WRUA members.

3rd Stage Training for WRUA

- First stage training entailed WRMA staff being trained by JICA Project Team on Flood Management. Second stage training entailed the trained WRMA staffs to train other WRMA Flood Management Officers countrywide.
- Having accomplished the first and second training in capacity development for effective flood management the trained WRMA Flood Management Officers in partnership with JICA project supervisors conducted a 3rd stage training for LOGUMI members in Migori.

3rd Stage Training for WRUA Contd.

- The 3rd stage training sought to raise the awareness , share knowledge and experience in Integrated River Basin Flood Management,Flood Early Warning System,Rainfall Observation and data analysis,Evacuation Centre Management,Evacuation Drills ,development of flood hazard Maps,Structural and non Structural flood mitigation measures and Cooperation betweeen upper and lower catchment communitiies in a flood prone basin.

3rd Stage WRMA Training Photo Album

Conclusion

- Last but not least I paraphrase the words of LOGUMI WRUA Chairlady: She said during the entry of JICA Project Team in LOGUMI wherein the expectations of the community were heavy structural measures but when the scope of the Project in LOGUMI was explained she pointed was heartbroken. But after undergoing through the various training, workshops and interactions with other stakeholders, she now understands why the training were important! She added that now LOGUMI community members were in control of their own destiny! Using a Luo proverb she said it is better to train a person on how to fish than just giving that person fish to eat! She added that LOGUMI WRUA were now able to know importance of any flood structure that when they will be constructed in the area O&M will be per excellence!! She also stated that LOGUMI WRUA had written proposal solociting for funds to construct an evacuation centre at Nyora village to Japan Embassy.
- As WRMA staffs in Kisii our interaction with JICA Project Team has shaped and influence our thinking from reactionary to proactive and all the staffs have greatly benefited from the capacity development exercise. The current staffs and even those who were transferred.
- Integrated Flood Management approach that encompasses non-structural and structural measures is therefore the right approach for effective flood management

Attachment Nine

Presentation of draft manuals for structural measures against flood such as “Preparation of evacuation centre” and “Riverbank protection”.

WATER RESOUCES MANAGEMENT AUTHORITY

JAPAN INTERNATIONAL COOPERATION AGENCY

Draft Manuals for structural measures against floods

24th June, 2014

Presented by

Mr. Joseph Maina

Flood Management Officer, Nolturesh Lumi

Project on Capacity Development For Effective Flood Management In Flood Prone Areas In the Republic of Kenya

How to make a gabion wall

•Things you'll need

Pliers	Gabion box	Galvanized wire
Boulders	Masons Hammer	Wheel barrow
Shovel/Spade	Wooden pile	Mattock

Process of the Construction of the gabion

Making Gabion Baskets

1) Set up the gabion box
2) Join the corners using wire that is supplied with the gabion box
3) The set should be on a flat ground
4) Taking care not to scratch your skin by wire

Choosing and gathering boulders

1) The boulders should be between 15 to 25 cm in diameter.
2) If the rock size is too big, you should break up appropriate size.

Place Gabion box and fill with boulders

1) Gabion box to be set and wooden pile driven to firmly anchor the gabion on ground.
2) Put boulders in the gabion box with combination of infill boulders
3) If you use only small or thin stones, they will be lost by high level with high speed water stream.

Fix Gabion box and connect each other

1) Use malleable galvanized wire to connect one gabion box to another.
2) Back fill with soil before setting the next layer of the gabion
3) Plastic sheet between soil and gabion box is effective to avoid further erosion.

Sodding

1) Prepare the back fill and plant grass to protect the gabion surface
2) Procedure of cutting sod/turf
3) Mark the area for cutting sod/turf (grass)
4) Cut the sod/turf in a rectangular shape
5) After cutting all the sod/turf remove 10 to 15 roots from each of the cut sod/turf and plant on the borrow pit. This will help regenerate the turf and reclaim the borrow pit

How to carry out sodding/turfing

1) Cover 50% of the slope area with sod/turf
2) Plant sod/turf in a triangle format. This will help to reduce the velocity of the surface runoff at the slopes hence reducing soil erosion

Sodding

Maintenance

1) Regularly check the gabion boxes and fix any torn/cut gabion net.
2) Galvanized wire, pliers, wheelbarrow, spade, mattock are essential tools for maintenance of the gabion box
3) Add more backfill material when the back fill settle down .

Observations to be conducted

After high water level

1) Shapes: any damages, survivals
2) Connections: slack, broken
3) Lacking boulders: slack, broken

Before rainy season

1) Ensure all gabion box are in good condition
2) Fix any loose connections between the gabion boxes
3) Plant more grass on the backfill to protect back fill material from erosion

How to make Evacuation Road by Do-nou technology

Equipment and material required

Do-nou bags	Containers (20 little cans)	Jembes/Fork jambes
Compactors	Slashers	Mattocks
Pick axes	Spades	Tape measures
Tri- squares	Measuring Strings	Wheel barrows
Sledge hammers	Claw hammers	Spirit levels

Process of Construction of Do-nou Road

Preparing Do-nou bags

1) Use 45cm x 60cm gunny bag
2) Tie Do-nou bag tightly with string 45cm from the bottom of bag even if your bag size is different.
3) Other sizes of bags may be used depending on availability

How to make Evacuation Road by Do-nou technology

Putting murram into Do-nou bag using half cut Containers

1) Approximately 20kg murram is filled in cut container.

Preparation the place

1) Identify targeted road section
2) If there is mud, remove and dispose off.
3) Mark out the portion with a string.
4) Excavate the marked area

Poor road at Eldoro

Siting and marking of road

Excavation

Road Formation

Filling up of the Donou Bags

- Fill the Do-nou bags with the recommended amount of soil and tie tightly.
- Lay Do-nou bags appropriately.
- Compact Do-nou by at least 20 strokes
- Fill the space between the Do-nou bags
- Apply a 10cm thick murram layer and compact.
- If the soil is too dry, water it to facilitate compaction

Filling the bags

Tying the bags

Laying the bags

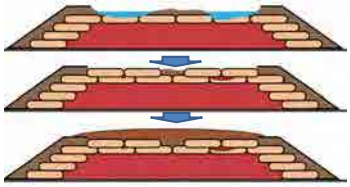
Filling the spaces with murram

Compaction

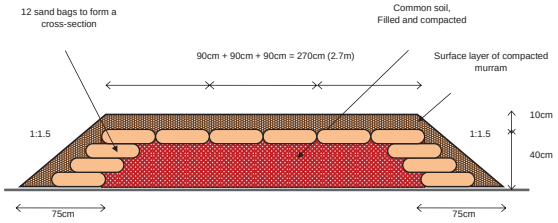
Raised Road

Operation and Maintenance

- Each rainy season, road constructed using Do-nou technology require regular maintenance offer.
- Shapes: any damages, survivals
- Exposed Do-nou bags
- Sunken road profile
- If road surface is damaged,
- Lay the additional layer of Do-nou
- Cover the top layer of Do-nou with murram
- Compact the murrum.



Simplified Cross-section of Do-nou raised road



Attachment Ten

Presentation of draft manuals for non-structural measures against flood such as “Community based FEWS”, “Education for disaster prevention”, “Community based flood hazard map” and “Evacuation drill”

Manuals on Non Structural Measures on Flood Management

Phoebe Orina- CDO
WRMA

Ministry of Environment, Water and Natural

Water Resources Management Authority

Japan International Cooperation Agency

Presentation Outline on Non-structural Measures

- Background
- Manual on supporting WRUA procurement
- Manual on flood disaster education
- Manual on evacuation drill
- Manual on community-based flood hazard map

Background

- In order to develop capacity of WRMA officers in the field of community-based flood management the Project on Capacity Development for Effective Flood Management in Flood Prone Area (the Project) conducted WRMA Flood Management Training and formulated WDC Manual for Flood Management .
- The Training Materials are developed to complement WDC Manual and reference documents for WRMA FM training are collected for better and deep understanding of training materials.
- Supplemental manuals and lessons learnt case study reports were developed.

1. Manual on supporting WRUA procurement on Non Structural Measures

- In implementing community-based flood management activities, some construction works will be procured by WRUA through WRUA Development Cycle (WDC) scheme funded by Water Service Trust Fund (WSTF) or other development partners.
- WRUA executives such as members of management committee, procurement sub-committee, finance sub-committee and monitoring sub-committee should know the procedure, progress management and supervising the construction project.
- WRMA officers also should understand these procedures and instruct WRUA executives.
- For this purpose, the following manual was developed.

The outline of this manual is as follows:

Role of WRUA and WRMA in procurement

- Consideration for planning necessary facilities
- Consideration of legal matters
- Procurement 1: Long-listing and short-listing of bidder (Selection of bidders to be invited for bid)
- Procurement 2: Bidding
- Procurement 3: Contract negotiation with successful bidder and contracting
- Construction
- Completion inspection
- Completion certificate
- Defect inspection
- Defect inspection certificate

TENDER NO. ISL/21/2012-2013 – PRE-QUALIFICATION FOR WATER PANS,DAMS, WATER RESERVIOUR & OTHER WATER WORKS

The under listed are the pre-qualified contractors from whom competitive bidding should be sought.

ISL/21/2012-2013/1	SOELLETA GENERAL BOX 569, ISIOLO TEL: 0733453702
ISL/21/2012-2013/2	JATIM ENGINEERING BOX 58, ISIOLO TEL: 0720875677
ISL/21/2012-2013/3	WAGUMI CONTRACTORS BOX 329, ISIOLO TEL: 0721463592
ISL/21/2012-2013/4	BARETU GENERAL CONSTRUCTION CO. BOX 330 ISIOLO TEL: 0721921186
ISL/21/2012-2013/5	EL – ADI CONSTRUCTION CO. LTD BOX 226, MOYALE
ISL/21/2012-2013/6	CENTER STAR CO. LTD BOX 16335, NAIROBI TEL: 0722523264
ISL/21/2012-2013/7	RONCCON GENERAL CONTRACTORS BOX 348, ISIOLO TEL: 0721841660
ISL/21/2012-2013/8	AKARIM CONSTRUCTION CO. LTD BOX 32268, NAIROBI TEL: 0726293622

C.A.T.C

Rep. Sample of evaluation report

PROJECT ON CAPACITY DEVELOPMENT FOR EFFECTIVE FLOOD MANAGEMENT IN FLOOD PRONE AREAS
EVALUATION FOR SHORTLISTING OF CONTRACTORS

idder 1	TIMES TEC CONSTRUCTION
idder 2	SHIBLI ENTERPRISES
idder 3	CENTER STAR CO. LTD
idder 4	SOELLETA GENERAL CONTRACTORS
idder 5	BARETU GENERAL CONSTRUCTION
idder 6	IMENTI CONSTRUCTION COMPANY
idder 7	WASO BUILDING AND ROAD WORKS
idder 8	WAGUMI LIMITED
idder 9	ISIOLO MWANAGAZA HARDWARE AND CONSTRUCTION
dder 10	MODOGASHE AGENCIES LIMITED
dder 11	NORTHGATE INVESTEMENT LTD

			Weighted Marks	Bidder 1	Bidder 2	Bidder 3	Bidder 4	Bidder 5	Bidder 6	Bidder 7	Bidder 8	Bidder 9
1	STATUS		15									
	Max. Score 15	Certificate of Incorporation	5	5	5	Nil	5	5	5	5	5	5
		Class of Registeration	5	5	5	Nil	5	5	5	5	5	5
		KRA -certificate of Compliance	5	5	Nil	Nil	5	5	5	5	Nil	5
2	Experience on Similar works for last 3 yrs		40									
		Minimum 3 jobs	40	40	Nil		40	40	40			Nil
		Minimum 2 jobs	30		Nil	20						Nil
		1 Job	20		Nil					20	20	Nil
		Nil	10		Nil							
3	FINANCIAL Max. score=15		15									
		Audited Accounts last 3 yrs	15	Nil	Nil	10	0	15	15	10	Nil	10
		Bank statements	5	Nil	Nil	5	0				Nil	
4	Personel		30									
		Site Manager	10	Nil	10	10	10	Nil	10	10	Nil	Nil
		Surveyor	10	Nil	10	Nil	10	Nil	10	10	Nil	Nil
		Artisans	5	Nil	Nil	Nil	Nil	Nil	5	Nil	Nil	Nil
		Storekeeper	5	Nil	5	Nil	Nil	Nil	5	5	Nil	Nil
TAL SCORE			100	53	32	55	75	70	100	70	27	24
				Qualified	Disqualified	Disqualified	Qualified	Qualified	Qualified	Qualified	Disqualified	Disqualified

QUALIFIED BIDDERS

DER	COMPANY NAME	SCORE
idder 1	TIMES TEC CONSTRUCTION	53
idder 4	SOELLETA GENERAL CONTRACTORS	75
idder 5	BARETU GENERAL CONSTRUCTION	70
idder 6	IMENTI CONSTRUCTION COMPANY	100
idder 7	WASO BUILDING AND ROAD WORKS	70

EVACUATION DRILL GUIDE-BOOK FOR THE FLOOD PRONE AREAS IN KENYA

2. MANUAL ON EVACUATION DRILL FOR THE FLOOD PRONE AREAS

- The WRUAs operate within the WDC Module and are therefore required to develop Sub-catchment Management Plan (SCMP).
- It is therefore within the SCMP that the WRUAs are able to come up with strategies on how to manage floods within their sub-catchments.
- This manual was developed to help the WRUAs to effectively conduct evacuation drills in flood prone areas

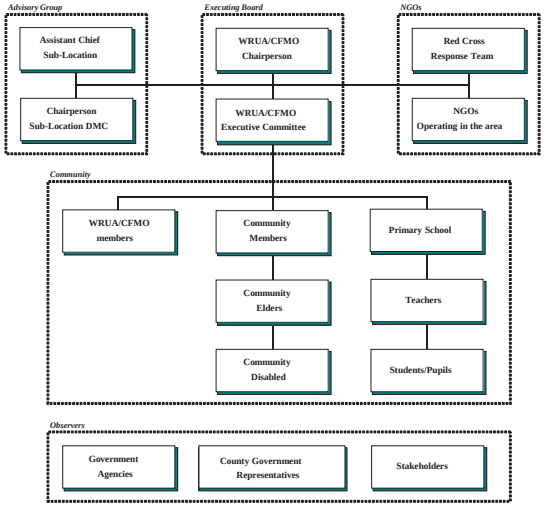
The outline for the manual on Evacuation drill is as follows

Preparatory stage

- Preparatory Meeting
- Confirmation of Executing Board and Organizations
- Implementation Programme on how to evacuate in case of flood disaster

Execution of evacuation drill

- STEP 1 : Commencement of Drill
- STEP 2 : Causing alert by use of megaphones
- STEP 3 : Evacuation of community members to evacuation centre
- STEP 4 : Dissemination of Information for External Assistance
- STEP 5 : Settling of Evacuees at the Evacuation Centre
- STEP 6 : First Aid Demonstration
- STEP 7 : Evaluation and Assessment of Flood Damage
- STEP 8 : Wrap Up Meeting



Evacuation drill timetable

Time	Case	Activity	Subject
8.00	Guest arrive	Briefing of Guests on the essence of the Drill	WRUA/CFMO Chairman
09.00	Community still at home and daily activity in each house. Suddenly river level rises abnormally	Wailing of a community member who has seen the swollen river	Parents give command to everyone
09.10	Overflow of river leading to floods	Siren goes on and announcement of overflow and evacuation starts.	WRUA/CFMO and clan elder
9.15	Movement to evacuation centre	WRUA/CFMO members are positioned to give direction on the routes to evacuation centre	Community People
9.26	Community move in mass to evacuation centre	secretary of the WRUA/CFMO to take roll call while the organizing secretary assess the damages	WRUA/CFMO team
9.40	Assisting the vulnerable to safety	The old, the sick and the young are assisted to the evacuation centre with the help of youths	Community health workers, Youths and WRUA/CFMO
09.45	Wrap up Meeting: Assessment of the routes and prepared ness	1. Assess the routes 2. Areas of improvement 3. Missing people (the forgotten)	WRUA/CFMO Chairman
09.50	Basic First Aid	Instruction on necessary steps in flood emergency	Kenya Red Cross
10.20	Re-cap	Review of the day	WRUA/CFMO Secretary
10.30	Closing Ceremony	Refreshment/Lunch and Sharing	WRUA/CFMO Chairman

3. Manual on flood disaster education

Manual on flood disaster education

- This Project is expected to strengthen WRMA/WRUA institutional ability through the capacity development on basic flood management to promote community based flood management activities within the WDC framework.
- This manual focuses how WRMA staff conducts flood management education to WRUAs and schools with utilization of the existing teachers manual in the Lower Gucha-Migori Sub-catchment

The outline of the manual on Manual on flood disaster education

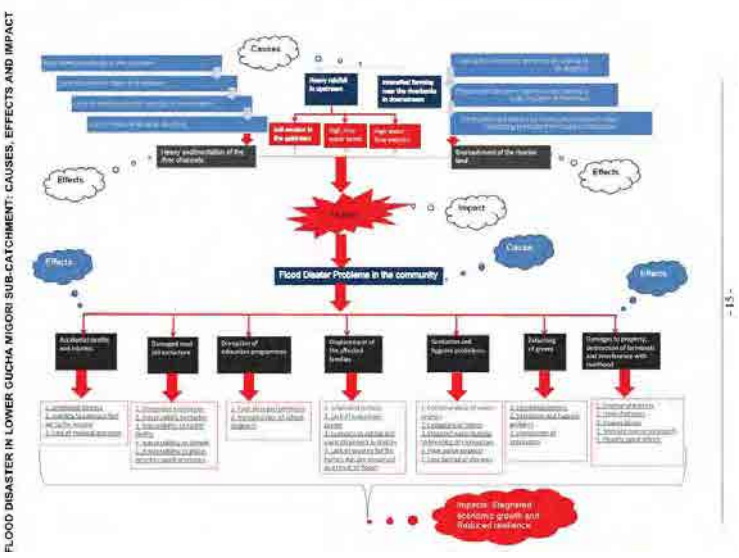
Background of Floods in the A River Basin
- Definition of floods
- Terms and vocabulary in flood management
- Organizations and Agencies involved in Flood Management
- Types of Floods
- Causes of Floods
- Effects of Floods
- History of floods disaster in the area

Flood Safety Measures at household level
- Background of the A Sub-catchment
- Floods in the A Sub-catchment
- Flood impact on schools in the A Sub-catchment

Flood Hazard in a River Basin

ce: LOGUMI WRUA SCMP

4 Satellite Map of LOGUMI Sub-Catchment



FLOOD DISASTER IN LOWER GUCHA MIGORI SUB-CATCHMENT: CAUSES, EFFECTS AND IMPACT

- 15 -

Outline cont..

Flood safety measures at Household Level
- Pre-Flood phase (before floods)-Preparedness
- Flooding Phase (during floods)- Response
- Post-flood Phase (after floods)-Recovery

Flood safety measures in Schools
- School Flood Safety Measures
- Safety on the way to school

Flood Early warning system
- What is flood early warning system?
- What are flood warning and forecasting?

Common Disease during flood season
- Causes and treatment for diarrhea
- Acute diarrhea for children
- Fever

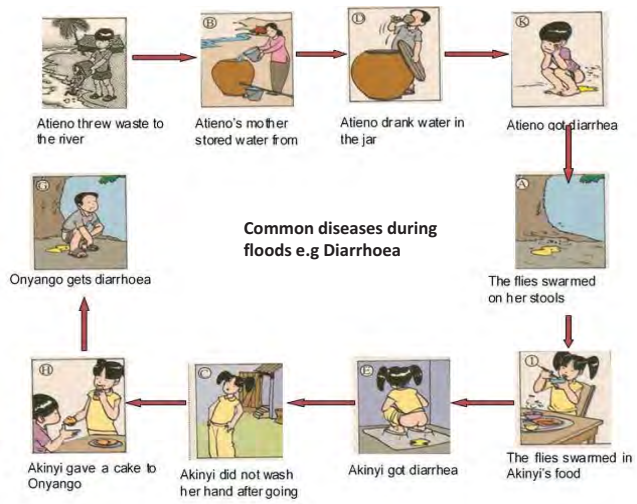
Outline cont..

School Flood safety Program

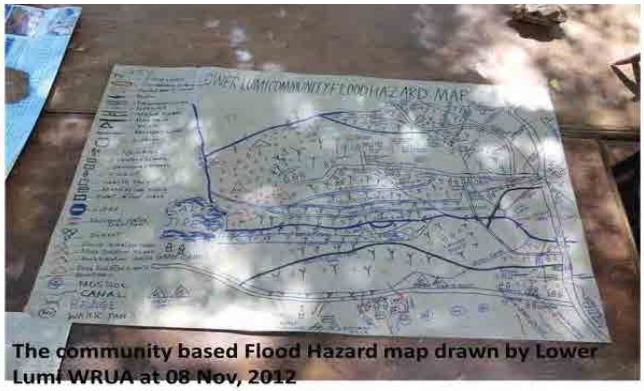
- Assessment on flood risk for school
- Developing School Flood Management Plan
- Teacher orientation on flood hazards
- Students orientation on flood hazards
- Designing public awareness activities in schools

First Aid

- Lessons on basic first Aid skills



4. Manual on community-based flood hazard map



The community based Flood Hazard map drawn by Lower Lumi WRUA at 08 Nov, 2012

Manual on community-based flood hazard map

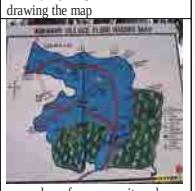
- Flood hazard mapping aims at delineating flood hazard areas along streams and lakes
- This tool has been developed to raise public awareness and to ensure smooth evacuation when a flood or another disaster is imminent

Objectives of flood hazard maps:

- Understand the characteristics of flood in the community
- Understand the weaknesses to floods in the community;
- Increase awareness of personal flood mitigation measures; and
- Assist the establishment and strengthening of community organisations for flood disaster mitigation.

Outline of manual on community-based flood hazard map

- Definitions
- Developing Community-driven Flood Hazard Mapping
- Importance of Local Knowledge in Community-driven Flood Hazard Map Implementation of Community-driven Flood Hazard Map
- Merits of Community-driven Flood Hazard Map
- Advantages of Community-driven Flood Hazard Map
- Point to note on Community-driven Flood Hazard Map
- How to use community flood hazard mapping to update topographical map

 Arrangement of material	 Explanation of the steps in drawing hazard map	 Identifying a person to lead in drawing the map
 Drawing the boundaries of the area	 Drawing the link roads, culverts, rivers, streams, bridges etc	 example of community drawn flood hazard map