ケニア共和国
環境・水・天然資源省
水資源管理庁

ケニア共和国
洪水に脆弱な地域における効果的な
洪水管理のための能力開発プロジェクト

プロジェクト業務完了報告書
第４巻　付属資料（2/2）

平成 26 年 9 月
（2014 年）

独立行政法人
国際協力機構（JICA）

株式会社　ニュージェック

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2014 年 3 月

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Constitution of IFMC

Constitution of the Integrated Flood Management Committee

The constitution of the Committee is proposed as follows.

1) PREAMBLE (Purpose of the Constitution)

   This constitution defines the establishment of "Isiolo River Basin Flood Management Committee" (hereinafter referred to as "the Flood Committee") and its necessary matters. The Flood Committee shall therefore be established by Regional Manager of WRMA

2) Objectives

   The objectives of the Flood Committee are to:

   - ✓ Collect opinions on draft Flood and Water Resources Management Plan prepared by WRMA; and
   - ✓ Collect opinions on how to reduce Flood damage
   - ✓ Ensure that stakeholder's opinions are reflected to the plan.
   - ✓ Incorporate implementation aspect
   - ✓ Monitoring and evaluation

3) Membership

   3.1 The Flood Committee shall consist of not more than 41 members and all prospective members shall become Flood Committee Members at the invitation of the Regional Manager of WRMA. A member shall fulfill the following requirements:

   - ✓ Shall be a local community member from the Isiolo River Basin or a resident and officer of administrations related to the Isiolo River Basin. H/she must understand the current conditions and problems on flood and water resource management in the Isiolo River Basin;
   - ✓ Shall be able to express his/her opinions and also listen and accommodate opinions of others expressed in the public without fear of intimidation or intimidating others; and
   - ✓ Shall regularly attend Flood Committee meeting.

   3.2 To add members can be requested to Regional Manager if it is needed through consultation to the Flood Committee.

   3.3 The Flood Committee can establish sub-committees on some topics if needed. Membership and operation of sub-Flood Committees shall be determined by the Flood Committee.

4) Composition of members

   The Isiolo River Basin Flood Management Committee shall consist of not more than forty

one (41) and not less than fifteen (15) members drawn from various areas that administer on work related to the Isiolo River Basin. The members shall include government institutions, non-governmental organizations (NGOs), private organizations, Community Based Organizations (CBOs), Faith Based Organizations (FBOs), Water Users Associations and Water Resources Users Associations (WRUAs).

5) Structure of the Flood Committee

5.1 Chairperson

The Flood Committee shall have a Chairperson and he/she shall be selected through mutual selection by members of the Flood Committee. The Chairperson shall manage the Flood Committee and represent it. In case of any incident of the Chairperson, a member who is designated as an acting chairperson shall act as the chairperson.

5.2 Secretary

The Secretary shall be an officer of WRMA Sub Regional Office in the Pilot Project Area. The Secretary shall be responsible with calling the Flood Committee meeting in consultation with the Chairperson. Among other duties the Secretary shall ensure effective operation of the Flood Committee.

5.3 Plenary

This shall be the membership of the Flood Committee that meet to deliberate and in-put their opinion to the draft Flood and Water Resources Management Plan prepared by WRMA.

5.4 Office bearers (Executive)

5.5 Elections and terms of the office

5.6 Frequency of the meetings –quarterly rotational hosting-

6) Proceedings

6.1 The Flood Committee shall be called by the Secretary in consultation with the chairperson.

6.2. The Flood Committee shall proceed with its deliberation when it attains the quorum of two-third of total members in attendance. But, the proxy shall not be allowed.

6.3. The Flood Committee shall make a decision by being agreed by more than half. But if there are any minority opinions, it should be mentioned.

6.4. WRMA can make explanations or express opinions after a member requests their opinion or permission of the chairperson.

6.5. The Flood Committee can request to hear opinions from person(s) with specialty in an area, if need be or out of necessity.

6.6. The Chairperson can give a chance for the public gallery to express his/her own opinions, if necessary.

7) Operation of the Flood Committee

The procedure of the Flood Committee Meetings shall be as follows:

- ✓ All regular Flood Committee meetings shall be under the invitation of the Secretary by giving at least five (5) days notice accompanied by the proposed agenda;
- ✓ The Flood Committee meeting will be held regularly at periodic intervals as shall be determined by the Flood Committee;
- ✓ The Chairperson shall chair all the Flood Committee meetings and only in his/her absence shall the Flood Committee elect one member to act as the Chairperson to chair that particular Flood Committee meeting;
- ✓ The Secretary shall undertake the recording of all the Flood Committee meetings;
- ✓ All the records of the Flood Committee shall be kept and maintained by the Secretary of the Flood Committee;
- ✓ The Flood Committee shall constitute special committees on ad-hoc basis; and
- ✓ The special committees shall report to the Flood Committee of their findings and a report that will form part of the Flood Committee records submitted to the Secretary.

8) Disclosure of Information

8.1 Information of the Flood Committee and information of discussion in it shall be open to the public. The methodology to disclose information shall be decided in the Flood Committee.

8.2. WRMA should cooperate to disclose information as mentioned above in 8.1.

9) General Affairs

Following general affairs of the Flood Committee shall be conducted by WRMA with instruction of the Chairperson;

- ✓ To prepare materials of the Flood Committee meeting
- ✓ To prepare the draft minutes of meeting
- ✓ To arrange the discussion in the Flood Committee and to make materials to be disclosed
- ✓ Any other as need arises

10) Amendments to the Constitution

Amendments to the Constitution shall be done after getting agreement of more than two third of members.

11) Subsidiary Rules

Subsidiary rules necessary for the operation of the Flood Committee shall be presented by the Chairperson to the Flood Committee and decided through discussion in the Flood Committee.

付属資料 3-6

Isiolo 川流域における第 1 回 IFMC 会議議事録等

The First Meeting of the
Isiolo River Basin Integrated Flood Management Committee
Agenda

Date: 23rd January 2013
Venue: Rangeland Hotel, Isiolo

Arrival of participants (8:00 am)
Registration（8:00 a.m. to 08:30 a.m.）30min

Morning session I (08:30-09:55) 1hr 25 min

1) Introductions (10min) (ATCM- Isiolo)
2) Opening remarks from WRMA Regional Manager (purpose, objectives and schedule) (15min)
3) Opening remarks from County Commissioner, (officially declaring the meeting open) (5min)
4) Keynote address by Project Team (operational outline) (30 min)
5) Basic River Basin characteristics and features with a bias towards floods by WRMA SRO Manager Isiolo (15min)
6) Flood damage situation in Isiolo River Basin by Project Team (10min)

Tea Break (09:55 a.m. to 10:20 a.m.) 25min

Morning session II（10:20 a.m. to 12:15 p.m.）2h 10min

7) Comments and additional information/experiences in flood damages or based on the presentations from the Project Team (50 min)
8) Group discussion and Presentations (4 groups) led by Moderator (40 min)
9) Wrap up by IFM Committee Interim Chairman assisted by Project Team, way forward on the next actions (10 min)
10) Closing remarks: (1) from Project Team (conclusions, IFM Committee next meeting Schedule, and what participants need to think about i.e. solutions (short-term, Mid-term and long-term , (2) JICA –Kenya office (3) WRMA – representative from the HQ (15min)

Lunch (12:15 to 13:15)

Minutes of Isiolo River Basin Integrated Flood Management Committee

January 23, 2013

Introduction

The meeting kicked off at 9:40 am with a word of prayer and thereafter the moderator led the participants through a session of self-introductions for the participants.

Opening Remarks

The Regional Manager Mr. Samuel Wangombe in his opening remarks first apologized for the late start of the IFM Committee meeting which had been scheduled to start at 8:00 am but commenced at 9:40 am. He also informed the participants that the Isiolo County Commissioner had sent his apologies and was unable to attend the meeting due to unavoidable circumstances. He explained to the participants that County Commissioner was an active stakeholder in the issues concerning flood management and that the County Commissioner was grateful with establishment of IFM Committee in Isiolo. The Regional Manager on behalf of the County Commissioner thereafter declared the IFM Committee officially opened.

The Regional Manager also officially welcomed the various organizations that were present to the IFM Committee meeting. He pointed out that WRMA was appreciative of the fact that WRMA had invited the stakeholders via letters and various organizations had sent representatives to the meeting which he pointed out that was an indication of the willingness of various stakeholders to engage in the integrated flood management in the Isiolo River Basin.

He further appreciated the effort of JICA in assisting Kenya in Flood Management. He clarified that Kenya can learn from Japan the good experiences in Disaster Management. He thereafter gave the background of the Project, he also enumerated on the objectives of the IFM Committee and the membership. He further clarified that the Regional Manager was the interim Chair in the first meeting and that in the second IFM Committee meeting the members will elect a new Chair from amongst themselves. He also gave the themes for the first three IFM Committee meetings as follows: the 1st Meeting: discussion of the current problems; the 2nd Meeting: discussion on counter measures to the problem and the 3rd Meeting: Focus will be on Operation and Maintenance of the proposed counter measures.

The Regional Manager finalized his opening remarks by clarifying that the Project aimed at involving the community as key stakeholders in flood management.

Keynote Address: Operational Outline

The Chief Advisor to the Project Mr. Kondo discussed the outline of the Project in his presentation. He explained that Japan was a small country with a high density population and thus encounters many natural disasters and therefore disaster management has been at the core in policy formulation. He therefore hoped that Japanese experience can be replicated in Kenya.

He pointed out that disasters had been increasing in their occurrences in Kenya. He also explained that the data from Crisis Response Centre collected between the years 2010 to 2012 estimated a cost of 13 billion in losses as a result of disasters.

He also explained to the participants why WRMA was the counterpart agency to the Project which primarily was predicated on WRMA's mandate. He also explained the historical background of JICA Projects on Floods in Kenya and in particular Nyando River Basin.

He further explained to the participants the phrase Integrated Flood Management Plan which implies both structural and non-structural measures in management of floods.

In the structural measures he explained that there were the short-term, mid-term and long-term. He expounded on the short-term which he pointed out that it implied emergency activities with short life span to implement, while on long-term he expounded on it as big size structures with long life span in implementation and can also imply measures that can be implemented in the future.

On the non-structural he explained that they can be categorized into two, i.e. the measures that are Government assisted initiatives and measures that are community initiated initiatives. He explained to the participants the Nyando case wherein the following non-structural measures activities like O&M, evacuation drills, education programme, borehole were implemented.

He also explained to the participants the flood Hazard Mapping that had since been carried out in Isiolo. He pointed out the importance of flood Hazard Mapping and gave an example of flood Hazard Map that was done in Japan. Flood Hazard Map is used as strong tools for scientific assessment and also policy-based management. There must be interaction between science and policy, community and government. He pointed out that by use of flood Hazard Map it was possible to come up with water flood depth level and directions to safe grounds during flood disaster.

He further explained the project target areas and the scope of the project. He thereafter explained the necessity of River Basin Flood Management Plan and the importance that plan when it was river basin, i.e. the river basin as the basic unit in the plan.

He also explained the viewpoint of measures/capacities that address floods, i.e. pre-flood that aims at minimizing floods by engaging activities that mitigate or reduce impact of floods and during flooding response whose activities mainly aims at helping the vulnerable affected persons. He further explained the self-help, mutual-help and public assistance, in which he pointed out that all these three levels often overlaps between the levels. He also explained the concept of community-based activity that leads to developing resilient community. He therefore pointed out that the IFM Plan is at the core in reducing floods and entails all parties, which consist of government, community and individual fulfilling and playing their roles.

Basic River Basin Characteristics

WRMA Isiolo Sub-regional Manager Mr. Kinyanjui explained to the participants the geographical features and characteristics of Isiolo River Basin. He also explained the physical features characterizing the rivers, the rainfall features and topographical features in Isiolo River Basin.

In his presentation, he explained by giving the analysis of a case study of flood disaster analysis in the Isiolo River Basin. He also explained the flash floods in Isiolo in which he attributed to the surface run-off that flows on the road into the town. He also explained the sediment discharge problem and increased human activities leading to increased incidences of floods. He thereafter explained the impact of the floods in the town.

In his conclusion, he also elaborated cause and effect of floods in Isiolo to the participants. He summarized the impacts of floods in Isiolo as follows: loss of livelihood, destruction of infrastructure, soil erosion in the upstream, water contamination and loss of human life. He also summed up the causes of floods as encroachment of the riparian area and uncontrolled garbage and waste disposal. He gave an example of Merire River in Isiolo River Basin which has been encroached and lack of storm drainage infrastructure leading to sheet flows in flat areas.

Flood damage situation in Isiolo River Basin

The Project Team Leader Mr. Sawa explained to the participants that the Project Team had visited Isiolo on various occasions in fact finding missions and study. He pointed out that based on these missions the Project Team had identified four types of flooding in Isiolo town. He also explained the impact of each type of flood on Isiolo River Basin.

He also explained the cause of inundation of town centre. He explained that River Merire was shallow and narrow and that many houses had build in encroached river areas, culverts and bridges were clogged that during high flows leads to floods. He further pointed out that the drainage channels and network in Isiolo were not sufficient and that the road and the airport cause heavy rainfall surface run-off leading to flooding of the Isiolo town.

Comments and information/experiences in flood damages or based on the presentations from Project Team (Panel Discussion)

The WRUA chair was selected as the chair of panel. He started off by stating that the Isiolo has too extreme scarcity and voluminous water as a problem. He also pointed out that there were buildings being constructed in the water ways and riparian land and he posed the following rhetoric question to the participants. Where will the water that was flowing through those areas be channeled to? He also gave historical background of the water channels and he pointed out that through the oral traditions in the area it is believed that River Merire was formed when there were serious bombing during the World War Ⅱ.

Another panelist the CAAC member stated that what had been presented during the morning session represented and reflected the true scenario of floods in Isiolo. He clarified that the heavy rains in the upstream led to cut down tree logs flowing downstream and blocking drainage channels. He stated that, the problem was that the floods caused damages to infrastructure and the flood water flows away leaving the residents with damaged infrastructures and also with lack of water.

An officer with Isiolo Water Service Board stated that Isiolo was seriously affected by floods. He explained that the Service Board during dry season could not supply sufficient water to the town and during rainy season the water sources are silted, making it again difficult for water treatment leading to the Service Board inability to supply sufficient water to the Isiolo town. He pointed out

that floods led to infrastructural damages on water supply infrastructure. He therefore pointed out his optimism that the Project timing was appropriate.

Mr. Silas Mureithi of KWS stated that there is need to consider the causes of floods rather than consider the impact of floods. He explained that during colonial period the communities were ordered to make terraces in their farms which in essence reduced the speed of water and acted as sediment checks. He therefore stated that dams should be constructed to store water. He also pointed out the need for conservation of water at their sources. And he concluded his contribution by pointing out the need for community sensitization on problem of siltation and proper farming methodology.

An Officer with Ministry of Agriculture on his party pointed out the initiative that his office had undertaken. He stated that his office was encouraging the communities to engage in 10% agroforestry, training on use of waste paper use instead of charcoal, community sensitization is being done. Moderator pointed out lack of sharing information led to the stakeholder not knowing who does what and where and stated that the IFM Committee will be such a forum that stakeholders could share information.

A participant from Bola Pesa Marire Isiolo stated that a person who was his neighbor had died in the flood and houses have been damaged by floods. He explained that these negative impacts of floods led the community members to organize themselves in preparation which led the community members to meet with various relevant agencies. He also pointed out that the major problem was uncontrolled construction, feeder roads that were being constructed in the area without appropriate feasibility studies with respect to problems of floods as a result of roads that act as water channel. He further pointed out that the constructed culverts in the area drains the water into Isiolo town. He further stated that the County Council has not taken up the responsibilities to address the above mentioned problems. He also explained to the participants that Isiolo does not experience heavy rainfall but yet heavy rains in the upstream that led to floods in Isiolo town.

KRCS risk reduction officer pointed out that lack of contingency planning was a major problem which should be addressed right from the village level with the capacity of the community being developed to tackle the flood menace and manage risk assessment in their villages.

Group Discussion Session

The participants were thereafter divided into four groups and each group was assigned with a particular topic to discuss. The groups and the topics to be discussed were as follows:

Group A: Causes of floods

Group b: Mitigation measures that government can put in place to address floods in Isiolo

Group C: Mitigation measures that community can put in place to address floods in Isiolo

Group D: What are the impacts of flooding within the urban area and the rural area that is affected by floods?

Group A: What are the causes of floods in Isiolo

Causes of floods

- Catchment degradation in the upstream
- Poor farming methods: No conservation measures, poor planting
- Lack of check dams along the water course
- Poor drainage system
- Poor planning in town
- Uncontrolled development
- Irregular land allocation
- Poor solid waste disposal
- Lack of infrastructure maintenance
- Lack of water harvesting techniques
- Climate change impact

Group b: Mitigation measures that government can put in place to address floods

Mitigation measures by the government

- Undertake study of catchment to determine flood characteristics in the catchment area
- Propose dams/check dams to be built in strategic positions
- EIA for all civil works and other major projects
- Disaster response unit with contingencies measures: disaster mgt funds, technical capacity
- Safe Evacuation grounds in events of flood disaster
- Early warning systems
- Reconstruction funds

Group C: Mitigation measures that community can put in place to address floods in Isiolo

Mitigation measures by the community

- Flood Hazard Map as a community as EWs
- Effective communication or collaboration between up/down stream
- Collaboration with relevant authority in community planning
- Use traditional ways mitigation measures: destocking, building gabions
- Avoid settlement around river course

Group D: What are the impacts of flooding within the urban area and the rural area that is affected by flood.

Impact of floods in rural and urban

Rural

- Destruction of crops in rural areas
- Soil erosion
- Displacement of people
- Loss of lives for livestock and human
- Outbreak of waterborne diseases
- Destruction of services e.g. water intakes
- Destruction of businesses rural areas

Urban

- Destruction of services; water pipes etc
- Water contamination
- Business suffer those rely on agricultural produce from rural areas
- Insecurity in urban areas especially during blackouts
- Outbreak of diseases

Wrap up meeting

The Regional Manager in the wrap up discussed the countermeasures to floods based on what the government can do, what community can do with the assistance of the government and community based and managed initiatives. He reminded the participants the first three initial meetings and the 2nd Meeting be held on 15th March 2013 and it is in the second meeting that the Chairman will be elected. In the second meeting also the various proposals both of the IFM Committee and the one for Project Team will be discussed. The third meeting will come two months after the second meeting.

The WRUA chair was selected as the chair of panel. He started off by stating that the Isiolo has too extreme scarcity and voluminous water as a problem.

Closing remarks

Mr. Kondo stated that the meeting fruitful and there was emergence of new information and new ideas and requested that participants should send email and share the information. Mr. Sawa requested that Committee members to fill the forms with their ideas and submit to reception. Ms. Fukai appreciated the attendance and stated that good disaster management can be achieved when every person take responsibilities and perform their roles.

Mr. Bosuben stated that flood was an issue as result of climate change that is now global matter. Pointed out that there was water policy that was being undertaken, he appreciated the Japanese government's assistance towards flood management in Kenya.

Eng. Kimanga pointed out that there was framework proposed on flood management, he appreciated the committee members for attending the meeting and he requested the committee members to maintain the spirit and attend the subsequent IFM Committee Meetings in Isiolo River Basin.

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Issued by: .....

(Management Representative)

Approved by: .....

(Chief Executive Officer)

	TITLE: Meeting Attendance Form	REF. NO:F/18/1
		ISSUE NO:04
	DEPARTMENT: Management Representative	REV. NO: 3
	ISSUED BY: MR	DATE OF ISSUE: 17th July, 2012
	AUTHORIZED BY: CEO	PAGE: 2 of 2

Issued by: .....

(Management Representative)

Approved by: .....

(Chief Executive Officer)

付属資料 3-7

Isiolo 川流域における第 2 回 IFMC 会議議事録等

添付資料-1

MINUTES OF MEETING

OF

THE SECOND INTEGRATED FLOOD MANAGEMENT COMMITTEE MEETING

IN THE ISIOLO RIVER BASIN

The second Integrated Flood Management Committee Meeting in the Isiolo River Basin (hereinafter referred to as "the Committee") was held at Rangeland Hotel in Isiolo on 14 August 2013. As the result of the discussions, committee members confirmed the following issues.

1. The Integrated Flood Management Committee in the Isiolo River Basin

On the basis of the discussion in the first meeting of the Committee held on 23 January 2013, Mr. Timothy MUTIE, Assistant Technical Coordination Manager, Ewaso Ng'iro North Catchment Area Regional Office, Water Resources Management Authority (hereinafter referred to as "WRMA") explained the purpose, members and other related matters of the Committee.

The attendants built consensus upon the following.

(1) Purpose

1) In order to mitigate the damage by the flood in the Isiolo River Basin, Flood Management Plan which is one of the important contents of the Sub Catchment Management Plan (SCMP) shall be formulated by the relevant stakeholders in Isiolo River Basin.

2) The progress of the implementation of the Flood Management Plan shall be confirmed and the Plan shall be updated if necessary.

3) The other related issues for implementing the Flood Management Plan shall be discussed.

(2) Members

Members of the committee are;

- WRMA Ewaso Ng'iro North Catchment Area Regional Manager: Chairperson;
- Isiolo WRUA;
- Representatives of residents;
- Isiolo County Government;
- Meru County Government;
- Concerned line ministries and governmental institutions;
- Concerned NGOs.

The Chairperson can nominate necessary members for the discussion of the related issues, if necessary.

(3) Frequency of the Committee

The Committee shall be held once a year at least by the arrangement of WRMA Regional Office.

2. Integrated Flood Management Plan (Draft)

(1) The Integrated Flood Management Plan in the Isiolo River Basin (Draft) was explained by Mr. Timothy MUTIE, Technical Manager, Ewaso Ng'iro North Catchment Area Regional Office, WRMA and was got consensus by the attendants. It was understood by the attendants that the target period of the plan would be five (5) years and the necessary update of the plan should be conducted in the Committee in every year. The outline of the Integrated Flood Management Plan is shown in the **Attachment 1.**

3. Pilot Project – Structural Measures-

(1) Selection of the Pilot Project

Mr. GITONGA, Catchment Management Officer, Isiolo SRO, WRMA, explained the candidates of Pilot Project which should be implemented in the early stage of the Flood Management Plan through the Technical Assistance by JICA.

He pointed out the necessity of consideration on the budgetary allocation and the project term as the JICA's technical cooperation project and then asked the attendants for their opinions.

At the result of discussion, the following projects were prioritized as the Pilot Project by the attendants shown in the **Attachment 2.**

If there are difficulties in implementing the selected project, e.g. approval from relevant authorities, technical difficulties, budget, then WRMA, WRUA and JICA team consider the possibility of implementing the next highest priority project. The result will be informed at the next Committee.

Mr. SAWA, Team Leader of the JICA Project Team, pointed out that the Pilot Project aimed;

-to implement flood management activities in the categories of "self-help" and "mutual-support";

-to follow the WDC process during the course of implementation of the Pilot Project;

-to establish sustainability through the experience of actual maintenance activities.

Therefore, he requested WRUA members to participate in the Pilot Project actively.

(2) Schedule of the Pilot Project

Mr. GITONGA explained the expected schedule of the Pilot Project shown below and the understanding by the attendants was made. Also, it was confirmed that the progress of the Pilot Project would be reported in the next Committee.

1) At the middle of August 2013: Finalizing the design

2) At the middle of August 2013: Getting approval from the land owner, the river management authority, the road management authority and the environmental management authority

3) At the middle to the end of August 2013: Holding WRUA Procurement Committee meeting which will be supported by WRMA and JICA Project Team to make a contract for the construction of the Pilot Project

4) At the beginning of September 2013: Actual construction work will be started and the total term of the construction work is supposed to be two (2) or three (3) months

He also requested the WRUA's contribution during the implementation of the construction work because it was a requirement described in the "WDC FINANCIAL GUIDELINES".

4. Community based flood management activities (non-structural measures)

Ms. Fukai explained the candidate Pilot Projects by non-structural measures and got the understanding of the attendant.

As the result of the discussion by the attendants, followings were selected as the Pilot Project by non- structural measures shown in the Attachment 4.

1) Community Based Early Warning System

2) Disaster Management Education

Attachment list

- Attachment 1: Isiolo River Basin Integrated Flood Management Plan – Draft-
- Attachment 2: Priority of the Pilot Project
- Attachment 3: Community based flood management activities (non-structural measures)
- Attachment 4: Attendance List

Isiolo, 14 August 2013

Mr. David Ochilo

Regional Manager, Ewaso Ng'iro North Catchment Area Regional Office

Water Resources Management Authority

Ms. Kai Kikuiri

Deputy Director

Disaster Management Division 1

Water Resources and Disaster Management Group, Global Environment Department

Japan International Cooperation Agency

Eng. Wilfred Matagaro

Head, Flood Management Unit

Water Resources Management Authority

Mr. Katsuro Kondo

Chief Advisor

JICA Project Team

Mr. Felix Karimba

Chairperson

Isiolo Water Resources Users Association

Mr. Hideki Sawa

Team Leader

JICA Project Team

The 2nd Integrated Flood Management Committee Meeting in Isiolo River Basin
-Agenda-

Date: 14 August 2013

Venue: Rangeland Hotel, Isiolo

Time	Session name	Min	Speaker
08:30 09:00	Registration	30	--------
09:00 09:10	1.Opening Remarks	10	WRMA・R M
09:10 09:20	2.Opening Remarks	10	County Governor
09:20	3.Review and Confirmation of Minutes of Previous Committee Meeting on January	10	WRMA- ENNCA RO Mr. Timothy Mutie
09:40	Discussion	10	
09:40	4.Current Progress of PCDEFM -Training plan under the WDC module & cycle	20	JICA Chief Advisor Eng. Kondo
10:00	Discussion	10	
10:00	5.Nyando and LOGUMI Exchange Visit Report	10	WRUA Chairperson/Secretary
10:15	Discussion	5	
10:15	6.Integrated Flood Management Plan in Isiolo River Basin	40	WRMA – RO, Mr. Timothy Mutie
11:20	Discussion	25	
20 min	**Tea Break**		
11:40	7.Structural Measures - Selection of Structural Measures as The Pilot Project	30	WRMA-Isiolo SRO, Mr. Gitonga
12:35	Discussion	25	
12:35	8.Non Structural Measures	20	KRCS/JICA Kenya
13:30	Discussion	25	
1330 13:40	Closing Remarks	10	WRMA-HQ, FMU Eng. Matagaro

Moderator: WRMA Isiolo SRM, Mr. Kinyuanjui

Attachment 1

Isiolo River Basin Integrated Flood Management Plan – Draft-

	Countermeasures	Required Preparation	Main Actor	Support Actor			WRMA's role	WRUA's role	1st year	2nd year	3rd year	4th year	5th year	6th year or later
				NGO	Administrative Authority	Techinical Authority								
Structural Measure	Development of Drainage Canal at Airport Area	Study/Survey/Discussion	County/District/WRUA		KeRRA	MWI, WRMA	coordination with related ministries	planning/ construction/ maintenance	Study and Discussion					
	Development of Drainage Network in Whole Urban Area of Isiolo Town	Study/Survey/Discussion	County/District		Ministry of Planning	MWI, WRMA	coordination with related ministries	maintenance			Study and Discussion			
	Culvert under road at airport area	Study/Survey/Discussion	KeRRA		County/District	MWI, WRMA	coordination with related ministries	maintenance	Study and Discussion					
	Retarding Basin/Pond at airport area	Study/Survey/Discussion	Airport Authority		County/District	MWI, WRMA	coordination with related ministries		Study and Discussion					
	Bank Protection (affected area to the transportation and farmlands)		WRUA		WRMA/ County/ District, Ministry of Road/ KeNHA	MWI, WRMA	approval of construction, coordination with related ministries, techinical advice	planning/construction/ maintenance						
	Improvement of Merire River (widening, etc)	Study/Survey/Discussion	NWCPC		County/District	MWI, WRMA	coordination with related ministries	maintenance			Survey and Discussion			
	Dam/Check Dam in the upstream of Merire River	Study/Survey/Discussion	WRUA/NWCPC		County/District	MWI, WRMA	coordination with related ministries	planning/ construction/ maintenance			Survey and Discussion			
Non-structural Measure	Flood Hazard Map		WRUA		County/District	MWI, WRMA	coordination with related ministries/techinical advice	cooperation/participation/enlightenment activity						
	Contingency Plan	Study and Discussion	County/ District	KRCS/World Vision	Min. of Special Programmes	MWI, WRMA	coordination with related ministries/techinical advice	cooperation/participation/enlightenment activity	Study and Discussion					
	Communication and collaboration between up/down stream	Already started in the committee	WRUA		MWI, WRMA	MWI, WRMA	coordination with related ministries/techinical advice	cooperation/participation/enlightenment activity						
	Flood Evacuation Programme	Study and Discussion	WRUA		County/District	MWI, WRMA	coordination with related ministries/techinical advice	cooperation/participation/enlightenment activity	Study and Discussion					
	Education on Disaster Prevention		Schools, WRUA	KRCS/ PTA	Ministry of Education/ County/District	MWI, WRMA	coordination with related ministries/techinical advice	cooperation/participation/enlightenment activity						
	Trash picker Campaign		WRUA		County/District	MWI, WRMA	coordination with related ministries	cooperation/participation/enlightenment activity						
	Flood Early Warning System	Study and Discussion	WRUA/County/District	KRCS	KMD/Ministry of Special Programs	MWI, WRMA	techinical advice	planning/formulation/operation/maintenance	Study					
	Sandbag		WRUA		County/District	MWI, WRMA	coordination with related ministries	cooperation/participation/enlightenment activity						
	Reconstruction and Recovery including Funds		County/ District	KRCS	Min. of Special Programmes	MWI, WRMA	coordination with related ministries	cooperation/participation/enlightenment activity						
	Forestation Activity		WRUA	KRCS	Kenya Forest Service	MWI, WRMA	coordination with related ministries	cooperation/participation/enlightenment activity						
	Restriction on land use		WRMA MOL		MOL	MWI, WRMA	coordination with related ministries	cooperation/participation/enlightenment activity						

Attachment 2

Priority of the Pilot Project

Summary of Pilot Project Evaluation

Proposed measures	Feasibility	Term	Expenditure
Development of Drainage Canal / Airport Area	C	B	C
Culvert Under Roads / Airport Area	C	B	C
Bank Protection	A	A	A
Dam / Check Dam / Upstream of Merire River	C	B	B

A(3Points): Excellent / B(2Points): Good / C(1Point): Fair

COMMUNITY BASED FLOOD MANAGEMENT ACTIVITIES (NON-STRUCTURAL MEASURES) - IMPORTANCE OF ROLE OF COMMUNITY-

JICA KENYA OFFICE

CONTENTS

- Key Lessons Learned from Great East Japan Earthquake 2011 – the Role of Community in Disaster Management-
- Community based Flood Management Activities (non-structural measures) in Gucha Migori, Isiolo & Lower Lumi

KEY LESSONS LEARNED FROM GREAT EAST JAPAN EARTHQUAKE OF 2011

"COMMUNITY BASED DISASTER RISK MANAGEMENT" 80% OF PEOPLE WERE RESCUED BY THEIR NEIGHBORS!!

Importance of the Role of Community

"RISK COMMUNICATION" UNDERSTANDING THE RISKS, BUT ALSO, BE PREPARED FOR THE UNEXPECTED!!

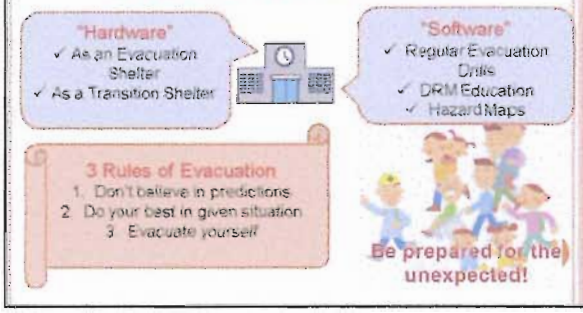
Only 20 % of people utilized the hazard maps

Some people died by relying only on the information in the hazard maps

Limitation of the Early Warning System...

"KAMAISHI MIRACLE"? CHILDREN'S SURVIVAL RATE OF 99.8%!!

Importance of the Role of Schools

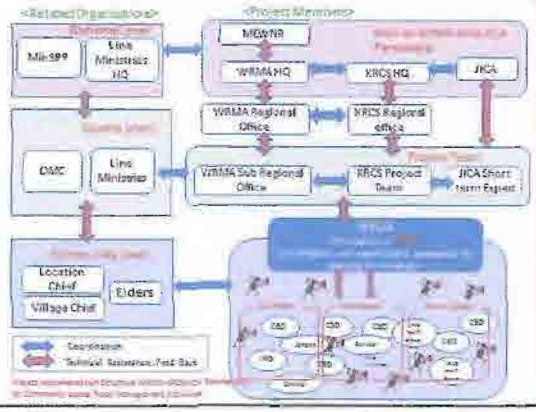


SELF SUPPORT & MUTUAL SUPPORT & PUBLIC SUPPORT

COMMUNITY BASED FLOOD MANAGEMENT ACTIVITIES (NONSTRUCTURAL MEASURES) IN GUCHA MIGORI, ISIOLO, AND LOWER LUMI

PATRTNERSHIP BETWEEN WRMA, KRCS, AND JICA

PROJECT IMPLEMENTATION STRUCTURE



OUTLINE OF THE ACTIVITIES

Duration: August 2013 – December 2013 (5 Months)

Implementing Partners: WRMA, and KRCS

Overall Objective: To build flood resilient communities through effective collaboration among WRMA, local government, WRUAs and community members

Specific objectives:

1. To establish community based early warning system
2. To equip pupils / communities with appropriate knowledge, awareness, skills, values and attitudes that will enable them prepare and react to floods through Disaster Management Education / Hygiene Education
3. To improve the capacity of the communities on livelihood interventions adopted to floods – Lower Lumi
4. To share the experience and lessons learned with various stakeholders
5. **Target Group**: WRUAs, Community Leaders, Schools, KRCS Volunteers / KRCS Youth Groups / KRCS Clubs

ACTIVITIES IN ISIOLO

【Community based Early Warning System】

WRMA/ KRCS and WRUA will:

- Consult with community key persons for establishment of EWS (analyze current situation, identify location for installation of rain gauge, how to manage the system, how to transfer information, etc.)
- Install rain gauges / water gauges
- Conduct trainings on management of EWS
- Sensitize community on EWS
- Monitor and evaluate the EWS

ACTIVITIES IN ISIOLO - CONTINUED

【Disaster Management Education】

WRMA/ KRCS and WRUA will:

- Select 4 target schools (2 primary, and 2 secondary)
- Conduct the baseline survey on disaster awareness in each school
- Conduct trainings on children-centered disaster management education in schools
- Support KRCS Club's activities on disaster management education (e.g. DRR games, risk analysis, making of hazard maps, evacuation trainings, cleaning of river, etc.)
- Monitoring of the activities

NONSTRUCTURAL MEASURES (EXAMPLES FROM JICA'S NYANDO PROJECT)

THANK YOU!

付属資料 3-8

Isiolo 川流域における第 3 回 IFMC 会議議事録等

MINUTES OF MEETING

OF

THE THIRD MEETING OF THE ISIOLO RIVER BASIN

INTEGRATED FLOOD MANAGEMENT COMMITTEE

The 3rd Meeting of the Isiolo River Basin Integrated Flood Management Committee (hereinafter referred to as "the Committee") was held at Rangeland Hotel in Isiolo on 21st May 2014. As the result of the discussions, the attendants built consensus upon the following.

1. Minutes of the Previous Isiolo River Basin IFMC meeting

   Minutes of the previous Isiolo River Basin IFMC meeting was explained by Mr. Timothy Mutie, Assistant Technical Coordination Manager, Ewaso Ng'iro North Catchment Area (ENNCA) Regional Office, Water Resources Management Authority (hereinafter referred to as "WRMA") explained the minutes of the previous Committee meeting and the participants didn't have any objections.

2. Finalization of the Integrated Flood Management Plan

   Overview of the draft IFMP was explained by Mr. Mutie and it was understood by the attendants that the IFMP would be finalized as it was but the necessary update of the plan should be conducted in the Committee in quarterly meetings. The IFMP is to be incorporated in the CMS. The scope of the IFMP to be cascaded in the Isiolo WRUA SCMP. The numbers of committee members were identified to be 33; this number is subjected to review either downwards or upwards. The finalized IFMP to be assimilated to the County Governments (Isiolo and Meru) for easy implementation, this should be done before the end of financial year 2013/2014 for consideration for funding of the proposed activities in the draft IFMP. The outline of the Integrated Flood Management Plan is shown in the **Attachment 1**.

3. Report on the river bank protection structure and CBFEWS installation and operation

   River bank protection structure and community-based flood early warning system (CBFEWS) installation and operation were reported by Mr. Jared Otieno, Supervisor, JICA Project Team and was understood by the attendants. The media was identified as key partner in the dissemination of flood early warning information. The outline of the report is shown in the **Attachment 2**.

4. IFMC Constitution

   IFMC constitution was proposed by Mr. Muthinja, ENNCA RO, WRMA and discussed. The proposed IFMC constitution is shown in the **Attachment 3**. The following opinions were made by the attendants;

   1) Membership of the IFMC should be reviewed to include the media, and membership shared/distributed to ensure proper representation of both the County Government of Meru and Isiolo.

   2) The frequency of meetings should be in quarterly basis.

3) The suggested amendments to be looked at and where relevant be adopted so that the whole constitution will be passed and adopted during the next IFMC meeting. A time frame was then set to be two weeks for any suggestion for finalization of the Constitution.

4) The Election of the new office holders will be done during the next IFMC meeting after the constitution has been adopted.

Attachment list

- Attachment 1: Outline of the finalized Isiolo River Basin Integrated Flood Management Plan
- Attachment 2: Outline of the report on the river bank protection structure and CBFEWS installation and operation
- Attachment 3: Proposed IFMC Constitution
- Attachment 4: Attendance List

Isiolo, 21 May 2014

Mr. David Ochilo

Regional Manager, Ewaso Ng'iro North Catchment Area Regional Office

Water Resources Management Authority

Mr. Hideki Sawa

Team Leader

JICA Project Team

Mr. John Kinyanjui

Sub Regional Manager, Middle Ewaso Ng'iro Sub Regional Office

Water Resources Management Authority

Mr. Felix Karimba

Chairperson

Isiolo Water Resources Users Association

Attachment 1

WATER RESOUCES MANAGEMENT AUTHORITY

JAPAN INTERNATIONAL COOPERATION AGENCY

OVERVIEW OF
ISIOLO RIVER BASIN
INTEGRATED FLOOD MANAGEMENT PLAN
- DRAFT –

Timothy Mutie, ATCM(FM)
ENNCA Regional Office

Project on Capacity Development For Effective Flood Management In Flood Prone Areas In the Republic of Kenya

21st May, 2014

Rangeland Hotel

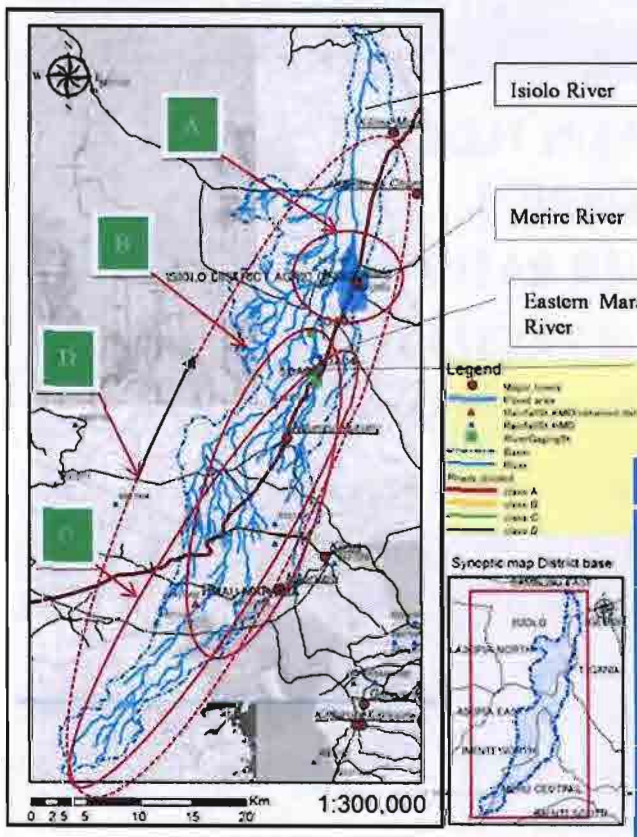
Contents of Isiolo IFM Plan

1. OBJECTIVE OF RIVER BASIN FLOOD MANAGEMENT PLAN (DRAFT)
2. OUTLINE OF ISIOLO RIVER BASIN
3. ANALYSIS OF FLOOD CHARACTERISTICS
4. EVALUATION OF COUNTERMEASURES TO THE FLOOD PROBLEM
5. PROJECT IMPLEMENTATION PLAN OF FLOOD COUNTERMAURES (SCHEDULE)
6. RECOMMENDATIONS

Objective/Purpose of Flood Management Plan

- Mitigation of flood damage in Isiolo Town area
- Mitigation of flood inundation in other areas of the river basin
- Mitigation of river bank erosion damage of socio economically important points/areas
- Framework for stakeholder participation and resource mobilization from both public and private sources.
- Framework for WRUA and community participation in flood management
- The plan covers period of 5 years from 2013 to 2018
- This plan shall be revised if and when necessary

Flood Characteristics and Situation of Damages in the Isiolo River Basin



Concept of Flood Characteristics and Situation of Damages in the Isiolo River Basin

	Flood Type	Area
A	Inundation in urban area	Isiolo Town
B	Inundation which is caused by overflow and over-topping of river banks	Midstream and tributary streams
C	Debris flow	Upstream
D	Bank erosion	Entire basin

Selection of Flood Damage Type to be Managed on priority basis

Flood type	Social impacts		Economic impact				Priority order
	Number of affected people	Number of affected houses	Merchandise	Agriculture	Transportation	Tourism Industry	
A. Inundation in urban area of Isiolo town	High	High	High	Low	High	Mid	Extremely High
B. Inundation which is caused by overflow and dyke break	Low	Low	Low	Mid	Low	Low	Slightly low
C. Debris flow in the upstream	Low	Low	Low	Mid	Low	Mid	Slightly low
D. Bank erosion in the entire basin	Low	Low	Low	Mid	High	Mid	Partially high in transportation

The Stakeholders in Isiolo River Basin

No	Organization
1	Isiolo River WRUA
2	Provincial Administration
3	Ministry of State for Special Programmes
4	Kenya National Highways Authority/Kenya Rural Roads Authority - Representative
5	Ministry of Water and Irrigation
6	Ministry of Lands
7	Ministry of Agriculture
8	Ministry of Livestock
9	Ministry Of Education
10	Ministry of Development of Northern Kenya and Other Arid Lands
11	Kenya Meteorological Department
12	Ewaso Ng'iro North Development Authority (ENNDA)
13	National Environmental Management Authority
14	County Government of Isiolo
15	County Government of Meru
16	Red Cross

No	Organization
17	World Vision
18	Food for Hungry (fhi)
19	Lewa Conservancy
20	Pastoralists
21	Farmers
22	CAAC
23	Environment/Natural Resources Management CBOs
20	Kenya Wildlife Service
21	Religious Group
22	Northern Water Service Board (NWSB)
24	Kenya Forest Service
26	Department of Social Services
29	Kenya National Chamber of Commerce and Industry
30	Catholic Diocese of Isiolo
31	Kenya Airports Authority
32	WRMA

DRAFT IMPLEMENTATION SCHEDULE OF FLOOD MANAGEMENT COUNTERMEASURES

Draft Implementation Schedule of Flood Countermeasures in Isiolo River Basin

	Countermeasures	Required Preparation	Main Actor	Support Actor			WRMA's role	WRUA's role	1st year	2nd year	3rd year	4th year	5th year	6th year or later
				NGO	Administrative Authority	Technical Authority								
Structural Measure	Development of Drainage Canal at Airport Area	Study/Survey/Discussion	County/District/WRUA		KeRRA	MWI, WRMA	coordination with related ministries	planning/construction/maintenance	Study and Discussion					
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	Improvement of Merire River (widening, etc)	Study/Survey/Discussion	NWCPC		County/District	MWI, WRMA	coordination with related ministries	maintenance			Survey and Discussion			
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	Restriction on land use		WRMA MOI.		MOI.	MWI, WRMA	coordination with related ministries	cooperation/participation/enlightenment activity						

RECOMMENDATIONS

- Observation data of rainfall and flow discharge that can be utilized for detailed design of works is inadequate. WRMA should observe rainfall and flow discharge data consistently to improve the accuracy and amount of data available.

- Countermeasures against inundation of whole urban area of Isiolo Town (inland water) and flooding from Merire River (river water) are in long term category and should be considered in that perspective.

Finalization of Isiolo IFMP

- Incorporation final stakeholders views
- Grammatical corrections
- Printing
- Distribution

Way forward

- Review of Isiolo SCMP to incorporate IFM activities
- Incorporate IFM in ENNCA CMS during review
- Full scale implementation: Through development of proposals to implement IFM activities as per set priority of counter measures
- Coordination of stakeholders and lobby for inclusion of IFM activities in line budgets
- Enhance monitoring network for collection of more reliable data for flood management

Attachment 2

WATER RESOUCES MANAGEMENT AUTHORITY

JAPAN INTERNATIONAL COOPERATION AGENCY

JICA

REPORT ON RIVER BANK PROTECTION STRUCTURE , FEWS INSTALLATION AND OPERATION

May 21, 2014

Presented

by

Jared Otieno
JICA Project Supervisor

Project on Capacity Development For Effective Flood Management In Flood Prone Areas In the Republic of Kenya

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;

2

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

3

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;

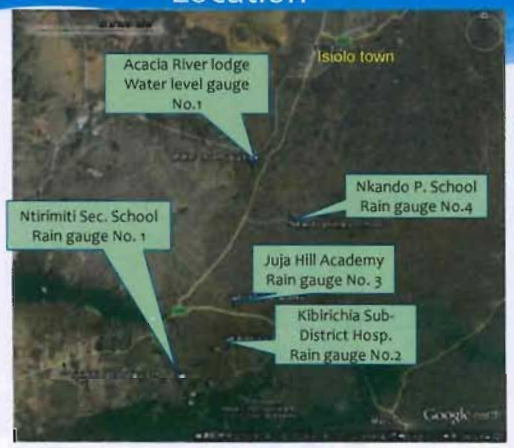
- contacts addresses for support e.g WRUA monitoring committee, WRMA –SRO and Church Management.

4. FEWS Installation and Operation

- Flood Early warning Systems have already been installed in 5 locations;
- No rain hyetograph stations at Ntirimiti Sec. School, Kibibirichia Health Center, Juja Hill Academy, Nkando Primary School;
- No river water level gauge at Acacia River lodge.

Rain gauge Installation at Kibirichia sub- district Hospital

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 keep records .

A tool set for the maintenance of the FEWS was given to Isiolo WRUA.

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.

Analysis of limitations of community participation

- Sensitization of the community on demarcation of scope of contractor services and community participation was not properly done.
- Nature of work- Collection of boulders by the community was laborious without incentive.
- Direct Benefit- the beneficiary community considered the output of the structural measures does not address the current need which is water scarcity.
- Project entry point- WRUA was the project entry point, and the beneficiary community were not members of the WRUA, coordination of activities within the two institution was a challenge.

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.
- The should be structure that link .

Attachment 3

Proposed Outline of Constitution of the Flood Committee

The constitution of the Committee is proposed as follows.

1) PREAMBLE (Purpose of the Constitution)

   This constitution defines the establishment of "Isiolo River Basin Flood Management Committee" (hereinafter referred to as "the Flood Committee") and its necessary matters. The Flood Committee shall therefore be established by Regional Manager of WRMA

2) Objectives

   The objectives of the Flood Committee are to:

   - ✓ Collect opinions on draft Flood and Water Resources Management Plan prepared by WRMA; and
   - ✓ Collect opinions on how to reduce Flood damage
   - ✓ Ensure that stakeholder's opinions are reflected to the plan.
   - ✓ Incorporate implementation aspect
   - ✓ Monitoring and evaluation

3) Membership

   3.1 The Flood Committee shall consist of not more than 41 members and all prospective members shall become Flood Committee Members at the invitation of the Regional Manager of WRMA. A member shall fulfill the following requirements:

   - ✓ Shall be a local community member from the Isiolo River Basin or a resident and officer of administrations related to the Isiolo River Basin. H/she must understand the current conditions and problems on flood and water resource management in the Isiolo River Basin;
   - ✓ Shall be able to express his/her opinions and also listen and accommodate opinions of others expressed in the public without fear of intimidation or intimidating others; and
   - ✓ Shall regularly attend Flood Committee meeting.

   3.2 To add members can be requested to Regional Manager if it is needed through consultation to the Flood Committee.

   3.3 The Flood Committee can establish sub-committees on some topics if needed. Membership and operation of sub-Flood Committees shall be determined by the Flood Committee.

4) Composition of members

   The IsioloRiver Basin Flood Management Committee shall consist of not more than forty

one (41) and not less than fifteen (15) members drawn from various areas that administer on work related to the Isiolo River Basin. The members shall include government institutions, parastatals, non-governmental organizations (NGOs), private organizations, Community Based Organizations (CBOs), Faith Based Organizations (FBOs), Water Users Associations and Water Resources Users Associations (WRUAs).,media

5) Structure of the Flood Committee

5.1 Chairperson

The Flood Committee shall have a Chairperson and he/she shall be selected through mutual selection by members of the Flood Committee.The Chairperson shall manage the Flood Committee and represent it.In case of any incident of the Chairperson, a member who is designated as an acting chairperson shall act as the chairperson.

5.2 Secretary

The Secretary shall be an officer of WRMA Sub Regional Office in the Pilot Project Area. The Secretary shall be responsible with calling the Flood Committee meeting in consultation with the Chairperson. Among other duties the Secretary shall ensure effective operation of the Flood Committee.

5.3 Plenary

This shall be the membership of the Flood Committee that meet to deliberate and in-put their opinion to the draft Flood and Water Resources Management Plan prepared by WRMA.

5.4 Office bearers (Executive)

5.5 Elections and terms of the offiionalce

5.6 Frequency of the meetings –quarterly…….rotational hosting

6) Proceedings

6.1 The Flood Committee shall be called by the Secretary in consultation with the chairperson.

6.2. The Flood Committee shall proceed with its deliberation when it attains the quorum of two-third of total members in attendance. But, the proxy shall not be allowed.

6.3. The Flood Committee shall make a decision by being agreed by more than half. But if there are any minority opinions, it should be mentioned.

6.4. WRMA can make explanations or express opinions after a member requests their opinion or permission of the chairperson.

6.5. The Flood Committee can request to hear opinions from person(s)withspecialty in an area, if need be or out of necessity.

6.6. The Chairperson can give a chance for the public gallery to express his/her own opinions, if necessary.

7) Operation of the Flood Committee

The procedure of the Flood Committee Meetings shall be as follows:

- ✓ All regular Flood Committee meetings shall be under the invitation of the Secretary by giving at least five (5) days notice accompanied by the proposed agenda;
- ✓ The Flood Committee meeting will be held regularly at periodic intervals as shall be determined by the Flood Committee;
- ✓ The Chairperson shall chair all the Flood Committee meetings and only in his/her absence shall the Flood Committee elect one member to act as the Chairperson to chair that particular Flood Committee meeting;
- ✓ The Secretary shall undertake the recording of all the Flood Committee meetings;
- ✓ All the records of the Flood Committee shall be kept and maintained by the Secretary of the Flood Committee;
- ✓ The Flood Committee shall constitute special committees on ad-hoc basis; and
- ✓ The special committees shall report to the Flood Committee of their findings and a report that will form part of the Flood Committee records submitted to the Secretary.

8) Disclosure of Information

8.1 Information of the Flood Committee and information of discussion in it shall be open to the public. The methodology to disclose information shall be decided in the Flood Committee.

8.2. WRMA should cooperate to disclose information as mentioned above in 8.1.

9) General Affairs

Following general affairs of the Flood Committee shall be conducted by WRMA with instruction of the Chairperson;

- ✓ To prepare materials of the Flood Committee meeting
- ✓ To prepare the draft minutes of meeting
- ✓ To arrange the discussion in the Flood Committee and to make materials to be disclosed
- ✓ Any other as need arises

10) Amendments to the Constitution

Amendments to the Constitution shall be done after getting agreement of more than two third of members.

11) Subsidiary Rules

Subsidiary rules necessary for the operation of the Flood Committee shall be presented by the Chairperson to the Flood Committee and decided through discussion in the Flood Committee.

付属資料 3-9

Lumi 川流域における第 1 回 IFMC 会議議事録等

The First Meeting of the
Lumi River Basin Integrated Flood Management Committee
(Agenda)

February 22nd, 2013
Location – Green Park Hotel, California Street, Taveta, Kenya

Arrival of participants (8:30 am)
Registration（8:30 a.m. to 09:00 a.m.）30min

Morning session I (09:00-10:40) 1hr 45 min

1) Introductions (Mr. Stephen M. Ngao) (ATCM- Athi) (10min)
2) Opening remarks from WRMA Regional Manager (purpose, objectives and schedule) (Mr. Canute M. Mwakamba) (10min)
3) Opening remarks from District Commissioner, (officially declaring the meeting open) (Mr. Nkaduda Hirabae) (5min)
4) Keynote address by Project Team (operational outline) (Mr. Katsuro Kondo) (25 min) (JICA CA)
5) Basic River Basin characteristics and features with a bias towards floods Loitokitok (Mr. Kimeu Musau) (WRMA SRO Manager) (15min)
6) Flood causes and effects in Lumi River Basin (Mr. Yukihiro Mikumo) (JICA P.T.) (10min)
7) Possibilities of preventing deforestation by charcoal production (Mr. Clement Ngida) (JICA P.T.) (10min)
8) Integrated Flood Analysis System and Lumi River Basin (Mr. Joseph Kimanga) (WRMA HQ) (15min)
9) Opinion writing by participants (5min)

Tea Break (10: 45 a.m. to 11:05 a.m.) 20min

Morning session II（11:05 a.m. to 12:40 a.m.）1h 35min

10) Discussion, comments and additional information/experiences in flood damages led by Moderator (Mr. Stephen M. Ngao) (ATCM- Athi) (45 min)
11) Wrap up by IFM Committee Interim Chairman assisted by Project Team, way forward on the next actions (35 min)
12) Closing remarks: (1) from Project Team (conclusions, IFM Committee next meeting Schedule, and what participants need to think about i.e. solutions (short-term, Mid-term and long-term , (2) JICA - Kenya office (3) WRMA - representative from the HQ (15min)

Lunch (12:40 to 13:30)

Introduction

The meeting kicked off at 9:35 am with a word of prayer and thereafter the moderator led the participants through a session of self-introductions for the participants.

Opening Remarks

The Regional Manager Mr. Mwakamba in his opening remarks first apologized for the late start of the IFM Committee meeting which had been scheduled to start at 8:30 am but commenced at 9:40 am.

The Regional Manager also officially welcomed the various organizations that were present to the IFM Committee meeting. He gave the background of the Project. He further stated that flood management was the mandate of WRMA. He pointed out that purpose of IFMC for LUMI River Basin. He explained that the river basin was trans-boundary with Tanzania. He stated that the members were selected by the Regional Manager. He pointed out that the IFMC Lumi will also be represented in Joint Coordinating Committee of L. Chala, Jipe and the MOU had been signed in Kisumu on 14th February 2013. He thereafter outlined the agenda for the day and what was expected of the stakeholders.

He pointed out that East Africa Community decisions 2005 allowed the Lake Victoria Basin to extend its scope to other Lakes within the region that have lakes that cut across the boundaries of the East Africa countries. He pointed out that Jipe and Chala lakes are equally shared between Tanzania and Kenya. He pointed out that there MOU signed will allow the cooperation in management of the resources. He explained that L. Jipe receives its water from R. Lumi.

Moderator Lake Chala and Jipe development plan had been developed and the TZ community members had expressed the intention that the Project be extended to their country. He clarified the importance of the stakeholders involvement was important.

The DC in his opening remarks welcomed the stakeholder into the meeting. He appreciated JICA for extending the Project to Taveta which is heavily affected by floods. He clarified that rains in Taveta instead of being a blessing was a curse and he stated that by the Project entry in Taveta was the starting point for the curse being converted to a blessing.

He explained that there were various stakeholders involved in similar projects and therefore the IFMC was important in synchronizing and synergizing and share information through the IFMC. He stated that it was imperative to share the Project activities with Tanzania to avoid suspicions. He stated that the paradigm of involving the community was important for ownership and sustainability.

Keynote Address: Operational Outline

The Chief Advisor to the Project Mr. Kondo discussed the outline of the Project in his presentation. He stated that he had more than twenty years experience dealing with the subject of flood management. He explained that Japan was a small country with a high density

population and thus encounters many natural disasters and therefore disaster management has been at the core in policy formulation. He stated that Japan was glad to share her experience with Kenya and he hoped that such experiences were going to be replicated in Kenya.

He pointed out that disasters had been increasing in their occurrences in Kenya. He explained that floods disaster in Kenya was an emerging issue that was affected more areas in Kenya. He also explained that the data from Crisis Response Centre collected between the years 2010 to 2012 estimated a cost of 13 billion in losses as a result of disasters.

He explained the involvement of WRMA in FM was because FM was WRMA's mandate. He thereafter also explained to the participants why WRMA was the counterpart agency to the Project which primarily was predicated on WRMA's mandate. He also explained the historical background of JICA Projects on Floods in Kenya and in particular Nyando River Basin.

He further explained to the participants the phrase Integrated Flood Management Plan which implies both structural and non structural measures in management of floods.

In the Structural measures he explained that there were the Short-term, Mid-term and Long-term. He expounded on the Short-term which he pointed out that it implied emergency activities with short life span to implement while on long-term he expounded on it as big size structures with long life span in implementation and can also imply measures that can be implemented in the future.

On the non-structural he explained that they can be categorized into two i.e. the measures that are Government assisted initiatives and measures that are community initiated initiatives. He explained to the participants the Nyando case wherein the following non-structural measures activities like O&M of existing structures, evacuation drills, education programme, borehole were implemented vis-à-vis integrated flood management plan matrix. He explained the matrix in which IFM Plan can be implemented.

He also explained to the participants the flood hazard mapping that had since been carried out in Lumi. He pointed out the importance of flood hazard mapping and gave an example of flood hazard map that was done in Japan whereby the features are scientifically diagnosed and thereafter appropriate actions later taken up i.e. risk assessment thereafter risk management leading to policy formulation for flood map there must be interaction between science, community and government. He pointed out that by use of flood hazard map it was possible to come up with water flood depth level and directions to safe grounds during flood disaster. He gave example of Japan how one can use the flood information for purposes of evacuation.

He further explained the Project duration, Project target areas and the scope of the Project. He also explained the three themes that revolve around the Project. He thereafter explained the necessity of River Basin Flood Management Plan and the importance that plan when it was river basin i.e. the river basin as the basic unit in the plan.

He also explained the viewpoint of measures/capacities that address floods i.e. pre-flood that aims at minimizing floods by engaging activities that mitigate or reduce impact of floods; and

during flooding i.e. response whose activities mainly aims at helping the vulnerable affected persons. He also pointed out the importance of community preparedness and readiness.

He further explained the self-help, mutual help support and public assistance in which he pointed out that all these three levels often overlaps between the levels. He also explained the concept of community based activity that leads to developing resilient community. He therefore pointed out that the IFM Plan was at the core in reducing floods and entails all parties i.e. government, community and individual fulfilling and playing their roles.

Moderator in rejoinder explained various community activities and gave an example of the discussion during the workshop where various activities undertaken by communities in the Project areas.

Basic River Basin Characteristics

WRMA Lumi Sub-regional Manager Mr. Kimeu Musau explained to the participants the geographical features and characteristics of Lumi River Basin. He also explained the physical features including the topography that characterizing the rivers, the rainfall features and topographical features in Lumi River Basin. He pointed out the R. Lumi was trans-boundary.

In his presentation to the participants, he explained that during rainy seasons the area experience floods leading to infrastructure damage, lives lost and property damages. He also discussed the monitoring stations within the Lumi River Basin he pointed that there were two stations in the basins. He explained that their were honorarium data readers who read the data in the morning and evening and WRMA collected the data on monthly basis and stated that this approach was not affective for early warning and the need for hourly data collection stations in the area. He also explained the rainfall data for Challa and Jipe.

In his conclusion he also elaborated the cause and measures that minimize floods or mitigate impact of floods in Lumi River Basin to the participants. He summarized the impacts of floods in Lumi as follows: loss of livelihood, destruction of infrastructure, waterborne diseases rampant spread in the basin, soil erosion in the upstream, water contamination. He also stated that approximately Kenya shillings 38 million flood damage was caused every year .

He completed his presentation by distributing the IFM plan matrix to the participants who were to fill the forms and thereafter a discussion was to be held.

Flood Damage Situation in Lumi River Basin

The JICA Expert Mr. Mikumo explained to the participants the background and purpose of the Project. He gave the flood disaster analysis of Lumi River Basin. He explained the outcome of the community in developing the flood hazard map of the area. He thereafter explained the various site visits in Lumi Ribver Basin. He explained the breached dykes in the area he also explained the location map around the canals.

He also explained the the location map of Rekeke area and the current status of the floods impact in the area, he pointed out the erosion of the banks that if not checked will affect houses around the area.

He also discussed the countermeasures master plan in Lumi River Basin proposal. He stated that repair of breached dyke by government, disaster prevention education programmes in school. He also explained the conceptual planning of structural measures. He explained in details the planned repair of the dykes. He also explained the importance of IFAS/GFAs and its importance in trans-boundary river basin. He pointed out that IFAS will be made easy to understand that the WRUA could engage in. In education programme he explained the conventional curriculum and engage children in developing rain-gauges Kimorigo and Eldoro location primary schools will be engaged in disaster prevention programmes.

Possibilities of preventing deforestation by charcoal production

Mr. Clement Ngida in his presentation highlighted on the importance of conserving the forests. He also explained that the community members needed fuel for cooking that leads them to cut tree for charcoal production. He stated that there were other alternative source of energy other than charcoal produced from wood. He gave an example of Kakamega forest that was a target of community member whereby they could cut trees for charcoal production. He further stated that KAMADEP an organization in Kakamega that had a JICA volunteer attach to it got involved with the community. He further explained that based on innovation and using locally available material the community with the assistance of JICA volunteer were able to come up with a homegrown solution of producing charcoal by using agricultural waste. Mr. Clement pointed out that this innovation was an value addition to hitherto considered useless materials i.e. agricultural waste through value addition this waste turned to raw material for environmental friendly charcoal which the community members were selling and therefore generating income for themselves.

He thereafter used video clips to explain the various steps engaged in environmental friendly charcoal production and throughout the presentation the key words used were value addition, non-wood charcoal production, simple and affordable technology, locally available materials as resources for environmental friendly charcoal production. He concluded his presentation by explaining how bamboo could be introduced. He clarified that by use of ecosan toilets the toilet waste could be used as manure in the bamboo farms and these bamboos be used for charcoal production.

Integrated Flood Analysis System and Lumi River Basin

Mr. Kimanga began his presentation by introducing the participants to IFAS. He explained that IFAS was a tool that was used for flood analysis. IFAS is a good tool for flood forecasting and warning. He stated that IFAS was important on trans-boundary river basin like Lumi. After defining IFAS he elaborate that there was need for satellite data on rainfall. He explained the concept of IFAS. He gave graphic explanation of background information of Lumi Area. He also explained there was as total of 18 rainfall stations the area. He pointed out that there was a symmetry relationship between rainfall station (14) and regular gauging station (4). He pointed out the issues in Lumi and problem analysis. He pointed out the difficult of hydro metrological data in the area that makes it difficult for flood early warning. He described the steps in IFAS application. He thereafter explained the IFAS results including the Flood Hyeto hydrograph. He

also explained objective of such analysis and what is needed in order to use the remote sense data. He thereafter explained the next step to IFAS that will lead to flood early warning.

Morning session discussion

The participants pointed out that the impacts of floods in river Lumi basin which he pointed out included loss of life. He asked if the JICA Project could assist train community members on matter of addressing health issues that affect the community during flooding. He singled out Bilharzias. Moderator asked in whether in the absence of floods can there be waterborne diseases and the answer was in the affirmative. Moderator pointed out Bilharzias a problem in rice growing areas. He pointed out that IFMC is a stakeholder based committee and various stakeholders can point out what can be done. Mr. Kimanga pointed out the education programme was in the pipeline of the Project and school pupils will be able to learn on how to deal with flood related diseases which becomes the first step in addressing the bilhazia problem.

Discussion of opinion on integrated flood management plan matrix

The participants wrote down the countermeasures they felt were suitable for implementation in effort of flood management. The moderator Eng. Kimanga pointed out that due to time constraint the Project Team should analyze the proposed countermeasures and make a presentation of the same in the next IFMC meeting. He thereafter outlined the short-term countermeasures that were proposed and sought consensus with IFMC members. The short-term countermeasures proposed and discussions thereafter were as follows:-

a) Community participatory works/activities with government assistance including structural and non-structural (Medium Scale)

   i. Use of gutters (One participants from town council pointed out that based on the last meeting discussion with Community, KRCS, other stakeholders and JICA it had been agreed that town council enforce planning of houses whereby the town council ensures that gutters must be in the house plan that clearly indicates where the rain water will drain to. Mr. Modi from Public Health pointed out that gutters and house design planning was a town issue and not in the rural set up where the floods affects the community members. Participant from town council pointed out that contrary to public opinion which postulates that planning was a preserve of the town area it was a requirement that any kind of construction must get approval from the Taveta town council).

   ii. Repair and Rehabilitation dyke and canal C

   iii. Education of community on flood management

   iv. Digging of diversion drains

   v. Sensitization and awareness creation for community members

   vi. Land demarcation

vii. Regulation and law enforcement (Mr. Muindi requested for clarification on riverbank regulations. He pointed out that lands department allocate land upto the middle part of the river yet WRMA on the other hand points out that the farms should be a 30M distance from riverbanks and in that bufferzone there should be no cultivation. Mr. Memo clarified that the land indeed belonged to individuals known as riparian land owners and that these land must be conserved based on the laid down regulations though the land belonged to individuals.)

viii. Tree planting

ix. Construction of checkdams

x. Evacuation routes

b) Community initiative works/activities including structural and non-structural (Small Scale)

i. Maintain good drainage system

ii. Planting trees and grass

iii. Construction of gabions

iv. Engage in alternative energy sources

v. Raised foundations for house

vi. Establishment of tree nurseries

vii. Education of community on tree nursery establishment (KRCS p education not only on tree nursery but on disaster prevention and management. Eng. Kimanga there is a joint responsibility between government, ngo and community

viii. Canal and small drains desilting

ix. Digging trenches (cut-off drains)

x. Relocating to raised higher ground

Wrap up meeting

The Project Team Leader Mr. Sawa in the wrap up session pointed out that he appreciated the members for the active and lively discussions. He also pointed out that the Project team was going to read through the members' opinion vis-à-vis the countermeasure master plan in Lumi River Basin (proposal). He also observed that the discussions on the countermeasures had lots of similarities with the ones proposed by Project team i.e. repair of dyke, canal and drainage improvement was important, education programme in school and tree planting which also emerged as core to the members of IFMC.

He explained that concerning the short-term the Project was going to start on them. He explained that in the next IFMC meeting the draft plan would have been prepared and the members shall discuss on them and agree and thereafter sign them into action. He added that his expectation was that the short-term measures should commence before the long rainy seasons.

One participant pointed out that since the IFAS knowledge was available with WRMA and therefore wondered if Eng. Kimanga could give prediction of the possible floods during the long rains expected in April. Eng. Kimanga responded by pointing out that KMD was core in providing early warning. He added that IFAS was in the process of being set up within WRMA and that the process was going to take not less than one year. He added that IFAS aimed at having offices at grassroots, Regional Office and Headquarters and the data would thereafter be analyzed. He added that once the system was in place then WRMA would be able to give early warning for floods.

One participant keenly observed that the proposed dyke construction and canal improvement in the downstream without dealing with the source of the problem in the upstream and develop check dams in the upstream would not be of great assistance to flood mitigation in the downstream. He also pointed out that there was a for spring protection in the upstream from contamination from the flood water that flows downstream.

The moderator Mr. Musau stated that it was important to mitigate floods from the point of view of the river basin rather than just one area and explained that holistic river basin approach was the approach that the Project had adopted and he explained that the terminology integrated flood management was commonly used in the Project because of the holistic approach on river basin flood management.

Closing remarks

Mr. Sawa in his closing remarks thanked the members for their fruitful discussion. He added that based on these discussions the activities in the river basin can be accelerated and the mitigation activities against floods undertaken.

Mr. Mwakamba in his closing remarks referred to the comments by one participant that there was need for the mitigations to start from the upstream wherein Mr. Mwakamba pointed out that the MOU that was going to allow holistic approach in Lumi River Basin had been signed and that the check-dams that the participant had pointed could now be constructed in Tanzania to help mitigate flood in the downstream in Kenya. He further pointed out that WRMA aimed at centralizing data and integrating various issues, stakeholders' opinions and sharing of the information. He further pointed out that the Pilot Project Area was going to be a step ahead in the management of flood in the country. He further clarified that based on the discussion that had taken place in the meeting that it was now clear that the ideas were with the community and all that was needed was the IFMC to tap into this knowledge within community empirically analyze these ideas based on science and then develop homegrown solutions that would be easy to own and sustain.

Mr. Musau thanked the participants and declared that the first IFMC was a success wherein the IFMC members applauded the statement.

Eng. Kimanga pointed out that there was a framework proposed on flood management. He also appreciated the IFMC members for attending the meeting and he requested the committee members to attend the other subsequent IFM Committee Meetings.

付属資料 3-10

Lumi 川流域における第 2 回 IFMC 会議議事録等

添付資料-1

MINUTES OF MEETING

OF

THE SECOND INTEGRATED FLOOD MANAGEMENT COMMITTEE MEETING

IN THE LUMI RIVER BASIN

The second Integrated Flood Management Committee Meeting in the Lumi River Basin (hereinafter referred to as "the Committee") was held at Greenpark Hotel in Taveta on 16th August 2013. As the result of the discussions, committee members confirmed the following issues.

1. The Integrated Flood Management Committee in the Lumi River Basin

On the basis of the discussion in the first meeting of the Committee held on 22 February 2013, Mr. NGAO, Assistant Technical Coordination Manager, Athi Catchment Area Regional Offiee, Water Resources Management Authority (hereinafter referred to as "WRMA") explained the purpose, members and other related matters of the Committee.

The attendants built consensus upon the following.

(1) Purpose

1) In order to mitigate the damage by the flood in the Lumi River Basin, Flood Management Plan which is one of the important contents of the Sub Catchment Management Plan (SCMP) shall be formulated by the relevant stakeholders in Lumi River Basin.

2) The progress of the implementation of the Flood Management Plan shall be confirmed and the Plan shall be updated if necessary.

3) The other related issues for implementing the Flood Management Plan shall be discussed.

(2) Members

Members of the committee are;

- WRMA Athi Catchment Area Regional Manager: Chairperson;
- Upper Lumi WRUA;
- Lower Lumi WRUA
- Representatives of residents;
- Taveta County Government;
- Concerned line ministries and governmental institutions;
- Concerned NGOs.

The Chairperson can nominate necessary members for the discussion of the related issues, if necessary.

(3) Frequency of the Committee

The Committee shall be held once a year at least by the arrangement of WRMA Regional Office.

2. Integrated Flood Management Plan (Draft)

(1) The Integrated Flood Management Plan in the Lumi River Basin (Draft) was explained by Mr. NGAO, Assistant Technical Manager, Athi Regional Office, WRMA and was got consensus by the attendants. It was understood by the attendants that the target period of the plan would be five (5) years and the necessary update of the plan should be conducted in the Committee in every year. The outline of the Integrated Flood Management Plan is shown in the **Attachment 1**.

3. Pilot Project – Structural Measures-

(1) Selection of the Pilot Project

Mr. MAINA, Catchment Management Officer, Nolturesh-Lumi (Loitokitok) SRO, WRMA, explained the candidates of Pilot Project which should be implemented in the early stage of the Flood Management Plan through the Technical Assistance by JICA.

He pointed out the necessity of consideration on the budgetary allocation and the project term as the JICA's technical cooperation project and then asked the attendants for their opinions.

At the result of discussion, the following projects were prioritized as the Pilot Project by the attendants shown in the **Attachment 2**.

If there are difficulties in implementing the selected project, e.g. approval from relevant authorities, technical difficulties, budget, then WRMA, WRUA and JICA team consider the possibility of implementing the next highest priority project. The result will be informed at the next committee.

Mr. MAINA pointed out that the Pilot Project aimed;

-to implement flood management activities in the categories of "self-help" and "mutual-support";

-to follow the WDC process during the course of implementation of the Pilot Project;

-to establish sustainability through the experience of actual maintenance activities.

Therefore, he requested WRUA members to participate in the Pilot Project actively.

(2) Schedule of the Pilot Project

Mr. SAWA, Team Leader of the JICA Project Team, explained the expected schedule of the Pilot Project shown below and the understanding by the attendants was made. Also, it was confirmed that the progress of the Pilot Project would be reported in the next Committee.

1) At the middle of August 2013: Finalizing the design

2) At the middle of August 2013: Getting approval from the land owner, the river management authority, the road management authority and the environmental management authority

3) At the middle to the end of August 2013: Holding WRUA Procurement Committee meeting which will be supported by WRMA and JICA Project Team to make a contract for the construction of the Pilot Project

4) At the beginning of September 2013: Actual construction work will be started and the total term of the construction work is supposed to be two (2) or three (3) months

He also requested the WRUA's contribution during the implementation of the construction work because it was a requirement described in the "WDC FINANCIAL GUIDELINES".

4. Community based flood management activities (non-structural measures)

Ms. Fukai explained the candidate Pilot Projects by non-structural measures and got the understanding of the attendant.

As the result of the discussion by the attendants, followings were selected as the Pilot Project by non- structural measures shown in the Attachment 4.

1) Community Based Early Warning System

2) Disaster Management Education

3) Livelihood improvement adopted floods

Attachment list

- Attachment 1: Lumi River Basin Integrated Flood Management Plan – Draft-
- Attachment 2: Priority of the Pilot Project
- Attachment 3: Community based flood management activities (non-structural measures)
- Attachment 4: Attendance List

Taveta, 16 August 2013

Mr. Canute M Mwakamba

Regional Manager, Athi Catchment Area Regional Office

Water Resources Management Authority

Ms. Kai Kikuiri

Deputy Director

Disaster Management Division 1

Water Resources and Disaster Management Group, Global Environment Department

Japan International Cooperation Agency

for

Eng. Wilfred Matagaro

Head, Flood Management Unit

Water Resources Management Authority

Mr. Katsuro Kondo

Chief Advisor

JICA Project Team

Mr. Wilfred Rama Leshamta

Chairperson

Upper Lumi Water Resources Users Association

Mr. Hideki Sawa

Team Leader

JICA Project Team

for

Ms. Mini Mary Ngaluma

Chairperson

Lower Lumi Water Resources Users Association

The 2nd Integrated Flood Management Committee Meeting in Lumi River Basin
-Draft Agenda-

Date: 16 August 2013

Venue: Green Park Hotel, Taveta

Time	Session name	Min	Speaker
08:30 09:00	Registration	30	--------
09:00 09:10	1.Opening Remarks	10	WRMA・R M
09:10 09:20	2.Opening Remarks	10	County Governor
09:20	3.Review and Confirmation of Minutes of Previous Committee Meeting on January	10	WRMA- Athi RO, Mr. Stephen Ngao
09:40	Discussion	10	
09:40	4.Current Progress of PCDEFM -Training plan under the WDC module & cycle	20	JICA Chief Advisor Eng. Kondo
10:00	Discussion	10	
10:00	5.Nyando and LOGUMI Exchange Visit Report	10	Lower Lumi WRUA Secretary
10:15	Discussion	5	
10:15	6.Integrated Flood Management Plan in Lumi River Basin	40	WRMA – Athi RO, Mr. Stephen Ngao
11:20	Discussion	25	*Moderator=SRM*
20 min	**Tea Break**		
11:40	7.Structural Measures - Selection of Structural Measures as The Pilot Project	30	WRMA –Loitokitok SRO, Mr. Joseph Maina
12:35	Discussion	25	*Moderator=SRM*
12:35	8.Non Structural Measures	20	KRCS/JICA Kenya
13:30	Discussion	25	*Moderator=SRM*
1330 13:40	Closing Remarks	10	WRMA-HQ, FMU Eng. Wilfred Matagaro

Attachment 1

Lumi River Basin Integrated Flood Management Plan – Draft-

	Countermeasures	Required Preparation	Main Actor	Support Actor			WRMA's role	WRUA's role	1st year	2nd year	3rd year	4th year	5th year	6th year or later
				NGO	Administrative Authority	Techinical Authority								
Structural Measure	Environmental Improvement of Evacuation Camp		WRUA	KRCS	County/District/Ministry of Education	MWI, WRMA	techinical advice	planning/construction/operation/maintenance						
	Raised-up Toilet		WRUA/Community/Individual		County/District/Ministry of Public Health	MWI, WRMA	techinical advice	planning/construction/enlightenment activity						
	Repair of existing embankment	Study/Survey/Discussion	NWCPC or County		County/District	MWI, WRMA	coordination with related ministries	planning/maintenance	Study/Survey/Discussion					
	Development of Community Road	Study/Survey/Discussion	WRUA		County/District/Ministry of Road/KeRRA	KeRRA, MWI, WRMA	techinical advice	planning/construction/maintenance		Study/Survey/Discussion				
	Drainage Channel Improvement	Study/Survey/Discussion	NWCPC or County		County/District	MWI, WRMA	coordination with related ministries	planning/maintenance		Study/Survey/Discussion				
	Spring protection (Gabion)		WRUA		County/District, MWI, WRMA	WRMA	techinical advice	planning/construction/maintenance						
	Channel Improvement of Lumi River	Study/Survey/Discussion	NWCPC or County		County/District	MWI, WRMA	coordination with related ministries	planning/maintenance			Study/Survey/Discussion			
	Dredging of Lake Jipe	Study/Survey/Discussion	NWCPC or County		County/District	MWI, WRMA	coordination with related ministries	planning/maintenance			Study/Survey/Discussion			
	Small check dam	Study/Survey/Discussion	NWCPC,MWI or County		County/District, MWI, WRMA	MWI, WRMA	techinical advice	planning/construction/maintenance		Study/Survey/Discussion				
	Bank Protection	Study/Survey/Discussion	WRUA		County/District, MWI, WRMA	MWI, WRMA	techinical advice	planning/construction/maintenance			Study/Survey/Discussion			
	Rain water harvesting	Study/Survey/Discussion	Town council,/WRUA		Town council	MWI, WRMA	techinical advice	planning/construction/maintenance		Study/Survey/Discussion				
Non-structural Measure	Education on Disaster Prevention		Schools, WRUA	KRCS	Ministry of Education/County/District	MWI, WRMA	coordination with related ministries	cooperation/participation/enlightenment activity						
	Community based Early Warning System against Flash Flood		WRUA	KRCS	KMD/Ministry of Special Programs	MWI, WRMA	techinical advice	planning/establishment/operation/mainenance	Formulation					
	Early Warning System for downstream (IFAS/GFAS)		WRUA/Community	KRCS	KMD/Ministry of Special Programs	MWI, WRMA	coordination with related ministries	cooperation/participation/enlightenment activity	Consideration					
	Forestation Activity		Youth group/Residents	KRCS	Kenya Forest Service	MWI, WRMA	coordination with related ministries	cooperation/participation/enlightenment activity						
	Restriction on landuse		KFS		Kenya Forest Service	MWI, WRMA	coordination with related ministries	cooperation/participation/enlightenment activity	Consideration					

Attachment 2

Priority of the Pilot Project

Summary of Pilot Project Evaluation

Proposed measures	*Feasibility	Priority
Environmental improvement of evacuation camp	A	1
Raised up toilet	A	2
Development of Community Road	A	4(2)
Spring protection (Gabion)	A	3(1)
Bank protection	A	5

A(3Points): Excellent / B(2Points): Good / C(1Point): Fair

*Feasibility

- Can WRUA be a main actor of the project?
- Can it be implemented by community level?

COMMUNITY BASED FLOOD MANAGEMENT ACTIVITIES (NON-STRUCTURAL MEASURES) - IMPORTANCE OF ROLE OF COMMUNITY-

JICA KENYA OFFICE

CONTENTS

- Key Lessons Learned from Great East Japan Earthquake 2011 – the Role of Community in Disaster Management-
- Community based Flood Management Activities (non-structural measures) in Gucha Migori, Isiolo & Lower Lumi

KEY LESSONS LEARNED FROM GREAT EAST JAPAN EARTHQUAKE OF 2011

"COMMUNITY BASED DISASTER RISK MANAGEMENT"

80% OF PEOPLE WERE RESCUED BY THEIR NEIGHBORS!!

Importance of the Role of Community

DRM activities
- ✓ Fire fighting
- ✓ Issuing warnings
- ✓ Assisting evacuations
- ✓ Conducting rescue operations,etc.

Members of Community based Organizations

Advantages of Supporting Community Based DRM
- ✓ Know the local context and their residents
- ✓ Cost-effective way of mobilization
- ✓ Can respond immediately
- ✓ Ensure awareness of DRM on daily basis

Neighborhood Associations

"RISK COMMUNICATION" UNDERSTANDING THE RISKS, BUT ALSO, BE PREPARED FOR THE UNEXPECTED!!

Only 20 % of people utilized the hazard maps

Some people died by relying only on the information in the hazard maps

Limitation of the Early Warning System...

Tsunami Hazard map

Is my house safe?

Hazard maps are important in understanding risks, and identifying evacuation routes
Yet
Understand the limitations of prediction

Never underestimate the risks, just evacuate!

"KAMAISHI MIRACLE"? CHILDREN'S SURVIVAL RATE OF 99.8%!!

Importance of the Role of Schools

"Hardware"
- ✓ As an Evacuation Shelter
- ✓ As a Transition Shelter

"Software"
- ✓ Regular Evacuation Drills
- ✓ DRM Education
- ✓ Hazard Maps

3 Rules of Evacuation
1. Don't believe in predictions
2. Do your best in given situation
3. Evacuate yourself

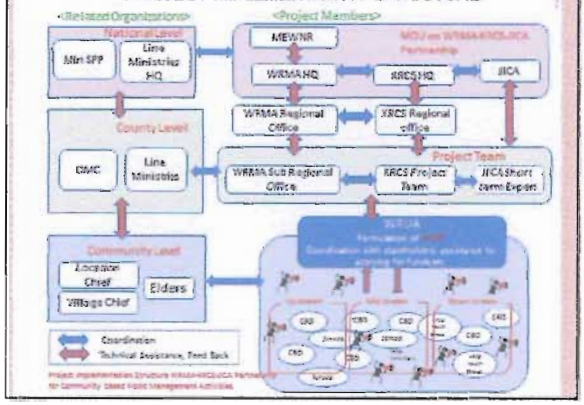
Be prepared for the unexpected!

Self Support & Mutual Support & Public Support

Community based Flood Management Activities (nonstructural measures) in Gucha Migori, Isiolo, and Lower Lumi

Patrtnership between WRMA, KRCS, and JICA

Project Implementation Structure



Outline of the Activities

Duration: August 2013 – December 2013 (5 Months)

Implementing Partners: WRMA, and KRCS

Overall Objective: To build flood resilient communities through effective collaboration among WRMA, local government, WRUAs and community members

Specific objectives:

1. To establish community based early warning system
2. To equip pupils / communities with appropriate knowledge, awareness, skills, values and attitudes that will enable them prepare and react to floods through Disaster Management Education / Hygiene Education
3. To improve the capacity of the communities on livelihood interventions adopted to floods – Lower Lumi
4. To share the experience and lessons learned with various stakeholders
5. **Target Group**: WRUAs, Community Leaders, Schools, KRCS Volunteers / KRCS Youth Groups / KRCS Clubs

Activities in Isiolo

【Community based Early Warning System】

WRMA / KRCS and WRUA will:

- Consult with community key persons for establishment of EWS (analyze current situation, identify location for installation of rain gauge, how to manage the system, how to transfer information, etc.)
- Install rain gauges / water gauges
- Conduct trainings on management of EWS
- Sensitize community on EWS
- Monitor and evaluate the EWS

Activities in Isiolo - continued

【Disaster Management Education】

WRMA / KRCS and WRUA will:

- Select 4 target schools (2 primary, and 2 secondary)
- Conduct the baseline survey on disaster awareness in each school
- Conduct trainings on children-centered disaster management education in schools
- Support KRCS Club's activities on disaster management education (e.g. DRR games, risk analysis, making of hazard maps, evacuation trainings, cleaning of river, etc.)
- Monitoring of the activities

NONSTRUCTURAL MEASURES (EXAMPLES FROM JICA'S NYANDO PROJECT)

THANK YOU!

付属資料 3-11

Lumi 川流域における第 3 回 IFMC 会議議事録等

MINUTES OF MEETING

OF

THE THIRD INTEGRATED FLOOD MANAGEMENT COMMITTEE MEETING

IN THE LUMI RIVER BASIN

The third Integrated Flood Management Committee Meeting in the Lumi River Basin (hereinafter referred to as "the Committee") was held at Greenpark Hotel in Taveta on 14th April 2014. As the result of the discussions, committee members confirmed the following issues.

1. Opening remarks during Lumi River Basin IFMC

Ms. Philis Wachira made the opening remarks on behalf of Mr. Mwakamba. She began her speech by informing the participants that Mr. Mwakamba had send his apologies on not being able to attend the third IFMC meeting because of official and urgent business matter. She pointed out the purpose of the days business was adoption of the IFMP. She pointed out that Taveta County Government has been supportive of the IFMP and the IFMC meeting. She further stated that the Taveta County government through the County Executive for Water had informed WRUAs that they could write financial proposals to the Taveta County government to support some of their activities.

2. Minutes of the previous Lumi River Basin IFMC

Mr. Maina read the minutes of the second IFMC meeting and thereafter the minutes were seconded as the correct record of the previous meeting. It was therefore mutually agreed upon that the minutes read were the actual deliberations of the IFMC meeting held on 16th August 2013.

3. Overview of Integrated Flood Management Plan (IFMP) for finalization

Mr. Maina pointed out that the draft IFMP had been presented in the second IFMC meeting. He thereafter explained the Policy of Flood Management Plan in LUMI River Basin (draft). He also explained the roles and responsibility of WRMA. He thereafter explained the River Basin Committee (IFMC). He also stated the stakeholders in Lumi River Basin as per April 2014. He outlined the schedule of IFMC meetings; he also explained that the 4th IFMC meeting was scheduled for August 2014. He thereafter explained the IFMC meeting was going to be held annually. He also explained the environmental and social consideration. He thereafter explained chapter two, three, four, five and six of the LUMI IFMP. Mr. Maina thereafter requested for consensus building on the draft IFMP as the document to be finalized and adopted as the final IFMP for Lumi River Basin. The meeting therefore adopted the draft IFMP as the final IFMP document. Attached with this report is Mr. Maina's presentation as Attachment 1.

During the discussions Eng. Kondo pointed out that it was important to define the relationship of WRMA, County Government, IFMC and WRUA in the implementation of the IFMP. Mr. Musyumi of Ministry of Irrigation pointed out that the Taveta County government had taken up some of the countermeasures that they intend to implement. The IFMP has been included in the County Strategic Integrated Plan for Voi and Taveta. Eng. Kondo explained the relationship between Migori County government and WRMA in flood management. Mr Musysumi pointed out that repairing of the dyke required big financial engagement and inquired if JICA can cooperate with Taveta County government on the repair of the Dyke. Eng. Kondo explained that the current Project was culminating

to an end in few months' time and therefore it is not possible for JICA to engage in dyke rehabilitation. He pointed out that WRMA and Ministry were requesting JICA for another Flood Management Project and therefore WRMA or Ministry can raise the matter during the negotiations.

The overview of the Integrated Flood Management Plan is herein attached as the **Attachment 2**.

4. Discussion on current improvement and future revision of the IFMP

Mr. Maina, Flood Management Officer, Nolturesh-Lumi (Loitokitok) SRO, WRMA, explained the evaluation criteria of the countermeasures. He clarified that the stakeholders need to point what they can undertake and how they can work with other stakeholders. He added that as the stakeholders undertake countermeasures then the IFMP will be reviewed accordingly.

Participant from Lower Lumi WRUA pointed out that they had applied for third level funding to WSTF for spring protection was one of the activities that feature in their proposals. Eng. Kimanga pointed out that WRUA should not confine themselves on single funding of WSTF but they should also think of writing proposals to CDF or County government to fund some of their activities. Upper Lumi WRUA pointed out that they had requested funding from county government on constructing a dam in the upstream of Lumi which will play an important role in flood management in the area.

Mr. Maina pointed out that flood had been incorporated into the WDC manual and therefore the revision of the SCMP was inevitable and therefore the flood management activities would be incorporated into the SCMP.

It was therefore agreed that IFMC meetings would be held annually after flood occurrence in the month of August and point of discussions will be assessment of flood damage, implementation of the IFMP and review of the IFMP. The proposals for future IFMC meeting were outlined until the 10th IFMC meeting that was scheduled for year 2020. The tentative scheduled was agreed upon by IFMC members.

5. Report on countermeasures at Eldoro Primary School and FEWS installation and operation in Lumi River Basin.

Mr. Owaga explained the countermeasures at Eldoro Primary School, he explained the basic plan of the environmental improvement to evacuation camp to the participants. He explained that the evacuation centre that was constructed was simple and cost effective and therefore easy to replicate in other areas. He explained that an evacuation place, raised toilet, culvert and raised evacuation road. He pointed out that the raised evacuation road was done by community who provided the material and labour of the road construction. Mr. Owaga also explained the procurement and implementation process for construction works. He explained that the works were targeted for 90 days but the construction commenced during rainy season that led to delay in the works. He explained that the foundation of the evacuation place was raised by 1.1M compared to flood depth of 0.5M. He explained that a culvert had been constructed to drain water out of the school. Eldoro school acts as evacuation place for affected families during flood disasater.

He further explained that the community members had been trained on how to construct raised roads. He stated that the training was undertaken Kiambu County. He clarified that the trained community members supervised the construction of the road. He also stated that these trained community members had agreed to play key role in the O&M of the raised evacuation road.

He also explained that the community-based flood early warning system had been installed in Lumi river basin. In his explanation he pointed out that the river gauge gadget and rainfall gauge gadgets had been installed. He pointed out that the FEWS installed were community based Flood Early Warning System (FEWS) wherein community members issued early flood. He pointed out that the community observers were trained on observation, and assembly of the flood early warning gadgets. He added that JICA Project team had handed over tools for O&M to the Lower Lumi WRUA.

Eng. Kondo explained to the participants of the successes achieved by Community based Flood early warning and gave a case example of the effective use in Isiolo. In his explanation he pointed out that the recent rains in Isiolo led to floods but by virtue of the Community based flood early warning that led to early evacuation of communities near town and therefore reduced the flood damage though two people died as a result of the flash flood in Isiolo. KRCS representative for Taveta County pointed out that FEWS used in floods in Nov. and Dec 2013 and was effective.

Presentation on report on construction of evacuation facilities, FEWS installation and operation is herein attached as the **Attachment 3**.

6. Explanation of the trial in LOGUMI WRUA (CFMO establishment and its advantage/ problems.

Mr. Ngida made a presentation on how to establish Community driven flood management organization (CFMO). In his presentation Mr. Ngida used Kiswahili language. In the course of the presentation the following key issues were presented: a) definition of the community, b) definition of CFMO, c) objectives and purposes of the CFMOs, activities that can be undertaken by the CFMO, d) comparative view of CFMOs in Nyando vis-à-vis CFMOs in Lower Gucha Migori SC, and e) merits and demerits of CFMOs. In the course of his presentation the following salient issues emerged:

a) Importance of having CFMOs: It was pointed out that CFMOs play an important role in flood management at village level and as a result the effort of the CFMOs would supplement the efforts of WRUA flood management committee and ease the work of WRUA in flood management at village level. He gave an example of LOGUMI WRUA wherein the LOGUMI Flood Management Committee was initially involved in evacuation, evacuation place management, relief distribution, coordination with other stakeholders but after the establishment of the CFMOs in LOGUMI SC the evacuation, management of evacuation place and even relief distribution was being carried out by the CFMOs;

b) Enhanced sensitization on flood management: It was pointed out that since CFMOs are based at village it was easy to sensitize communities on issue of flood management. It was also pointed out that since the activities of the CFMOs were at the village level then most community members would gladly participate;

c) Enhanced mobilization. It was also pointed out that floods affect a particular village where the CFMO is located and therefore it easy to mobilize community members to engage in the issues of flood management;

d) Resource mobilization. It was also pointed out that CFMOs can develop proposals to the CDF, County government to assist them in flood management. This ability of reaching to other developmental agencies will enhance flood management at village level; and

e) CFMOs are village based at grassroots. It was pointed out that since CFMOs are located at grassroots it was easy for them to be self-sustainable because they are established by community members based on the problems that the village commonly faces.

The presentation attracted the attention of the participants because it was being relayed in Kiswahili. During the discussion one participant from Lower Lumi WRUA wanted to know whether WRUA could write proposals or even fund the activities of the CFMO when the CFMOs were not members of the WRUA. He also inquired if it was possible for WRUA to include CFMOs flood action plan into the SCMP and ask for the funding. The presenter explained the importance of CFMOs working in collaboration with the WRUA. He further clarified that WRUA cannot write proposal or even fund activities of the CFMOs when the CFMOs were not part of the WRUA and therefore it was imperative that CFMO be bonafide corporate members of the WRUA. He also pointed out that once the CFMOs are members of the WRUA then the CFMOs Flood Action Plan should be incorporated into the SCMP in order for the action plans to be funded WSTF fund that WRUA can access.

Mr. Fred Reuna of Lower Lumi pointed out that from the presentation he noted that LOGUMI WRUA played a pivotal role in ensuring the establishment of the CFMOs and therefore easy for CFMOs to collaborate with LOGUMI WRUA. He added that also the formation of the CFMOs in LOGUMI showed that WRUA and CFMOs can coexist, work together to realize the common good of the affected areas. He therefore stated that if Lower Lumi area were to establish the CFMOs then Lower Lumi WRUA should take the leading role in sensitization of the communities in affected areas to establish CFMOs.

Dr, Mikumo JICA expert pointed out that one of the demerits of the CFMOs that was pointed out during the presentation was poor leadership and organization structure of the CFMOs. He therefore challenge the stakeholders especially KRCS and School to actively participate in the WRUA and enable capacity building of the WRUA on group formation, organization structure development and leadership skills. The presenter concurred with the observation and stated that in LOGUMI SC where CFMOs have been established the challenge of organization structure had been noted with new influential members joining CFMOs and try to influence change of leadership without apperent concrete reason and this influential community members thereafter take the leadership of the CFMOs. He also pointed out that in Nyando the performance of the CFMOs was strongly predicated on the leader of the CFMO and where the leaders were strong the CFMOs performance was also good but where the leadership of the CFMOs was weak the performance of the CFMO after the Nyando Project has been dismal.

Presentation on how to establish community driven flood management organizations (CFMOS) is herein attached as the **Attachment 4**.

7. Wrap up meeting.

Eng. Kimanga explained the purpose of the meeting. He stated that the IFMP has not been developed for purposes of having good document but implementation of the plan. He stated that in five years' time the IFMP should have implemented at least 75% percent if not all. He stated that the IFMP had been adopted and also the stakeholders had agreed to periodic meeting of at least once a year for purposes of review of the plan and assessment of current flood damage after rainy seasons.

Attachment list

- Attachment 1: Lumi River Basin Integrated Flood Management Plan – Draft-
- Attachment 2: Priority of the Pilot Project
- Attachment 3: Community based flood management activities (non-structural measures)
- Attachment 4: Attendance List

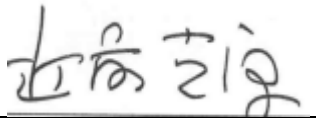
Taveta, 14th April 2014

Ms. Philis Wachira for

Mr. Canute M Mwakamba

Regional Manager, Athi Catchment Area Regional Office

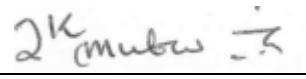
Water Resources Management Authority



Mr. Katsuro Kondo

Chief Advisor

JICA Project Team



Eng. Joseph Kimanga

Member, Flood Management Unit

Water Resources Management Authority

Mr. Yukihiro MIKUMO

JICA Expert

JICA Project Team

Ms. Mini Mary Ngaluma

Chairperson

Lower Lumi Water Resources Users Association

The 3rd Meeting of the Lumi River Basin
Integrated Flood Management Committee
- Agenda -

Date : 7th April 2014 Monday
Venue : Green Park hotel
Objectives : To considerthe finalization of IFMP for Lumi River Basin

(MC: Mr. Ongoro)

Time	Session name	Min	Speaker
09:00 09:30	Registration	30	--------
09:30 09:40	1.Prayer and Introduction	10	Moderator (Mr. Ongoro)
09:40 09:45	2.Opening Remarks	5	WRMA RM (Ms. Phylis)
09:55 10:10	5. Minutes of previous Lumi River Basin IFMC Meeting	15	Mr. Maina
10:10 10:40	6. Overview of IFMP and approach for finalization	30	Mr. Maina
10:40 11:05	**Tea Break**	25	
11:05 11:35	7. Report on countermeasures at Eldoro P. School and FEWS installation and operation in Lumi River Basin	30	Mr. Maina / Mr. Owaga
11:35 12:15	8. Discussion on current improvement and future revision of IFMP	40	Mr. Maina/Mr. Ongoro
12:15 12:30	9.Explanation of the trial in Logumi WRUA (CFMO establishment and its advantage / problems)	15	Mr.Clement Ngida (from Kisii SRO)
12:30 12:45	10.Wrap up	15	Eng. Kimanga
12:45 12:55	11.Closing Remarks	10	Eng. Kimanga
12:55 14:00	**Lunch Break**	65	
14:00	**Departure**		

NB: Report on the recent flood damage will be reported after rainy season in the next IFMC.

付属資料 3-12

Gucha Migori 川流域における第 1 回 IFMC 会議議事録等

MINUTES OF MEETING

OF

THE FIRST INTEGRATED FLOOD MANAGEMENT COMMITTEE MEETING

IN THE GUCHA MIGORI RIVER BASIN

The first Integrated Flood Management Committee Meeting in the Gucha Migori River Basin (hereinafter referred to as "the Committee") was held at Migori Teachers College in Migori Town on 18th December 2013. As the result of the discussions, committee members confirmed the following issues.

1. Purpose of the first Integrated Flood Management Committee in the Gucha Migori River Basin includes:

    - To get understanding on flood situation and flood management within Gucha Migori River Basin among the relevant stakeholders.
    - To understand necessity of river basin wide flood management plan
    - To request relevant stakeholders to assist and cooperate with WRMA and WRUAs formulation of flood management plans

2. Members of the Gucha Migori Integrated Flood Management Plan

    Members of the committee are:

    - WRMA Lake Victoria South Catchment Area Regional Manager: Chairperson;
    - WRMA Lake Victoria South Catchment Area Southern Shoreline Sub-regional Manager
    - LOGUMI WRUA, Ongeche WRUA (downstream);
    - Oyani WRUA (midstream)
    - Nyangweta WRUA (upstream)
    - Representatives of residents i.e. CFMO;
    - Provincial Administration: Represented by District Commissioner;
    - Gucha Migori County Government;
    - Concerned line ministries and governmental institutions;
    - Concerned NGOs.

    The Chairperson can nominate necessary members for the discussion of the related issues, if necessary.

3. Frequency of the Integrated Flood Management Committee

    The Committee shall be held once a year at least by the arrangement of WRMA Regional Office.

4. Opening Remarks

Mr. Maturwe made the opening remarks where he described the overview of the Lake Victoria South Catchment Area. He explained the importance of integrated approach in the management of the river basin. He welcomed the stakeholders to the first Gucha Migori IFMC and thereafter gave a brief overview of the Lake Victoria South Catchment.

Ms. Everlyne Onyango representing the County Government in her opening remarks stated that the County Governor and the Executive for Environment and Disaster were engaged in the Migori County Government Cabinet Meeting.

She pointed out that the County Government was appreciative of JICA effort in flood management in the Migori County. She challenged the education sector to incorporate flood and disaster management in the schools. She added that the Ministry of Environment and Disaster are engaged in reforestation in the County and also riverbank protection. She challenged the stakeholders to be generation minded and stated that starts with developing futuristic plans like the intended Gucha Migori Integrated Flood Management Plan. She finalized her remarks by pointing out that the County Government was ready to cooperate with other stakeholders in the management of floods disaster.

5. Keynote Address

Eng. Kondo the JICA Chief Advisor to the Project gave the key note address where he address the objective of the Integrated Flood Management Committee and the purpose of the first IFMC as follows:

(1) Floods in Gucha Migori River Basin

(2) The role and responsibility of WRMA and WRUAs

(3) River Basin Flood Management Committee

He thereafter explained the Nyando Project and lesson learnt wherein he explained that the Nyando Project implementation was expensive and difficult for community to implement on their own or even under the support of the government. He clarified that the current Project aims at capacity development in flood management for WRMA and WRUA. He explained that Flood Management was currently the mandate of WRMA and sixteen Flood Management Officer had been dispatched to the sub-region offices.

6. Basic River Basin characteristics and features with a bias towards floods

Mr. Leonard Masafu the Sub-regional Manager WRMA-LVSC Sourthern Shoreline Gucha Migori made a presentation entitled "Integrated Flood Management Plan for Gucha Migori River Basin". He explained the vastness of the river basin which has five counties and nine WRUAs. He pointed out the importance of stakeholders involvement in the Integrated Flood management Approach.

(1) Establishment of Gucha Migori Integrated Flood Management Committee

Mr. Masafu explained the concerted effort towards establishment of the Gucha Migori IFMC that eventually led to consensus on the formation and eventual take off of the first IFMC meeting.

(2) Draft Integrated Flood Management Plan

Mr. Masafu explained that during the consensus building it was agreed that Integrated Flood Management Plan for Gucha Migori River Basin and it was agreed that WRMA take a lead in developing the IFMP. He explained that two chapters had been developed already as follows:

1) Chapter One: Policy of River Basin Flood Management Plan

2) Chapter Two: Outline of Gucha Migori River Basin

One stakeholder raised the issue of accuracy of population data indicated in Chapter Two and requested the data on population should be reviewed. River changed course from the South Kadem not from the West Kadem as indicated in the draft plan. One participants wanted to know the scientific reason why the river changed its course. He thereafter outlined in bullet form the possible ideas that the IFMC members should pounder on and discuss and thereafter build consensus and reflect such progressive ideas in the IFMP.

The question was raised on the proactive nature of LOGUMI WRUA visavis sharing information with the community members at large. The LOGUMI WRUA secretary pointed out that the WRUA do not have big forums where they can address the community members. He added that the LOGUMI WRUA was reaching out to the communities by developing the Community Based Flood Management Organizations (CFMOs) where the LOGUMI WRUA can engage the community on the issues of flood management.

7. Flood management in Lower Gucha Migori vis-à-vis Japan Experience

Mr. Joshua Ouma made a presentation on Lower Gucha Migori Flood Management visavis Japan Experience. He explained the background of the Lower Gucha Migori. He thereafter gave the flood history in Gucha Migori. He also explained the villages affected by floods and the number of people affected and the damage experienced during floods in those areas.

He also explained the experience in Japan and lesson that Gucha Migori River Basin can draw from Japan on flood management in summary he pointed out the following.

1) Effective Data System Management;

2) Cooperation and coordination between Central Government, County Government and the Community;

3) Historical Data Management; and

4) Effective structural and non-structural measures.

He thereafter explained the lessons learnt from Japan experience and what can be replicated in Gucha Migori River Basin which includes:

1) Use of skelton triangle structures to control riverbank erosion;

2) Single riverbank embankment;

3) Man-made forests to control floods;

4) Kaeru caravan (rescue drills) for disaster education amongst pupils;

5) Effective river basin based flood management plans;

6) Modern technology in the management of the river basin; and

7) Establishment of river basin disaster operation centres.

DC Nyatike pointed out that the main problem ailing the floods in Gucha Migori River Basin was lack of responsibility on the side of community members, stakeholders and some government agencies leading to reckless attitude towards conservation of wetlands. Mr. Maturwe applauded the DC and stated that the stakeholders would join the DC in ensuring that the wetlands are conserved, river bank protected. LOGUMI WRUA Flood Management Committee Secretary pointed out that the CFMOs had been established at grassroots level and requested the stakeholders to assist LOGUMI in capacity building of the CFMOs and making them effective.

8. KRCS Current Activities in Lower Gucha Migori

Mr. Elly Onyango made a presentation on the current activities that KRCS were undertaking in Lower Gucha Migori SC. He gave the background of KRCS Migori Branch and pointed out that there were 1250 volunteers in Migori County. He explained the Flood effects in Lower Gucha Migori SC. He added that in April May floods 2013 600 HH affected, 30acres of farm affected, 38 houses damaged, 300 chickens lost and crops damaged. He thereafter gave the Project outline where he explained the duration of the Project and specific objectives. He explained the Kick-off meeting took place on 26th September 2013; stakeholders meeting that took place on 19th November 2013, Community Meeting on 24th November 2013. Current activities that are being undertaken are community based flood early warning and awareness creation. Planned activities include training of teachers in January, emergency evacuation drills in January, wrap-up stakeholders meeting in February, exchange programme to other pilot project area.

9. Human activities in the Upstream that have direct impact on the Downstream

Mr. Richard Onsongo CAAC member from the upstream made a presentation on the human activities that are being undertaken in the upstream that affects the downstream. He defined what a watershed and watershed management.

He pointed the importance of upstream and downstream counties governments' cooperation. Agricultural cultivation in the hilltops and roadside that enhances run-off, depleting forest cover in the hilltops as a result of deforestation in the upstream, affluent discharge from the factories in the upstream, uncontrolled sedimentation discharge from the upstream and planting of eucalyptus along the water catchments.

He explained activities that can be undertaken to solve the problems in the downstream which included the following: Cutting down of eucalyptus trees along the riverbanks, riparian and wetlands conservation, improve agricultural cultivation methods, spring protection, construction of gabions to minimize sediment discharge, control of affluent discharge by requesting factories to develop control affluent discharge plan., control of run-off by sand-bagging, development of fishponds and terracing works.

10. Plenary discussions on the activities noted by WRUA that can cause floods

Eng. Kimanga the moderator for the session welcomed the KRCS Regional Coordinator for Disaster who in turn pointed out the importance of cooperation in the management of disaster

and added that the Gucha Migori IFMC acts as a model that can be replicated in other areas. One participant pointed out that building evacuation centre was important but he pointed out that preventive measures were also important like riverbank stabilization. One participant wanted to know what entails Japan Grassroots Grant Aid and who can access the grant and the ceiling of the Grant. Operation Centre should be in a place where the data can easily be computed, analysed and disseminated. Eng. Kondo explained that Japan Grassroots Grant is under the Japan Embassy and aimed at assisting communities and is not accessed by Government agencies.

11. Closing Remarks

Mr. Maturwe appreciated the stakeholders for attending the meeting and requested the members to always attend when they are called upon. He added that the members should ponder what should be in the Integrated Flood Management Plan.

Mr. Nzyuko made the closing remarks wherein he pointed the importance of integrated approach in the management of floods. He pointed out that the world as a whole has been experiencing floods and therefore the issue of eliminating floods was not the question but how to effectively manage floods. He explained the importance of WRUAs from upstream, midstream and downstream cooperating and working together in the water resource management. He pointed that SCMPs in the river basin should incorporate flood management activities and coordination on how such activities could be implemented.

Attachment list

- Attachment 1: Attendance List

Gucha Migori, 18th December 2013

Mr. Bilancio Maturwe

Regional Manager, Lake Victoria South Catchment Area Regional Office

Water Resources Management Authority

Mr. Katsuro Kondo

Chief Advisor

JICA Project Team

Eng. Alexander Nzyuko

Head, Flood Management Unit

Water Resources Management Authority

Mr. Hideki Sawa

Team Leader

JICA Project Team

Ms. Ruth Nanjala

Chairperson

Lower Gucha Migori Water Resources Users Association

The First Meeting of the

Gucha Migori River Basin Integrated Flood Management Committee

Agenda

Date: 18th December 2013

Venue: Migori Teachers' College Hall

Purpose:

- To get understanding on flood situation and flood management within Gucha Migori River Basin among the relevant stakeholders

Time	Session name	Min	Speaker
10:00 10:30	Registration	30	--------
10:30 10:40	1.Opening Remarks	10	WRMA･LVSCA RM
10:40 10:50	2.Opening Remarks	10	County Governor
10:50	3. Keynote address by Project Team	15	JICA Team
11:05	Discussion	10	
11:15	4. Necessity of Integrated Flood Management Plan for Gucha Migori River Basin	20	WRMA Kisii SRM Mr. Leaonard Masafu
11:35	Discussion	10	
11:45 12:05	**Tea Break**	20	
12:05	5. Lower Gucha Migori Sub-catchment Floods vis-à-vis Japan Experience	15	LOGUMI WRUA Secretary Mr. Joshua Ouma
12:20	Discussion	15	
12:35	6. KRCS Current Activities in Lower Gucha Migori	15	
12:50	Discussion	10	
13:00	7. Human activities in the Upstream that have direct impact on the Downstream	15	CAAC Member from Upstream Mr. Richard Onsongo
13:15	Panel Discussion	15	*Moderator (Eng. Kimanga)*
13:30	WRAP UP Discussion	10	*Moderator (Eng. Dienya)*
13:40 14:00	8. Closing Remarks	20	WRMA-LVSC RM Mr. Bilancio Maturwe District Commissioner, Nyatike County Governor WRMA-HQ, FMU Eng. Wilfred Matagaro
14:00 15:00	**Lunch**	60	
15:00	**Departure**		

付属資料 3-13

Gucha Migori 川流域における第 2 回 IFMC 会議議事録等

MINUTES OF MEETING

OF

THE SECOND INTEGRATED FLOOD MANAGEMENT COMMITTEE MEETING

IN THE GUCHA MIGORI RIVER BASIN

The second Integrated Flood Management Committee Meeting in the Gucha Migori River Basin (hereinafter referred to as "the Committee") was held at Migori Teachers Training College on 27th February 2014. As the result of the discussions, committee members confirmed the following issues.

1. The Integrated Flood Management Committee in the Gucha Migori River Basin

The attendants built consensus upon the following.

(1) Purpose

The purpose of the second IFMC Meeting for Gucha Migori was elaborated as to establish causes and effects of floods for R. Gucha Migori Basin. Mr. Samuel Njihia gave the background of Gucha Migori basin and an overview of Gucha Migori river basin floods.

Frequency of the subsequent meetings

It was agreed that the subsequent IFMC meetings will be as follows:

a) 3rd IFMC will be held on 10th April 2014 and the discussions will revolve around draft IFMP and building consensus on the draft IFMP;

b) Tentative date for 4th IFMC was scheduled for 22nd May 2014 and the discussions will revolve around Methods of incorporating the IFMP into the SCMP, CMS, county government strategic plans; and

c) Tentative date for 5th IFMC was scheduled for 26th June 2014 and the discussions will revolve around Prioritization of countermeasures and identifying avenues for funding the implementation.

2. Cause and effects of floods

(1) Case example of cause and effects of floods Isiolo River Basin

Mr. Maina made a presentation on cause and effects of floods in Isiolo River Basin on behalf of Mr. Kinyanjui. In his presentation he pointed out that the causes of floods in Isiolo were inundation in town centers, newly constructed roads and airport have changed river courses resulting into floods. Some of the effects for floods in this area includes; destruction of infrastructure, death of human and animals, poor hygiene and sanitation among others. Counter measures include; culvert improvement, flood disaster in schools and improvement of drainage channels. Early warning systems have been installed in 6 No locations while 5 No rain gauge stations and 1 No river level gauge also installed. KRCS has conducted flood disaster education in 4 No schools within Isiolo river basin while WRUA members have been trained on early warning awareness and preparation of community flood hazard map.

(2) Case example of cause and effects of floods Lumi River Basin

Mr. Maina Flood Management Officer WRMA-Athi NolTuresh Loitoktok made a presentation on cause and effects of floods in Lumi River Basin. In his presentation he pointed out that the IFMC for Lumi basin comprises of; WRUA members, Deputy County Commissioner, KERA, Provincial administration among other stakeholders. On the analysis of floods, he pointed out that there is cooperation between all stakeholders, restriction on logging, channel improvement of river Lumi, repair of existing embankment, upstream forestation, rain water harvesting, spring and river bank protection and small check dam.

Several measures have been adopted on evaluation of countermeasures. Evaluation is based on relevance, effectiveness, efficiency, sustainability and impact. Prioritized countermeasures are; raised up toilets, rain water harvesting, river bank protection, construction of community roads and spring protection (gabions).

He further stated that the effects of floods in Lumi River Basin were as follow:

a) Transport disruption
b) Poor hygiene and sanitation
c) Death of animals and human
d) Loss of crops
e) Infrastructure destruction

(3) Guidance on Cause and effects of floods

Ms. Lencer Opiyo Community Development Officer WRMA-LVSC Regional Office made a presentation on guidance on the cause and effects of floods. She acknowledged that her presentation was based on the training she received on Flood Management during WRMA Stage 1 training that was held in Nairobi. She explained the concept of risk, hazard and disaster and their relation. She further explained the pressure release model. She also explained the disaster risk management cycle. She thereafter explained the causes of floods, the effects of floods and there relation.

(4) Cause and effects of floods in Gucha Migori River Basin

Mr. Njihia Flood Management Officer WRMA-LVSC Southern Shoreline Kisii made a presentation on cause and effects of floods in Gucha River Basin. In his presentation he explained the background information of Gucha Migori, overview of Gucha Migori River Basin, types of floods in Gucha Migori River Basin, major flood type in the downstream, areas affected by floods in the downstream, estimated crop damage in the downstream, Flood disaster analysis for Gucha Migori River Basin, planned flood management activities in Gucha Migori River Basin.

He further stated that the effects of floods in Gucha Migori River Basin were as follow:

i. Destruction of health and social amenities
ii. Destruction of farms
iii. Causes school drop outs among school going children
iv. Poor hygiene and sanitation
v. Destruction of evacuation centres
vi. Human and animal deaths

3. Group discussion and presentation

The participants were divided into three groups and after 45 minutes of discussion each group made a presentation as follows:

(1) Group 2 presentation

Group one presenter began the presentation by pointing out that the causes of floods were:

a) Poor land use
b) Heavy rainfall
c) Deforestation
d) Poor enforcement of laws

Thereafter he stated that the effects of floods were:

a) Loss of livelihoods
b) Destruction of property
c) Job opportunities
d) Poor hygiene and sanitation
e) Communication breakdown
f) Displacement of people

.

(2) Group 3 presentation

Group three presenter began the presentation by pointing out that the causes of floods were;

i. Heavy rainfall upstream
ii. Human activities (poor farming methods, deforestation, overgrazing, sand harvesting and wetlands destruction)
iii. Siltation and depositation of materials
iv. Land topography
v. River capacity
vi. Animal activities

Thereafter he stated that the effects of floods were:

i. Deaths
ii. Economic sabotage
iii. Water borne diseases
iv. Pollution
v. Destruction of education

(3) Group 1 presentation

Group threes presentation was done by Mr. Charles Ongaro. He began the presentation by pointing out that the causes of floods were

i. Too much rain
ii. Too much water
iii. Change of land use
iv. Deforestation
v. Encroachment on human settlements
vi. Sedimentation

vii. Back flow from lake water
viii. Size of rivers (diversion of water course, industrialization, mining work, lack of river protection)

Thereafter he stated that the effects of floods were:

i. Famine
ii. Deaths
iii. Pollution
iv. Destruction of destruction of destruction
v. Loss of lives

4. Community based Flood Early Warning System

Mr. Joshua Ouma LOGUMI WRUA Secretary explained the Community-based Flood Early Warning System in LOGUMI SC. He further pointed out the importance of cooperation between the upstream WRUAs and downstream WRUAs in flood early warning. He added that LOGUMI WRUA had developed three rain gauge gadgets and that the WRUA intended to discuss with upstream WRUA to install the two rain gauge gadget and in case of the heavy rains the upstream WRUA where the gadgets would be install would warn the downstream WRUA of the impending floods.

5. Flood Management Education Programme in Nyatike

Mr. Elly Onyango KRCS Project Officer explained the discussion with District Education Office and agreement of cooperation. He also explained the mobilization of teachers for the training, sharing of the training material with JICA Project office in Kisii and WRMA-LVSC Kisii. He thereafter explained the training of teachers and thereafter training of the pupils and eventually the development of Flood Management Teachers Booklet. He also explained the challenges and the way forward in implementation of education programme

6. Discussion on interventions

a) This will be an item to be discussed during the 3rd IFMC meeting scheduled for 10th April 2014.

7. Mr. Omwamba the Kisii County Director of Water suggested that mechanisms for tapping of underground water should be enhanced to help in recharge and also excess water can be directed to boreholes. A community member observed that mining activities are contributing flooding due to release of toxic substances into the river. A member from LOGUMI area noted that downstream farmers record good harvest after floods. Other observations noted during flooding season include; hyacinth thriving on fertilizers from upstream farming activities, burial becomes a problem during floods while businesses are negatively affected.

Attachment list

- Attachment 1: Attendance List

Migori, 27th February 2014

Mr. Reuben Ndienya

Regional Manager, LVSC Catchment Area Regional Office

Water Resources Management Authority

Mr. Katsuro Kondo

Chief Advisor

JICA Project Team

Mr. Leonard Masafu

Sub Regional Manager, Southern Shoreline Gucha Migori Sub Regional Office

Water Resources Management Authority

Mr. Hideki Sawa

Team Leader

JICA Project Team

Mr. Joshua Ouma

Secretary

Lower Gucha Migori Water Resources Users Association

The Second Meeting of the Gucha Migori River Basin
Integrated Flood Management Committee
- Agenda -

Date : 27th February 2014 Thursday
Venue : Migori Teachers' College Hall
Objectives : To develop causes and effects of floods for R. Gucha Migori Basin

(MC: Mr. Masafu)

Time	Session name	Min	Speaker
09:00 09:30	Registration	30	--------
09:30 09:40	1.Prayer and introduction	10	Moderator (Mr. Ngessa)
09:40 09:45	2.Opening Remarks	5	WRMA RM
09:45 09:50	4.Opening Remarks	5	County Deputy Commissioner Nyatike Sub-county
09:50 09:55	5.Opening Remarks	5	County Governor
09:55 10:10	6. Review of previous Gucha Migori river basin IFMC meeting	15	Mr. Masafu
10:10 10:25	7. Cause and Effects, Flood Management Plan in Isiolo	15	Mr. Kinyanjui, Isiolo SRM
10:25 10:40	8. Cause and Effects, Flood Management Plan in Lumi	15	Mr. Maina, Loitokitok SRO
10:40 11:05	**Tea Break**	25	
11:05 11:20	9. Guidance on cause and effects by WRMA RO	15	Mrs. Lencer
11:20 11:40	10. Cause and effects explanation by SRO	20	Mr. Njihia
11:40 12:25	11. Group Discussion on cause and effects	45	
12.25 12:55	12. Presentations by group 1 and 2	15X2	
12:55 13:55	**Lunch Break**	60	
13.55 14:10	13. Presentation group 3	15	
14:10 14:40	14. Plenary Discussion	30	Moderator (Mr. Masafu)
14:40 14:50	15. Flood Early Warning System	10	Mr. Joshua, LOGUMI WRUA
14:50 15:00	16. Education Program	10	Mr. Elly, KRCS Project Officer
15:00 15:10	17. Discussion on Interventions	10	Moderator (Mr. Masafu)
15:10 15:15	18. Closing Remarks	5	WRMA RM
15:30	**Departure**		

付属資料 3-14

Gucha Migori 川流域における第 3 回 IFMC 会議議事録等

MINUTES OF MEETING

OF

THE THIRD INTEGRATED FLOOD MANAGEMENT COMMITTEE MEETING

IN THE GUCHA MIGORI RIVER BASIN

The third Integrated Flood Management Committee Meeting in the Gucha Migori River Basin (hereinafter referred to as "the Committee") was held at Migori Teachers Training College on 10th April 2014. As the result of the discussions, committee members confirmed the following issues.

1. Opening Remarks

The Regional Manager LVSC (Ag) gave the first opening remark wherein he thanked the participants for their commitments in attending the IFMC whenever the meetings are called. He reminded the participants that the rainy seasons had commenced and therefore there was a need to put up measures to cope with the flood occurrence. He stressed on flood management approach rather than flood control approach in dealing with flood disaster. He further stated that the IFMC was an important player in ensuring effective management of floods. He thereafter declared the 3rd IFM meeting officially opened.

The second opening remark was made by the County Deputy Commissioner Nyatike. In his speech he appreciated the IFMC meetings and stated that the IFMC was an avenue where issues of floods were discussed. He pointed out that the success in flood management is not predicated on discussions alone but taking action on what was discussed and deliberated upon. He pointed out that sensitization and building the capacity of community on flood management and safety measures was important and should be implemented by stakeholders. He gave two graphic examples of seven people who lost their lives in Nyatike as a result of high flows in River Gucha Migori. He stated that one woman was swept away by high flows when she went to the river to wash utensils and one of her kitchen utensil was washed away and in her effort to retrieve the utensil she drown and died. He pointed out the need to capacity built communities on flood issues and countermeasures.

The final opening remark was made by Director of Environment and Disaster Migori County. In his speech he stated that the new constitution devolved disaster management and at the same time allows the National Government to take the lead in disaster management. He pointed out that Migori County had a budget on disaster. He added that there were floods in Nyatike in Aeko village and County government, KRCS and WRUA visited the area for flood Assessment. He pointed out that the WRUAs in Migori County should develop proposals and submits to county government for funding. He added that Migori County was currently working with LOGUMI WRUA and urged other WRUAs to follow suit. He added that WRUAs in the upstream should also cooperate with their respective County governments to enhance flood management in the river basin. He also stated that since community at village level had organized themselves into the CFMOs and therefore enhancing flood management at grassroots levels therefore the CFMOs should also write proposals to Migori County government for funding. He stated that he was pleased with the presentation on the good practices in the Nyando where CFMOs are proactive even though amorphous but he urged the SRM Kisumu to encourage the CFMOs to write proposal to county government for funding for flood management activities.

2. Confirmation of the 2nd IFMC Meeting Minutes

The sub regional Manger Southern shoreline Gucha Migori presented the previous minutes held on 27th February 2014 at Migori Teacher College in Migori County to the committee. He proposed the

previous minutes and was confirmed by Awithi from LOGUMI WRUA and seconded by Mr.Steven from Middle Gucha WRUA. There was no matter arising.

3. Presentations

3.1 Mr. Samuel Njihia Flood Management Officer (FMO), Southern Shoreline Gucha Migori sub region made presentation on the draft IFMP and outlined the cause and effects of floods in Gucha Migori River Basin. In his presentation he gave an overview of chapter one and two of the IFMP for Lower Gucha Migori WRUA. He pointed out the need to borrow experience gathered from Nyando pilot study by JICA. He recommended Lower Gucha Migori WRUA for developing early warning system. He mentioned heavy rainfall, encroachment of the riparian areas, heavy sedimentation of the river channel, intensive farming near the river bed as causes of floods and Accidental deaths, damaged road infrastructure, Disruption of education programs, displacement of the affected families, poor sanitation and hygiene, damaging of graves ,and properties as effects of floods in Lower Gucha Migori .He stressed on the importance of imparting Knowledge of resilience to the flood affected communities. The presentation is attached as Attachment 2.

The following comments or questions arose after the first presentation:

Q. Is it possible for each sub county`s population census presented as a stand-alone?

A. The population census was for the entire catchment.

Q. Are all WRUAs within Gucha Migori river basin supposed to develop integrated flood management plan?

A. No, IFMP is for low lying areas which are inundated

A committee member recommended that people with disability should be involved and participate in the IFMC meetings. Another member also pointed out that the IFMP should include spiritual nourishment for the affected families during floods. The Sub-regional Manager Gucha Migori pointed out that WRUA was an all-inclusive organization that has a place for people with disabilities and therefore their interest were well taken care off in the IFMP. On the issue of spiritual nourishment he pointed out that communities members affected evacuate to a particular place and the church could visit the families and conduct church services.

3.2 Mr. Reuben Ndienya Regional Manager (Ag). He started by mentioning the types of floods in Gucha Migori river basin as; Type A, that starts from upstream and affects also Mid areas of Gucha Migori River basins, B affecting low lying areas and C affecting upstream and Midstream areas . He further explained about flood disaster analysis done within Gucha Migori River basin. His presentation is herein attached as Attachment 3.

Eng. Kimanga explained about prioritization of counter measures and its importance as knowing the activities to be implemented first. He then suggested that prioritization of countermeasures be done as a groups work. It was therefore mutual agreed that that WRMA prioritize the countermeasures and thereafter present to the IFMC meeting for ratification.

During plenary discussion a committee member confirmed that irrigation project works by National Irrigation Board were ongoing. He pointed out that during the second phase dyke was going to be constructed 7.5KM and 7.3KM on both side of the river i.e. from Wath Onger to the Lake. He added that a survey for a new dam at Gogo was ongoing. He pointed out that the NIB Project also aimed at developing drainage infrastructure, road network in the Project Area. He clarified that the study for establishment of new dam was in process and that the dams will be

used for irrigation and power generation. Johana Ouma, County environment officer; emphasized on the stakeholder involvement and WRMA as a lead expert.

3.3 Mr. Joshua Ouma, Secretary LOGUMI WRUA made a presentation on the approach to get funds for implementation of the IFMP. In his presentation he explained the raising of funds for the LOGUMI WRUA. He thereafter pointed out the following ways of resource mobilization strategies:

1. Identifying the stakeholders (Key players) within their county
2. participate actively with the stakeholders
3. Write Funding proposals
4. Assess Governors investment funds

He pointed out CDF- 5% emergency funds, WSTF, Community Development Trust Funds and Road maintenance levied funds 16% as identified avenues. His presentation is herein attached as Attachment 4.

During plenary discussion Mr. Joseph Adipo a member of CFMO, requested the county government of Migori to fund the construction of evacuation centers as the community provides land. Mr. Richard Onsongo CAAC member pointed out that WRMA should build capacity of WRUAs on how to mobilize resources.

3.4 Mr. Benard Omuya Sub Regional Manager Northern Shoreline Nyando made a presentation on flood damage in Nyando and the good practies of flood management in Nyando. He began his presentation by giving a brief introduction of Kano plains and mentioned Awach Kano , Nyaidho, Nyalbiego among other rivers to drain into River Nyando. He emphasized that the area is affected by floods and WRMA in collaboration with JICA funded structural and nonstructural measures to manage the floods in the area. He pointed out raised latrines, evacuation centers, raised boreholes and culverts as structural measures put in place for the Kano plains community. He added that the flood management lessons are in cooperated into primary school lessons within the flood prone areas of Kano plains. As any flooding area, he mentioned that Kano plains experience the following challenges; Food insecurity, Damage of farmland and crops, loss of sources of livelihood, human suffering, disruption of social activities, destruction of roads, drainage systems, lack of places to evacuate.

He suggested flood management education programs, evacuation drills, CFMOs integration into WRUA, human safety given first priority during floods, Raised toilets, boreholes, Establishment of evacuation centers, footpaths, information sharing, stakeholders' involvement and cooperation as good practices to be imitated from Nyando Project. His parting short was "it's difficult to control floods but easy to manage floods". His presentation is herein attached as Attachment 5.

4. Future IFMP meetings schedules and frequency of the meetings.

Mr. Leonard Masafu WRMA Sub-regional Manager Southern Shoreline Gucha Migori informed the committee that the IFMC must have a life even after the Project. He pointed out that there was a possibility that in the next IFMC meeting the Project Team (JICA) will not be around for the next meetings but WRMA and the stakeholders must continue with the meetings. He explained that flood frequency in Gucha Migori river Basin was twice a year i.e. during the long and short rains. He therefore proposed for a biannual IFMC meeting for purposes of review of the IFMP, confirm the implementation of the IFMP activities and discuss the flood damage after rainy seasons.

He further explained the future IFMC meeting schedule as follows: 4th meeting is tentatively scheduled for 4th June 2014, while fifth meeting scheduled for 5th December 2014, 6th June 2015, 7th December 2015, 8th June 2016, 9th December 2016, and finally, 10th June 2017. The main agenda of the meetings is to report on flood damage after the rainy season and implementation status of the IFMP.

5. AOB

NEMA's Environment Officer pointed out that NEMA had funds that they are ready to give to community based organizations that will write a good winning proposal on water and energy. He added that the money was two million Kenya shillings.

6. Adjournment

The Regional Manager, Eng. Dienya and Eng. Kimanga made the final remarks and thanked the participants for the patience throughout the meeting. The meeting was adjourned at 15.40 with a word of prayer and therefore the next meeting was scheduled for 4th June 2014 at Migori Teachers college from 9.00 am.

Attachment list

- ✓ Attachment 1: Attendance List;
- ✓ Attachment 2: Draft Integrated Flood Management Plan for Gucha Migori River Basin;
- ✓ Attachment 3: Possible Countermeasures for Gucha Migori River Basin for Gucha Migori River Basin;
- ✓ Attachment 4: The approaches to get funds for implementation of the IFMP; and
- ✓ Attachment 5: Flood damage and interventions in Nyando River Basin.

Migori, 10th April 2014

Mr. Reuben Ndienya

Regional Manager, LVSC Catchment Area Regional Office

Water Resources Management Authority

Mr. Joseph Kimanga

Member, Flood Management Unit

Water Resources Management Authority

Mr. Joshua Ouma

Secretary

Lower Gucha Migori Water Resources Users Association

Mr. Yukihiro Mikumo

JICA Expert

JICA Project Team

The 3rd Meeting of the Gucha Migori River Basin
Integrated Flood Management Committee
- Agenda -

Date : 10th April 2014 Thursday
Venue : Migori Teachers' College Hall
Objectives : To develop possible flood countermeasures for R. Gucha Migori Basin

(MC: Mr. Masafu)

Time	Session name	Min	Speaker
09:00 09:30	Registration	30	--------
09:30 09:40	1.Prayer and introduction	10	Moderator (Mr. Masafu)
09:40 09:45	2.Opening Remarks	5	WRMA RM
09:45 09:50	4.Opening Remarks	5	County Deputy Commissioner Nyatike Sub-county
09:50 09:55	5.Opening Remarks	5	County Governor
09:55 10:10	6. Review of previous Gucha Migori river basin IFMC meeting	15	Mr. Masafu
10:10 10:40	7. Cause and Effects, Flood Management Plan in Gucha Migori and presentation of draft IFMP	30	Mr. Njihia FMO Kisii
10:40 11:05	**Tea Break**	25	
11:05 11:45	8. Possible Countermeasures for Gucha Migori and prioritization of countermeasures	40	Eng. Dienya
11:45 12:05	9. Future IFMC Meetings Schedule and frequency of the meetings	20	Mr. Masafu
12:05 12:15	10. The approach to get funds for implementation of IFMP	10	Mr. Joshua
12:15 12:35	11. Flood Damage report from Nyando project Area	20	Mr. Omuya
12.35 12:50	12. Wrap up	15	Eng. Dienya
12.50 13:00	13. Closing Remarks	10	Eng. Kimanga
13:00 14:00	**Lunch Break**	60	
14:00	**Departure**		

付属資料 3-15

Gucha Migori 川流域における第 4 回 IFMC 会議議事録等

MINUTES OF' THE FOURTH INTEGRATED FLOOD MANAGEMENT MEETING HELD AT IFAD BUILDING IN MIGORI COUNTY ON 24TH JULY 2014.

Introduction

This was the fourth Integrated Flood Management Committee (IFMC) meeting. The meeting started at 10.00 am with a word of prayer from one of the participants. The following were the itinerary for the meeting: Opening Remarks, Presentation of the previous minutes, presentation of the zero draft Integrated Flood Management Plan (IFMP), presentations of the lessons learnt, group discussions, plenary session, adoption of the IFMP, Wrap up and closing remarks.

Opening Remarks

Sub regional manager (Southern Shoreline Gucha Migori) (Mr. Mwangogo)

He welcomed everyone to the meeting and introduced the meeting agenda as presentation and discussion of the IFMP zero draft. He urged the committee members to look at the document critically and effectively.

JICA Project Team Leader (Mr. Sawa)

He identified the activities they achieved during the integrated flood projects like structural and non-structural measures. He recommended replication of such projects to other flood prone areas in Kenya like: Tende, Kibuon and Nyakwere among others. He appreciated Lower Gucha Migori WRUA for their commitments and participation in the projects that were replicated in their sub catchment.

Regional Manager LVSC (Naomy Olero)

On behalf of Regional manager(Mr. Khisa) and LVSC, she welcomed the participants for the meeting and appreciated everyone for coming together to manage floods. She added that when floods are controlled the areas that experience floods become better places to live and no life is endangered. She called for taking responsibilities for positive and faster results. She quoted from Dr. Simiyu CEO Geothermal who said "Good things come as a result of taking responsibility)

She mentioned that WRMA`s general principles or measures and main activity in terms of flood protection included;

- land use to keep the people away from foods
- Structural measures to keep the floods away from the people
- flood preparedness measures to get people ready for the floods
- Flood emergency measures to help affected people cope with floods.

She concluded by saying that one who does not plan, plans to fail in that there will be increased loss of lives, damage of properties, change in the ecosystem.

DTCM Flood management (Eng. Matagaro)

He began by giving background information of lower Gucha Migori WRUA Sub catchment Area to have two main river systems that is River Migori and Gucha that converge at some point. He added that the IFM committee was composed of WRUAs and stakeholders from upstream of Lower Gucha Migori WRUA sub catchment. He mentioned the past IFM committee meetings to entail:

1st Brainstorming of the flood issues,

2nd Identification of causes of floods and effects,

3rd Draft on effects and mitigation measures

4th Adoption of the zero draft integrated flood management plan.

He stressed that the plan should in cooperate all the details required because it will be used to solicit funds for implementation of the activities from different developmental partners.

He mentioned about 16 areas in Kenya that are flood prone and only four have already come up with Integrated flood management plans ie Nyando, Isiolo, Taveta and Nyatike. He added that WRMA has plans for rolling out the program to other 12 flood affected areas in Kenya. He also encouraged Inter Counties flood management programs where flood affects more than one county.

County director economic and planning

He said that that the county has a disaster management plan put in place to manage disaster issues for the next five years and will allocate resources for management of floods. He appreciated WRMA for the invitation.

Previous IFMC meeting minutes

The sub regional manager Southern Shoreline Gucha Migori presented the minutes for the last IFMC Meeting which was held on 10th April 2014 at Migori Teachers college. He then moved the minutes to the committee for confirmation. The minute was then proposed by Mr. Ouma Joseph and Seconded by Mr Abila Julius.

Matters arising

The committee wanted to know whether the issues raised during 3rd IFMC plenary session were captured in the IFMP. The flood management officer, Mr. Njihia confirmed that the issues were captured and that was evidently seen in his presentation.

Presentation of the zero draft IFMP: FMO- Samwel Njihia.

He presented the overview of the integrated flood management Plan to entail. Chapter1: policy of river basin management plan, which aims at mitigating against the impact of floods. Chapter 2: on Natural conditions;- topography, vegetation and soil, river characteristics. Other issues discussed were; 3 types of flood characteristics in Gucha Migori river basin, flood disaster analysis, possible counter measures as enshrined in the IFMP and finally recommendations.

Executive summary on lessons learnt: CDO – Cloy Anyango

The following were the achievements and lesson learnt during the project implementation

- WRUA flood management subcommittee established
-Conducted evacuation drills
-Learned appropriate disaster management skills.
-In cooperated students and pupils in the installation of community early warning systems.
-excursion visits between upstream and downstream WRUAs from Gucha Migori river basin
-Developed community driven maps at ; Nyora, kabuto, lwanda misiwi , Ratiany, Aheko.
- In cooperated the IFMP in the SCMP
- Stakeholders participation in their projects
- Development of community hydrographs
- developed CFM action plan to be implemented as short term, midterm and long term.
- Held a lot of trainings on integrated flood management.

Group work and Group presentations

The participants were divided into 3 groups, Group one discussed the short term counter measures while group two Midterm countermeasures and finally group 3 long term countermeasures of flood damages.

The following criteria was used;

- Relevance
- effectiveness
- efficiency
- impact
- sustainability
- timeframe

Below are the presentations for each group.

Group 1

Terms of reference: Effectiveness, Sustainability, Relevance

Priority	Activity	Time Frame
1	Developing flood sensitization posters	Jan 2015-Dec 2017
2	Conducting evacuation drills (bi-annually);	Jan 2015- Dec 2017 (JICA/WRMA/County has supported 2No. drills in 2014)
3	Drilling of borehole and installing water tanks at evacuation places	Jan 2015-Dec 2017
4	Construction of raised toilets in evacuation places	Set 2014-Sept 2016
5	Advocacy on sanitation and hygiene	Jan 2015-Dec 2017
6	Promotion of low-cost water treatment;	Jan 2015-Dec 2017
7	Construction of mobilets or provision of mobilets to every homestead	Jan 2015-Dec 2017
8	Improvement of agricultural practices;	Jan 2015-Dec 2017
9	Mainstreaming Flood Management concepts into school curriculum	Jan 2015-Dec 2017
10	Construction of well maintained flood resistant toilets;	June 2015-June 2016
11	Construction of Retarding basins;	Jan 2016-Dec 2017
12	Check dams in the up-streams	Jan 2016-Dec 2017

Group two.

Indicators (Very high=5, High=4, Fair=3, low =2)

Counter Measures	Criteria						
	Relevance	**Effectiveness**	**Efficiency**	**Impact**	**Sustainability**	**Time frame**	**Category**
1. Improvement of evacuation route by constructing footbridges, culverts and bridges;	Highly	Highly	Highly	High	Fairly	January 2015-2018	High
2. Construction of check-dams in the upstream and mid-stream	Highly	Highly	Highly	Highly	Fair	2015-2023 (Long term)	High
3. Improvement of drainages including the storm run-off water on the feeder road	Fairly	Fair	Fairly	Fairly	Low	2015-2019	Fair
4. Construction of an evacuation centre;	High	High	High	High	High	2015-2017	Very High
5. Construction of water pans	High	High	high	high	High	2015-2020	Very High
6. Establishing an integrated flood management forum (Umbrella WRUA)	High	High	High	High	high	2015	Very High
7. Construction of a storage facility that can store food and household properties of the evacuees;	High	High	High	High	High	2015-2017	Very High
8. Improved Irrigation-based agriculture	High	High	High	High	High	2015-2025 (Long term)	Very High

9. Establishing community based early warning system;	high	high	high	high	fair	2015-2017	High
10. Capacity building on use of eco-san toilets;	high	high	high	high	high	2015	Very High
11. Capacity development in proper farming methods in the upstream	high	high	high	high	fair	2015-2020	High

Group three (3)

Indicators: 1 - High, 2- Medium 3 - Low

	relevance	**effectiveness**	**efficiency**	**impact**	**sustainability**	**timeframe**		**Total marks**
Construction of dykes along R. Gucha Migori	1	1	1	2	2	5 years	1/01/2015 to 31/12/2020	7
Desilting of R. Gucha Migori and its tributary	2	3	2	2	3	5 years	Breaking during rainy season	12
River training of R. Gucha Migori;	2	2	2	2	3	8 years		11
Gabion works at breached riverbank	1	2	2	1	1	5years		7
Improvement of Gogo falls dam	1	1	1	2	2	10 years		7

Construction of health facility (dispensary)	1	1	1	1	1	5 years		5
Raising of houses in the flood affected areas; (Through capacity building)	1	1	1	1	1	5 years		5
Construction of the dams in the upstream	2	2	2	2	2	10 years		10

Counter measures in order of priority

1- Desilting of R. Gucha Migori and its tributary
2- River training of R. Gucha Migori;
3- Construction of the dams in the upstream
4- Construction of dykes along R. Gucha Migori
5- Gabion works at breached riverbank
6- Improvement of Gogo falls dam
7- Construction of health facility (dispensary
8- Raising of houses in the flood affected areas;(Through capacity building)

Plenary Discussions: ATCM FM, Mr. Mwangi.

He said that "the monitoring stations were being automated to be able to capture the river flows as it builds up during the rainy seasons to provide real time data." He highlighted specific documents that should be in cooperated in the IFMP;

- Flood mitigation strategy
- National water master plan
- CMS for LVS
- The SCMP for the respective WRUA s within the basin
- WDC

He added the there is need to spell out the various responsibilities and activities for; middle catchment, lower catchment and upper catchment.

He also talked about development of on farm water pans as a strategy for flood management. The small pans within the individual farms will act as storage and for flood management especially on the lower zones. He said that the community local signs will be harmonized with the conventional signs in

Other issues noted at the plenary were:

Issue	**Recommendation**
Vision 2013	vision 2030
Disability Mainstreaming	be in cooperated in the IFMP
Aquarium lab and text books	be established in schools and text books provided to students
-Lack of capacity for community in desiliting the river channels -Lack of machinery for desiltation;	should be in cooperated in the IFMP as capacity and not hazard
IFMP Comments	Sent via the sub regional managers Email address before next meeting. mwangongo@yahoo.com
Presentation of the final draft IFMP	other Stakeholders a part from IFMC be invited
midterm measures during group two presentation	Group two felt that; Construction of check-dams in the upstream and mid-stream and Improved Irrigation-based agriculture be incooperated in the IFMP as long term measures

Adoption of the IFMP

The presentation of the IFMP was validated by the participants as a true representation of the Gucha Migori River basin and also the contribution of the community. The IFMP was declared adopted

Adjournment

The IFM committee agreed that the comments be sent to the Sub regional meeting email address before the next meeting. The next meeting is scheduled for December 2014.

付属資料 3-16

Isiolo 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

Isiolo 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

－Isiolo 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。

- 市街地の排水ネットワーク整備の調査
- 空港付近からの流入対策（排水路、道路下カルバート、調整池）の調査・協議
- 交通に影響する河岸浸食部の護岸
- Merire 川の改修（河床掘削、拡幅）の調査・協議
- Merire 川上流でのダム/砂防ダムの調査・協議

これらの対策のうち､コミュニティ防災活動として WRUA で実施すべき事業については、SCMP に組み込み、WSTF を取得して実施することが想定されている。

表 1.1.1 ISIOLO 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	空港周辺での排水路設置	調査・測量・協議	County/District/WRUA		KeRRA	MWI, WRMA	関連省庁との連携	計画、建設、維持管理	調査・協議					
	市街地全体の排水ネットワーク整備	調査・測量・協議	County/District		計画省	MWI, WRMA	関連省庁との連携	維持管理				調査・協議		
	空港周辺での道路下カルバート設置	調査・測量・協議	KeRRA		County/District	MWI, WRMA	関連省庁との連携	維持管理	調査・協議					
	空港周辺での洪水調整池設置	調査・測量・協議	空港庁		County/District	MWI, WRMA	関連省庁との連携		調査・協議					
	護岸（交通に影響のある箇所、農地被害）		WRUA		WRMA/County/District、道路省/ KeNHA	MWI, WRMA	技術アドバイス	計画、建設、維持管理						
	Merire川の改修（拡幅等）	調査・測量・協議	NWCPC		County/District	MWI, WRMA	関連省庁との連携	維持管理			調査・協議			
	Merire川上流でのダム/砂防ダムの設置	調査・測量・協議	WRUA/NWCPC		County/District	MWI, WRMA	関連省庁との連携	計画、建設、維持管理			調査・協議			

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 洪水管洪水対策事業（コミュニティ防災活動）の評価

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、WRMA が実施主体であって、「共助」に分類される事業がコミュニティ防災活動の事業である。計画に含まれる複数のコミュニティ防災活動のうち 1 つを選択し、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。

パイロット事業の実施を通じて検証・実証していくべき課題・テーマについては次章で検討を行うが、本プロジェクト内で実施をし、さらにその結果を評価して以降の事業に展開するというパイロットの性格上、その選定には要件が発生する。

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 本プロジェクトとの関連性についての評価項目と着目点

	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

洪水管理計画案に提示された評価マトリクスに、本プロジェクトとの関連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 Isiolo 市街地での浸水被害対策事業の評価検討

対象地区と原因		山側・空港エリア（内水）		
対策		排水路		
概要		雨水を一つに集め、適切で安全な方向に流す		
イメージ				
メリット		ステークホルダーとの交渉、測量、計画、設計等の実施前の検討に長い時間を要する		
デメリット		コストが高い 計画・設計・工事に長い時間を必要とする		
環境への負の影響		土地の掘削が必要となる 重機を使用する必要がる		
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/District/WRUA		
事業関係機関		<許認可> 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		
本プロジェクトとの関連性	WRUA による実施可能性	高度な技術を要するものではなく小規模であれば WSTF を使って WRUA で実施可能だが、Isiolo 市街地への雨水流入を効果的に削減するには、大規模な排水路が必要である。小規模なものでは劇的な効果は見込めないため、WRUA レベルでの実施は難しいと判断される。	C	1
	事業期間	上述の通り、効果的な事業をするには大規模な事業になるため、数カ月単位の期間がかかる。	B	2
	事業予算	予算は事業規模によって決まるが、WSTF 資金での実施（レベル 4 または 5）は不可能ではない。	B	2
本プロジェクトとの関連性の合計			5	
評価コメント		ここでは空港エリアでの排水路設置を想定している。空港エリアからの雨水の流入は Isiolo 市街地の洪水被害を増大させている大きな要因の一つである。しかしながら、技術的な検討の結果、Isiolo 市街地の洪水を軽減するためには事業規模が大きくなり、パイロット事業の予算を超えることが判明したためパイロット事業としての実施は難しい。		

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

表 1.3.2 Isiolo 市街地での浸水被害対策事業の評価検討

対象地区と原因		山側・空港エリア（内水）		
対策		道路下のカルバート増設		
概要		雨水を安全に流下させる		
イメージ				
メリット		空港エリアからの雨水の流入は減少する		
デメリット		計画・設計・工事に長い時間を必要とする 最適な設置場所が Isiolo Town と MeruTown の境界にあり、双方との調整に時間がかかる		
環境への負の影響		土地の掘削が必要となる 重機を使用する必要がる		
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）		KeRRA		
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		
本プロジェクトとの関連性	WRUA による実施可能性	高度な技術を要するものではなく小規模であれば WSTF を使って WRUA で実施可能だが、Isiolo 市街地への雨水流入を効果的に削減するには、大規模なカルバートが必要である。小規模なものでは劇的な効果は見込めないため、WRUA レベルでの実施は難しいと判断される	C	1
	事業期間	事業場所が Isiolo county, Meru county の境界を跨ぐため両 county との調整を必要とする。また、道路管理者(KeRRA)との協議にも時間を要する。したがって、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	予算は事業規模によって決まるが、WSTF 資金での実施（レベル 4 または 5）は不可能ではない。	B	2
本プロジェクトとの関連性の合計			4	
評価コメント		対策としての評価は高いものの、空港付近からの雨水排水不良対策として有効な設置場所が Isiolo 市と Meru 市にまたがっていること、道路管理者が KeRRA であることから、各機関との調整に時間を要するものと思われ、当プロジェクト期間内に実施することは難しい。		

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

表 1.3.3　全域の河岸浸食対策に関する評価検討

対象地区と原因		Isiolo 川上流		
対策		護岸		
概要		河岸を保護する対策工。河岸の浸食を防ぐ		
イメージ				
メリット		護岸設置場所周辺の河岸浸食を防ぐ		
デメリット		上下流への影響や対岸への影響を考慮する必要がある		
環境への負の影響		護岸の設置には重機が必要であり、環境への影響は起こりうる。		
EIA の必要性		大規模な護岸であれば EIA が必要だが、小規模な護岸であれば必要ない		
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>WRMA/ County/ District、道路省/ KeNHA <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		
本プロジェクトとの関連性	WRUA による実施可能性	高度な技術を要するものではなく、類似事例は多数存在する。WRUA レベルであっても小規模であれば WSTF 資金を獲得することで実施は可能。	B	2
	事業期間	数カ月単位の期間が想定される。規模により、短期間での完了も可能である。	B	2
	事業予算	予算程度それほど大きくなく WSTF (Level3~4) での実施も十分可能である。	A	3
本プロジェクトとの関連性の合計			7	
評価コメント		予算・期間も当プロジェクト内で実施可能であり、WRUA レベルでも WSTF 基金の獲得で実施可能な事業である。また、今後同様の事業を必要とする場所は多数存在するためパイロット事業として先行して実施することは望ましいと考えられる。		

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

表 1.3.4 Isiolo 市街地での浸水被害対策事業の評価検討

対象地区と原因		Isiolo 市街地 (全般)		
対策		ダム/砂防ダム		
概要		砂防ダムは低地や河道に建設する比較的小規模な構造物である		
イメージ		 (Source: WRMA, NALEPO Project in Athi CA)		
メリット		土砂をせき止め、土砂流出を防ぐことができる		
デメリット		ステークホルダーとの交渉、測量、計画、設計等の実施前の検討に長い時間を要する		
環境への負の影響		下流への影響や、水の流れをせき止めたことによる生物への影響が懸念される		
EIA の必要性		規模が大きい場合は必要と考えられる		
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。		
事業実施者（メインアクター）		WRUA/NWCPC		
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		
本プロジェクトとの関連性	WRUA による実施可能性	効果的な事業を計画・実施するには技術的に容易ではなく、WRMA による実施はかなりのリードタイムを要する。	C	1
	事業期間	上述のとおり計画が重要であり、それにはかなりの時間を要する。	C	1
	事業予算	ダムの規模、基数に依存する。 WSTF でも実施可能なケースもあると考えられる。	B	2
本プロジェクトとの関連性の合計			4	
評価コメント		小規模の砂防ダムを建設すること自体は技術的に難易度の高いものではない。しかし、単体のダムの効果は限定的であり、複数のダムを効果的に配置し始めて土砂流出に対して一定の効果を発揮するようになる。このことから、効果的に事業を計画・実施することは難易度が高く、また時間を要する事業となる。		

A (3 point) : Excellent / B (2 point) : Good / C (1 point) : 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。このことから、Isiolo 川流域のパイロット事業として、護岸対策を選定する。

表 1.4.1 コミュニティ防災活動（構造物）の評価

事業	点数
護岸	7
空港エリア排水路	5
空港エリアカルバート	4
ダム / 砂防ダム	4

2. パイロット事業の実施計画

2.1 河岸浸食対策地点の選定

2.1.1 河岸浸食対策候補地点の抽出

Isiolo WRUA からの聞き取り、及び、現地踏査により、河岸浸食によって地域の社会・経済に大きな影響を与えている地点として、国道 A2 号線が Eastern Marania 川（河岸浸食地点 No.1）及び Western Marania 川（河岸浸食地点 No.2）を横断している 2 地点を、パイロット事業として河岸浸食対策を実施する候補地点として抽出した。

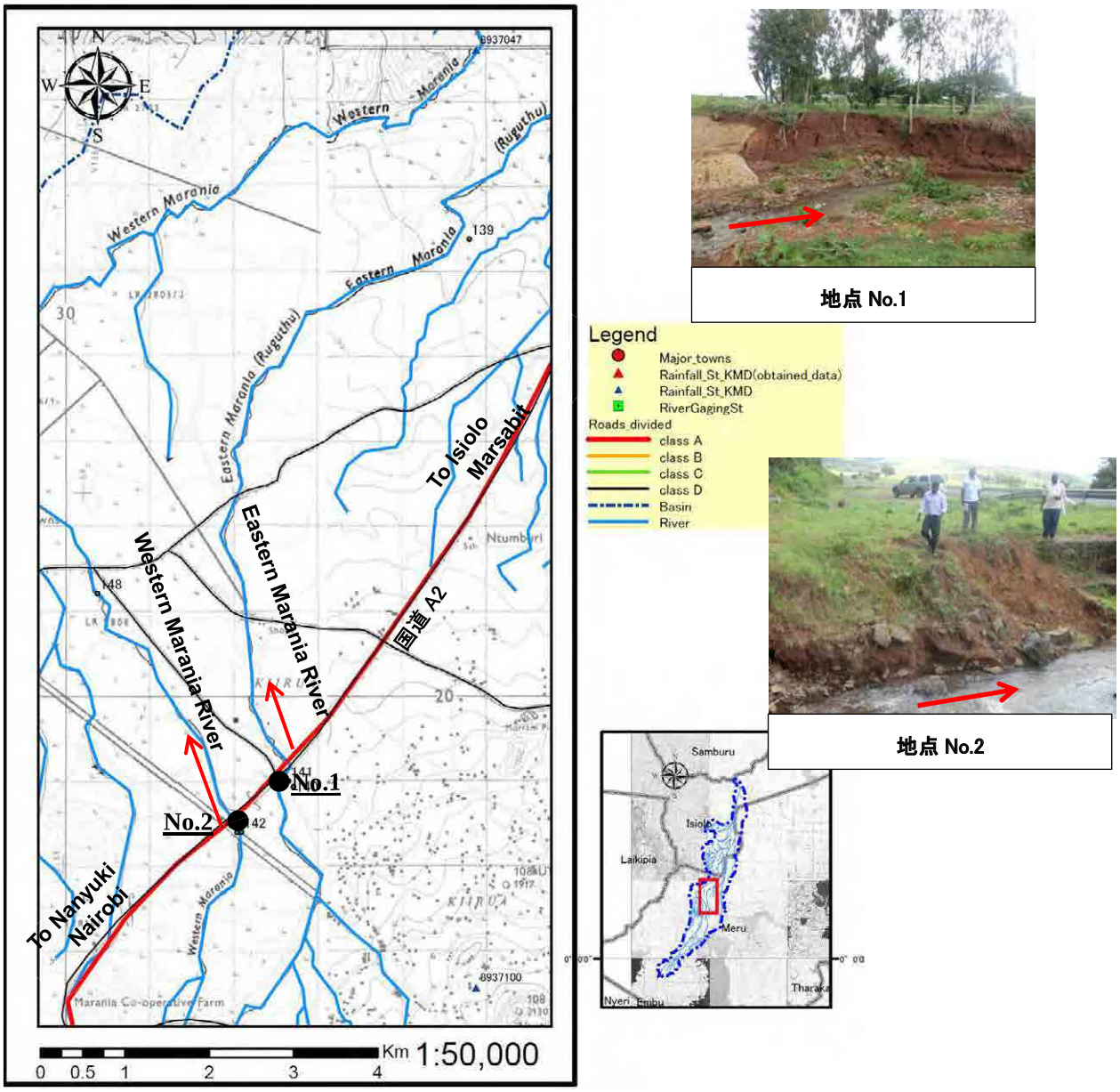


図 2.1.1 パイロット事業候補地点

(1) 河岸浸食地点 No.1

河岸浸食地点 No.1 は Isiolo 川中上流域に位置している（行政区分上は Buuri District、Ntumburi Location、KamareteSub Location）。国道 A2 号線が Eastern Marania 川を横断した地点である。河岸浸食はカルバート構造の橋梁の下流左岸側の水衝部で発生している。河岸浸食区間の全長は約 40m、高さ約 4m である。川幅は約 10m である。

図 2.1.2 Eastern Marania 川河岸浸食地点の全景（右岸側より左岸側を臨む）

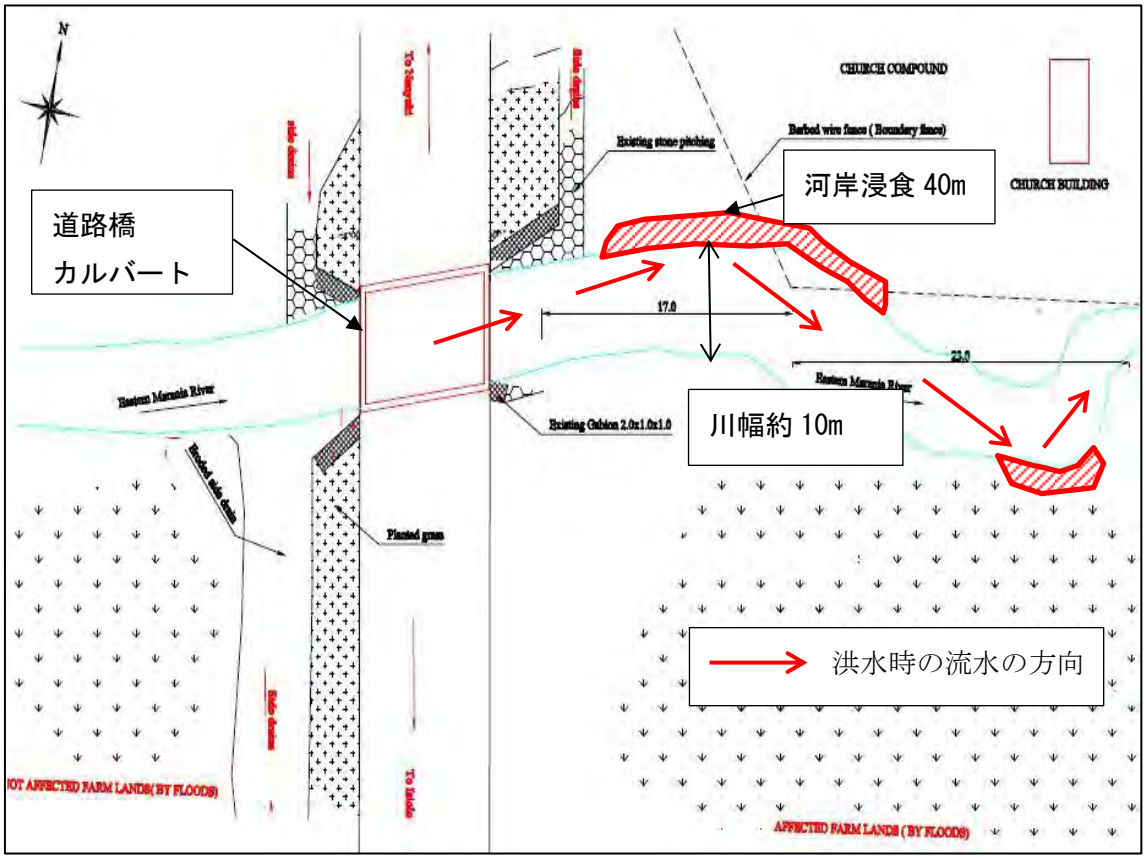


図 2.1.3 Eastern Marania 川河岸浸食地点の概略平面図

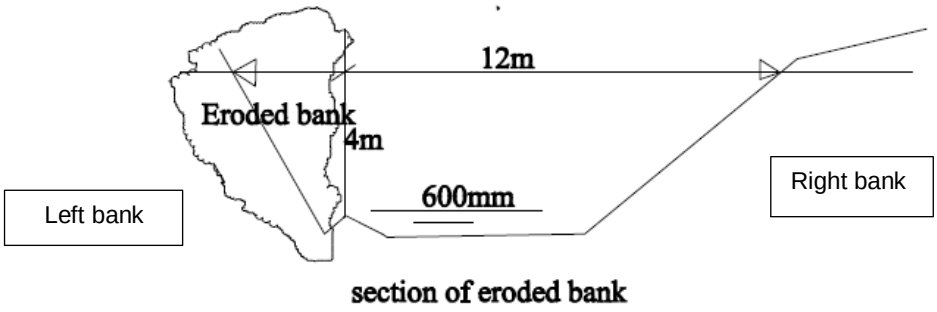


図 2.1.4 概略横断図

また、下記の衛星写真からわかるようにこの付近の河道は蛇行している。

図 2.1.5 河岸浸食地点付近の衛星写真

図 2.1.6 主要幹線道路 A2 横断地点より上流側

（左：橋より上流を見た風景、右：上流より橋を見た風景）

図 2.1.7 主要幹線道路 A2 横断地点より下流
（左：橋中央より下流を見た風景、右：橋の下流側の右岸から左岸を見た風景）

この地点の河岸浸食の原因は、上流側に設置されたカルバート形式の橋梁（下の写真を参照）による影響と推察される。つまり、カルバートは、上流側の河道断面よりも小さい断面であるため、カルバートを洪水流が通過する時に流速が大きくなり、その流速の大きくなった洪水流が、カルバート下流の左岸側に当たっていることが河岸浸食の原因である。なお、左岸側に当たった流水が下流右岸側に反射し、湾曲部外側である右岸側も短い区間であるが浸食している。

図 2.1.8 カルバート形式の橋梁

図 2.1.9 下流右岸側の河岸浸食箇所

(2) 河岸浸食地点 No.2

河岸浸食地点 No.2 も同様に、Isiolo 川中上流域である Western Marania 川を国道 A2 が横断する地点である（行政区分上は Buuri District、Ntumburi Location、Ntumburi Sub Location）。写真からも確認できるように、河岸浸食は橋梁の橋台の保護のために設置された蛇篭の直上流側で生じており、河岸浸食は全長 10m、高さ 1.5m、水面幅 10m である。

河岸浸食の原因は、既設の河岸保護のための蛇篭の擦り付け部（端部）の処理が不適切であるためと考えられる。なお、現状の浸食は軽微であり、農地の被害は生じていない。

右岸側より左岸側を見る

上流から下流を見る

図 2.1.10 河岸浸食地点 No.2 の状況

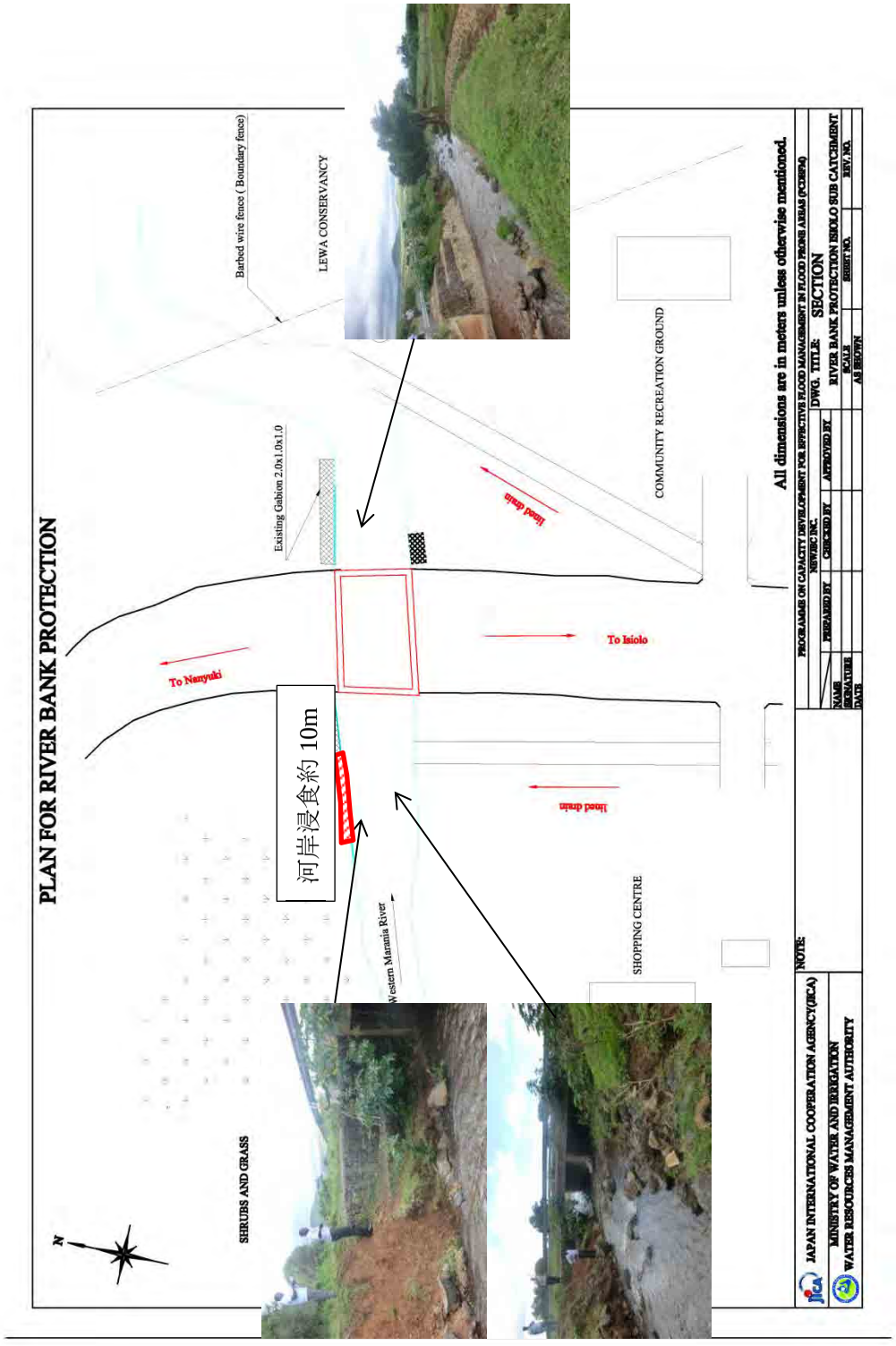

PLAN FOR RIVER BANK PROTECTION
Barbed wire fence (Boundary fence)
LEWA CONSERVANCY
Existing Gabion 2.0x1.0x1.0
COMMUNITY RECREATION GROUND
To Nanyuki
To Isiolo
Mud drain
河岸浸食約 10m
Western Maranja River
SHOPPING CENTRE
SHRUBS AND GRASS
N
All dimensions are in meters unless otherwise mentioned.
NOTE:
JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)
MINISTRY OF WATER AND IRRIGATION
WATER RESOURCES MANAGEMENT AUTHORITY
DWG. TITLE: SECTION
RIVER BANK PROTECTION ISIOLO SUB CATCHMENT

図 2.1.11 概略平面図

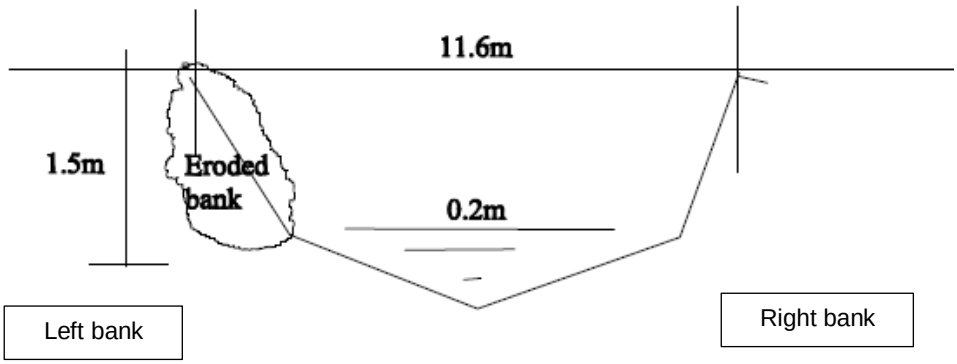


図 2.1.12 概略横断図

2.1.2 河岸浸食対策地点の比較・選定

上述した 2 つの河岸浸食対策候補地点から、本プロジェクトにおけるパイロット事業として河岸浸食対策を実施する地点を比較・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。

＜パイロット事業地点の評価視点＞

1) 洪水対策事業効果の視点
   - 現状の被害の大きさや深刻さ
   - 被害発生の頻度
   - 周辺に存在する重要施設や公共施設の有無
2) WRUA 開発サイクル(WDC)の視点
   - 地域住民参加の容易さ
   - 概算事業費や工期といった事業規模が大きすぎないこと
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

(1) 洪水対策事業効果の視点からの評価

河岸浸食地点 No.1 及び No.2 は、WRUA メンバーの聞き取り調査により、洪水による農耕地等への被害が大きい地点として挙げられている。

また、国道 A2 号線はナイロビと北部ケニアのマルサビット(Marsabit)を結ぶ最重要道路区分 Class A に位置づけられたケニア北部の物流網の要であるとともに、ナニュキ(Nanyuki)とイシオロを結ぶ地域の社会・経済上重要な役割を果たす道路であり、

両地点ともに河川を国道 A2 号線が横断している。したがって、橋梁・道路への被害に繋がれば、社会・経済的影響は極めて大きいことから、両地点ともに河岸浸食対策が必要な地点である。

特に、河岸浸食地点 No.1 は前述したように河岸浸食範囲、深さ、被害状況ともに地点 No.2 よりも深刻である。地点 No.1 は道路橋を流下後の左岸側水衝部の河岸浸食による影響が大きく、現時点では主要幹線道路 A2 への直接的な影響は確認されていないが、既設の河岸浸食対策部と自然河岸との繋ぎ目の浸食が既に始まっており、対処を施さなければ道路崩落につながる恐れがある。また、No.1 は雨季ごとに浸食が拡大していっている状況である。さらに、近傍に地域コミュニティにとって重要な教会の建物が位置しており、教会コミュニティによる対策の要望が高い。

(2) WDC の視点からの評価

地点 No.1 は、近傍に教会が位置しているため、教会コミュニティの協力を得られやすいという利点がある。一方、地点 No.2 は近隣に地域コミュニティ組織はない。

事業費の面では地点 No.1 は河岸浸食区間の長さが約 40m に及び、河岸の深さも 4m あるため、後述のとおり、事業費が 500 万 Ksh 近くになるとみられる。一方、WSTF 基金は次表のとおり、レベル 5 の 5,000 万 Ksh までであり、500 万 Ksh はレベル 3 相当であるため、問題とはならない。よって、浸食区間が短い地点 No.2 も同様に問題とならない。

次に、工期については、工期は農民の労働提供を考慮すると、農閑期である乾季（6 月～9 月の 4 ヶ月か 1 月～2 月の 2 ヶ月）だけで終了することが望ましい。しかし、住民の協力による人力での施工が多くなることを考慮すると、はっきりとした施工スピードは不明である。

表 2.1.1 WSTF 資金の上限値（WDC ガイドラインより）

4 WDC FINANCIAL GUIDELINES

4.1 Investment Thresholds

WDC is designed as a framework in which investment thresholds increased as WRUA absorption capacity increases. The following thresholds have been anticipated:

1. Ksh 1 Million, paid in two sums, to WRUAs receiving initial support from WRMA;
2. Ksh 2 Million, paid in three sums, to WRUAs receiving initial support from WSTF;
3. Ksh 5 Million, paid in three sums, to WRUAs who have proved themselves able to handle Ksh 2 Million;
4. Ksh 10 Million, paid in four sums, to WRUAs who have proved themselves able to handle Ksh 5 Million;
5. Upper ceiling of Ksh 50 Million to any one WRUA within any one 10 year period;

The cyclical nature of the WDC can only function if WRUAs are able to absorb smaller sums and pass the test of accountability in order to qualify for additional or larger sums. Each funding cycle must be audited for a WRUA to qualify for the next funding cycle.
(Source: WDC Manual, VOLUME 2, WDC OPERATIONAL GUIDELINES)

(3) 環境社会配慮の視点からの評価

地点 No.1 は、河岸浸食区間の上下流の断面とスムーズにつながるような断面・平面形状で護岸を設置し、下流への影響は最小限となるよう配慮する。地点 No.2 は直線部において護岸を設置することになるので、同様に上下流断面とスムーズにつながるような断面・平面形状とすることで、下流側への影響はほとんどないと考える。また、両地点とも非自発的移住や土地収用の問題は生じないため、社会環境面の影響はないと言える。

以上より、事業効果と WDC の視点では地点 No.1 が優位であり、環境社会面では両者ともにほとんど差はない。よって、河岸浸食地点 No.1 をコミュニティ防災活動（構造物対策）のパイロット事業地点として選定する。

表 2.1.2 河岸浸食対策地点の比較表

評価基準		地点 No.1	地点 No.2
1) 洪水対策事業効果の視点	被害の大きさや深刻さ	区間長約 40m 農地被害の発生 国道 A2 被害の懸念 ○	区間長約 10m 農地被害の発生 国道 A2 被害の懸念 ○
	被害発生の頻度	雨季毎に拡大 ○	侵食速度は小 △
	周辺に存在する重要施設や公共施設の有無	教会 ○	特になし ×
2) WRUA 開発サイクル(WDC)の視点	地域住民参加の容易さ	教会コミュニティの協力が得られる ○	地域コミュニティ組織は特にない ×
	事業規模（概算事業費や予想工期）が大きすぎないこと	区間長約 40m、高さ 4m ○	区間長約 10m、高さ 1.5m ○
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	下流への影響のない断面・平面形状とする ○	下流への影響のない断面・平面形状とする ○
	社会環境面の影響の有無や大きさ	なし ○	なし ○
総合評価		事業効果と WDC の視点で優位であり、環境面の影響も対策可能であるため総合的に優位	

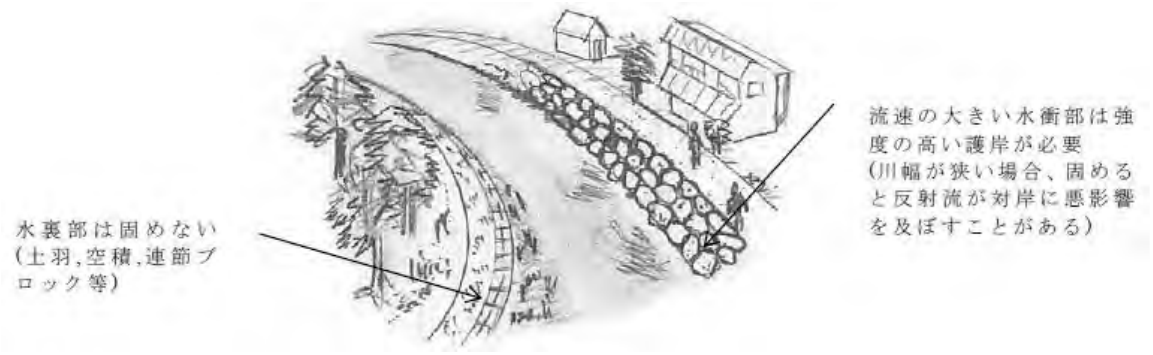
2.2 河岸浸食対策の基本設計

2.2.1 護岸工の選定

護岸の流水による浸食作用等から河岸を保護するために設けるもので、石積み工、コンクリート張り工、芝張工等の複数の工法があり、工法の選定にあたっては当該箇所の設計流速等の外力、被災状況、被災原因、河川の規模、河道状況、背後地の状況、河川環境、断面形状に加え、素材の耐久性、経済性、施工性等を総合的に勘案して選定する。

本地点の水衝部の河岸浸食状況を踏まえると、強度の高い護岸対策が必要とされる。現在、ケニアにおいて道路等の交通インフラを河川が横断するような地点で鉄線多段積み護岸工が採用されており、現地の施工業者による施工が可能である。加えて、現地で資機材が入手しやすいため、維持管理の観点からも利点がある。以上の理由から鉄線多段積み護岸工を選定した。

また、本選定地点のように橋流下後の左岸が水衝部となり、右岸が水裏部となるように河岸に作用する力が明確に異なる場合においては、一律の構造を選定するのではなく、それぞれ適切な強度を有する構造の護岸を配置することが望ましい。よって、左岸側水衝部への護岸対策に重点を置くこととする。



出典：美しい山河を守る災害復旧基本方針（平成 18 年 6 月）

図 2.2.1 水衝部と水裏部で工法を変えたイメージ図

2.2.2 鉄線籠型多段積み護岸工概略設計

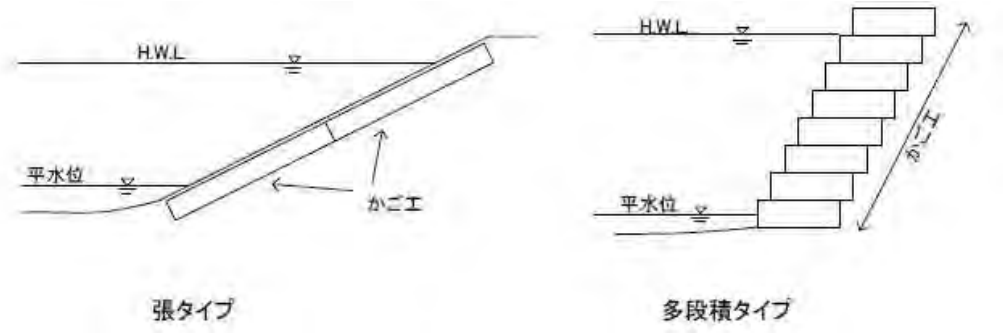
(1) 施工タイプの選定

蛇籠による護岸工の施工法は法勾配により、張タイプと多段積タイプに分かれる。

対象地点ののり勾配が 1:2.0 よりゆるい場合は張タイプを採用し、1:1.0 よりも急な場合は多段積タイプを採用するのが一般的である。

本対象地点は川幅が狭く、河岸の高さ（深さ）が 4m 以上に及ぶため、立地条件上、法勾配を緩くすることが難しい。また、流路勾配から本地点は早い流速が推察されるため、張タイプよりも設計流速の目安の上限値が高い多段積タイプを採用する。

・ 法勾配が 1 : 1.5 より緩い場合：張タイプ　→設計流速の目安 5.0 m/s
・ 法勾配が 1 : 1.5 より急な場合：積タイプ　→設計流速の目安 6.5 m/s



出典：山梨県　河川ハンドブック（平成 21 年 4 月）

図 2.2.2 鉄線籠工を用いた護岸の 2 タイプ

(2) 概略設計

鉄線籠型多段積護岸工には表面浸食防止機能に加え、背中土の崩落を防止する土留め擁壁としての機能が期待される。概略設計に際して、両機能を維持するために下記に示す事項を考慮にいれて概略設計を行った。

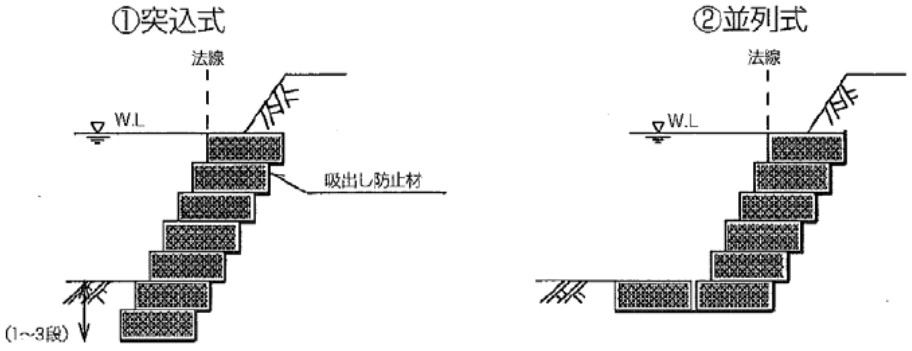
a) 擁壁としての安定性計算の省略

通常、安定計算を行う際には、転倒、滑動、地盤支持力の 3 つの視点から照査を行う。段積み護岸工事の擁壁としての安定計算に際して、積み重ねた高さが 5m 以下のものは背面土圧に対する剛な擁壁としての安定性を満たしている評価することができるため、安定計算を必要としない。本地点も施工高さが 5m 以下となるため、安定計算を省略することとする。

b) 洗掘対策

洗掘対策として、以下の 2 とおりが考えられ、河道や洪水流の特性に応じて選

択する。本地点は川幅が狭く、また、急流河川であることから、より強度の高い突込式を採用することとする。



出典：山梨県　河川ハンドブック（平成 21 年 4 月）

図 2.2.3 洗掘対策のタイプ

対象地点の概略設計図（平面図、横断図、正面図）を以下に示す。

c) 配置の考え方

護岸の配置の考え方として、災害復旧の基本的考え方に即し、被災原因に対応し、従来の河川環境を復元し、必要最小限の対策とすることを基本とする。

洪水時及び平常時の流水の阻害をさけるため､河岸侵食以前と同程度の河積(断面）を確保し、護岸法線は極力滑らかな曲線となるように、護岸を上下流法線に馴染みよく取り付けるようにする。

また、本事業は、護岸の設置により河岸浸食による道路構造物への影響防止及び農耕地等の土地の維持を目的としているため、土工事に伴う左岸側の土地の減少を極力減らすよう配慮した。

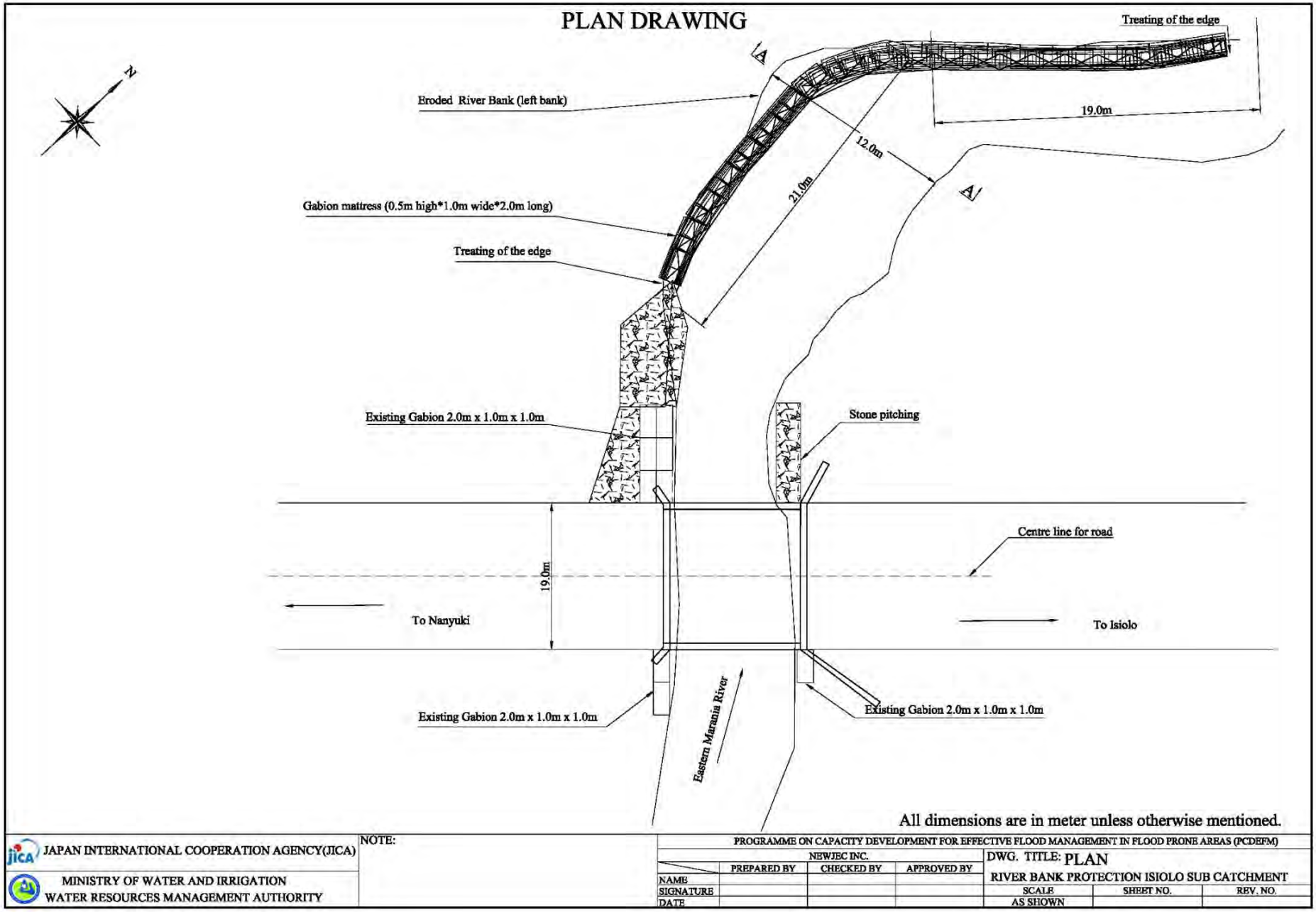


図 2.2.4 概略設計平面図

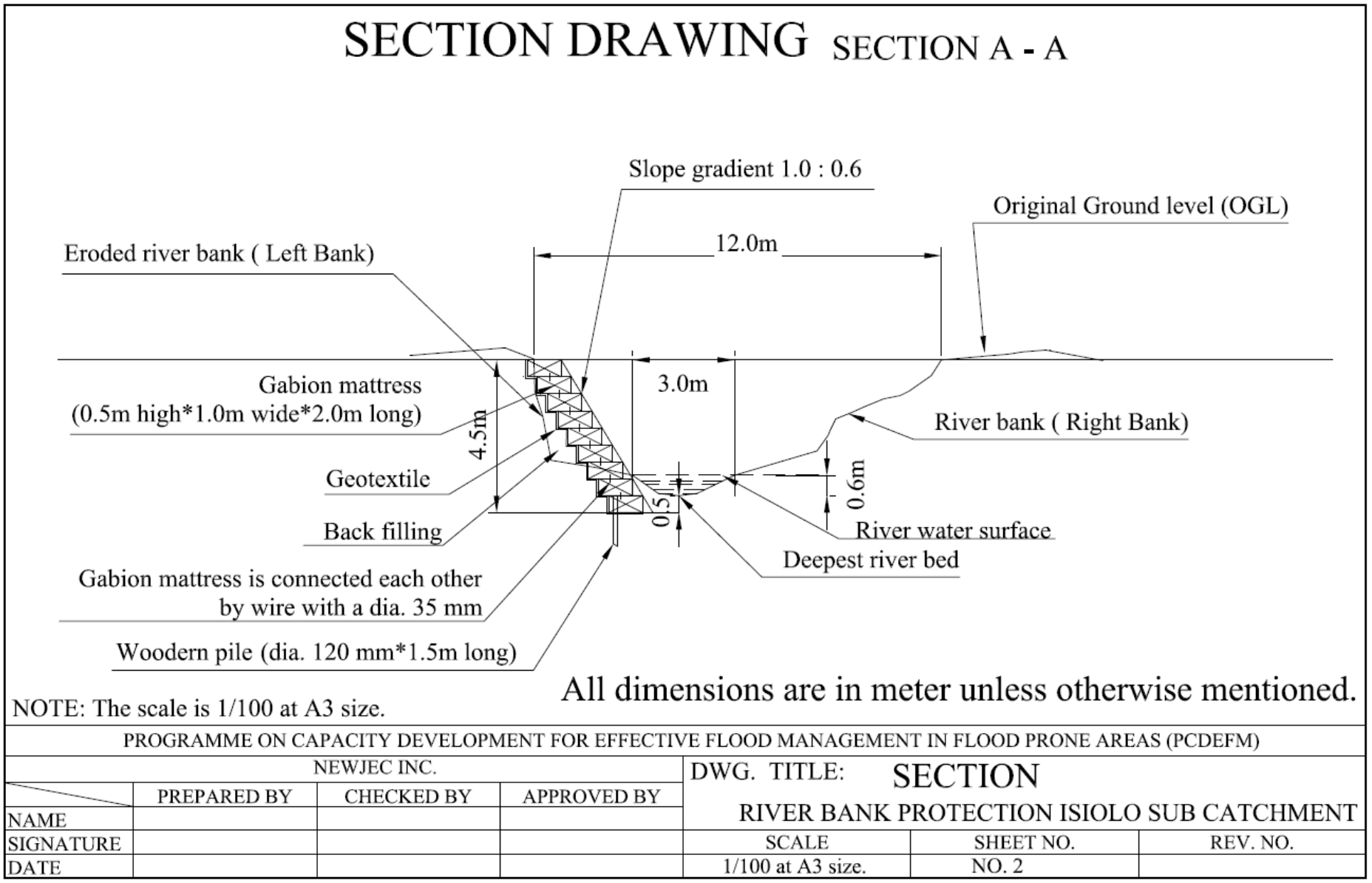


図 2.2.5 概略設計横断図

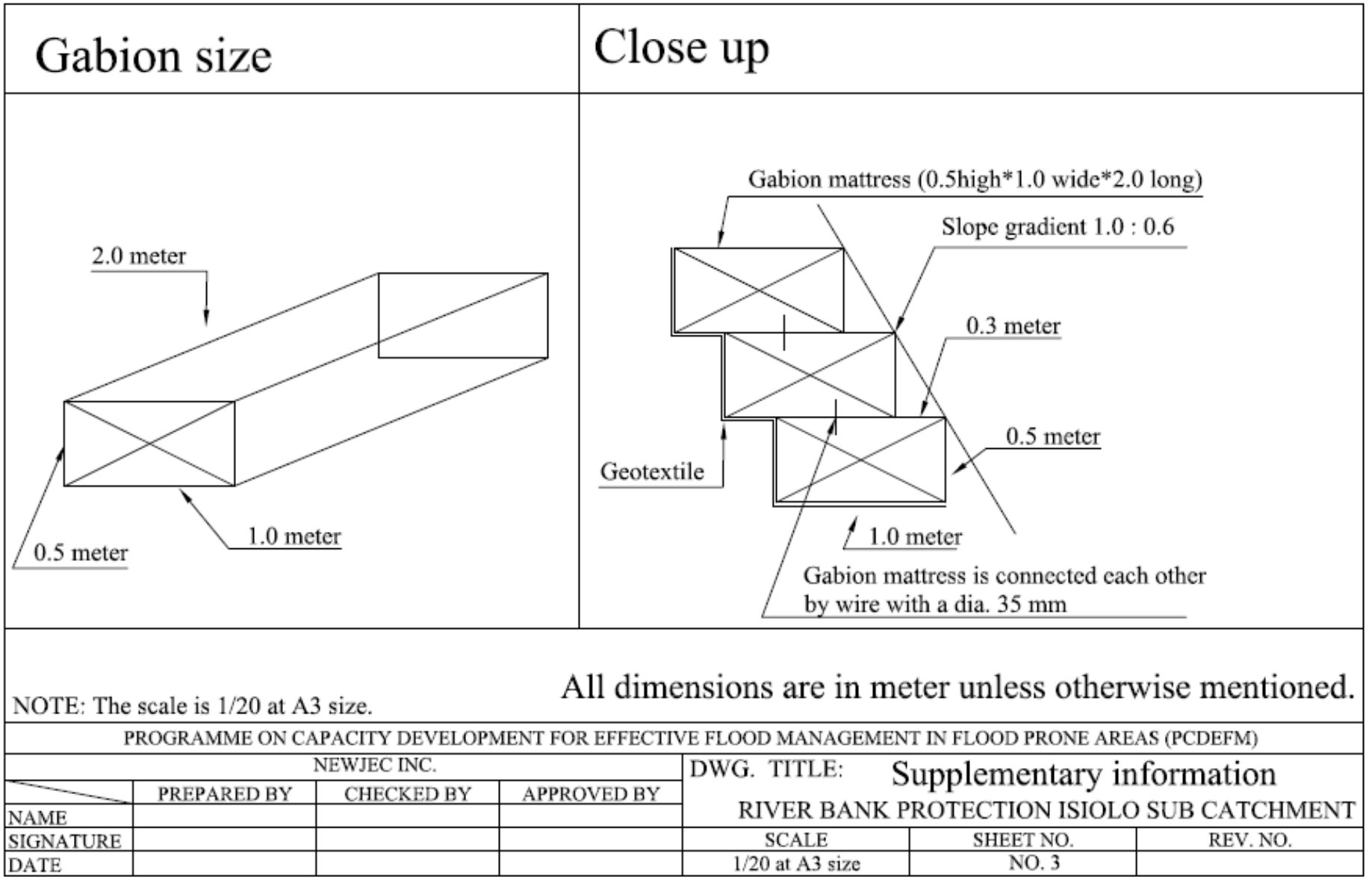

Gabion size
Close up
2.0 meter
0.5 meter
1.0 meter
Gabion mattress (0.5high*1.0 wide*2.0 long)
Slope gradient 1.0 : 0.6
0.3 meter
0.5 meter
Geotextile
1.0 meter
Gabion mattress is connected each other
by wire with a dia. 35 mm
All dimensions are in meter unless otherwise mentioned.
NOTE: The scale is 1/20 at A3 size.
PROGRAMME ON CAPACITY DEVELOPMENT FOR EFFECTIVE FLOOD MANAGEMENT IN FLOOD PRONE AREAS (PCDEFM)
NEWJEC INC.
PREPARED BY
CHECKED BY
APPROVED BY
NAME
SIGNATURE
DATE
DWG. TITLE: Supplementary information
RIVER BANK PROTECTION ISIOLO SUB CATCHMENT
SCALE
1/20 at A3 size
SHEET NO.
NO. 3
REV. NO.

図 2.2.6 図面補足情報

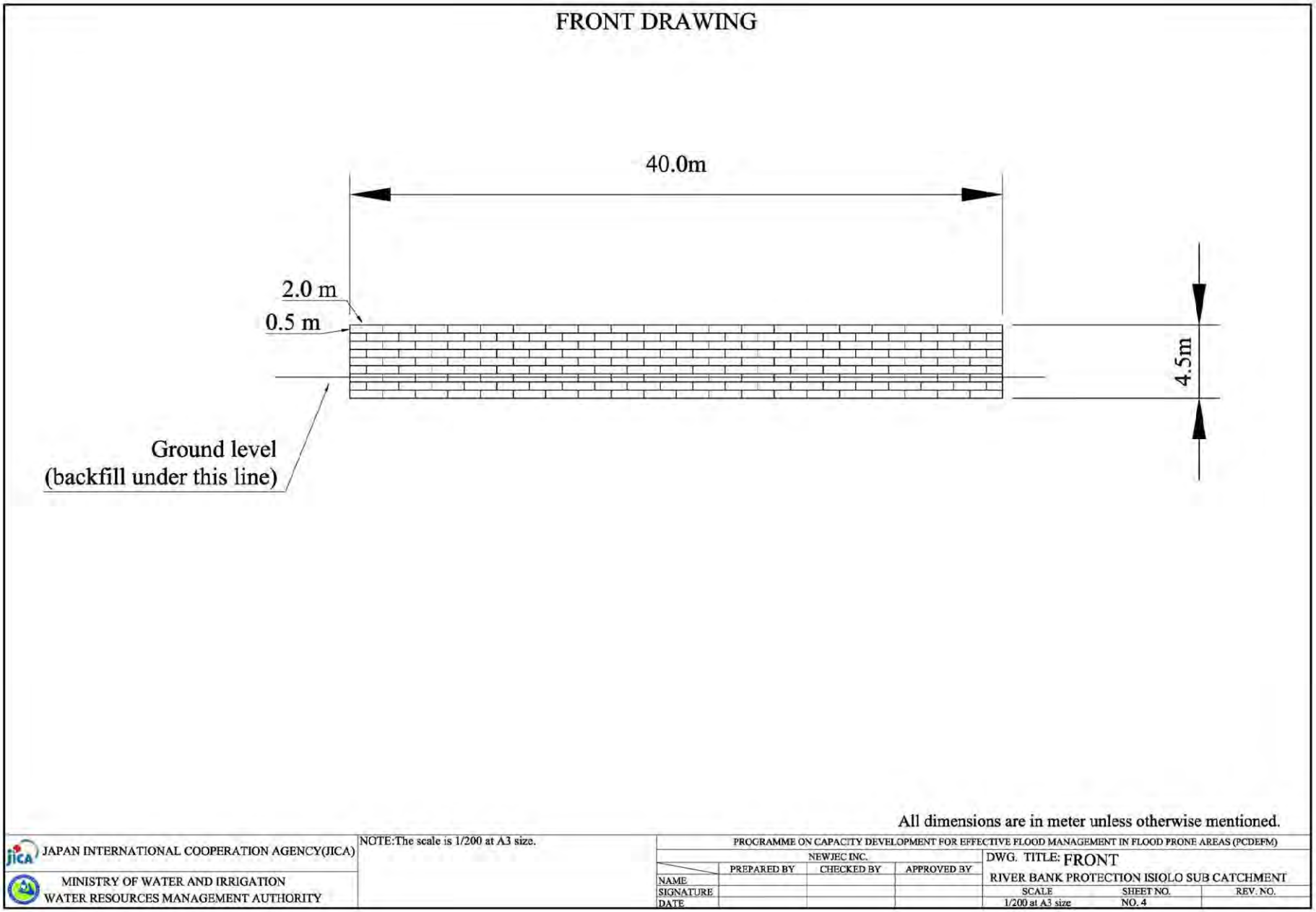


図 2.2.7 概略設計正面図

(3) 数量表及び概算事業費

当該地点における護岸工に必要な工種及びそれぞれの数量を、次ページの数量表に整理した。

仮に、上記数量に2007年7月時点のニャンドプロジェクトでの実績値を適用すると、約 340 万 Ksh.という結果が得られた。2007 年 7 月から、現時点までの物価上昇を50%まで見込むと、事業費は約 500 万 Ksh となる。

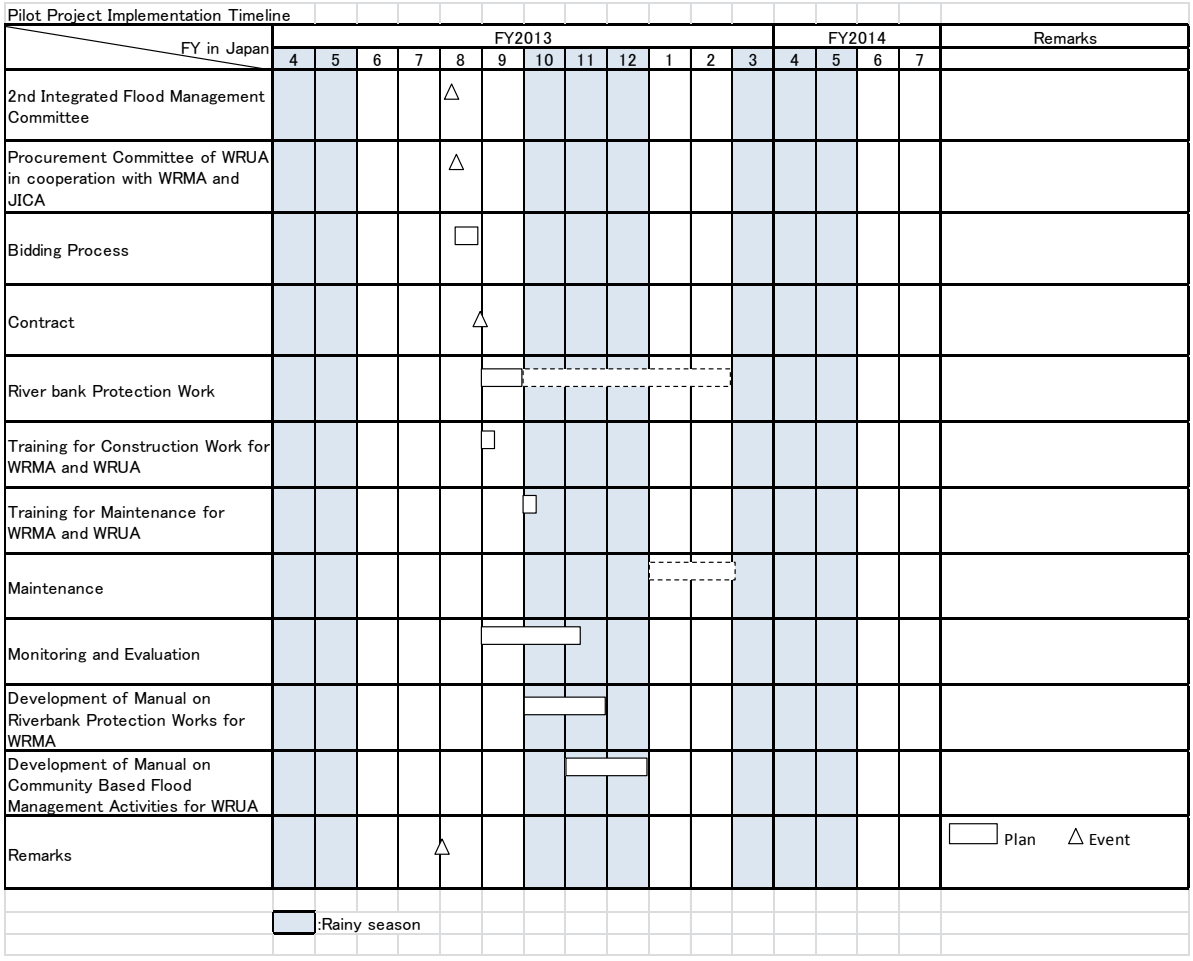
2.3 概略スケジュール

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、9 月末までの約 1 ヶ月間で終了することを予定する。

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。

1 ヶ月間で工事が終了しない場合は、施工した箇所が雨季に壊されないような対策を施して、いったん工事を中断するか、あるいは、平水流量よりも高い場所での工事が残されている場合は、雨季においても、出水時の配慮を行ったうえで、工事を継続することもあり得る。

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

Isiolo 川流域でのパイロット事業として護岸工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。

(1) 構造物対策そのものの観点

河岸浸食対策など小規模な構造物対策が必要な箇所は当該流域内で数多くあり、今回の事業をパイロット＝先行事例として、WRUA と WRMA が引き続き必要な箇所に対策を実施していく。

特に WRMA のキャパシティ・ディベロップメントの観点から、WRMA が河岸浸食対策案としての護岸工の計画・設計・施工上の留意点を理解する。

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、道路管理者である KeNHA 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) 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。

(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

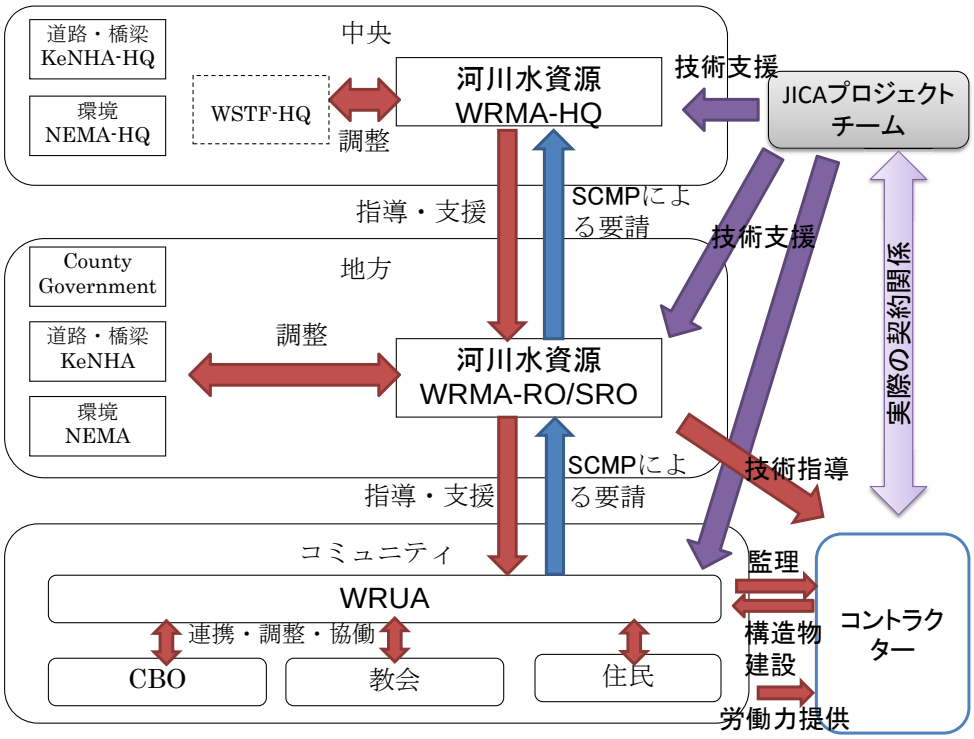
(1) 構造物事業実施における関係者の役割

河岸の浸食を防止するという事業は、河川管理者である WRMA が所管官庁（許可権限者）であるが、WRMA は工事を実施する責務と予算は有していない。河岸浸食対策を行いたいという要請が WRUA から SCMP 形成等の過程を通じて WRMA に上げられ、WRMA の指導のもと、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橋梁付近での護岸工事を行う場合には、国道の道路・橋梁管理者である KeNHA との調整が必要であり、また、環境影響については NEMA 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

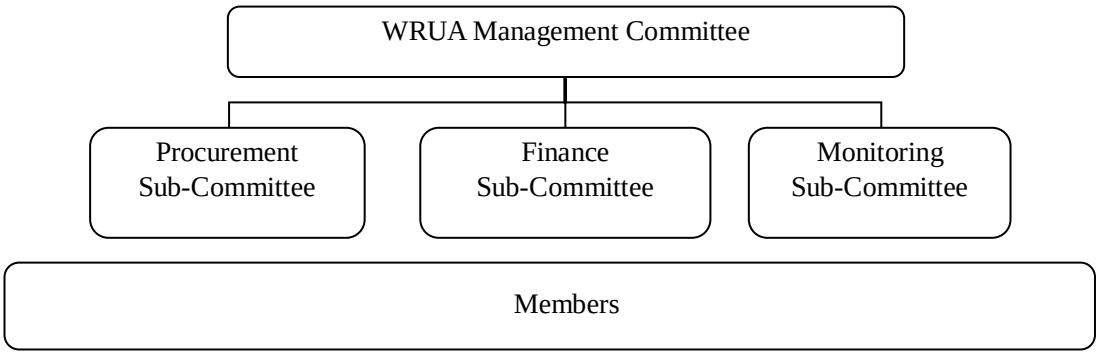
図 2.5.1 パイロット事業実施体制

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) 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

(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

(1) 維持管理体制とそのためのトレーニングの実施

蛇篭による護岸は、ケニアでは比較的よく目にする河岸浸食対策であるが、使用されている鉄線は錆びるため、経年的な劣化によって破損する可能性が高い。また、ケニアで一般的に使われている鉄線は細いため、流下する石礫や流木などの衝突によって破損する可能性もある。さらに、河岸浸食が生じているような区間は、河道の形状上湾曲部に位置しているため、河床も洗掘される恐れがあり、今回の設計では、根入れを十分に行うことにしているが、それでも河床が洗掘され、護岸の基礎部分が破壊される恐れは十分にある。

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) 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。

(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 ISIOLO 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 Isiolo River Basin
- Draft -

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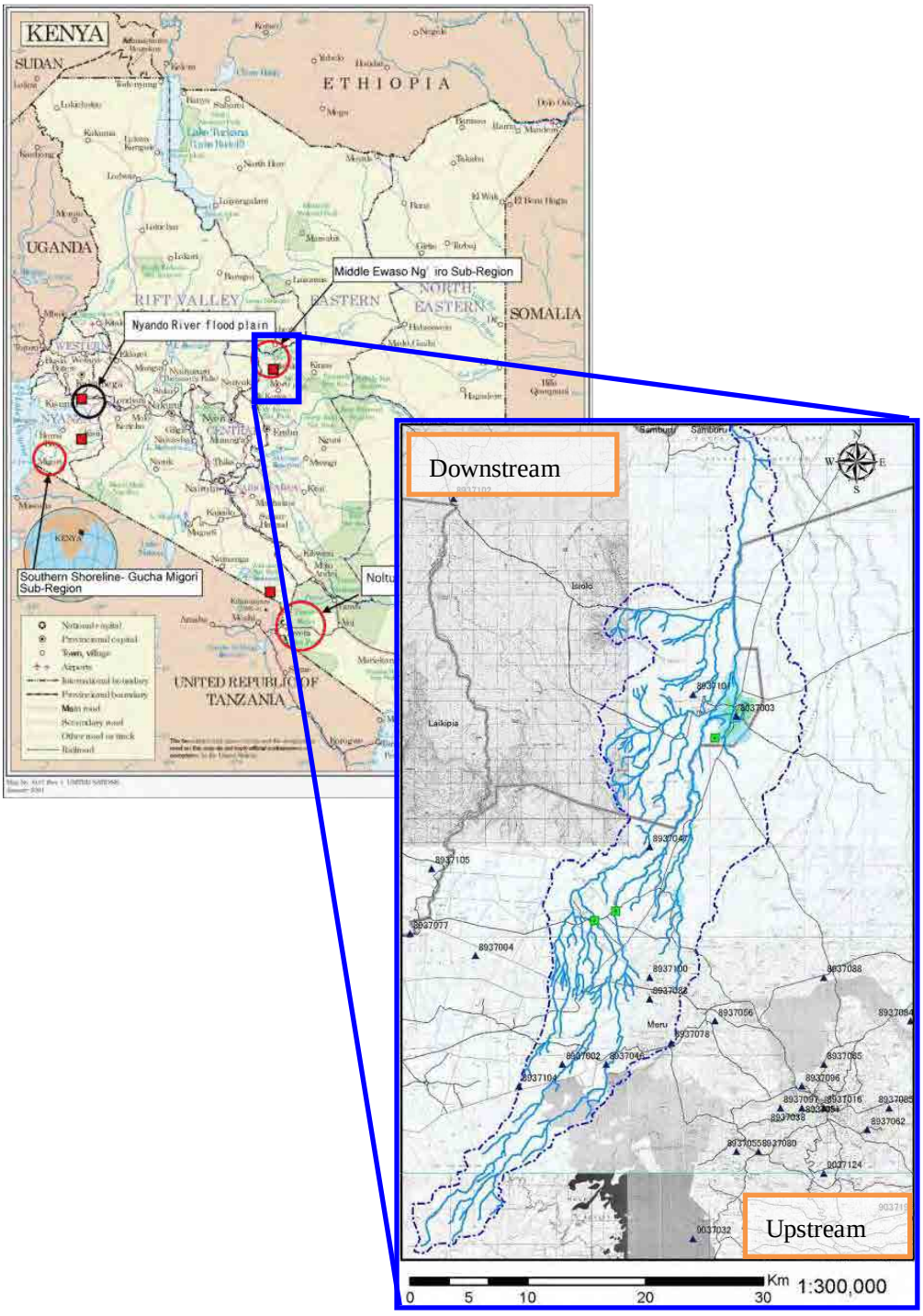
1. OUTLINE OF ISIOLO RIVER BASIN

Isiolo River Basin is located at the northern part of the piedmont of Mt. Kenya in the central part of the Republic of Kenya.



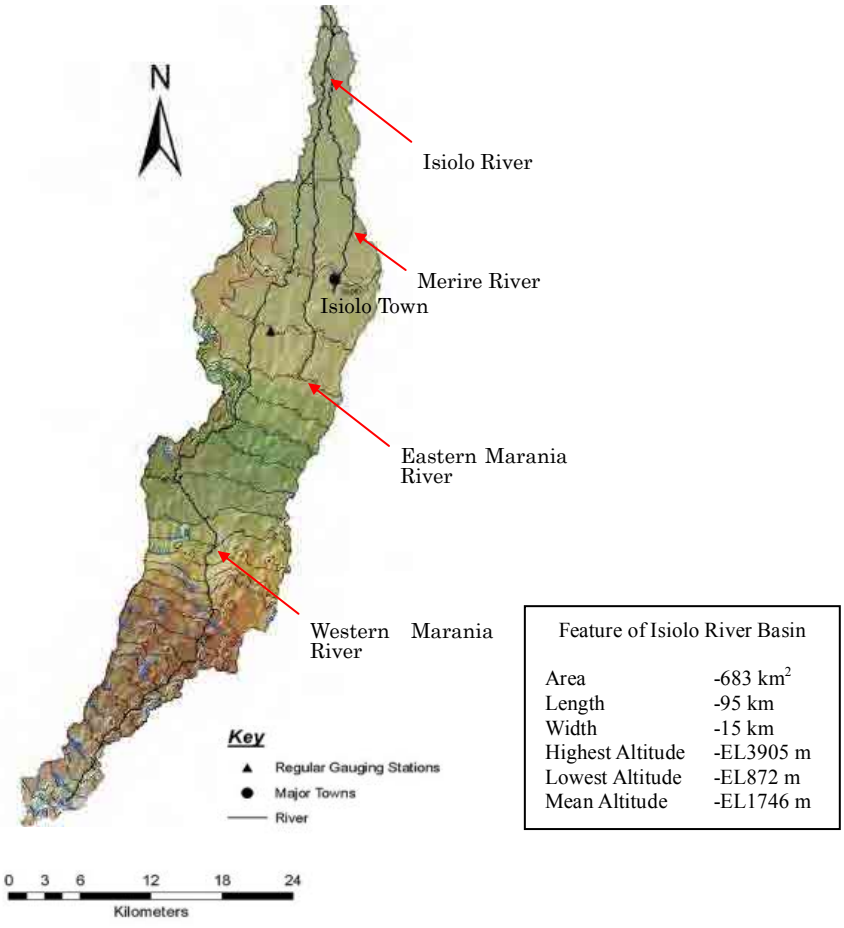
Location of Isiolo River Basin

1.1 NATURAL CONDITIONS

1.1.1 Topography and Soil

(1) Topography

Catchment area of Isiolo River is about 683km2 and the total length of the river is approximately 95km flowing from south to north. The river width reaches about 15km (east to west) in the widest part. Isiolo River originates from Mr. Kenya and it flows towards the north via three districts of Meru Central, Imenti North and Isiolo. The river flows together with Ewaso Ng'iro North in the vicinity of Archer's Post. There are many tributaries in the upstream and these tributaries are confluent with Isiolo River at the downstream of the Isiolo Town. Major tributaries are Western Marania River, Eastern Marania River and Marire River.

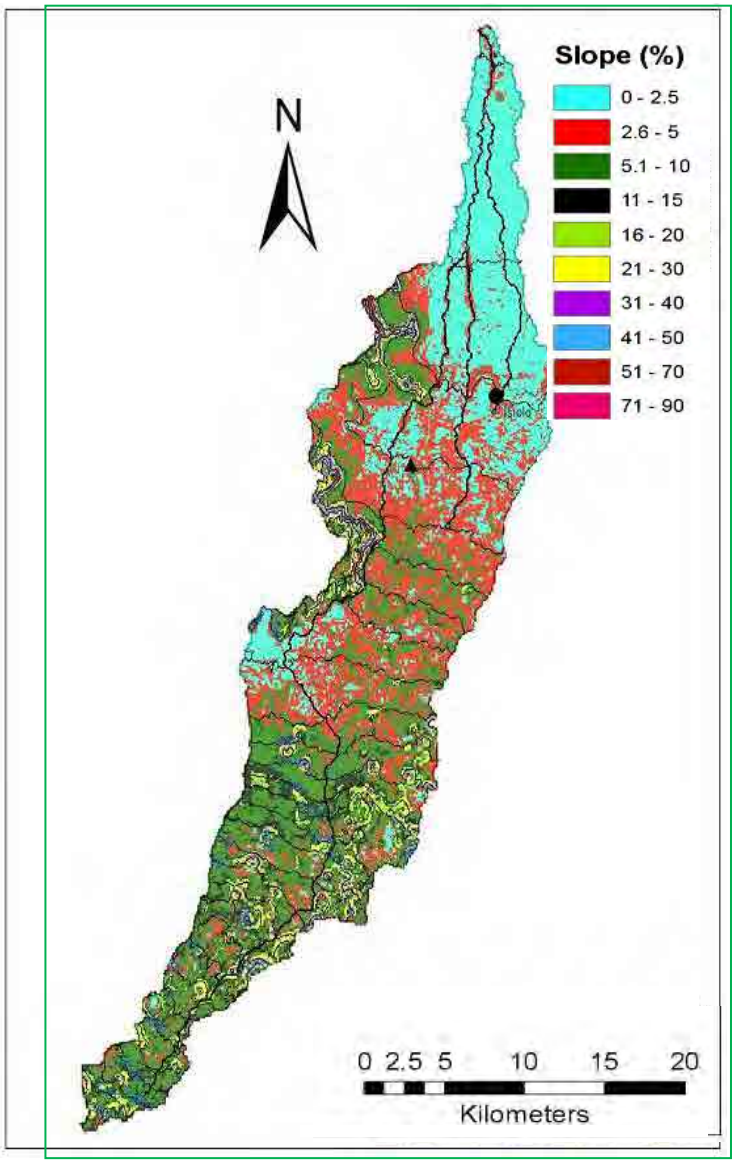


Source: Prepared by JICA Project Team based on WRMA's data

Figure 1.1.1 Map of Isiolo River Basin and Elevation Distribution

Topographic slope in the river basin is shown in Figure 1.1.2. There are some steep slopes of the river course varying from 10 to 70% in the vicinity of Mt. Kenya in the upstream to the middle stream. In the middle stream, the river course is rapid with the slope of approximately 5 to 2.6%. On the other hand, in the downstream, the river course shows the characteristic of rather flat with the maximum slope of 2.5%.

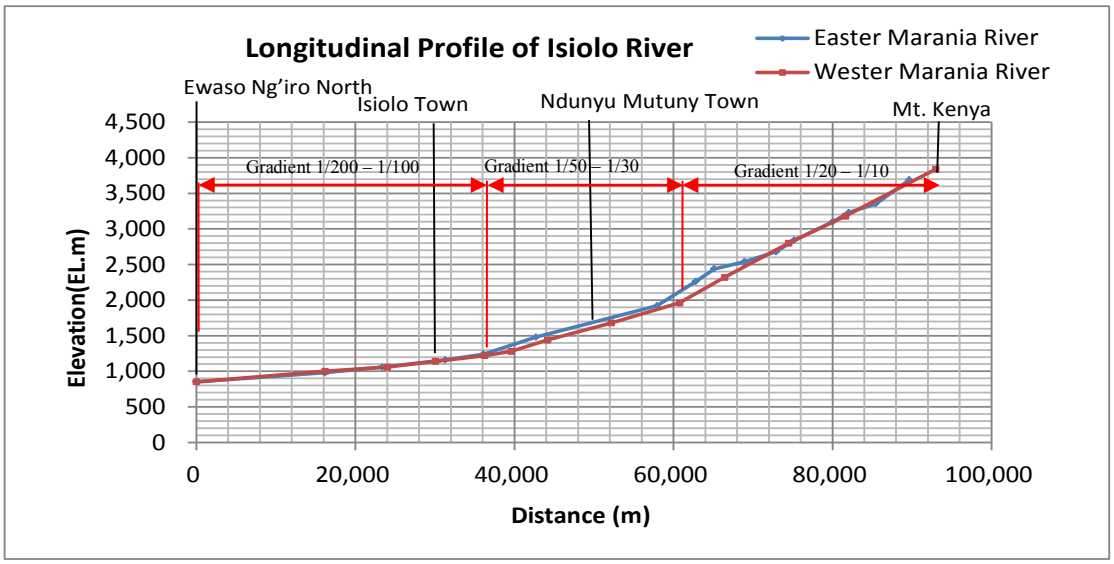
In Isiolo River Basin, the residential area is dominated on the transition area of the river course near Isiolo Town where the topographic slope of the river is turned from steep to flat. One of the reasons is that there is a spring in this vicinity and the groundwater level is shallow as this area is the transition point of topographic slope of the river. In the mountainous area where the river slope is steep, it tends to have regional heavy rain.



Source : Prepared by JICA Project Team based on WRMA's data

Figure 1.1.2 Distribution Map of Topographic Slope of Isiolo River Basin

Figure 1.1.3 shows longitudinal gradient of Isiolo River.

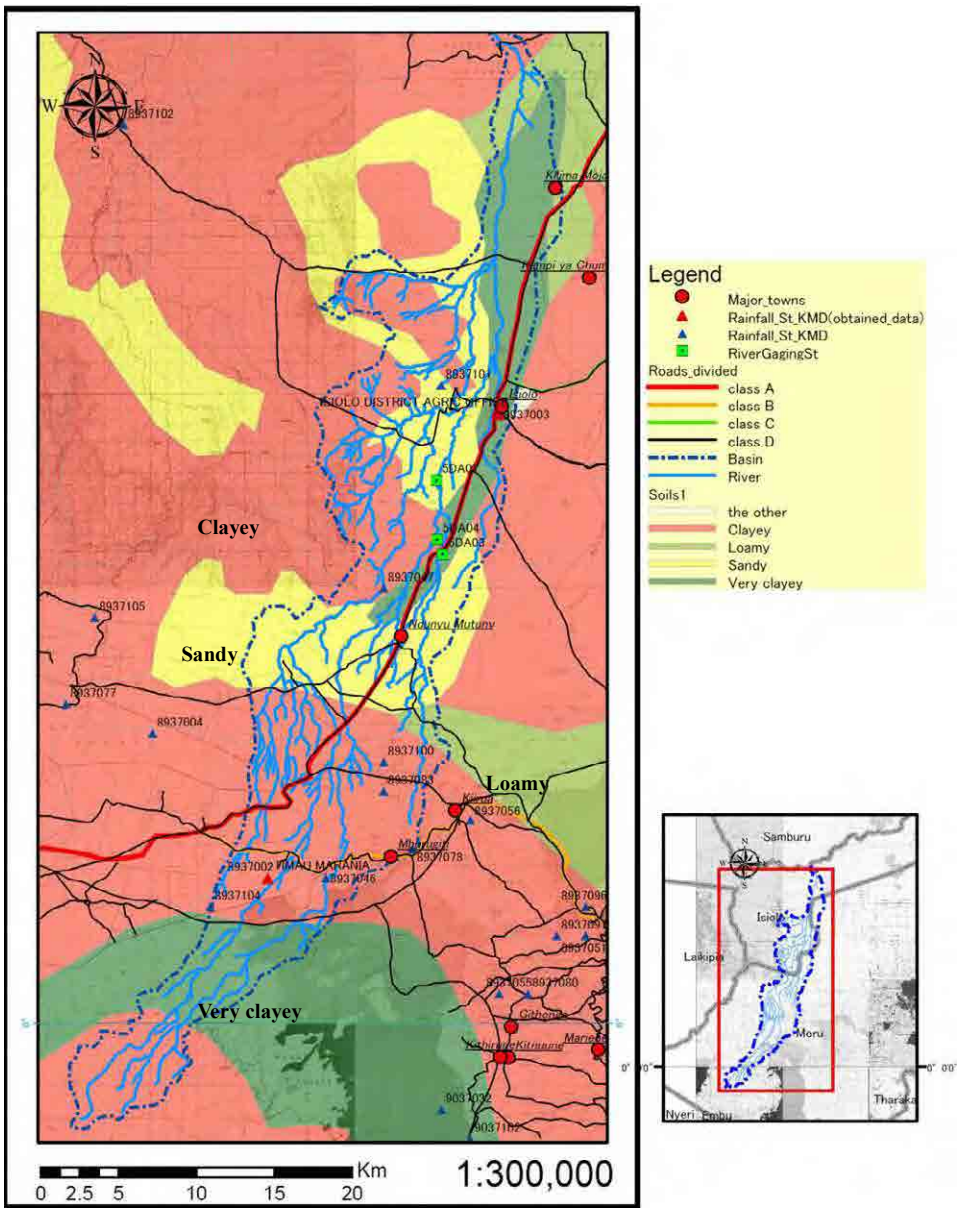


Source : Prepared by JICA Project Team based on 1/50,000Topo Map

Figure 1.1.3 Cross Section of River Stream

(2) Soil

Soil Distribution Map of Isiolo River Basin is as per Figure 1.1.4. Clayey soil covers all through the river basin, and sandy soil is distributed at the left bank of the river, from a part of the middle river basin and the middle stream to the downstream. High clayey content soil is deposited in the right bank of the downstream and the loam layer composed of silt and clay with the proportion of 25 to 40%. is distributed. Isiolo Town is located on the strong clayey soil land.



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

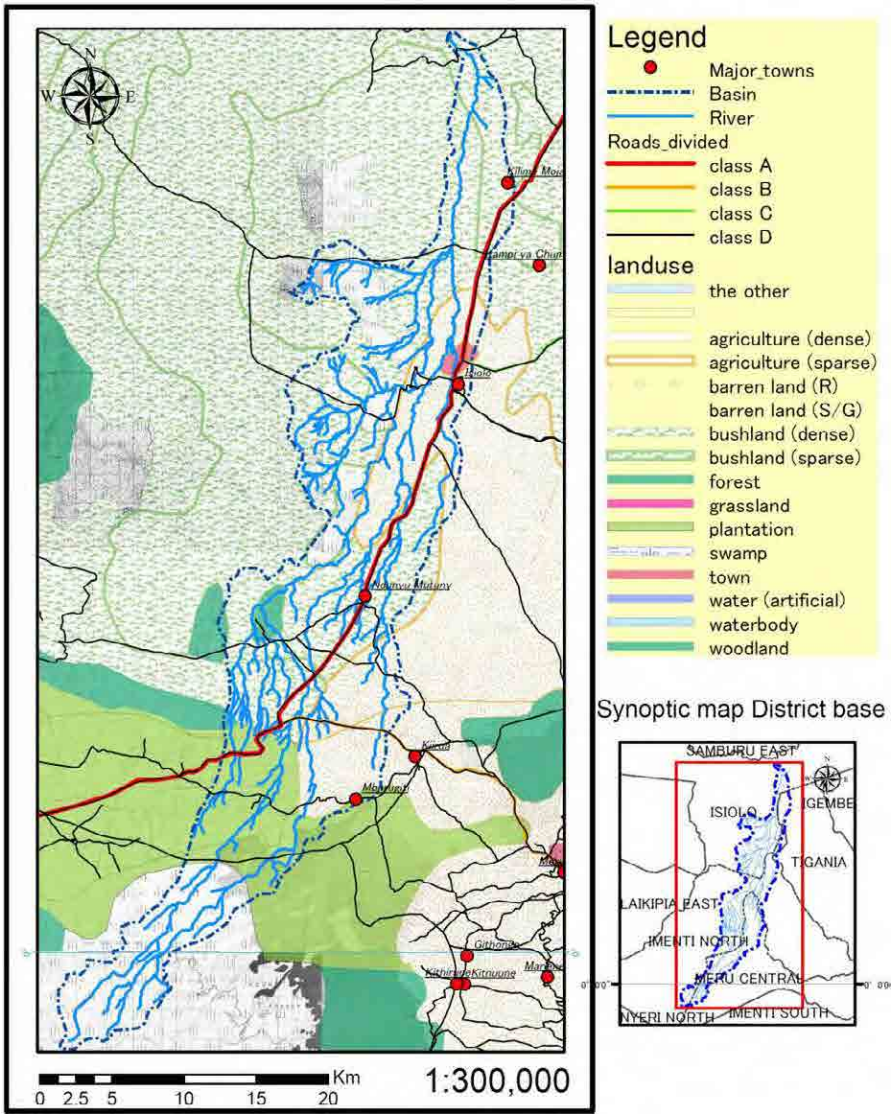
Figure 1.1.4 Soil Distribution Map (Soil texture)

1.1.2 Vegetation and Land Use

(1) Land Use

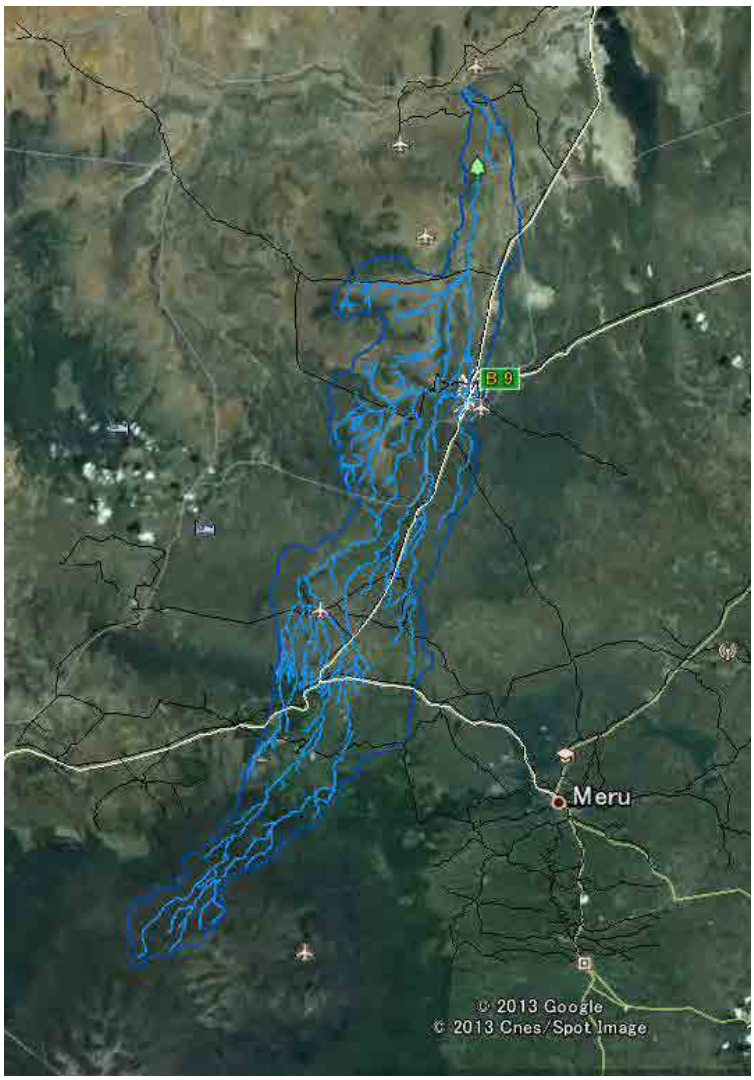
Land use characteristics of Isiolo River Basin are shown on Figure 1.1.5 and Figure 1.1.6. As seen in land use map, the mountainous area in the upstream river basin is a barren land, and from Google Earth Image Data it is known that the mountain is bare. In the middle river basin the plantation is extended. From the middle to downstream river basin the scrubland is extended, and there exists agricultural lands along the Western Marania River and Eastern Marania River of the middle river basin and in the suburb of downtown of Isiolo Town. In addition, as this river basin belongs to dry region and the xerophile vegetation is limited, forest

area is extremely few.



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

Figure 1.1.5 Land Use in Isiolo River Basin



Source : Prepared by JICA Project Team based on Satellite Image of December 10, 2012

Figure 1.1.6 Satellite Image of Isiolo River Basin

According to the survey of NRM3 and CETRAD, 29.1km^2 of forest area in 1995 in Isiolo River Basin is decreased to 14.1km2 in 2002. It is reported that 15km^2 of forest has been lost between 1995 to 2002. 2.1km2 of forest loss has occurred in average every year. If the forest loss is continued at this rate, the forest in the river basin will totally be disappeared by 2018.

1.1.3 Hydrology and Meteorology

(1) Feature of Rainfall and Water Level Gauging Station

(a) Gauging Stations

Figure 1.1.7 shows locations of KMD rainfall and water level gauging stations. Rainfall gauging stations are indicated in triangle shape (▲), while the water level gauging stations are shown in box-shape (■). Rainfall gauging stations where the daily rainfall data have already been obtained by JICA project team are colored in red. The numbers given in the map mean the gauging station number.

Timau Marania Rainfall Gauging Station (No. 8937002) is located in the mountainous area of the upstream river basin, while Isiolo District Agric Office (hereinafter referred to DAO) is located in the suburb of downtown of Isiolo.

Kithima Water Level Gauging Station (No.5DA03) is located in the middle river basin, while Isiolo Gauging Station (No.5DA07) is located in the suburb of downtown of Isiolo.

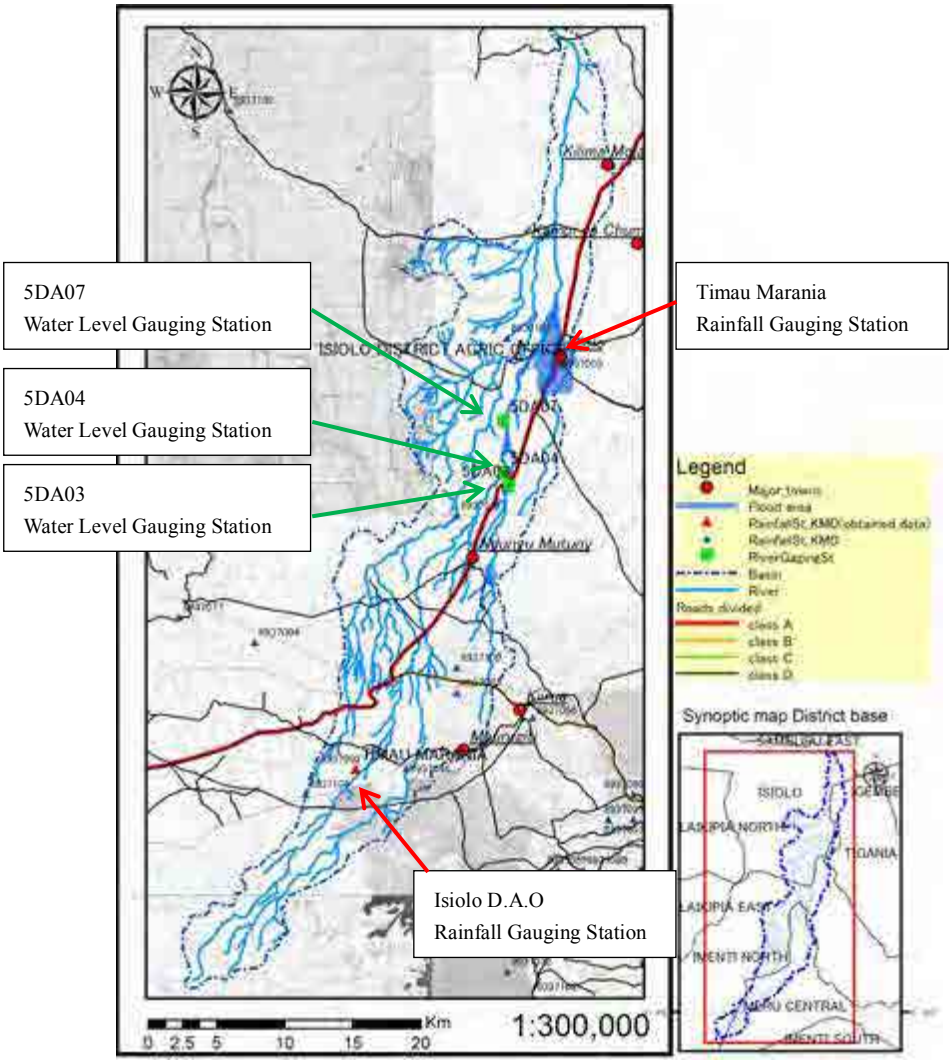


Figure 1.1.7 Location Map of Rainfall and Water Level Gauging Stations

Water Level Gauging Station No.: 5DA07
Observation River: Eastern Marania River

Same as left.

Water Level Gauging Station No.: 5DA04
Observation River: Eastern Marania River
Special Note: Water level gauge is broken off and damaged.

Water Level Gauging Station No.: 5DA03
Observation River: Eastern Marania River

(b) Rainfall Observation Data

Table 1.1.1 shows a list of KMD Rainfall Gauging Station within Isiolo River Basin and its vicinity. Of the stations listed below, those stations obtained daily rainfall data are Gauging Station of Timau Marania and Isiolo DAO indicated by color. Observation periods of the daily rainfall obtained are 32 years from 1957 to 1989 (including missing period).

For Timau Marania Gauging Station No.8937002, the monthly rainfall data is obtained for 82 years from 1930 to 2011.

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

STATION_NUMBER	stationname	Y	X	Year_Opened	Year_Closed	Obtain	ar_Closed	Obtain
8937002	TIMAU_MARANIA	0.083	37.450	1925	_	obtain	_	obtain
8937003	ISIOLO_DISTRICT_AGRIC_OFFICE	0.350	37.583	1930	_	obtain	_	obtain
8937004	NGARE_UNGA_FARM	0.167	37.383	0.167	1930	37.383	1941	1930	1941	
8937046	MARANIA_FOREST__NANYUKI	0.083	37.483	0.083	1951	37.483	1953	1951	1953	
8937047	BIRDS_HILL_RANCH_ISIOLO	0.250	37.517	0.250	1951	37.517	1963	1951	1963	
8937078	MUCHENE_FOREST_STATION	0.100	37.533	0.100	1973	37.533	_	1973	_	
8937083	NTUMBURI_PRIMARY_SCHOOL	0.133	37.517	0.133	1974	37.517	_	1974	_	
8937100	MARURU_PRIMARY_SCHOOL	0.150	37.517	0.150	1979	37.517	_	1979	_	
8937101	ISIOLO_HEADQUARTERS	0.367	37.550	0.367	1980	37.550	_	1980	_	
9037155	SIRIMON_GATE_MT_KENYA_PARK	0.283	37.283	-0.033	1970	37.283	_	1970	_	

Source : KMD

(c) Water Level and River Discharge Observation Data

List of water gauging stations in Isiolo River Basin is shown on Table 1.1.2 of the stations listed below, those stations obtained water level observation data is only Gauging Station Nos. 5DA07 indicated by color. Automatic measurement is not done at each water level gauging stations, but the visual observation is carried out two times in 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.

Table 1.1.2 List of Water Level Gauging Station in Isiolo River Basin

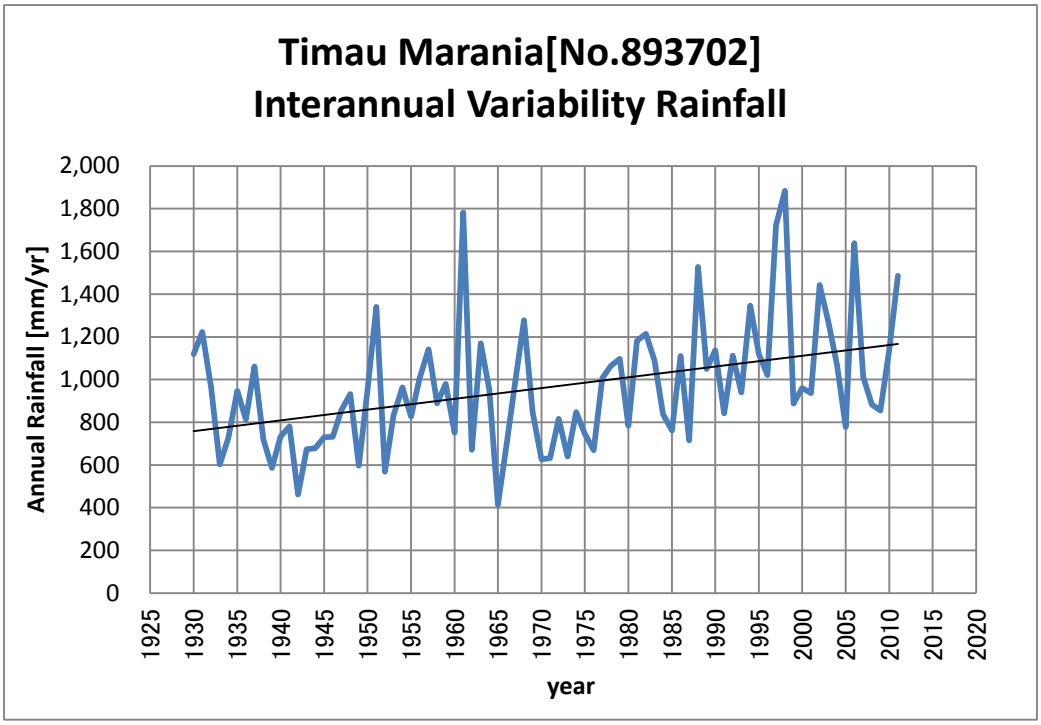
No.	ID	Name	River Name	Manual/ Auto/ Both	National/ MU/IMU/ Special	Daily/ Hourly/ Both	Operational	Start Year	End Year	SRO in charge
1	5DA07	Isiolo	Isiolo	Manual	MU	Daily	Yes	1976/1/1	N/A	MEN
2	5DA03	Kithima	Kithima	Manual	Intra-MU	Daily	Yes	2010/9/1	N/A	MEN
3	5DA04	Rugusu	Rugusu	Manual	Intra-MU	Daily	Yes	2010/10/1	N/A	MEN

Source : WRMA

(2) Feature of Annual Rainfall

(a) Long-Term Variability of Annual Rainfall

Figure 1.1.8 shows the variability of annual rainfall at Timau Marania Station in a period of 1930 to 2011. Out of the observation record from 1930 to 2011, the maximum annual rainfall, 1,883mm/year was recorded in 1998. The average annual rainfall during the same observation period is 959mm/year. The average annual rainfall tends to be increasing.

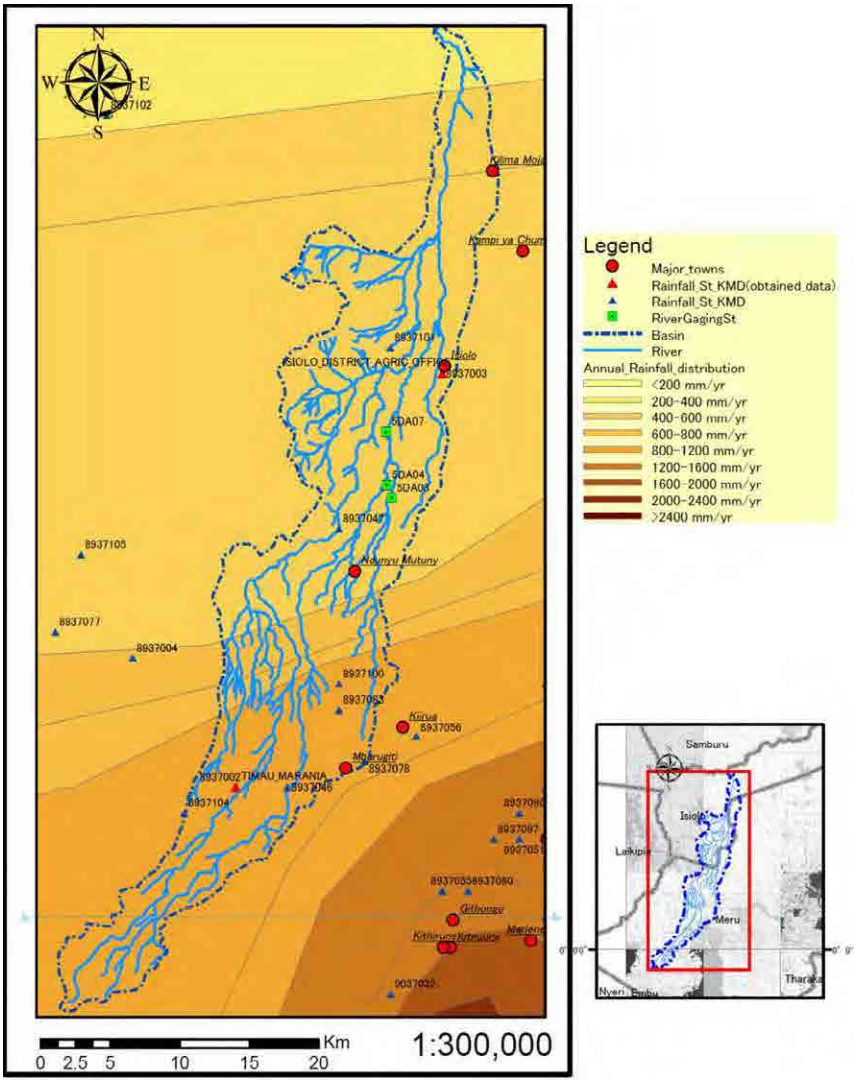


Source: Prepared by JICA Project Team based on WRMA's rainfall data of KMD gauging stations in the period between 1930 and 2011

Figure 1.1.8 Variability of Annual Rainfall at Timau Marania Station

(b) Distribution of Annual Rainfall

Monthly average temperatures vary from 7.6°C in highland to 32°C in low-lying area, and the low-lying area belongs to pindan.[1] Annual rainfall in the vicinity of Mt. Kenya, the headwaters of the river, goes beyond 1,200mm/year, and the average annual rainfall in the downtown of Isiolo which is the largest city in Isiolo River Basin, is approximately 600mm/year. Distribution of annual rainfall in Isiolo River Basin is shown below. From this distribution map, it is known that rainfall distribution is different between upstream and middle/downstream river basins. The annual rainfall in the upstream of EL.2,500m to EL.3,900m varies from 800 to 1,200mm/year, while those in the middle to downstream which occupies approximately 60% of the catchment area varies from 400 to 600mm/year.



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

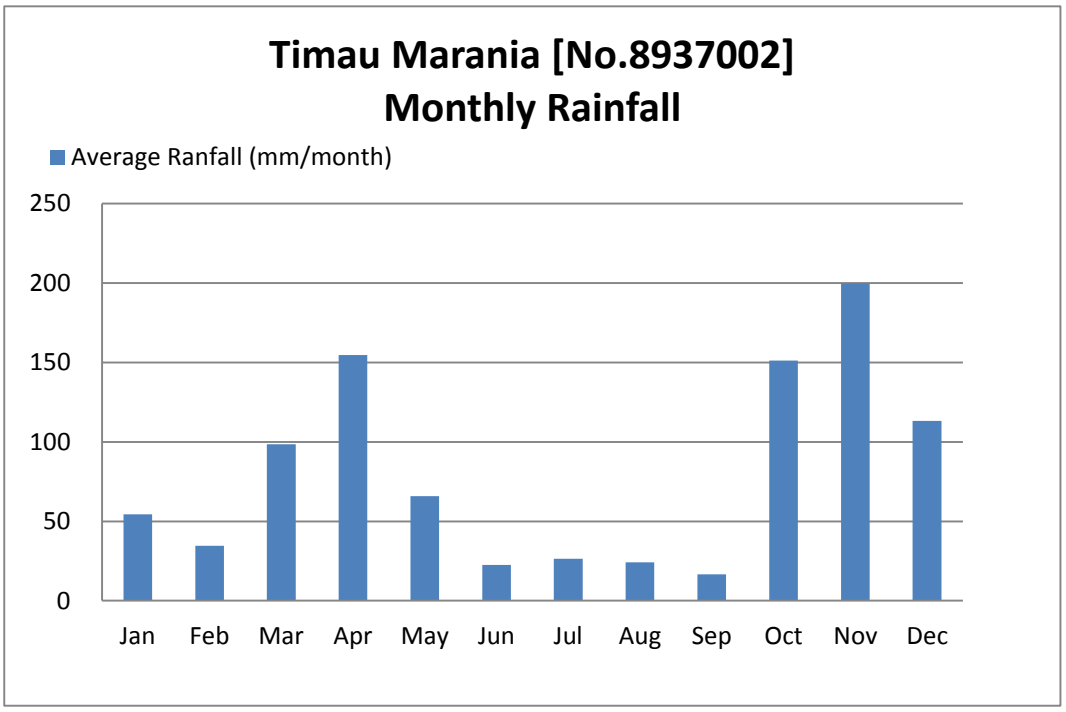
Figure 1.1.9 Distribution Map of Annual Rainfall of Isiolo River Basin

[1] Isiolo WRUA and WRMA, SCMP (March 2009)

(c) Monthly Rainfall

There are two times of rainy seasons in Isiolo River Basin, i.e. March to May and October to December. Much rainfall is recorded during such a rainy season. Monthly rainfall at Timau Marania Rainfall Gauging Station in the upstream of Isiolo River Basin is shown on Fig. 1.1.10. As shown in the following figure, it is understood that the maximum rainfall through the year can be observed in April and November. The heaviest monthly rainfall recorded in November is 200mm/month.

Besides, in recent years, it tends to have heavy rain in a short time. On the other hand, river flow is dried up during dry season of February, March, August and September.[2]



Source: Prepared by JICA Project Team based on WRMA's rainfall data of KMD gauging stations in the period between 1930 and 2011

Figure 1.1.10 Monthly Rainfall at Timau Marania Station

(d) Daily Rainfall

Timau Marania Station

Table 1.1.3 shows maximum daily rainfall, annual rainfall, number of missing data and period of missing data by the respective years from 1957 to 1989 at Timau Marania Station. Red numerical value indicates that there are missing data in the same year. And it

2 Isiolo SCMP

means annual rain fall data of the year can be incorrect. The maximum daily rainfall recorded in the same period is 127.7mm/day observed in December 28, 1983. Those of the maximum annual rainfall are 1,737mm/year recorded in 1961. (Data set is different from data described above.)

Table 1.1.3 Observation Record at Timau Marania Station

Year	Date	MaximumDailyRainfall [mm/day]	AnnualRainfall [mm/yr]	Number of missing data	Period of missing data
1957	1957/10/29	85.6	872	32	1/1-2/1
1958	1958/4/26	67.1	667	0	
1959	1959/12/11	114.3	823	90	1/2-4/1
1960	1960/10/25	51.8	751	0	
1961	1961/12/14	104.6	1,737	28	2/2-3/1
1962	1962/10/12	33.8	645	0	
1963	1963/5/29	63.0	1,161	0	
1964	1964/4/18	64.0	975	0	
1965	1965/3/25	26.4	414	0	
1966	1966/3/29	43.2	703	0	
1967	1967/11/26	52.1	985	0	
1968	1968/4/3	94.0	1,278	0	
1969	1969/5/2	84.3	865	0	
1970	1970/10/15	51.1	625	0	
1971	1971/4/27	61.7	631	0	
1972	1972/6/22	54.1	815	0	
1973	1973/4/15	32.9	640	0	
1974	1974/11/7	52.8	849	0	
1975	1975/11/17	42.6	740	0	
1976	1976/12/14	42.3	634	30	9/2-10/1
1977	1977/11/7	68.8	1,008	0	
1978	1978/11/26	49.4	1,052	0	
1979	1979/2/1	75.8	1,097	0	
1980	1980/10/19	62.5	775	30	9/2-10/1
1981	1981/11/7	65.3	1,173	0	
1982	1982/10/29	73.2	1,214	0	
1983	1983/12/28	127.7	1,093	0	
1984	1984/11/15	75.6	837	0	
1985	1985/11/12	65.1	775	0	
1986	1986/10/26	63.4	1,119	0	
1987	1987/6/4	64.7	723	0	
1988	1988/12/21	67.8	1,537	0	

Source : Prepared by JICA Project Team based on the observation data of the period of 1957 to 1989 at KMD owned Timau Marania Rainfall Gauging Station.

From October to December is short rainy season and from March to May is long rainy season in Kenya.

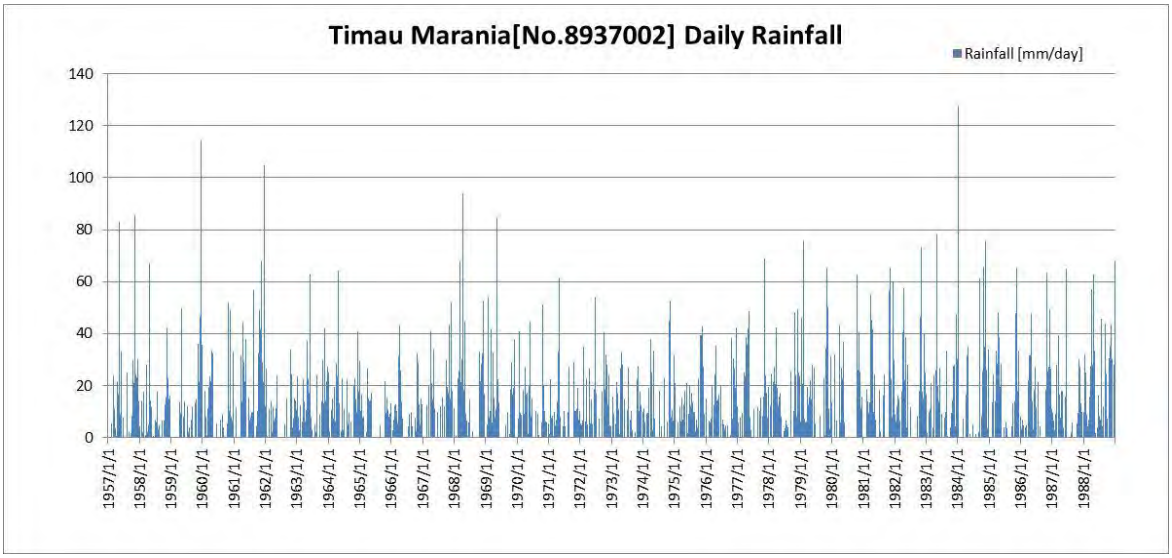
Concerning missing data (1957, 1959, 1961, 1976 and 1980), maximum daily rainfall of other 27 years is recorded 10 times in short rainy season, 9 times in long rainy season, 5 times in October, once in February and twice in June.

Missing period of 1957 is from 1/1 to 1/2. Frequency to occur maximum daily rainfall in this season is not high. Missing period of 1959 is from 1/1 to 1/4. The period includes long rainy season. However, maximum daily rainfall data recorded as 114.3mm in 11/12.

This rainfall data is one of the highest records of the list and probability to exceed this rainfall is relatively low. Missing period of 1961 is from 2/2 to 1/3 that means just before long rainy season. From same reason, the data 104.6mm of 14/12 is concluded as maximum rainfall of the year. Missing period of 1976 is from 2/9 to 1/10. There is no maximum daily rainfall recorded on the same season of other years. Possibility to record maximum rainfall is low. And also, missing period of 1980 is from 2/9 to 1/10. From same reason, the data is concluded as correct.

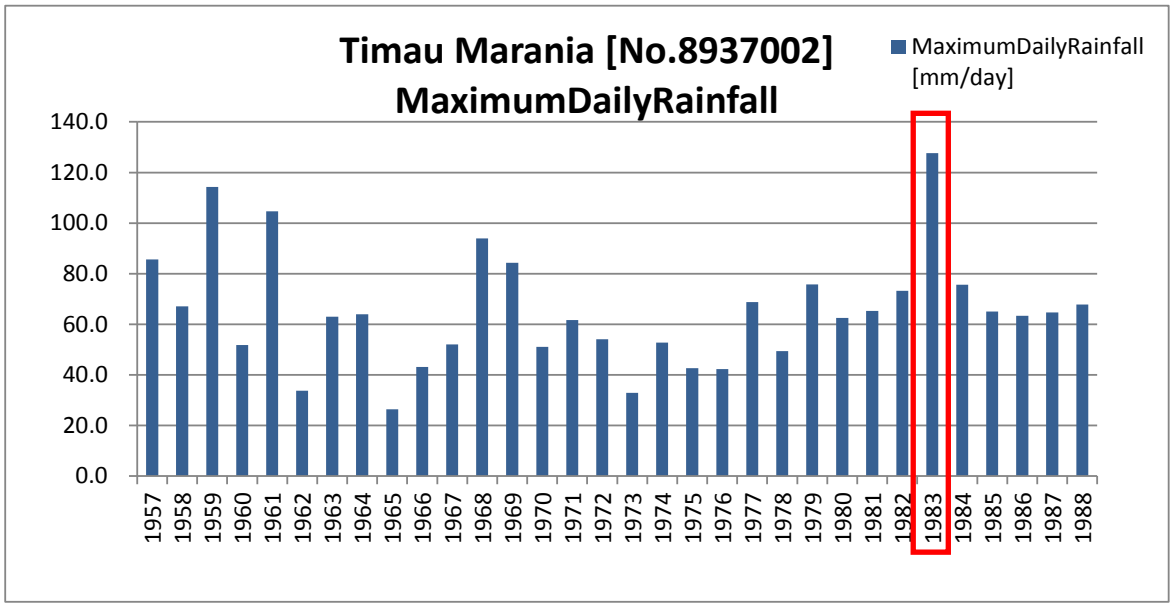
Therefore, probability to record maximum daily rainfall data in missing period is relatively low. JICA project team applies the data to analysis.

Variability of daily rainfall and maximum daily rainfall per year during the observation period of 1957 to 1989 at Timau Marania Station is shown on Figure 1.1.11



Source：Prepared by JICA Project Team based on the observation period of 1957 to 1989 at the KMD Timau Marania Rainfall Gauging Station that is offered by WRMA

Figure 1.1.11 Transition of Daily Rainfall at Timau Marania Station



Source：Prepared by JICA Project Team based on the observation data of the period of 1957 to 1989 at the KMD Timau Marania Rainfall Gauging Station that is offered by WRMA.

Figure 1.1.12 Maximum Daily Rainfall in a Year at Timau Marania Station

Probability statistics analysis by each probable years (1/50, 1/30, 1/20, 1/10 and 1/5) was carried out based on the maximum daily rainfall in a year during the observation period for 30 years (There are some missing periods.) at Timau Marania Rainfall Gauging Station within the river basin. Table 1.1.4 shows the result of hydrological statistics calculation and the planned daily rainfall.

Applied Provability Distribution Model "Gumbel distribution" is selected based on "guideline of high water planning" by Japan Institute of Country-ology and Engineering.

Table 1.1.4 Result of Rainfall Calculation by Provable Years at Timau Marania Station

Name of Rainfall Gauging Station : Timau Marania
Observation Period : 1957 to 1989
Applied Provability Distribution Model : Gumbel distribution

Provable year	Jack Knife Estimate Daily Rainfall (mm/day)	Planned Daily Rainfall (mm/day)
1/5	81.6	82
1/10	95.1	96
1/20	108	108
1/30	115.4	116
1/50	124.7	125

Isiolo DAO Station

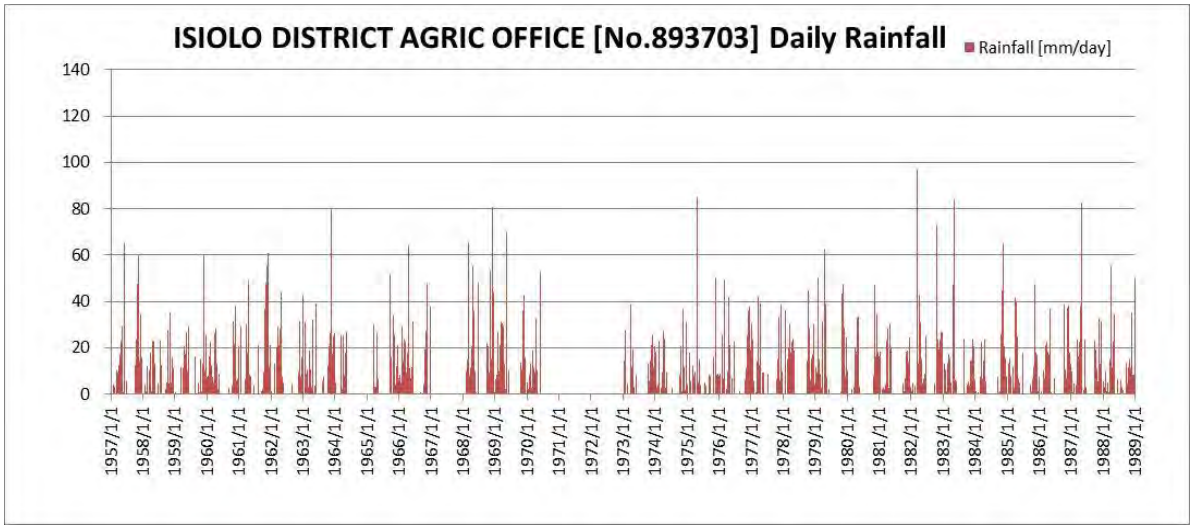
Maximum daily rainfall and annual rainfall, number of missing data and period of missing data by each year in the observation period of 1957 to 1989 are shown on Table 1.1.5 below. The maximum daily rainfall in the observation period is 97mm/day recorded on March 10, 1982, and the maximum annual rainfall is 1,261mm/year recorded in 1961.

Table 1.1.5 Observation Record of Rainfall at Isiolo DAO Station

Year	Date	MaximumDailyRainfall [mm/day]	AnnualRainfall [mm/yr]	Number of missing data	Period of missing data
1957	1957/05/28	65.3	737	0	
1958	1958/11/06	35.6	455	0	
1959	1959/11/24	60.5	550	59	1/2-3/2
1960	1960/11/17	38.4	593	0	
1961	1961/11/25	61.0	1261	28	2/2-3/1
1962	1962/04/22	43.7	689	62	1/2-2/1, 10/2-11/1
1963	1963/11/15	79.7	859	0	
1964	1964/05/02	27.0	209	243	1/2-3/1, 6/2-9/1, 10/2-12/31
1965	1965/09/21	52.0	309	94	1/1-2/1, 5/2-6/1, 7/2-8/1
1966	1966/04/13	64.1	682	30	9/2-10/1
1967	-	0.0	0.0	183	3/2-6/1, 10/2-12/31
1968	1968/11/27	80.8	1243	1	1/1
1969	1969/05/03	70.0	906	0	
1970	1970/05/28	53.1	296	213	6/2-12/31
1971	-	0.0	-	-	No data
1972	-	0.0	-	-	No data
1973	1973/03/28	38.6	475	1	1/1
1974	1974/11/08	36.7	498	0	
1975	1975/04/18	85.2	475	0	
1976	1976/02/26	49.2	624	0	
1977	1977/03/23	42.1	646	0	
1978	1978/10/13	44.8	807	30	6/2-7/1
1979	1979/04/10	62.3	726	0	
1980	1980/11/10	47.7	528	0	
1981	1981/05/03	30.3	467	0	
1982	1982/03/10	97.0	763	0	
1983	1983/04/27	84.1	555	0	
1984	1984/11/08	65.4	535	0	
1985	1985/11/05	48.0	581	0	
1986	1986/10/10	38.8	694	0	
1987	1987/04/23	82.9	638	0	
1988	1988/03/25	55.2	717	0	

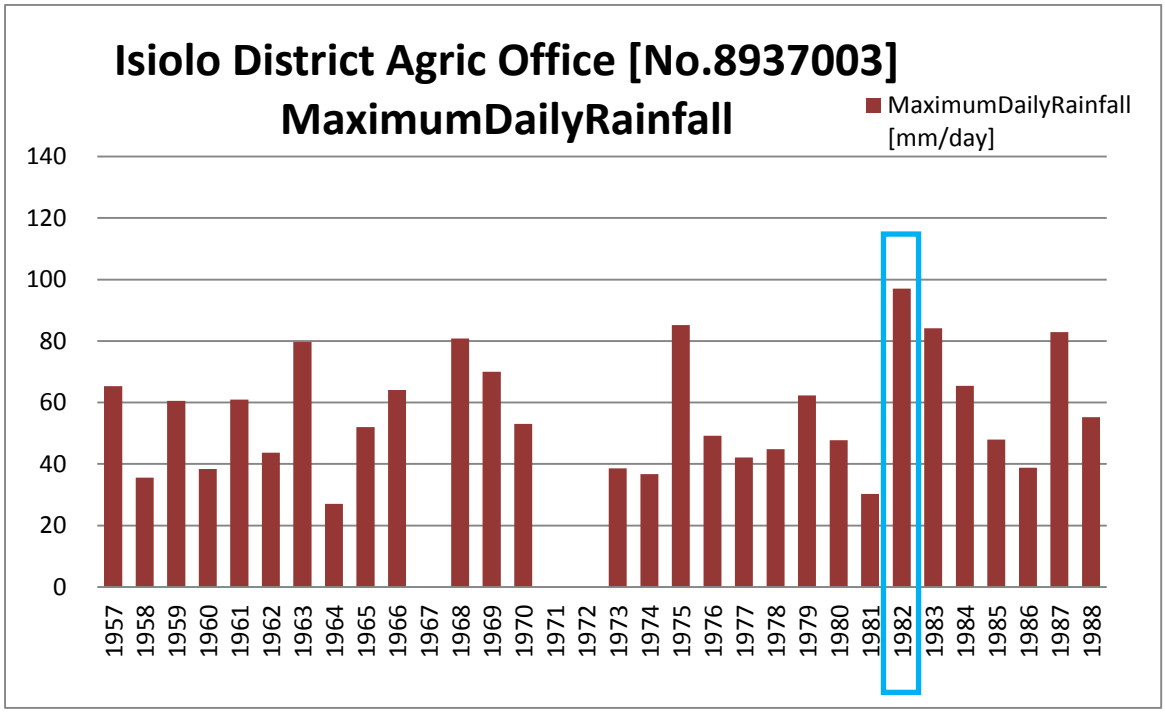
Source : Prepared by JICA Project Team based on the observation data for the period of 1957 to 1989 at KMD owned Isiolo DAO Rainfall Gauging Station

Variability of daily rainfall and maximum daily rainfall per year during the observation period of 1957 to 1989 at Isiolo DAO Station is shown on Figure 1.1.13



Source : Prepared by JICA Project Team based on the observation data for the period of 1957 to 1989 at KMD owned Isiolo DAO Rainfall Gauging Station

Figure 1.1.13 Transition of Daily Rainfall at Isiolo DAO Station



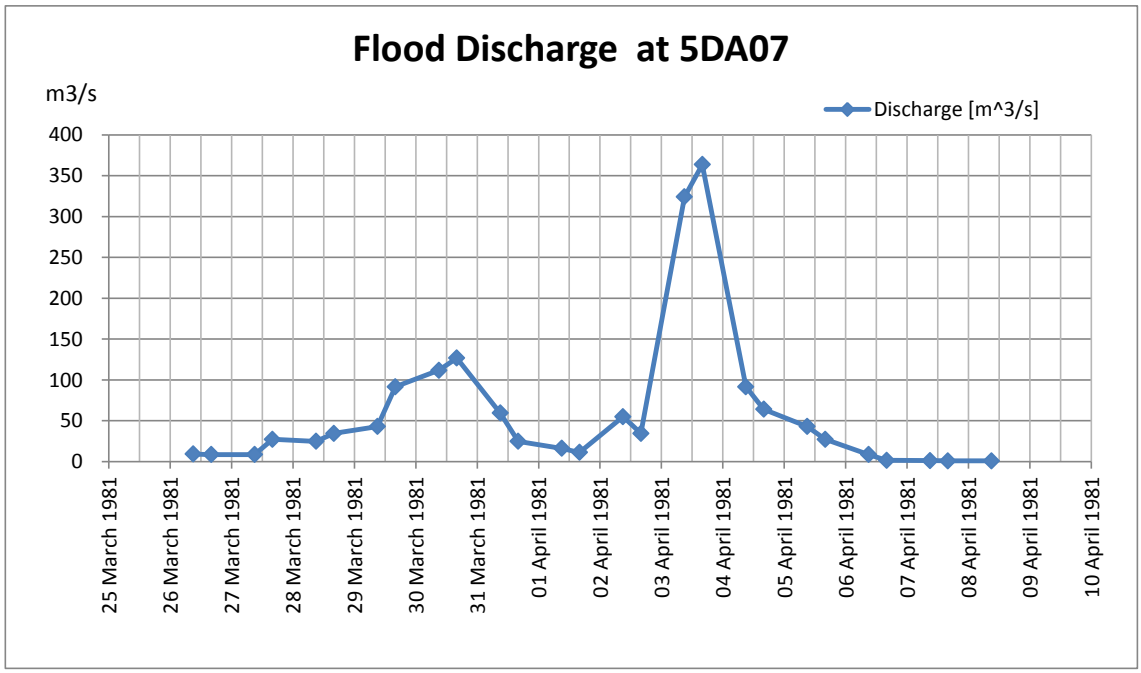
Source : Prepared by JICA Project Team based on the observation data for the period of 1957 to 1988 at KMD owned Isiolo DAO Rainfall Gauging Station

Figure 1.1.14 Maximum Daily Rainfall through the Year at Isiolo DAO Station

(3) Flood Peak Runoff

Peak flow on observation from 1971 to 2011 (There are missing data more than 12 years) at 5DA07 station that is located at upstream of Isiolo Town is 364 m^3/s on 16:00, 3/4/1981.

However, observation system works twice a day, 9:00 and 16:00. There is a possibility not to record correct flood peak runoff data. This data is offered by WRMA as converted data. Water level data is not offered.



Source : WRMA

Figure 1.1.15 Peak Flow of 5DA07 Station

Analysis from the view point of hydrology and hydraulics is studied. Specifically, daily rainfall data of each scale is calculated by stochastic method. In addition, rainfall intensity is estimated from the daily rainfall data. Flood peak runoff of each stochastic scale at main tributary stream and upstream of Isiolo Town is computed by rational formula. Generally, rational formula applies to basin area that is less than $100km^2$. However, rainfall and discharge measurement is not observed in this area and past flood flow data does not exist. There is no other choice. Dividing map of Isiolo River Basin is below.

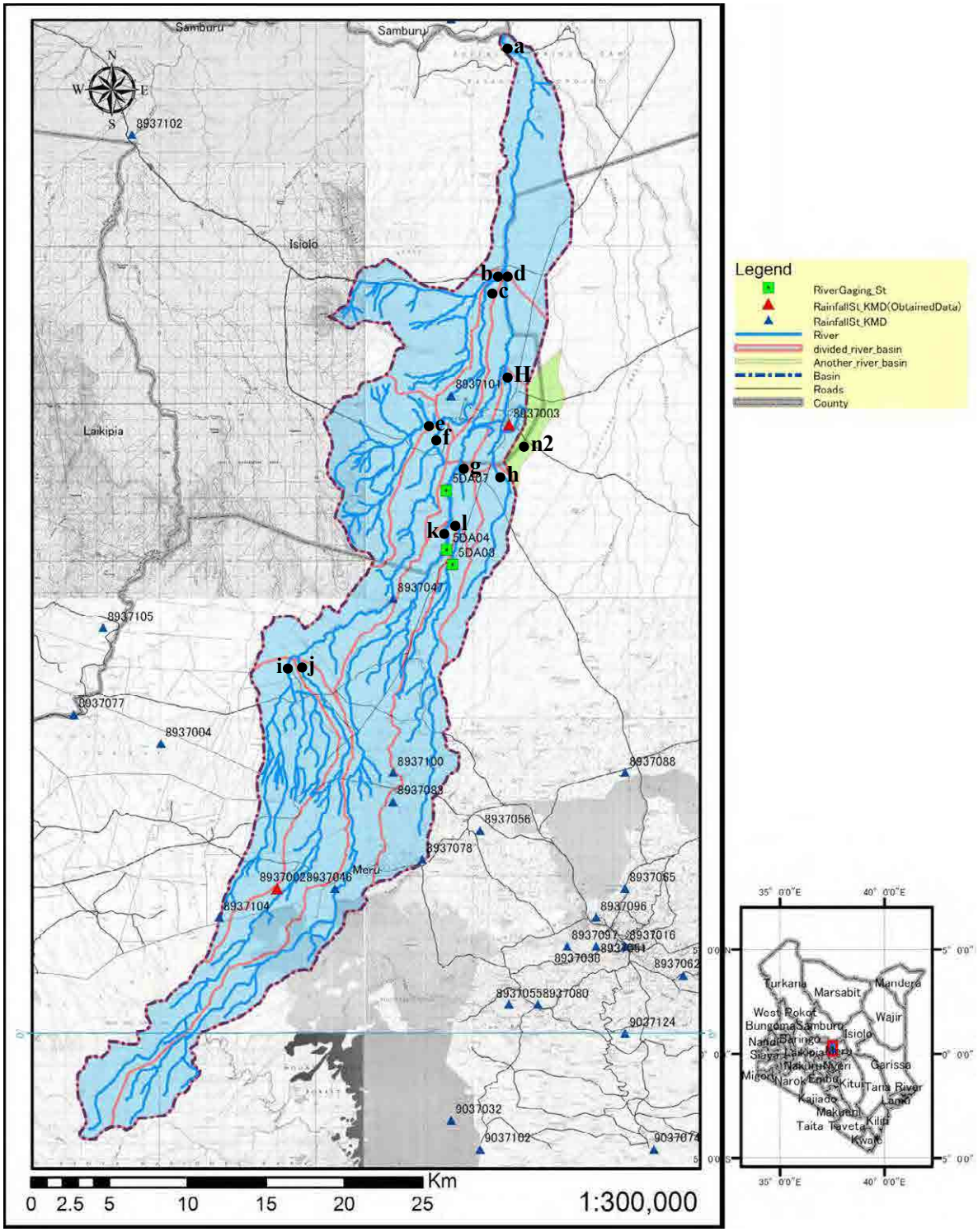


Figure 1.1.16 Dividing Map of Isiolo River Basin (Sample spots are marked)

Rational formula

Rational formula and setting condition are below.

$$Q = 1/3.6 * f * r * A \quad \text{----------Rational formula}$$

Q : flow discharge (m^3/s)

f : coefficient of discharge

r : average of rainfall intensity within arrival time of flood (mm/h)

A : dimension of river basin (km^2)

* Rational formula is a calculating formula to estimate flood peak runoff when rain water flows intensively from the most distant spots to sample spots. Considering canning condition of the surface, amount of flow is calculated by function as rainfall intensity and dimension of river basin.

[Condition of flood peak runoff calculation by rational formula]

- Calculating formula of arrival time of flood tc : Kraven-Rziha
- Planning daily rainfall of each scale : 1/50 r24 =125 mm/d, 1/30 r24 =116 mm/d, 1/20 r24 =108 mm/d, 1/10 r24 =96 mm/d, 1/5 r24 =82 mm/d
- Formula of average rainfall intensity within arrival time of flood r : Monobe formula
- Coefficient of dischargef = 0.6 (only n2 spot is applied f=0.45)
- Dimension of river basin : total dimension of river basin 474km^2

Table 1.1.6 shows the result of calculation of flood peak runoff by rational formula. The most inferior point of Isiolo River Basin to join in Ewaso Ng'iro North River is approximately 650m^3/s on 1/10. G and h spots of upstream of Isiolo Town (upstream of Eastern Marania River and Merire River) is 280 m^3/s, 85 m^3/s on 1/10.

Table 1.1.6 Result of Calculation of Flood Peak Runoff by Rational Formula
(Left to right:1/50, 1/30, 1/20, 1/10, 1/5)

Point	Arrival time of flood t_c (min)	Riverbasin area A(km^2)	1/50 : r24 = 125mm/day Peak discharge Qp(m^3/s)	1/30 : r24 = 116mm/day Peak discharge Qp(m^3/s)	1/20 : r24 = 108mm/day Peak discharge Qp(m^3/s)	1/10 : r24 = 96mm/day Peak discharge Qp(m^3/s)	1/5 : r24 = 82mm/day Peak discharge Qp(m^3/s)	River	Name of the Point
i	96	45.0	238	221	206	183	156	-	
j	218	64.1	196	182	169	151	129	Western.M.R	
k	275	90.1	236	219	204	181	155	Eastern.M.R	
l	131	46.3	199	184	172	153	130	-	
e	71	40.4	260	242	225	200	171	-	
f	333	150.6	347	322	300	267	228	Western.M.R	
g	297	145.6	362	336	313	278	237	Eastern.M.R	Isiolo townの直上流地点
h	76	17.6	109	101	94	83	71	Merire.R	Isiolo townの直上流地点
b	76	11.4	70	65	61	54	46	-	
c	400	229.6	468	435	405	360	307	Western.M.R	
d	368	184.3	397	369	343	305	260	Eastern.M.R	Western.M.Rとの合流地点
H	104	27.1	136	126	117	104	89	Merire.R	Eastern.M.Rとの合流地点
a	489	473.6	844	783	729	648	554	Isiolo.R	Ewaso Ng'iro North river合流点
n2	31	2.4	21	19	18	16	13	-	隣接流域からの流路変更地点

Estimate arrival time can be utilized as lead time of early warning system.

1.2 SOCIO ECONOMIC CONDITIONS

1.2.1 Administration

(1) Local Administration

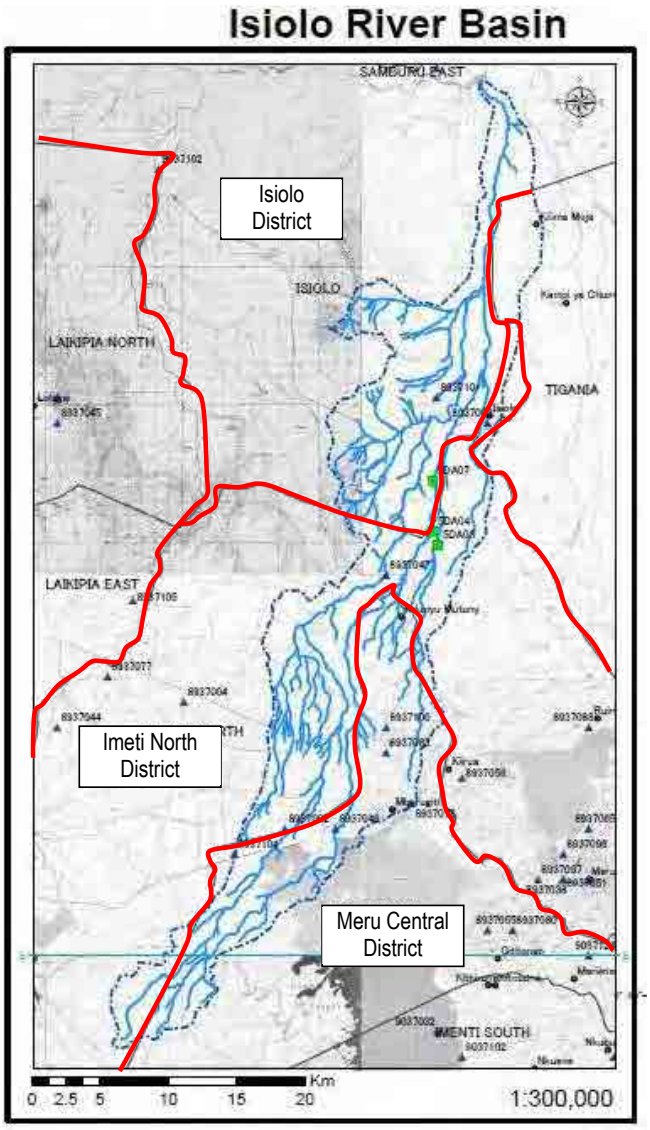
Administration division of the Republic of Kenya as of March 2013 is shown below.

Table 1.2.1 Administration 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.

Isiolo River Basin is mainly included in the three major districts of Meru Central, Imenti North and Isiolo. Locations of Isiolo River Basin and District and the administrative organizations included in Isiolo River Basin are shown in the following figure.



Source: International Livestock Research Institute GIS unit
Prepared by JICA Project Team based on the classified data in 1998

Figure 1.2.1 Locations of Isiolo River Basin and District

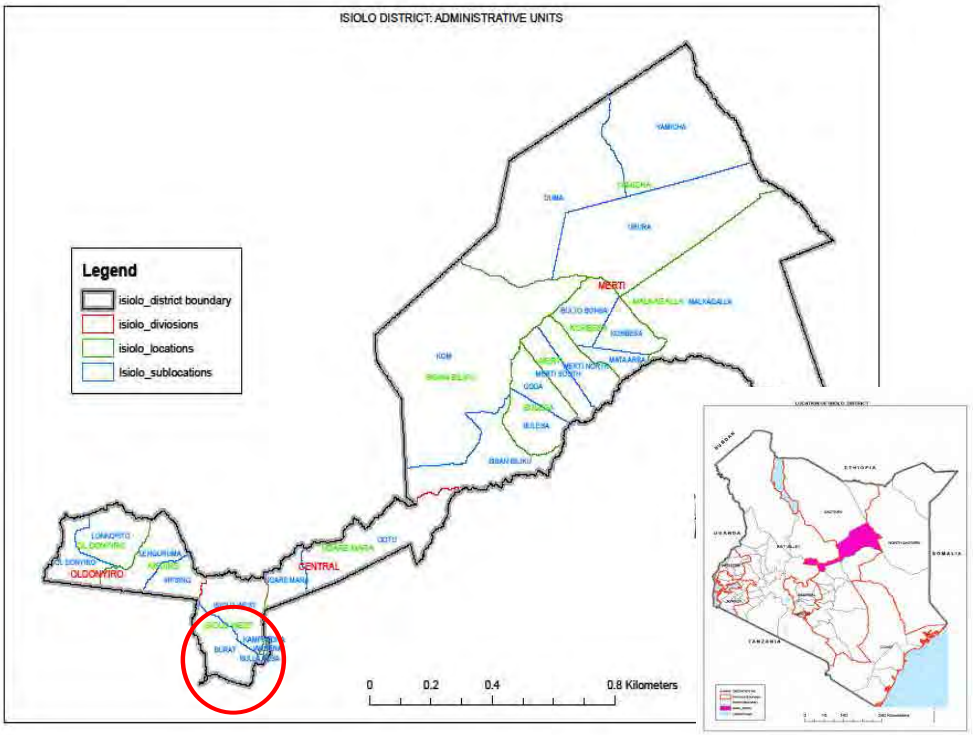
The detail of division of Division, Location, Sublocation in Isiolo River Basin is shown as below.

Table 1.2.2 Administrative Division at Isiolo River Basin (June, 2004)

Districts	Divisions	Locations	Sublocations
Isiolo	Central	Central	Bulla Pesa
			Kampi Odha
		Isiolo East	Kiwanjani
			Wabera
		Isiolo West	Burat
			Isiolo West
		Ngare Mara	Ngare Mara
Meru Central	Abothuguchi West	Kiamiogo	Kiamiogo
		Kibirichia	Kimbo
		Ntugi	Mboroga
		Ntumburi	Kamarete
			Thiira
	Buuri	Kiirua	Kithima
			Nkando
		Kisima	Ntirimiti
		Rwarera	Kirwiro
			Mugae
	Timau	Kisima	Buuri
			Mutonyi
		Ngusishi	Mutarakwa
	Mt Kenya Forest	Mt Kenya Forest	Mt Kenya Forest
	National Park	National Park	National park
Meru North	Akithi	Akithi	Thinyaine
	Tigania North	Buuri	Nturingwi
	Tigania West	Mituntu	Mumui

Source : Center for Training and Integrated Research in ASAL Development February 2005 , Upper Ewaso Ngiro River Basin Sub Catchments Directory

Boundary of Isiolo District and Division, Location and Sub location in the district is shown as below. Red circle is the location of Isiolo River Basin.



Source : Isiolo District Development Plan (2008 - 2012)

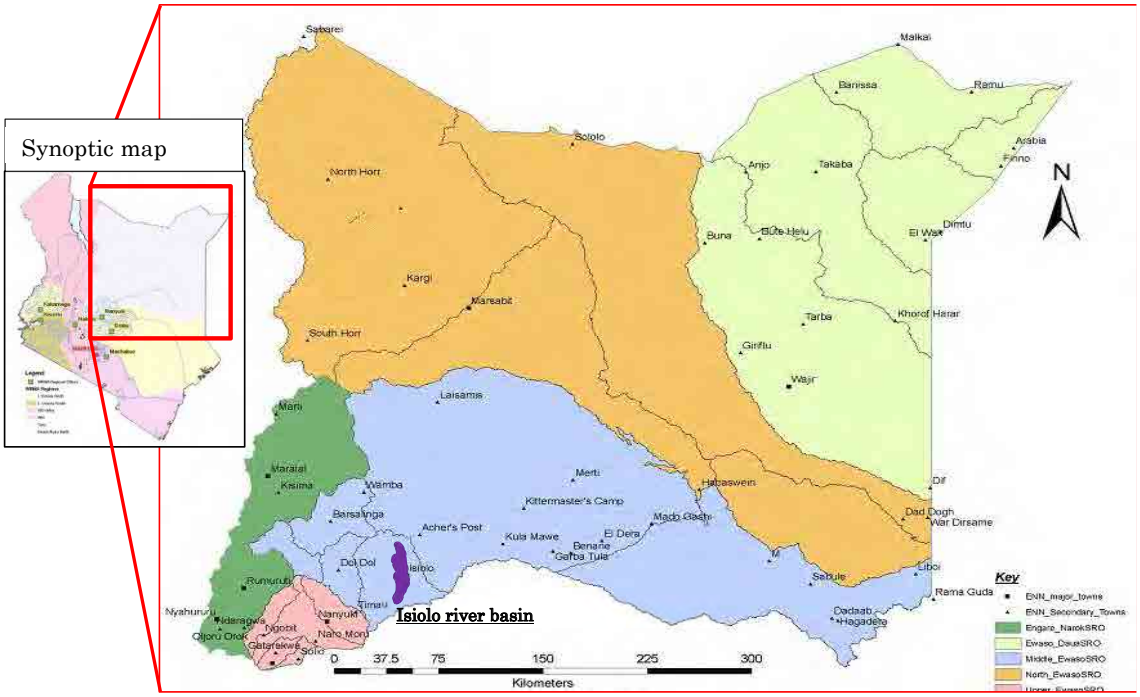
Figure 1.2.2 Location of Isiolo District

(2) Jurisdictional area of WRMA

Relation between the controlled area of WRMA (Water Resource Management Authority) responsible for the administration relating to the water resource and Isiolo River Basin is explained below.

WRMA divides the country in 6 catchment areas and Isiolo River Basin is included in the catchment called "Ewaso Ng'iro North Catchment Area (ENNCA)".

Nanyuk Region Office in ENNCA have jurisdiction over the whole ENNCA. Besides, the catchment is divided into 5, i.e. Upper Ewaso Ng'iro, Middle Ewaso Ng'iro, Middle Ewaso Ng'iro, Engare-Narok Melphis, Morth Ewaso Laggas and Ewaso-Daua. There are Sub-Regional Offices in the respective regions. Isiolo River Basin is in Middle Ewaso Ng'iro indicated in blue color and belongs to Middle Ewaso Ng'iro Sub-Regional Office.



Source : Ewaso Ngi’ro North Catchment Area Catchment Management Strategy (June 2009)

Figure 1.2.3 Regional Division within the ENNCA Catchment and Location of Isiolo River Basin

Photo 1.2.1 WRMA Middle Ewaso Ng'iro (Isiolo) Sub-Regional Office

Table 1.2.3 Demarcation of Isiolo River Basin

	Regional Office Level	Sub regional Office Level	Sub Catchment Level
Area	Ewaso Ng'iro North Catchment Area(ENNCA)	Middle Ewaso Ng'iro Sub-Region	Isiolo Sub Catchment
WRMA / WRUA	WRMA ENNCA	WRMA Middle Ewaso Ng'iro (Isiolo) Sub-Regional Office	Isiolo WRUA

1.2.2 Population

Population census data of 2009 in Isiolo District which includes Isiolo River Basin is presented in Table 1.2.4. The Central Division area including Isiolo Town is densely populated and the population reaches 40,000 persons occupying 40% of the total population of the whole district. No. of households is also concentrated in this area and occupies 45% of the whole district.

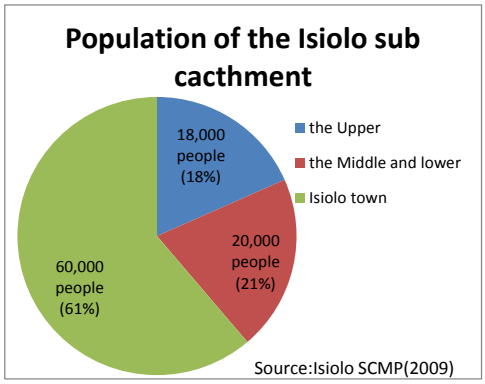
Especially in Bulla Pesa and Odha of Central area, the population density is high, i.e. about 3,000 persons/km^2 and about 1,000 persons/km^2, respectively.

Table 1.2.4 Population Census Data in Isiolo District (2009)

District	Division	Location	Sublocation	Male	Female	Total	Households	Area in Sq. Km.	Population Density
ISIOLO	CENTRAL	CENTRAL	BULLA PESA	11,148	11,574	22,722	6,190	7.66	2,965.93
			ODHA	2,860	3,062	5,922	1,236	5.67	1,044.57
		WEST	BURAT	4,580	4,010	8,590	1,640	345.51	24.86
			ISIOLO WEST	2,162	2,100	4,262	1,004	396.86	10.74
	CHERAB	KORBESA	BULTO BONSA	351	402	753	173	299.13	2.52
			KORBESA	871	939	1,810	361	247.40	7.32
			MATA ARBA	237	266	503	108	121.97	4.12
		MALKAGALLA	MALKAGALLA	1,105	1,071	2,176	443	2,812.81	0.77
		YAMICHA	DUMA	236	121	357	80	1,652.59	0.22
			URURA	587	470	1,057	243	1,621.58	0.65
			YAMICHA	807	764	1,571	307	1,552.10	1.01
	EAST	EAST	KIWANJANI	1,459	1,537	2,996	651	4.41	680.03
			WABERA	7,305	7,130	14,435	3,045	8.57	1,683.76
		NGARE MARA	GOTU	1,040	887	1,927	491	778.93	2.47
			NGARE MARA	2,071	1,522	3,593	759	184.96	19.43
	MERTI	BISAN BILIQU	BISAN BILIQU	663	686	1,349	285	636.46	2.12
			KOM	276	252	528	127	2,567.21	0.21
		BULESA	BULESA	851	888	1,739	384	316.65	5.49
			GODA	628	537	1,165	233	240.92	4.84
		MERTI	MERTI NORTH	2,375	2,448	4,823	998	312.92	15.41
			MERTI SOUTH	1,221	1,289	2,510	552	241.66	10.39
	OLDONYIRO	KIPSING	KIPSING	1,666	1,741	3,407	745	204.62	16.65
			LENGURUMA	1,031	1,122	2,153	473	335.74	6.41
		OLDONYIRO	LONKOPITO	1,406	1,450	2,856	587	365.81	7.81
			OLDONYIRO	3,444	3,528	6,972	1,348	255.06	27.34
Total				50,380	49,796	100,176	22,463	–	–

Source: Kenya National Bureau of Statistic, Census 2009

According to Isiolo Sub Catchment Management Plan, the population in Isiolo River Basin is approximately 98,000 persons. The breakdown by locations within the river basin is as per Figure 1.2.4, and the population by sub-catchment is about 18,000 persons in upstream, about 20,000 persons in middle/downstream and 60,000 persons in the downtown of Isiolo Town. This shows a trend of people to gather in the middle river basin where the water resource is abundant, and it also shows Isiolo, the largest town in the river basin is the center of economy.



Source : Prepared by JICA Project Team based on the population data of Isiolo SCMP

Figure 1.2.4 Population of Isiolo River Basin

1.2.3 Industry

Agriculture is the most active industry in Isiolo River Basin. Production of honey and nursery tree is also done. Livestock farming for beef cattle and fur is carried out in the upstream basin. In addition, production of charcoal and running of hotel business are also done. The most popular agricultural crops are onion, potato, cabbage, banana, etc. Spring in the middle stream is utilized as irrigation water for agriculture.

1.3 DEVELOPMENT PLAN

1.3.1 Vision 2030

Downtown of isiolo is at present developed economically as the center of development in the northern part of Kenya. According to "Vision 2030" which is the development program of Kenyan government for 22 years from 2008 to 2030, major development programs are as follows.

(1) Development of Logistics Corridor

In Kenya, logistics corridor is planned to be developed connecting with South Sudan and Ethiopia via Isiolo. This project is passing through Garissa, Isiolo, Maralal, Lodwar and Lokichoggio from Lamu Port, and reaching to Ethiopia and South Sudan. Isiolo is scheduled to be developed as a strategic stop of transportation. This corridor will be composed of new road network, railway network, oil pipeline, Lamu Airport, port and harbor at Lamu, and it will connect the coastal area with the resort town to be developed in Isiolo.

Figure 1.3.1 Main Spot of Development Plan of Logistics Corridor

(2) Development of Resort Town

Isiolo is planned to be developed as resort town for a tourists to Mt. Kenya and Meru National Park. Further, Isiolo is expected to be a foothold of economical activitiesy in the northern part of the country.

(3) National water supply and sanitation

Mzima pipeline is planned to be expanded for the purpose of meeting to supply water demand in the proposed development sites of resort in the coastal town, Isiolo, etc.

1.3.2 Isiolo District Development Plan (2008-2012)

According to "Isiolo District Development Plan" which is the development plan of Isiolo District, there are the following programs.

(1) Water Harvesting

The project is to improve an access to the water for community. Community will present the site to be developed, and the community itself will construct the reservoir using the fund raised after appraisal.

(2) Opening of Northern Tourlist Circuit

Garbatua Road will be connected with Kuramawe district through development of the road, and the access to Iisiolo will be strengthened.

1.3.3 Imenti North District Development Plan (2008-2012)

According to "Imenti North District Development Plan" covering in detail the development plan of Imenti North District and Meru Central District in the upstream/middle stream of the Isiolo River Basin, there are the following programs.

(1) Mt. Kenya east pilot project

To improve mainly vegetation along the river, forestation project of nursery tree is planned. 100,000 pieces of nursery tree are planted in rainy season every year.

(2) Sirmon water project

7km of waterway pipe is planned to be constructed for supply of clean water to 2,000 households.

1.3.4 Ewaso Ngi'ro North Catchment Area Catchment Management Strategy (June 2009)

According to "Ewaso Ngi'ro North Catchment Area Catchment Management Strategy" which is the management plan of WRMA in Ewaso Ngi'ro North Catchment, the concept on storage of surface water and underground storage is presented in the Chapter of Water Storage Options in ENNCA as follows.

Table 1.3.1 Water Storage Options in ENNCA

Scale	Surface Storage Options	Ground Storage Options
Household and on-Farm	Roof catchment tanks, (< 50 m^3) Farm pond (< 500 m^3)	RWH Underground tanks (<500 m^3)
Farm/Community/WRUA	Runoff harvesting to pan or dam (< 50,000 m^3), typically offline (out-stream)	Sand dams or sub-surface dams
Sub-catchment	Small – medium sized dam (< 500,000 m^3), on-course or off-course	Artificial groundwater recharge
Catchment (State Schemes)	Large multi-purpose dam, (>500,000 m^3) typically in- stream	

2. ANALYSIS OF FLOOD CHARACTERISTICS

2.1 OVERALL CONDITION ON FLOODS IN THE ISIOLO RIVER BASIN

2.1.1 Records of Flood Damages

Following table presents that floods occur in the Isiolo River Basin year by year, recently. Floods have major adverse effects on agricultural products, livestock, houses, infrastructures such as road, electric cable and etc., lives and properties, bountiful surface soil runoff, sediment deposition in farming land, stockpiled food, pollution of water resources, health problems such as waterborne diseases, increasing of conflicts on water resources, poor nutrition which is caused by damage of stockpiled food and etc.

Table 2.1.1 Recent of Flood Damages

Month/ Year	Place	Outline of flood damage
Sep. 25, 2012	Urban area of Isiolo Town, Kiwanjani Sublocation	The flood is caused by a 20-minute heavy rain with high wind. Flash flood occurred and inundated to a depth of below-knee at urban area of Isiolo town and it is detrimental to public transportation and economic activities. However, its adverse effect is limited about one hour. Residential district of Kiwanjani Sublocation where is located near the airport and high altitude, most of damages were that a number of houses were collapsed due to high wind.
2011	Urban area of Isiolo Town	Long-term dysfunctional farming land due to inundation, occlusion of culverts, destroyed IWACO's water intake facility and washing away a number of houses
Oct. 2006	Kulamawe, Bullapesa, Bulla Arera, Juakali, Kambiodha, Kambibulle, Kampigabra and kabiwacho villages	Embankment of the Isiolo river was broken and number of affected people is approximately 500, number of death: 8. People who were affected by flood were forced to evacuate and camp out at the Isiolo Catholic Church.
2005		Number of deaths: 10

Source: Data is created by JICA Project Team based on interview with WRMA and Isiolo WRUA

2.1.2 Flood Conditin Inquiring From Relevant Communities

JICA Project team conducted interviews at the local communities in the Isiolo River Basin which were affected by flood damage. Figure 2.1.1 presents a location map of local communities where interview were conducted. Table 2.1.2 presents results of interviews on flood damages at the local communities.

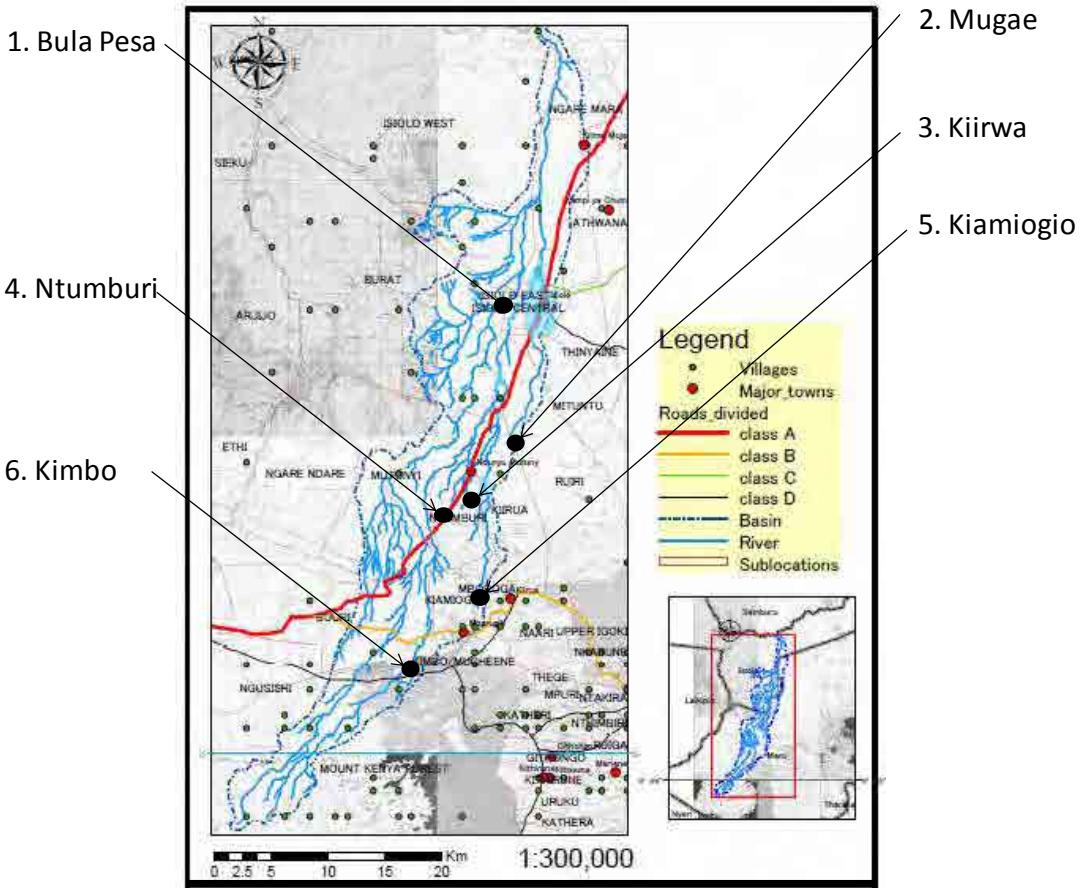


Figure 2.1.1 Map of IsioloRiver Basin and Location of Communities

Table 2.1.2 Communities in Isiolo River Basin and Each Flood Situation

No	Community	Population	Flood depth	Flood duration	Frequency
1	Bula Pesa	22, 722	Between 50 cm to 1.5 m	2-3 Hours	Erratic, but mostly expected between Oct.- Dec. every year
2	Mugae	1,217	Approximately 50 cm	2-3 Hours	Erratic
3	Kiirwa	4,196	Between 50 cm to 1.5 m	2-3 Hours	Erratic
4	Ntumburi	2,847	Between 50 cm to 1.5 m	2-3 Hours	Erratic
5	Kiamiogio	3,181	Approximately 50 cm	2-3 Hours	Erratic
6	Kimbo	4,149	Approximately 50 cm	2-3 Hours	Erratic

The damage situations and flood type in each community by project team's inquiring survey on the communities are shown below.

(1) Bula Pesa

- Human settlements are affected when Merire river over flows ..... (Inundation in urban area)
- Houses are knocked down by the debris carried by the flooding river .... (Outflow from rivers)
- Roads are badly eroded making access to social amenities like schools and hospitals inaccessible ..... (Inundation in urban area)
- In some cases there is loss of human life as a result of flooding of Merire river ..... (Inundation in urban area)

(2) Mugae

- Debris flow damaging river structures like water intakes, and bridges ..... (Debris flow)
- There is erosion carrying away arable top soil leaving the farmlands infertile hence decreased agricultural production ..... (Bank erosion)

(3) Kiirwa

- Sediments overflow into farm lands burying crops ..... (Debris flow)
- Access roads are eroded by flood water making accessibility to market for agricultural products difficult ..... (Bank erosion)

(4) Ntumburi

- River bank erosion reducing the size of farmlands, hence less agricultural produce ..... (Bank erosion)

-Crops are washed away by flood waters ..... (Outflow from rivers)

-Makeshift bridges are washed away when the river overflows making accessibility to social amenities difficult. ..... (Outflow from rivers)

(5) Kiamiogio

-Sediments are deposited on farmlands submerging the crops ..... (Debris flow)

-Makeshift bridges are washed away makinh accessibility to the market for farm products difficult..... (Outflow from rivers)

(6) Kimbo

- Erosion on farmlands carry away top fertile soil leaving farmlands infertile ..... (Bank erosion)
- Debris flow blocks access roads to market for farm products ..... (Debris flow)

2.2 FOOD CHARACTERISTICS AND SITUATIONI OF DAMAGES IN THE ISOLO RIVER BASIN

2.2.1 Concept of Flood Characteristics and SituationI of Damages in the Isiolo River Basin

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

Mark	Flood Type	Area
A	Inundation in urban area	Isiolo Town
B	Inundation which is caused by overflow and dyke break	Midstream and tributary stream
C	Debris flow	Upstream
D	Bank erosion	Entire basin

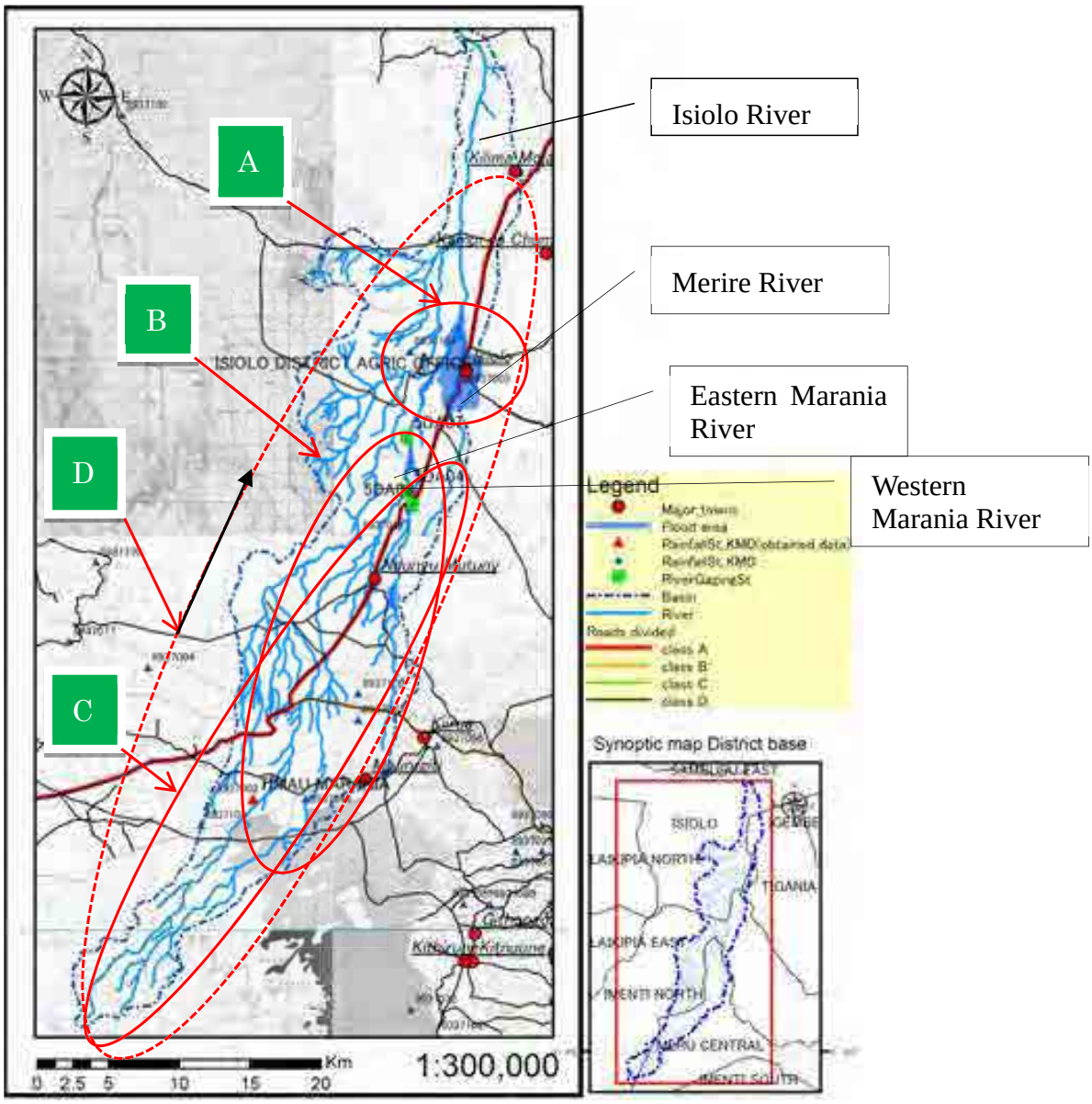
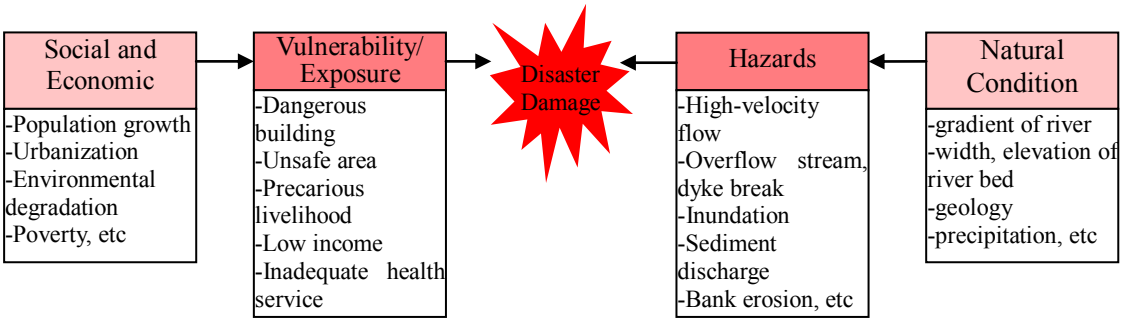


Figure 2.2.1 Records of Flood Damage and Classification of Flood Characteristics in the Lumi River Basin

Flood damage has a close relationship with between natural condition and social and economic condition in a local area. Natural condition defines types of Hazards in a river basin and social and 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 chaper (Natural condition and Socio-economic condition) about each flood characteristics of A), B), C) and D) as above-mentioned.

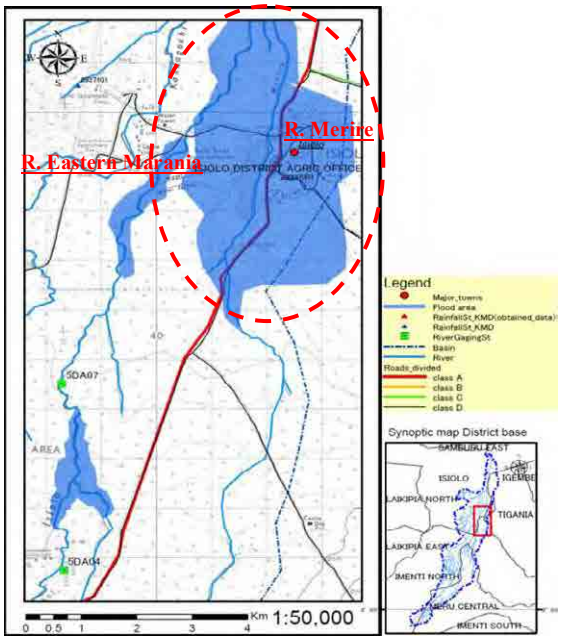


Source: Revised by JICA Project Team, based on material of "Community and Development assistant of Disaster Prevention, Mr. Mikio Ishiwatari(1997)

Figure 2.2.2 Mechanism of Flood Damage

2.2.2 Inundation in Urban Area of Isiolo Town (A)

Inundation near the Isiolo town area (Flood Characteristics (A)) is described in detail from the aspects of conditions on natural and socio-economic.



(1) Flood Characteristics from Natural Conditions

Natural Conditions in the Isiolo River Basin that are described in the last chapter and Hazards in this area are shown as Table 2.2.1.

Table 2.2.1 Natural Conditions and Hazards in urban area of Isiolo town

Natural Conditions	Hazards
Approximately, geographical gradient is 1/50; gradient of river bed is 1/100	High velocity of surface and inundated water
Clayey soil	Since rain water doesn't seep underground, surface run-off occurs

- The Merire River flows in urban area and the Eastern Marania and Western Marania River flow in the western part of the town.
- As geography gradient is 1/50 and river bed gradient is 1/100, therefore, flood arrival time is short and surface and inundated water have high velocity.
- Rain water doesn't seep underground and surface run-off occurs in this basin, because surface soil is composed chiefly of clay.
- JICA Project team infers that urban area and its surroundings have high sediment runoff and high ratio of runoff. This area is located in semi-arid zone and its vegetation is shrub zone. Therefore interception of rainfall and water retention function can't be very effective.

Condition of inundation in the urban area of Isiolo town

Condition of inundation in the urban area of Isiolo town

- There is only data of daily precipitation and daily maximum rainfall of Isiolo DAO in the Isiolo town is 97mm. JICA Project team infers that characteristics of precipitation in this area are high and intensive rainfall within a few hours. Result of calculated 10-year rainfall intensity during flood arrival using rational method is 26.7mm per hour at the upstream point (h) of Isiolo town. Considering this factor, we think result of calculation is appropriate.
- 10-year probable peak flood runoff in the Merire River is calculated 80m3/s and 5-year runoff is 70m^3/s. Current capacity of flow is not enough to floods which might be occurred only once in few years and it is natural phenomenon that the Merrire River overflows.

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

Relationship between conditions on Socio-economic and Vulnerability/ Exposure to Natural disasters in urban area of Isiolo town is shown in below.

Table 2.2.2 Conditions on Socio-economic and Vulnerability/ Exposure urban area of Isiolo

Socio-economic conditions	Vulnerability/ Exposure
Highly-populated residential area, (60% of population in the river basin, population density; 3,000 per square kilometer)	A large number of refugees who might be affected by flood
There are 45% of houses which stand all in this river basin	A large number of houses that might to be affected by flood
Commercial capital in the region	A temporary halt in economic activities due to inundation
Key junction of transportation network	A temporary halt and/or stagnation in logistics due to inundation
Resort area and facilities for tourists are placed	Stoppage and halt of service for tourists, due to inundation
Expansion of the airport	An increased risk of flood damage

- Population in the Isiolo town area is approximately 60,000. Even urban area inundates in a short time, flood damage gives a great impact to socio-economic in this region.
- Now infrastructure development projects such as expansion of the airport and construction of roads are in progress according to the higher regional master plan. In conjunction with these developments, housing land development is also promoting. However, impacts to flood management and municipal effluent are unconsidered in these development plans.

(3) Flood Damage Mechanism

Regarding to inundation in the urban area, three contributing factors are identified as described below;

1) Lack of flow capacity in the Merire River (River Water)

Since the Merire River doesn't have enough width and cross-sectional area, capacity of flow is lacking. Moreover, houses are building on the river front illegally; it is difficult to broaden rivers.

Merire River is; approximately width 5m, altitude 0.5m. Capaciy of flow is 4 m^3/s, when stream gradiant is 1/100.

The Merire River runs in the Isiolo town

Main builder of the river is sand. Height is approximately 0.5~1m. Sediment accumulates in the culvert. Sediment and illegal dump are some of causes of culvert blocking.

River bank erosing and soil runoff occur in the upper stream of the Merire River.

Sedimentation that is generated from those area and flat landscape are causing aggradation of river bed level. In addition to sedimentation, accumulation of illegal dumping of garbage and occlusion of culverts by garbage are also leading to lack of flow capacity.

Ilegal Constructions near Merire River

Downstream of Merire River

2) Poor storm drainage system in whole Isiolo town (Inland water)

Drainage system such as drainage channels, culverts, side ditches of road and etc. have not been developed to function as a network in Isiolo town. Therefore, drainage capacity in downtown is reduced and when rain in torrents in the urban area, inundation is occurred to stay on the surface of the road without being drained away. The depth is up to 50cm like around under knee deep of adult and there is the place that is around 2.5% of maximum inclines geographically and flood has a rapid current in the small alley of the urban area and it is dangerous for the disaster victims such as children, women and the aged and the report that someone comes a gutzer is heard. In addition, by the short rain like 2-3 hours, commercial district of the city central is flooded depending on time of the flood outbreak, and it is said that influence on this local economy is extremely damaged to be suspended all economic activity.

Situation of inundation in the town center where shops stand side by side

Situation of inundated house

Summarizing the above, it is found that the flood in Isiolo city exist both inland and outside water damage. Inland flood with poor drainage of similar local city is to be heard well in Kenya, in discussion with MWI and WRMA, it is found that the need of the correspondence is recognized.

3) Changing water course due to construction of airport and roads

Recent years, due to construction of airport and road in the mountainside of Isiolo town, water course changed by influences of these new facilities.In the past rain water ran from southern part of urban area didn't flow in a direction to the town area,it traveled down to the north in the eastern slope of the town. After the construction of those facilities, rain water from the south is blocked by embankment for the airport and roads and it is leading to the town area.

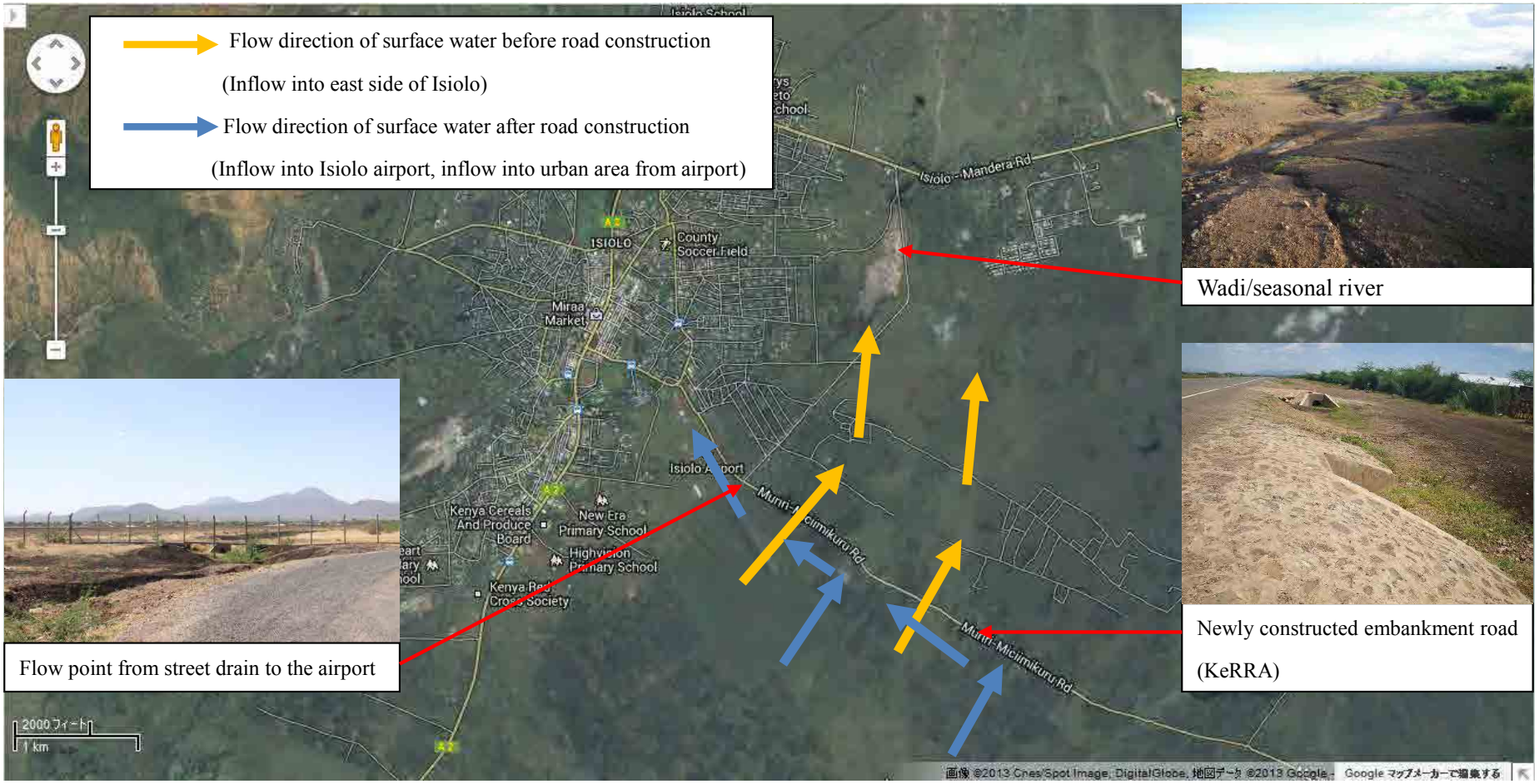
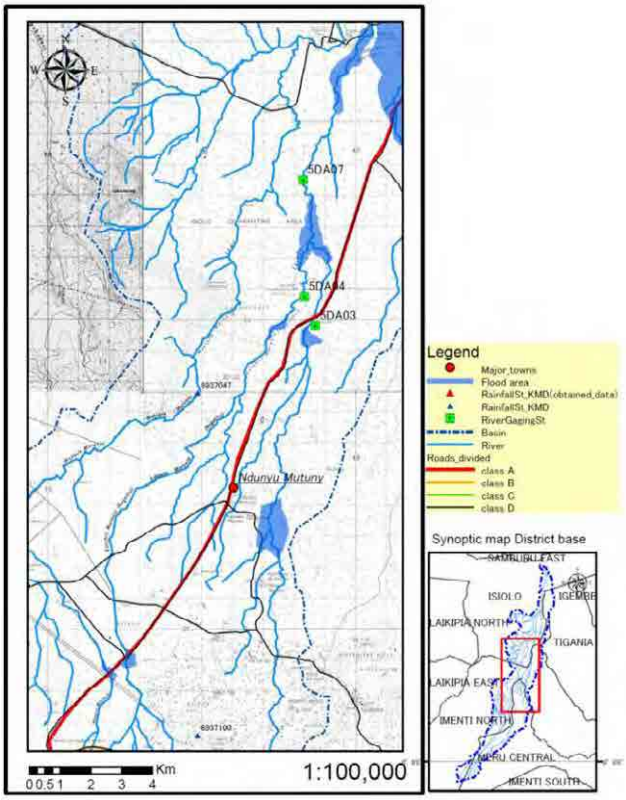


Figure 2.2.3 Direction of Rain Water from Airport Area

2.2.3 Inundation which is caused by overflow and dyke break in the middle river basin (B)

Flood Characteristics (B) in the middle of Isiolo River Basin is caused by overflow and dyke break. And it is described in detail from the aspects of natural, socio-economic conditions.



(1) Flood Characteristics from Natural Conditions

Natural Conditions in the Isiolo River Basin that are described in the Chapter-1 and Hazards in this area are shown as below table.

Table 2.2.3 Natural Conditions and Hazards in the Middle Isiolo River Basin

Natural Conditions	Hazards
Approximately, geographical gradient is 1/20; gradient of river bed is 1/50 – 1/30	High water velocity, unstable water course
Sandy soil	Vulnerable to erode

- Major rivers in the middle river basin are the Eastern Marania River and Western Marania River. In addition to these major water courses, there are many small tributaries and most of them are dry rivers normally.
- Geographical gradient is 1/20 and gradient of river bed is 1/50 - 1/30. The Isiolo River runs through the alluvial fan in the middle of its basin. The river has a sharp inclination; hence JICA Project team infers that the velocity flow is high and water course is unstable.
- Due to spreading clayey soil on surface layer in the upstream near Mt. Kenya, rain water doesn't seep underground and it accumulates in the middle river basin. Therefore JICA project team presumes that the river has much run off when floods occur.
- Calculated flood flow volume at the Eastern Marania River (g) is 260m^3/s (10-year flood) and 240m^3/s (5-year flood). Calculated flood flow volume is 250m^3/s (10-year flood) and 230m3/s (5-year flood).

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

Relationship between conditions on Socio-economic and Vulnerability/ Exposure to Natural disasters in the middle Isiolo River Basin is shown in below.

Table 2.2.4 Conditions on Socio-economic and Vulnerability/ Exposure in the middle of Isiolo River Basin

Socio-economic conditions	Vulnerability/ Exposure
Houses are dotted around dry rivers	When flood water comes through dry rivers, it leads to damage of houses along the rivers.
Plantation Farming land and scrub forest	Agricultural damages are occurred. Lose/ threaten former's livelihood
Highway and trunk route	A temporary halt and/or stagnation in logistics due to inundation
Development of Tourist resources	Stoppage and halt of service for tourists, due to inundation
Socio-economic conditions	Vulnerability/ Exposure

- Vegetation and land use in the middle of Isiolio River Basin is mainly farming land and scrub forest. When flood occurs, there is heavy agricultural damage in this area.
- Along with extension of urban area of Isiolo town, houses are built near water course of dry rivers. Once floods occur in dry rivers, flood flow hits and washes away those houses.

House was destroyed by flood

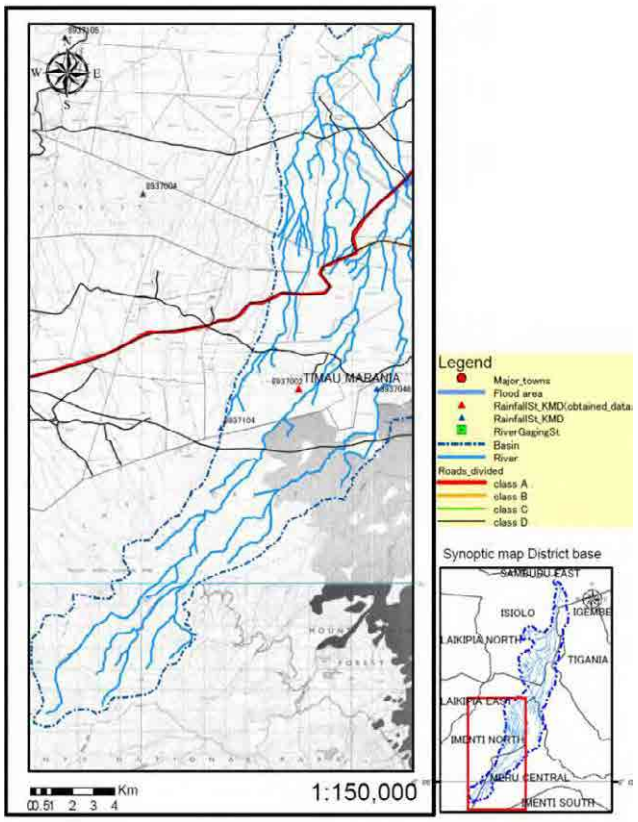
Houses were destroyed by flood

(3) Mechanism of the food damage with the overflow from the river in the middle basin

River channel is not clear because most of small branches flowing into Isiolo River midstream is dried up and ordinary flow is shallow. Flow at the time of flood is rapid and flow channel is unstable because of steep slope such as 5% (1/20) of topography inclines and 1/50-1/30 of river inclines. On the other hand, with the expansion of Isiolo urban area, house is built in the place that is dried up area and the neighborhood because river channel is not clear originally. As a result, flood streams overflow from the river channel at the time of a flood or duct changes, and damage hitting newly built house directly is occurred.

2.2.4 Debris Flow in the Upstream (C)

Flood Characteristics (C) in the upstream of Isiolo River Basin is caused by debris flow. And it is described in detail from the aspects of natural, social and economic conditions.



(1) Flood Characteristics from Natural Conditions

Natural Conditions in the Isiolo River Basin that are described in the Chapter-1 and Hazards in this area are shown as following table.

Table 2.2.5 Natural Conditions and Hazards in the Upstream of Isiolo River Basin

Natural Conditions	Hazards
Approximately, gradient of river bed is 1/10	High water velocity
Clayey soil on surface layer, volcanic sediment is including	brittle geology

- Major rivers in the upstream area are the Eastern Marania River and Western Marania River.
- Gradient of river bed is 1/10 approximately. The river has an extremely sharp inclination; hence JICA Project team infers that the flood velocity flow is very high.
- Surface layer of this region is identified as clay, however there is volcanic sediment. Thus, geologically, surface soil layer is likely to be highly effective erosional agents.

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

Relationship between conditions on Socio-economic and Vulnerability/ Exposure to Natural disasters in the upstream of Isiolo River Basin is shown in below.

Table 2.2.6 Conditions on Socio-economic and Vulnerability/ Exposure in the Upstream of Isiolo River Basin

Socio-economic conditions	Vulnerability/ Exposure
Villages are not concentrated in the same area. (Number of houses and population is small.)	Number of houses and population is small. Affected people and houses are few.
The area is straddled more than one local governments	Coordination between administrations of local governments is difficult.
Land use is limited to farming	Heavy damages suffer by agricultural products due to debris flood
Plantation proceeds a part of area	Heavy damages suffer by agricultural products due to debris flood. Lose/ threaten former's livelihood
Development of sightseeing resources	Delay of development suspension of service and due to debris (However, affected area is far from resort area. Influence is small.)

- Vegetation and land use in the upstream of Isiolio River Basin is mainly bare ground, plantation and farming. When debris flood occurs, there is heavy agricultural damage in this area.
- Although damages are caused by debris flood in this area, not many people and houses are affected due to a thinly populated.

Status of water course after debris flood

Damages by not only floods but also river bank erosion and sediment runoff appear prominently in the upstream area. Farming land erosion is forced to reduce amount of agricultural crop and sediment runoff by bank erosion becomes a problem in lower area.

(3) Mechanism of the food damage by debris flow in the upper basin

In the upper basin the river bed slope is very steep as 1/10, then the flow velocity is extremely high. Although the soil is easy to break because mainly it consists of volcanic sediment, then debris flow has occurred frequently. There are agricultural damages as principal flood damages because out flowed sediments cover farmlands. However, the actual situations of debris flow damages are not comprehend in detail because of low population density.

2.2.5 Bank Erosion in the Entire Basin (D)

Flood Characteristics (D) in the entire of Isiolo River Basin is caused by bank erosion. And it is described in detail from the aspects of natural, socio-economic conditions.

(1) Flood Characteristics from Natural Conditions

Natural Conditions in the Isiolo River Basin that are described in the Chapter-1 and Hazards in the entire river area are shown as following.

Table 2.2.7 Natural Conditions and Hazards in the Entire Isiolo River Basin

Natural Conditions	Hazards
Most of basin is arid zone and streamflow is small normally, sometimes heavy rain occurs in a local area	Aggradation of river bed by runoff soil, short river width
Loss of forest	Soil erosion, Soil runoff

· Water courses in the entire river basin have a steep slope; there are many bank erosions at curved reach of the river.

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

Relationship between conditions on Socio-economic and Vulnerability/ Exposure to Natural disasters in the entire Isiolo River Basin is shown in below.

Table 2.2.8 Conditions on Socio-economic and Vulnerability/ Exposure in the Entire Isiolo River Basin

Socio-economic conditions	Vulnerability/ Exposure
Villages are not concentrated in the same area, besides a part. (Number of houses and population is small.)	Number of houses and population is small. Affected people and houses are few.
The region has been prosperous in agriculture	Agricultural damages are occurred. Lose/ threaten former's livelihood
Highway and trunk road are developed	A temporary halt and/or stagnation in logistics due to inundation
Development of sightseeing resources	Delay of development suspension of service and due to debris (A part of the area includes resort area. Assumed damage is medium scale.)

· River banks are eroded in the upper and middle river basin, however population density is not high and houses are not concentrated. Therefore, mainly farming land and transportation infrastructure such as roads and bridges suffer damage from bank erosion.

· It is likely pointed out that residential area near Isiolo town in the lower river basin suffers damage from bank erosion. Though, landowners who have estate along the river have problems.

Bank erosion near urban area

Bank erosion at the Eastern Marania River

(3) Mechanism of the bank of river erosion damage in the whole area

Isiolo river tends that the riverbank is easy to be eroded unless river duct is steep slope and rock does outcrop in the river channel curved section. On the other hand, not only national highway A2is the highway which is demand for society, economic activities around Isiolo,but also is the most important highway to the northern part of Kenya. Therefore it is inferred that economical influence by bridge being damaged and suspended at the time of flood is extremely serious at the point of national highway A2 across the river.

2.3 ANALYSIS ON FLOOD DAMAGE AND COUNTERMEASURE

2.3.1 Analysis on Flood Damage and Countermeasure in the Urban Area of Isiolo

(1) Summary of Damage and Measures

Based on the survey done by this time, flood damage in the urban area of Isiolo was analyzed using logic tree. The following figure summarizes the specific causes of damage from the left side to the right side, i.e. kinds of damage, specific damage, condition of damage and its cause.

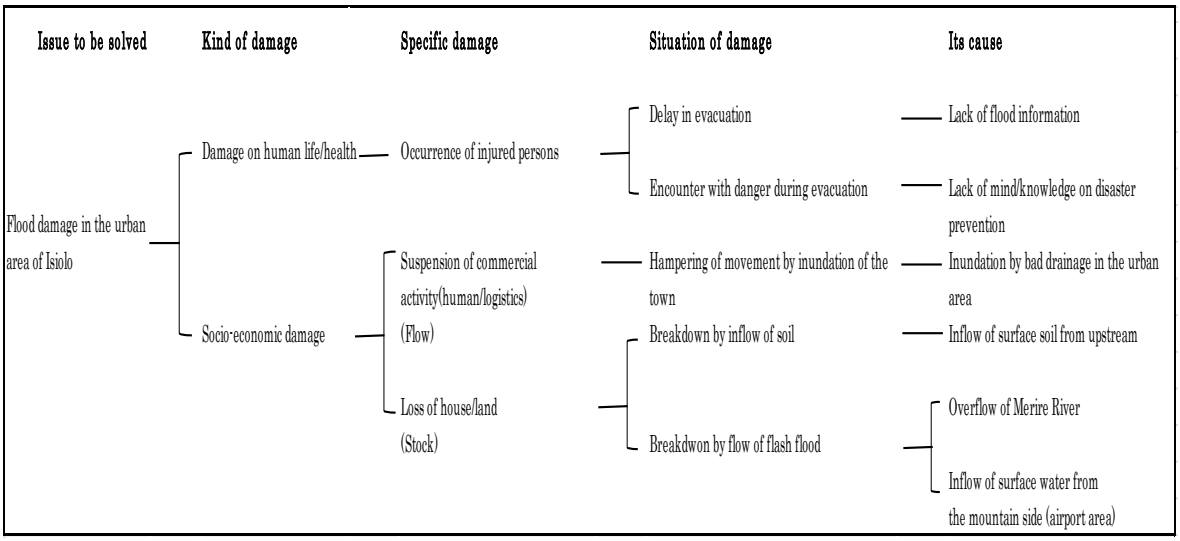


Figure 2.3.1 Analysis on Problem Tree

In the urban area of Isiolo, damage is occurred caused by a short term inundation of the whole city. Specifically, these damages are human damage derived from the lack of mind, knowledge and information on disaster prevention, damages to logistics and people's movement due to disturbance by inundation and loss of

Road after flood
Place: Isiolo Town

houses and land caused by inflow of soil and flood discharge. In addition to the lack of mind, knowledge and information on disaster prevention, the following three major causes are considered for the occurrence of large scale inundation as physical factors.

- Lack of discharge capacity of Merire River crossing the urban area
- Flow of rainfall has been changed by the airport and road newly constructed in the east side of the urban area and the flood hits the urban area directly, and
- Vulnerable drainage system in the urban area of Isiolo.

Inundated road
in the urban area of Isiolo by flood
Place: Isiolo Town

To derive the countermeasures, the 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.

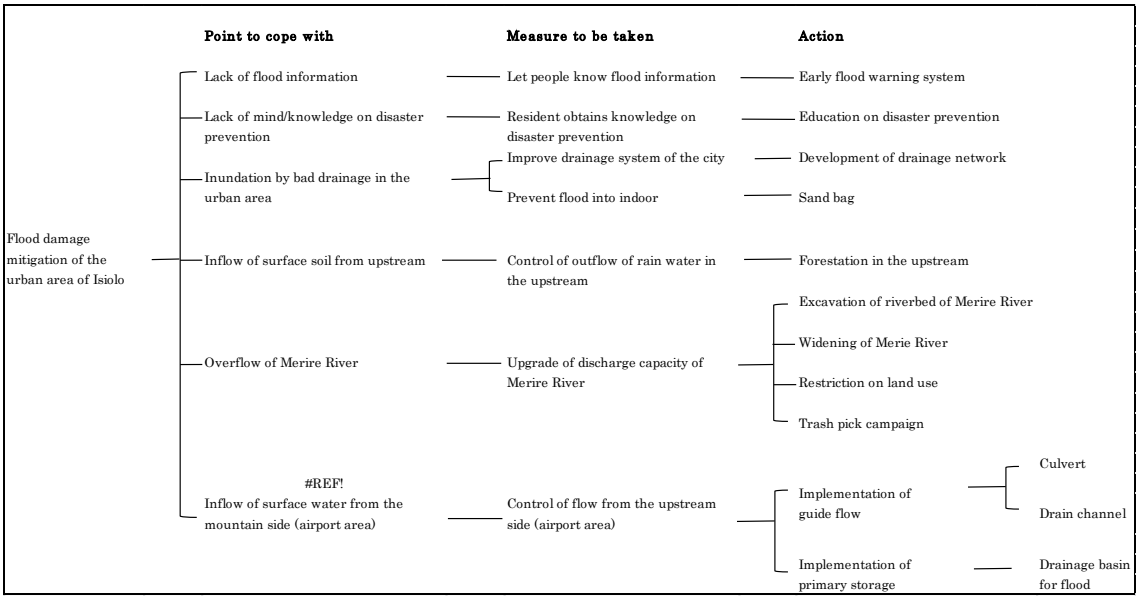


Figure 2.3.2 Analysis on Objective Tree

In Isiolo River Basin, even if there is a heavy rain in the upstream by the effect of Mt. Kenya, there is a case having no rain in the middle and downstream. In such case, effective measure can be taken such as evacuation and activity to prevent flood by obtaining information on rainfall and

Simple Hyetomete
Place: Nkando Primary School

water level in the upstream in advance. For this purpose, introduction of early flood warning system is effective. In the community too, rainfall in the upstream can be measured by simple hyetometer and the information transmitted to the downstream.

Flooded urban area due to vulnerable drainage system
Place: Isiolo Town

As the mind on disaster prevention of the residents is very low, dangerous situations are happened such as the people suffered from injury by crossing the road overflown with the flooded discharge and/or washed away by crossing the bridge submerged under water. To avoid such a situation, it is considered effective to educate the residents on disaster prevention about how much the floods are dangerous.

Shop taking measure by sand bag
Place: Isiolo Town

Vulnerable drainage system in the urban area is one of the reasons why the flood damage spreads. Since the drainage infrastructure is not properly functioned or not well developed, inundation is occurred in the urban area with a little rainfall. Or the road is cut into pieces and the commercial activity is suspended by the inflow of water into the shops. As countermeasures, it is considered to develop drainage network in the urban area and to protect the inflow of water by banking up sand bags in front of the shops.

Very few drain channel installed in the urban area
Place: Isiolo Town

Besides, houses and buildings are damaged and lost by overflowing of Merire River. Countermeasure to prevent overflow is to improve the discharge capacity of Merire River by way of excavation and/or widening of the river course. In addition, the following countermeasures are considered.
Restriction on land use which sets a limit to reside in a place nearby the river bank, and Trash picking campaign to remove garbage which blocks the flow.

Culvert installed near the airport
Place: Isiolo Town

Further, inundation in the urban area is becoming serious as the outflow route of flood has been altered by the impact of construction of the new road and expansion of the airport in the eastern slope of the urban area. To improve such a situation, countermeasures are considered to restore the flood outflow route to the original by developing

drainage channel and culvert, and to limit the outflow by flood basin.

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

Illegal dumping to Merire River
Place: Isiolo Town

Table 2.3.1 Countermeasure Method to be considered in the Rrban Area of Isiolo

Serial No.	Countermeasure Method to be considered	Remarks
I-T1	Early flood warning system	Collect and analyze information on flood such as rainfall and water level in the upstream of Isiolo River and transmit it to the urban area of Isiolo.
I-T2	Education on disaster prevention	Educate the residents on how to reduce by themselves the present flood damage
I-T3	Development of draining network	Development in the whole urban area of Isiolo
I-T4	Sand bag	Guidance on sand bag production and provision of materials
I-T5	Forestation activity	Activity to promote plantation and forestation
I-T6	Excavation of river course of Merire River	Excavation of deposited soil
I-T7	Widening of Merire River	Widening of river width
I-T8	Restriction on land use	Legislation on land use restriction
I-T9	Trash picker campaign	Carrying out of trash picker campaign near Merire River
I-T10	Drainage canal	Development of drainage canal in the airport area
I-T11	Culvert	Development of culvert in the airport area
I-T12	Flood basin	Development of flood basin in the airport area

2.3.2 Analysis on Flood Damage and Countermeasure in the Outskirt excluding the Urban Area (Mainly in the upstream of urban area of Isiolo)

(1) Summary of Damage and Measures

Based on the result of field survey by this time, analysis was carried out, as the same as the urban area of Isiolo, on the damage at the outskirt area excluding the urban area, mainly in the upstream of the urban area using logic tree.

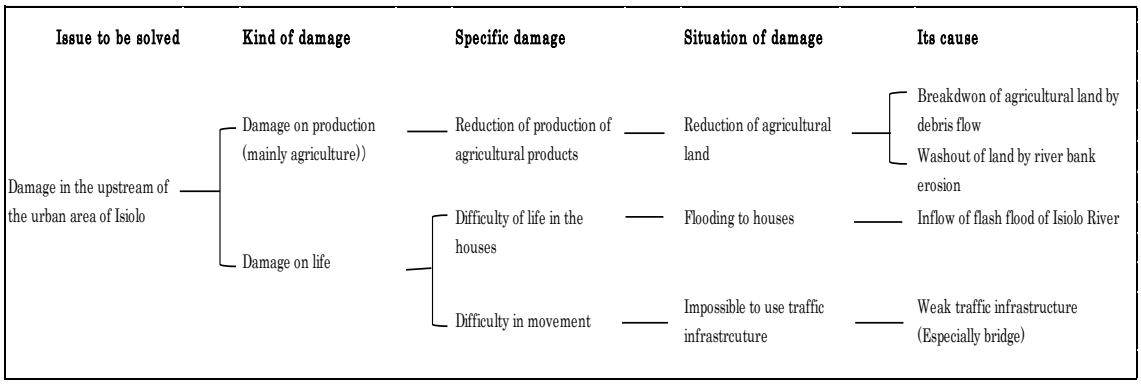


Figure 2.3.3 Analysis on Problem Tree

Damages in the outskirt area excluding the urban area are mainly caused by, as mentioned in last chapter, displacement of river course in the middle stream, occurrence of debris flow, erosions of river bank and soil. There are a lot of agricultural lands in the outskirt of Isiolo, therefore, the damage to agriculture is remarkable and destruction of agricultural land by debris flow and washout of land by river bank erosion are occurred. In addition, infrastructures such as houses and bridges are also damaged by inundation, and it gives a great impact to the living of the residents

Inundated up to elbow of theman
Place:Middle stream of Isiolo River

Progressed river bank erosion
in Eastern Marania River
Place: Upstream of Isiolo River

Bridge in the outskirts of Isiolo

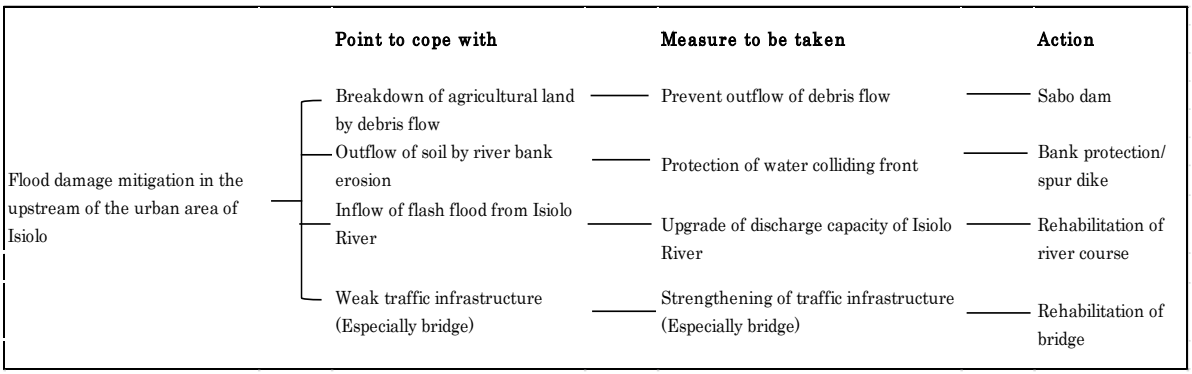


Figure 2.3.4 Analysis on Objective Tree

Production of agricultural crops is affected by the destruction of agricultural land by debris flow in this area. To prevent the outflow of debris flow, construction of sabo dam is considered effective. In addition, as a measure for river bank erosion, bank protection and spur dike are also effective to prevent outflow of debris.

Regarding the damage giving an impact to the living of residents by destruction of houses and infrastructures, there is a measure to prevent overflow by improvement of river course. If possible, upgrade or improvement of bridge is another option.
Countermeasures to be considered are summarized below

Check Dam (Example of Nzoia River)

Bank Protection (Example of Nzoia River)

Table 2.3.2 Countermeasure Method to be considered in the Outskirt Area excluding the Rrban Area
(Mainly in the Upstream of the urban area of Isiolo)

Serial No.	Countermeasure Method to be considered	Remarks
I-U1	Sabo Dam	Construction of sabo dam at Isiolo River
I-U2	Bank protection and spur dike	Construction at Isiolo River
I-U3	Improvement of river course	Improvement of river course of Isiolo River
I-U4	Improvement of bridge	Improvement of bridge of Isiolo River

2.4 SELECTION OF FLOOD DAMAGE TO BE PREVENT PREFERENTIALLY

2.4.1 The Result of Workshop For Flood Damage Analysis by Community

In Isiolo river basin, the workshop was held to analyze the problems in Isiolo sub catchment with WRUA members, WRMA-SRO staff and JICA project team members on Nov. 7th, 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	Rainfall around the Mt. Kenya slope	Flash flood from immediate rising in "wadi"
	Sediment flow around upstream	
	Lack of capacity for drainage	City area inundation caused by poor drainage
	Developed condition of poundage in the airport	

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	Sediment erosion	-Soil outflow from farmland -Loss of agricultural products -Sediment outflow	-Lack of farmlands -Inefficiency of harvest -Lack of lands -Obstruction of culverts
②	Damage of infrastructures	-Transmission wire -Roads -Bridges -Water intakes -Culverts	- Black out - Beyond reach of goods to markets - Unable to go to hospital or school - Insufficient water, conflicts over water, drought - Water spilling
③	Water pollution	-An epidemic of diseases -Growing worse of sanitation	- Epidemic of Cholera, Dysentery and Typhoid fever
④	Damage in daily life or livelihood	-Trash scattering -Overflowing from toilet -Destruction of houses	- Obstruction of culverts, water leaking - Sanitary conditions - Moving enforcement
⑤	Human life	-Lost of Human life by sweeping away -Drowned livestock	

2.4.2 Selection of Flood Damage to be Prioritized

As a description in previous chapter, the flood damages along Isiolo river is principally classified 4 types such as A) Inundation in urban area of Isiolo town , B) Inundation which is caused by overflow and dyke break, C) Debris flow in the upstream and D) Bank erosion in the entire basin .

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. Inundation in urban area of Isiolo town	**High**	**High**	**High**	Low	**High**	Mid	Extremely High
B. Inundation which is caused by overflow and dyke break	Low	Low	Low	Mid	Low	Low	Slightly low
C. Debris flow in the upstream	Low	Low	Low	Mid	Low	Mid	Slightly low
D. Bank erosion in the entire basin	Low	Low	Low	Mid	**High**	Mid	Partially high in transportation

In the 4 types of flood damages, it shows that the damage by "Inundation in urban area of Isiolo town" has strongest impacts socio-economically, and the impact of damage in the point concerned to transportation by dyke brake.

According to these review, in Isiolo river basin, "Inundation in urban area of Isiolo town" is selected as the damage should be corresponding extreme preferentially, and subsequently the dyke break in the point concerned to transportation.

3. SELECTING PROCESS OF PILOT PROJECTS

3.1 VIEWPOINT 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 to implement by WRUA", "Term" and "Budget" of the countermeasure. The item "Possibility to implement 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

Table3.2.1 Evaluation Study on Countermeasure against Inundation in Isiolo Town (1)

No.		I-T1			I-T2			I-T3		
Target Area		**Isiolo Town (Overflow from Merire River)**			**Isiolo Town (General)**			**Isiolo Town (Inland Water)**		
Countermeasure (Project)		**Early Warning System**			**Education on Disaster Prevention**			**Development of Drainage Network in the Whole Town**		
Outline		It is a system to transmit flood information based on hydrological data from upstream to downstream. People can prepare for the flood.			It is educational activity to give information to reduce damage from flood and raise awareness of disaster prevention.			It is improvement project to develop drainage system in whole Isiolo town.		
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	It can be operated by WRUA and incorporated into the SCMP.	A	3	It cannot be implemented by WRUA level. The required scope is bigger than community.	C	1
	Project Term	It can be implemented immediately with simple system. It is necessary to store the data to manage the system.	A	3	Depend on the content, preparation can be short term and it is not difficult to implement.	A	3	More than 1 year planning is required. It cannot be implemented within term of PCDEFM Project	C	1
	Project Budget	Budget can be relatively low.	A	3	Budget can be relatively low.	A	3	A large amount of budget is required. Neither SCMP (WSTF fund) nor PCDEFM project cover	C	1
Relevance with PCDEFM Project･Total			9			9			3	
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	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	Commercial area of Isiolo concentrates in urban area of Isiolo Town. There is a lot of economic loss by flood damage. In addition, debris flow makes it more serious. The necessity of development of drainage network is urgent.	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	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	If the development proceeds in the whole Town, its effect is extensively high.	A	3
	Efficiency	This can give good effect extensively with low cost.	A	3	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	Cost is extensive, but effectiveness is higher than that. It is a fundamental countermeasure against inundation at Isiolo Town.	A	3
	Impact	Application in other area is relatively easy. Supplemental effect such as activation of communication between upstream and downstream community is considered.	A	3	Knowledge can hand down from beneficiary to their family and friends. It can expand widely.	A	3	Spreading effect is small. (The construction requires respective design and plan according to flood characteristics, climate and geological formation of the site.)	C	1
	Sustainability	If it is low cost equipment and simple communication system, maintenance is not difficult.	A	3	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	Continuous maintenance is inevitable.	C	1
Evaluation by Five Criteria･Total			13			14			11	
Main Actor of the Project		WRUA			Ministry of Education/Isiolo County Educational Officer			Isiolo Town/Isiolo County/Ministry of Public Works /Ministry of Local Government		
Public assistance (Government Level) Mutual support (Community Level) Self-help (Personal Level)		Mutual Support			Public Assistance			Public Assistance		
Comment		It is a short term. In addition, it needs cooperation between upstream and downstream. Relevant with PCDEFM project that aims river basin management is high. Communication system can be expected a good effect with collaboration with Isiolo County. River basin level activity.			Preparation can be short term. Community based activity relates with concept of PCDEFM project.			Each stage such as planning, design, and construction need long term. Relevance with PCDEFM project is low.		

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

Table3.2.2 Evaluation Study on Countermeasure against Inundation in Isiolo Town (2)

No.		I-T4			I-T5			I-T6		
Target Area		**Isiolo Town (General)**			**Upstream of Isiolo River**			**Isiolo Town (Overflow from Merire River)**		
Countermeasure (Project)		**Sandbag**			**Forestation Activity**			**Excavation of River bed of Merire River**		
Outline		It is obstruction to flow water and sand. People put sand in bags and bank up.			It is to protect and recover vegetation in the upstream of the mountain. Its storage effect will rise.			It is a countermeasure to excavate river bed and increase flow section.		
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	It can be operated by WRUA and incorporated into the SCMP.	A	3	It is not a WRUA-scale project, but government-scale. Community cannot implement this countermeasure.	C	1
	Project Term	It can be implemented with short term preparation.	A	3	If seeding is acquired, preparation term is short. However, growth of a plant requires a long term.	B	2	More than 1 year planning is required. It cannot be implemented within term of PCDEFM Project	C	1
	Project Budget	Budget can be relatively low. Sandbag is already implemented in Isiolo Town by personal effort.	A	3	A certain amount of budged is required to purchase effective amount of seedling.	B	2	A large amount of budget is required. Neither SCMP (WSTF fund) nor PCDEFM project cover	C	1
Relevance with PCDEFM Project･Total			9			9			3	
Evaluation by Five Criteria	**Relevance**	Residents recognize its importance and effect. Some people already implements to sandbag. It is a simple measure against lack of infrastructure that is one of a main factors of inundation in Isiolo Town.	A	3	Residents are affected by soil erosion. Also, in “Imenti North District Development Plan” shows forestation at same area. It corresponds with higher plan.	B	2	Inundation by Merire River is reported frequently. Lack of cross section of river channel is a main cause, so demand is high.	A	3
	Effectiveness	A large amount of sandbag is necessary to obtain a good result from this countermeasure.	B	2	If this countermeasure implement at appropriate scale, sedimentation from upstream would reduce.	B	2	Overflow from Merire River reduces drastically. Damage reduction of overflow from Merire River can be expected.	A	3
	Efficiency	Cost is small and effectiveness is limited.	B	2	Large scale forestation is required to obtain certain effectiveness.	B	2	Both cost and effectiveness are extensive.	B	2
	Impact	It is relatively simplified measure. So application in other area is not difficult.	A	3	Application in other area is not difficult. In addition, it contributes environmental conservation.	B	2	Spreading effect is small. (The construction requires respective design and plan according to flood characteristics, climate and geological formation of the site.)	C	1
	Sustainability	Once people learn how to sandbag they can continue the activity. Maintenance is simple.	A	3	Once main actor is aware the importance, activity can continue. Maintenance is complicate. It takes time to grow up.	B	3	Continuous excavation is necessary. Additional cost is high.	C	1
Evaluation by Five Criteria･Total			13			10			10	
Main Actor of the Project		Personal			WRUA			Isiolo Town/Isiolo County /Ministry of Water and Irrigation/NWCPC		
Public assistance (Government Level) Mutual support (Community Level) Self-help (Personal Level)		Self-Help			Mutual Support			Public Assistance		
Comment		Preparation can be short term. It can be expected certain effect. Evaluation is high on all items.			Preparation can be short term. Evaluation is high on all items. It contributes to reduce global warming. However, climate in Isiolo is not suitable for forestation.			Each process such as planning, design, and construction need long term. Excavation should be continued semi-permanent. Sustainability is low. .		

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

Table3.2.3 Evaluation Study on Countermeasure against Inundation in Isiolo Town (3)

No.		I-T7			I-T8			I-T9		
Target Area		**Isiolo Town (Overflow from Merire River)**			**Whole Country (Overflow from Merire River)**			**Surrounding of Merire River (Overflow from Merire River)**		
Countermeasure (Project)		**Widening of Merire River**			**Restriction on land use**			**Trash picker Campaign**		
Outline		It is a countermeasure to widen river width and increase flow section.			It is to establish a law to prohibit people from illegal construction and illegal occupation of lands near the river.			It is an activity to remove garbage that can be obstacle to water flow.		
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 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
	Project Term	More than 1 year planning is required. It cannot be implemented within term of PCDEFM Project	C	1	More than 1 year planning is required. It cannot be implemented within term of PCDEFM Project t	C	1	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	Budget is not required.	A	3	Budget can be relatively low.	A	3
Relevance with PCDEFM Project･Total			3			5			9	
Evaluation by Five Criteria	**Relevance**	WRMA has expectation. The importance of high, because lack of cross section of river channel is the cause of overflow from Merire river. However, there are some illegal constructions around river edge. Resettlement can be occurred.	B	2	Its importance is recognized by stakeholders. Illegal constructions are existed around river edge. So, government can't implement widening of the river. And also, people who live in illegal houses can affect directly by overflow water.	B	2	A lot of residents complain about illegal dumping. This problem makes cross section smaller. In addition, illegal dumping is a cause of blockage of culvert. Its necessity is high.	A	3
	Effectiveness	Expected damage reduction is high. Overflow from Merire River can become less drastically.	A	3	This is not a direct measure against flood. Crackdown and educational activity is required at the same time.	C	1	Garbage removal from river bed and culvert can make its function back. Overflow from Merire River and from clogged culvert can reduce.	B	2
	Efficiency	Both cost and effectiveness are extensive.	B	2	Legislation is almost no cost to implement. However, direct effectiveness for disaster reduction is small.	B	2	Effectiveness is bigger than cost.	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	Legislation itself is nationwide.	A	1	Introduction is simple, so activity can spread in other area. And also, it contributes environmental conservation and improvement of sanitation.	A	3
	Sustainability	The cost can be lower than excavation. However, continuous maintenance is necessary.	C	1	Once the law is established, validity can continue. However, certain regulation and educational activity should be implemented the same time.	B	2	If people recognize the effectiveness, they became to have a keen awareness of disaster prevention. Continuity is high.	A	3
Evaluation by Five Criteria･Total			9			8			14	
Main Actor of the Project		Isiolo Town/Isiolo County/ Ministry of Water and Irrigation /NWCPC			Ministry of Lands/WRMA			WRUA		
Public assistance (Government Level) Mutual support (Community Level) Self-help (Personal Level)		Public Assistance			Public Assistance			Mutual Support		
Comment		Each process such as planning, design, and construction need long term. In addition, There are some houses around the river bank. Resettlement can occur. Coordination with stakeholder is difficult.			It is government level and takes long time to establish a law. What CDEFM project can do is to promote its importance to stakeholders.			Preparation can be short time. All evaluation items show high score. Collaboration with Isiolo Town can bring good result.		

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

Table3.2.4 Evaluation Study on Countermeasure against Inundation in Isiolo Town (4)

No.		I-T10			I-T11			I-T12		
Target Area		**Mountainside/Airport area (Inland Water)**			**Mountainside/Airport area (Inland Water)**			**Mountainside/Airport area (Inland Water)**		
Countermeasure (Project)		**Drainage canal**			**Culvert**			**Flood Basin**		
Outline		It is a structure to gather rain water and flow toward adequate and secure direction.			It is a structure to flow rain water safely.			It is to impound water rain temporary and reduce peak discharge.		
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. Essentially, it can be implemented by road maintenance authority.	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. Essentially, it can be implemented by airport authority.	C	1
	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	It is supposed that negotiation with road maintenance authority (KeRRA) needs time. It is difficult to implement within the PCDEFM project term.	C	1	It is supposed that negotiation with airport authority needs time. It is difficult to implement within the PCDEFM project term.	C	1
	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	A large amount of budget is required. Neither SCMP (WSTF fund) nor PCDEFM project cover	C	1
Relevance with PCDEFM Project･Total			5			4			3	
Evaluation by Five Criteria	**Relevance**	Flood damage in Isiolo Town is extensive. Local government has a strong request. This is a countermeasure for inland water from airport area that is one of 3 biggest factors of flood damage in Isiolo Town. Necessity is high.	A	3	Flood damage in Isiolo Town is extensive. Local government has a strong request. This is a countermeasure for inland water from airport area that is one of 3 biggest factors of flood damage in Isiolo Town. Necessity is high.	A	3	Flood damage in Isiolo Town is extensive. Local government has a strong request. This is a countermeasure for inland water from airport area that is one of 3 biggest factors of flood damage in Isiolo Town. Necessity is high.	A	3
	Effectiveness	When the problem of rain water flow from airport area is resolved, inundation in Isiolo Town reduces.	A	3	When the problem of rain water flow from airport area is resolved, inundation in Isiolo Town reduces.	A	3	When the problem of rain water flow from airport area is resolved, inundation in Isiolo Town reduces.	A	3
	Efficiency	Cost is medium scale, but drastic improvement is expected.	A	3	Both cost and effectiveness are medium scale.	B	2	Both cost and effectiveness are high.	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	Spreading effect is small. (The construction requires respective design and plan according to flood characteristics, climate and geological formation of the site.)	C	1
	Sustainability	Maintenance cost is not so expensive. Maintenance system should be established.	B	2	Maintenance cost is not so expensive. Maintenance system should be established.	B	2	Maintenance cost is not so expensive. Maintenance system should be established.	B	2
Evaluation by Five Criteria･Total			12			11			11	
Main Actor of the Project		Isiolo Town			Isiolo Town/Meru Town/KeRRA			Kenya Airport Authority/ Kenya Civil Aviation Authority		
Public assistance (Government Level) **Mutual support (Community Level)** **Self-help (Personal Level)**		Public Assistance			Public Assistance			Public Assistance		
Comment		According to relevance, request from stakeholders is considerably higher than other A ranked measures.			Candidate site is boundary between Isiolo Town and Meru Town. Coordination with stakeholders could be difficult.			Large-scale ground is necessary for Flood Basin. The most effective site is in the airport. Negotiation with airport authority is complicated and takes long time.		

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

Table3.2.5 Evaluation Study on Countermeasure against River Bank Erosion at Whole River Basin

No.		**I-U2**		
Target Area		**Upstream of Isiolo River**		
Countermeasure (Project)		**Bank Protection**		
Outline		It is a structure to prevent riverbank erosion.		
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
	Project Term	Few months are required for the implementation. There is a possibility to implement within term of PCDEM project, depend 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
Relevance with PCDEFM Project･Total			6	
Evaluation by Five Criteria	**Relevance**	Population and number of houses are few at upstream. However, damage to farmland and plantation is extensive. There is a main highway near by upstream of Isiolo River. Prevention for road erosion is necessary. Stakeholder has strong request.	A	3
	Effectiveness	It also functions as protection of highway. In addition, it contributes to reduce flood damage to physical distribution and human movement. However, the effect of one construction is limited.	B	2
	Efficiency	Both cost and effectiveness are medium scale.	B	2
	Impact	If it is simple design, application in other area is not difficult.	B	2
	Sustainability	Continuous maintenance is inevitable. However, if it is simple design, maintenance is not difficult.	B	2
Evaluation by Five Criteria･Total			11	
Main Actor of the Project		Ministry of Water and Irrigation / Ministry of Special Program /WRMA/WRUA		
Public assistance (Government Level) **Mutual support (Community Level)** **Self-help (Personal Level)**		Public Assistance		
Comment		Each process such as planning, design, and construction need long term. However, residents by the river have strong request, because damage from sedimentation from upstream also affects downstream.		

A (3 points) : Excellent / B (2 points) : 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.

(I-T3) Development of Drainage Network in the Whole Town

Relevance, effectiveness and efficiency are high scored. Continuous maintenance is necessary. However, it is one of fundamental solutions of inundation in Isiolo town. Drastic and extensive effect is expected. The possibility of implementation is considered on next section. .....Total Score on 5 criteria : 11

(I-T6) Excavation of River bed of Merire River

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

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

(I-T7) Widening of Merire River

Maintenance cost can be lower than excavation. However, widening of partial part of the river is not effective. Long-range and large scale works is necessary for extensive effect. In addition, there are some houses around the river bank. Resettlement can occur. Coordination with stakeholder is difficult.....Total Score on 5 criteria : 9

(I-T10) Drainage canal

It is a countermeasure for inland water from airport area that is one of 3 biggest factors of flood damage in urban area of Isiolo Town. Extensive improvement is expected. Person in charge of Isiolo Town recognizes its importance. The possibility of implementation is considered on next section. ..... Total Score on 5 criteria : 12

(I-T11) Culvert

It is a countermeasure for inland water from airport area that is one of 3 biggest factors of flood damage in Isiolo Town. Relevance, effectiveness and efficiency scored high. The possibility of implementation is considered on next section.

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

(I-T12) Flood Basin

It is a countermeasure for inland water from airport area that is one of 3 biggest factors of flood damage in Isiolo Town. Residents and stakeholders recognize that flood damage in urban area is increased after the airport is constructed. The possibility of implementation is considered on next section. ..... Total Score on 5 criteria : 11

(I-U2) Bank Protection

Request from residents of the river basin is relatively high. Even if it is small scale bank protection, certain effect is assumed. In addition, maintenance is more simple than other structural measures. All items of 5 criteria is more than B rank. The possibility of implementation is considered on next section. ..... Total Score on 5 criteria : 11

Table 3.3.1 shows total score of all countermeasures from section 3.2. 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	I-T10	Drainage Canal / Airport Area	12
	I-T3	Development of Drainage Network / Isiolo Town	11
	I-T11	Culvert / Airport Area	11
	I-T12	Flood Basin / Airport Area	11
	I-U2	Bank Protection / Upstream	11
	I-T6	Excavation of River bed / Merire River	10
	I-T7	Widening / Merire River	9
Non-structural Measure	I-T2	Education on Disaster Prevention / Isiolo Town	14
	I-T9	Trash picker Campaign / Merire River	14
	I-T1	Early Warning System / Isiolo Town	13
	I-T4	Sandbag / Isiolo Town	13
	I-T5	Forestation Activity	10
	I-T8	Restriction on land use	8

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 to implement 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, 5 structural measures; (I-T10) Drainage Canal, (I-T3) Development of Drainage Network, (I-T11)Culvert, (I-T12)Flood Basin and (I-U2)Bank Protection are featured below.

(I-T10) Drainage Canal / Airport Area

Water flow from airport area is main factor of increase of flood damage in urban area of Isiolo. However, on the technical study of JICA project team, total cost estimates 8 million yen at minimum price. It means to exceed the budget.

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

(I-T3) Development of Drainage Network / Isiolo Town

Development in the whole Isiolo Town is highly expected its effectiveness for inundation. However, it assumed to take more than 10 years to complete construction, including planning and design. Implementation within PCDEFM Project is impossible.

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

(I-T11) Culvert / Airport Area

Evaluation on 5 criteria is high. However, technical study by JICA project team indicates that the appropriate site for culvert is on the boundary between Isiolo Town and Meru Town. And also, the road administrator is KeRRA. Coordination with related stakeholders is inevitable. It takes long term to negotiate with them.

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

(I-T12) Flood Basin / Airport Area

It is assumed that flood basin in the Isiolo airport. Originally this construction should be implemented by airport authority, not WRUA. It is necessary to negotiate with airport authority and it takes time. It is not suitable for a pilot project.

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

(I-U2) Bank Protection / Upstream

River bank erosion at upstream of Isiolo town causes sediment inflow and deposition at

middle stream and downstream. Request from residents is high. Candidate site faces main highway. Bank protection can be protection of the highway. It prevents to destroy interception of logistical network and movement of persons. Budget and term is assumed in range of project scope. It is possible for WRUA to implement with WSTF fund. Therefore, it is appropriate as a pilot project.

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

Below table shows comparison of relevance with PCDEFM project between 9 countermeasures that is selected on last section..

Table3.4.1 Evaluation List of Relevance with PCDEFM Project

Structural/ Non-structural	No.	Countermeasure	Score
Structural Measure	I-U2	Bank Protection / Upstream	6
	I-T10	Drainage Canal / Airport Area	5
	I-T11	Culvert / Airport Area	4
	I-T3	Development of Drainage Network / Isiolo Town	3
	I-T12	Flood Basin / Airport Area	3
Non-structural Measure	I-T2	Education on Disaster Prevention / Isiolo Town	9
	I-T9	Trash picker Campaign / Merire River	9
	I-T1	Early Warning System / Isiolo Town	9
	I-T4	Sandbag / Isiolo Town	9

The most high scored structural measure is (I-U2)Bank Protection / Upstream. Bank protection is selected as a pilot project in Isiolo river basin.

4. IMPLEMENTATION OF PILOT PROJECT

4.1 SELECTION OF PILOT PROJECT SITE FOR COUNTERMEASURE OF RIVER BANK EROSION

4.1.1 Sites of Bank Erosion

As mentioned above, the highway A2 suffers severe effects on regional socio-economy, when bank erosion occurs. Whereat, JICA Project Team investigated current situation at the sites of the Eastern Marania River (No.1) and the Western Marania River (No.2) where the highway A2 is crossing.

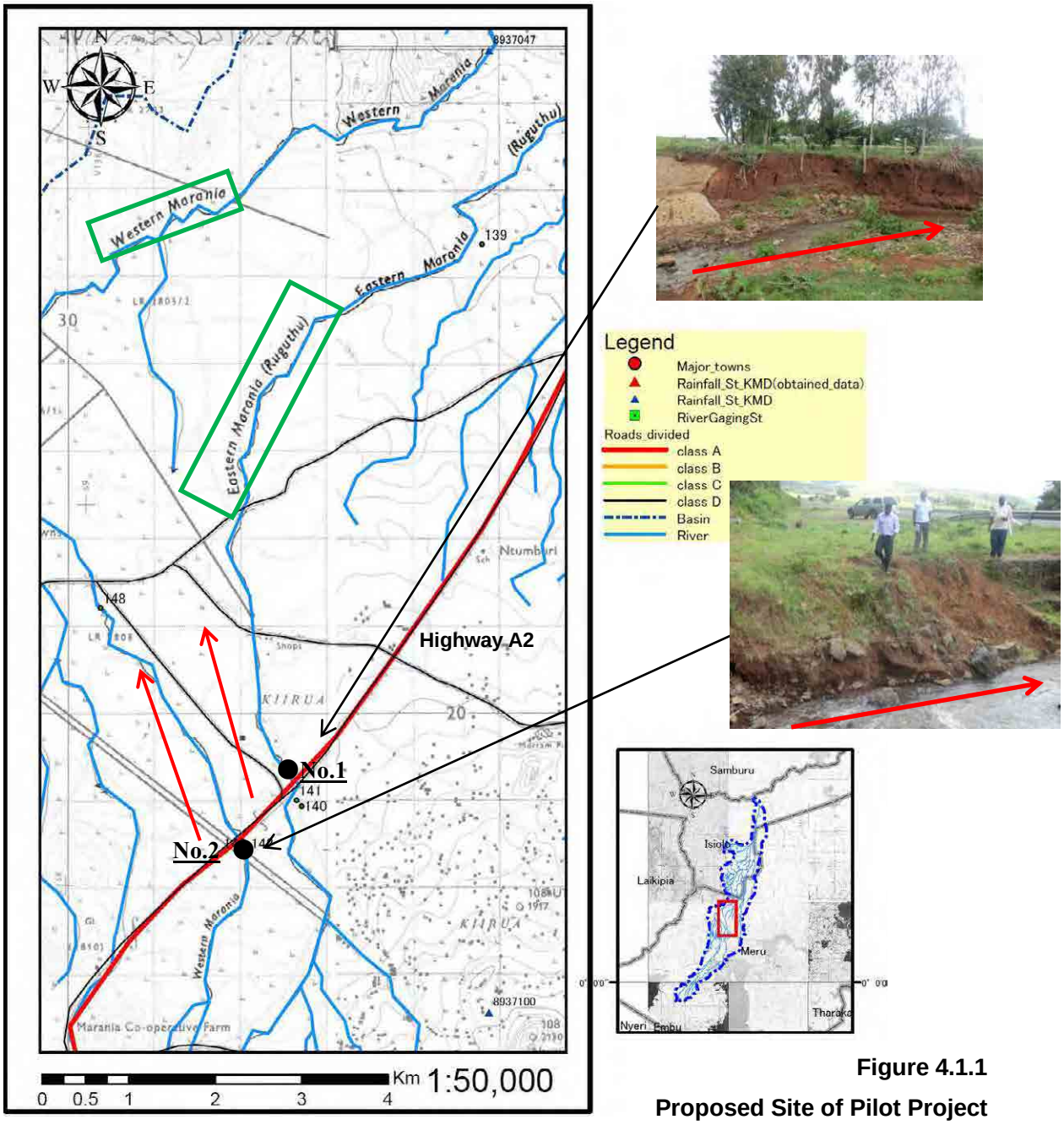


Figure 4.1.1
Proposed Site of Pilot Project

(1) River Bank Erosion Site No.1

The site of No.1 is located in the upper and middle Isiolo River Basin and it is in the administrative boundary of Buuri District、Ntumburi Location、KamareteSub Location. The site is the crossing point of the Highway A2 and the Eastern Marania River. Bridge piers and its surrounding part are protected by gabions and mortar masonry.

Bank erosion is found in the downstream of the bridge. As confirmed by pictures below, it is especially prominent on the water colliding front of left river bank. Moreover, it is seen that the river is meandering by the satellite data.

Figure 4.1.2 Satellite Image of the Site of River Bank Erosion

Photo 4.1.1 View of Upstream from the Crossing Point of Highway A2

(Left: View of upstream from the bridge, Right: View of bridge from upstream)

Photo 4.1.2 View of Downstream from the Crossing Point of Highway A2

(Left: View of downstream from center of the bridge,
Right: View of left bank from right bank of downstream of the bridge)

Figure 4.1.3 presents simple survey drawing of the point No.1. Bank erosion is approximately 40-meter-long; 4-meter-high; 12meter-wide (width of water surface).

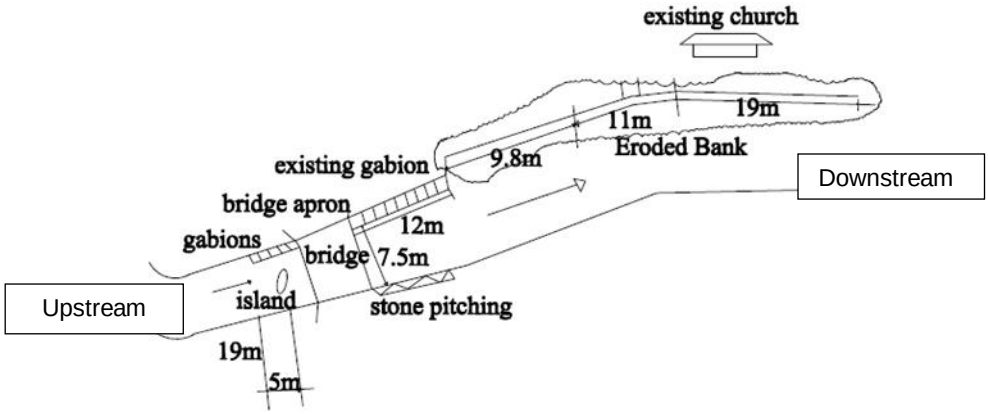


Figure 4.1.3 Simple Survey Drawing (Plane view)

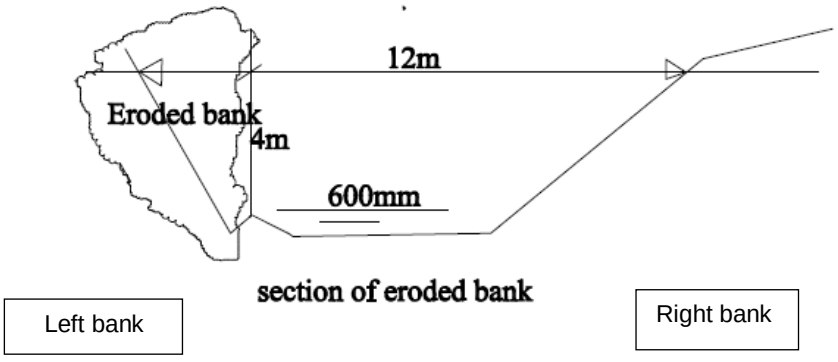


Figure 4.1.4 Simple Survey Drawing (Cross-section)

(2) River Bank Erosion Site No.2

The site of No.2 is located in the upper and middle Isiolo River Basin and it is in the administrative boundary of Buuri District, Ntumburi Location, Ntumburi Sub Location. The site is the crossing point of the Highway A2 and the Western Marania River. Bridge piers and its surrounding part are protected by gabions and mortar masonry.

Bank erosion is found at the upstream of the bridge. As confirmed by pictures below, it is especially prominent on the water colliding front of left river bank. The part of river bank where is the downstream of the A2 bridge, are protected by gabions and mortar masonry and there is less damage. It is 12-meter wide of water surface at the No.2 site.

View of upstream from the crossing point of Highway

View of downstream from the crossing point of Highway A2

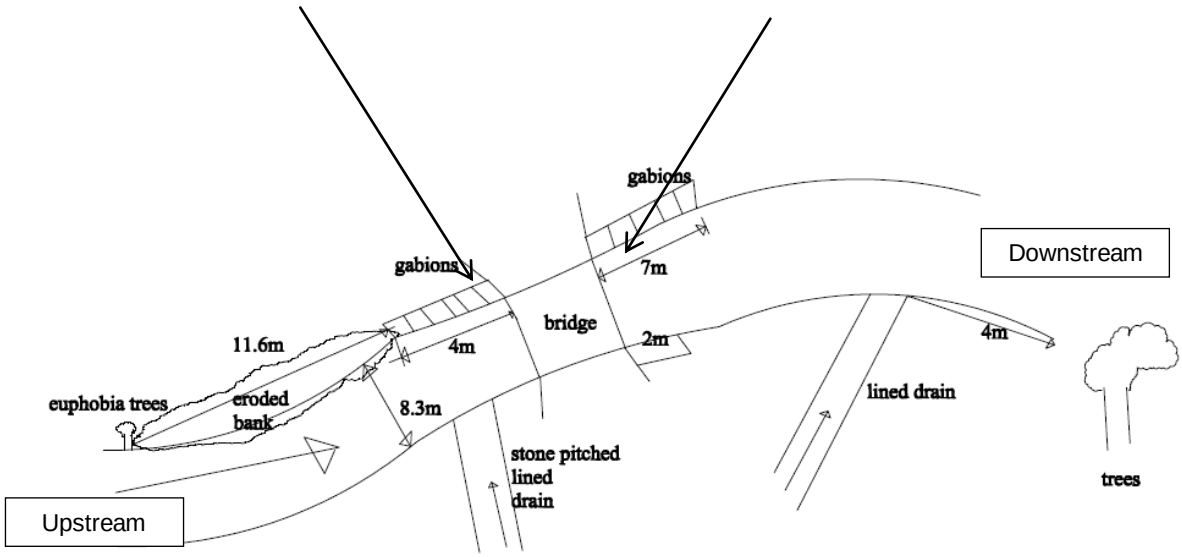


Figure 4.1.5 Simple Survey Drawing (Plane view)

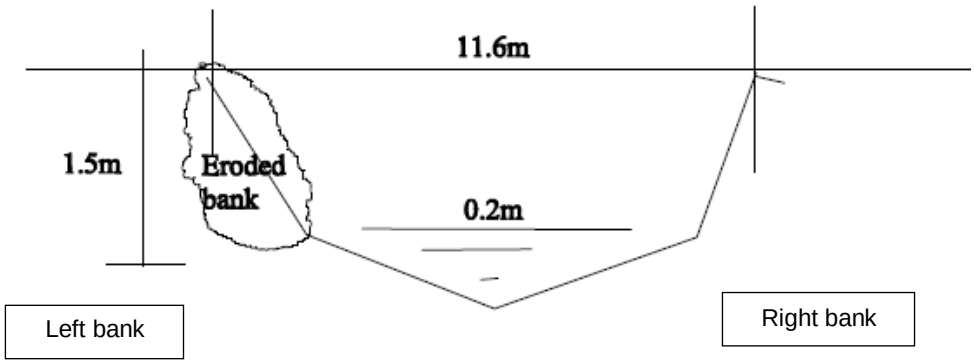


Figure 4.1.6 Simple Survey Drawing (Cross-section)

4.1.2 Selection of Pilot Project Site for Countermeasure of River Bank Erosion

According to interviews from staff of WRUA, bank erosion site No.1 and No.2 suffered heavy damages to the farming land from floods. Highway A2 that connects between town of Isiolo and Nanyuki is ranked Class-A which is the most important class of road in Kenya and it is served an important function of socio-economic aspects in this region. And Highway A2 comes across two rivers at the point of No.1 and No.2. If flood damage occurs on the road, it might have a significant impact on socio-economic situation, and therefore, river bank protection is needed to install on both sites.

Especially, as previously mentioned, a comparison of the site No.1 and No.1 on range, depth and damages of bank erosions shows that the site of No.1 is worse than No.2. The left river bank of No.1 site is the water colliding front and it has a high impact by bank erosion. However, bank erosion of No.1 is not confirmed that direct impact to the Highway A2 at this moment, bank erosion has been started connection part between natural embankment and existed antierosion works. If no countermeasures adopt, the road might be collapsed.

Accordingly, the JICA Project team determined that the site of No.1 would be installed a pilot project of community-based disaster reduction (structural measure).

4.2 CONCEPTUAL DESIGN

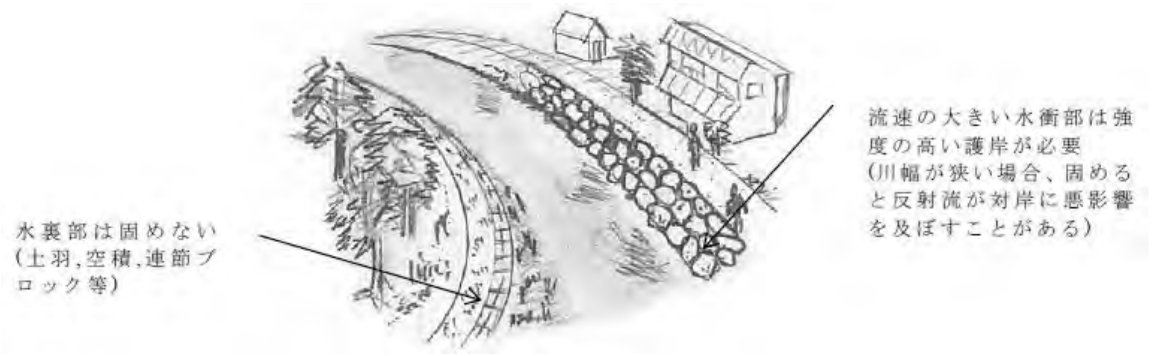
4.2.1 Selection of Revetment Works

There are a variety of revetment works such as rubble work, concrete plastering work, sodding and etc. in order to protect embankment from water flow. Selection of the type of work should be judged in a comprehensive manner from aspects of flow velocity, status of damages, scale

of the river, conditions of watercourse, land area behind the embankment, river environment, sectional form, durability of materials, construction economics, ease of construction and etc.

In the light of bank erosion at the water colliding front of the site No.1, high-strength type of river bank protection is required. Therefore, multi-layered gabion mattress should be installed at this site where road and river are crossing. Reasons for selection of this type of protection are shown in below; 1) local contractors are able to construct this type of work, 2) required equipment of this type of work is available from local and 3) it has the advantage of maintenance. For these reasons, JICA Project team selected multi-layered gabion mattress works on this site.

Moreover, it is preferable that adequate bank protection work should be installed at this type of the site where there is a difference of flow force between left and right river bank. This site is that left bank is the water colliding front and right is that water doesn't hit hard. Thereby the Project Team focuses on countermeasure of bank protection on the water colliding front.



Source : Basic Policy on Post-disaster restoration for conservancy of beautiful mountains and rivers (June, 2006)

Figure 4.2.1 Image: Difference Types of River Bank Protection Works between Left and Right on the Same Section

4.2.2 Conceptual Design for River Bank Protection Work (multi-layered gabion mattress)

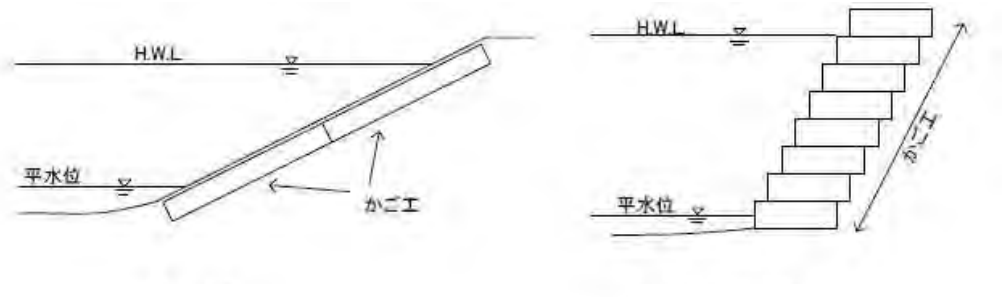
(1) Selection of construction method

There are two type of works (single-layer and multi-layer) using gabion mattress for river bank protection. In general, single layer type should be installed slope gradient is less than 1:2.0 and multi-layer type should be installed a bank slope steeper than 1:1.0.

Conditions of this site are short width and bank height of 4-meter or more. Under these

conditions, it is difficult to make river bank low-gradient. In addition, high flow velocity is inferred from conditions of the river bed gradient at this site; therefore, JICA Project team adopts a method of multi-layered gabion mattress at this site because this type is able to bear external force (designed flow velocity) as compared with single-layer mattress.

- In case of a bank slope is 1:1.5 or less: Single-layer mattress; target for assumed flow velocity: 5.0m/s
- In case of a bank slope is 1:1.5 and above: Multi-layer mattress; target for assumed flow velocity: 6.5m/s



Single layer mattress　　Multi-layer mattress

Source : Yamanashi Pref. River Handbook (April, 2009)

Figure 4.2.2　Two Types of Gabion Mattress for the River Bank Protection

(2) Conceptual Design

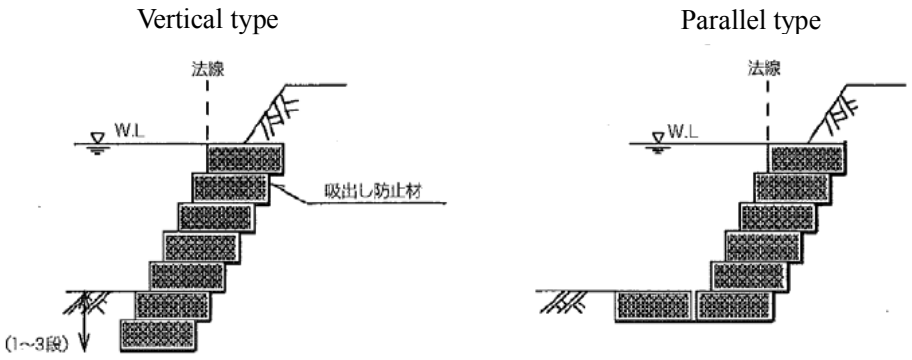
Multi-layered gabion mattress has functions not only to protect from surface layer erosion but also to protect collapsing river bank as a retaining wall. Conceptual design is reflected to maintain these functions in the light of points below.

a) Skip slope stability analysis of a retaining wall

In general, slop stability analysis should be conducted with the objective of verifying over-turning, sliding and bearing power of ground. However, in the case of the height of river bank is less than or equal to 5-meter, stability are fulfilled and it is not required to skip stability analysis. The height of construction work on this site is less than 5 meters; thereby stability analysis skips at this study.

b) Countermeasures for scouring (Foot protection)

There are two applicable countermeasures for scouring as shown below. Type of protection work is selected by conditions of watercourse and flood flow. Vertical type would be adopted in this project site.



Source : Yamanashi Pref. River Handbook (April, 2009)

Figure 4.2.3 Types of foot protection

Figure 4.2.4 presents conceptual design (Cross Section).

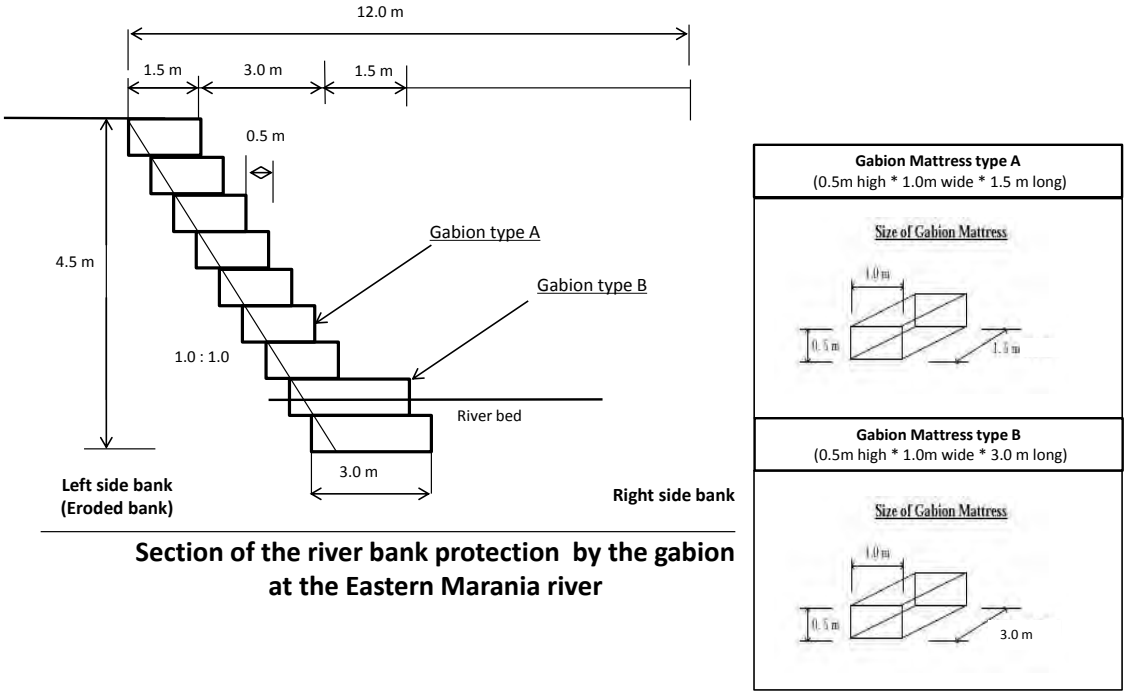


Figure 4.2.4 Conceptual Design (Cross Section)

(3) Preliminary cost estimation

According to the conceptual design and the length of project site which is eroded in 40 meters, amount of gabion mattress is 330 m3 (Type-A: 210 m3 plus Type-B: 120 m3) approximately. Specification of gabion mattress is shown as below.

Based on unit price and quantity of gabion mattress, rough cost estimation is 2,100,000 Ksh.

As shown in reference material, in the case of the project of the Nyando River Basin, cost for gabion mattress accounted for approximately 60% of total construction cost. Preliminary total construction cost is 3,500,000 Ksh on this project site that is derived from using this ratio of the project of the Nyando River. Other major items and materials of the construction work are back-filling, sodding and etc. Unit price that is using calculation of total construction fee was based on 2007, in view of current price increase rate, total construction cost is approximately 4,900,000Ksh (= 3,500,000 * 1.4 (price increase rate)). Thus, construction cost will be within the limit of the budget for community based activity.

- Type-A Gabion mattress: Height 0.5m * Width 1.0m * Length 1.5m (0.75m^3)
  Unit price: 6,000Ksh/m^3 *1
- Type-B Gabion mattress: Height 0.5m * Width 1.0m * Length×3.0m (1.5m^3)
  Unit price: 7,000Ksh/m^3 *1

*1: Unit price is quoted in the project of the Nyando River in 2007

4.3 TENTATIVE TIME SCHEDULE

Tentative time schedule of Pilot Project is shown onFigure 4.3.1. 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 September, 2013 for a period of approximately 3.5 months.

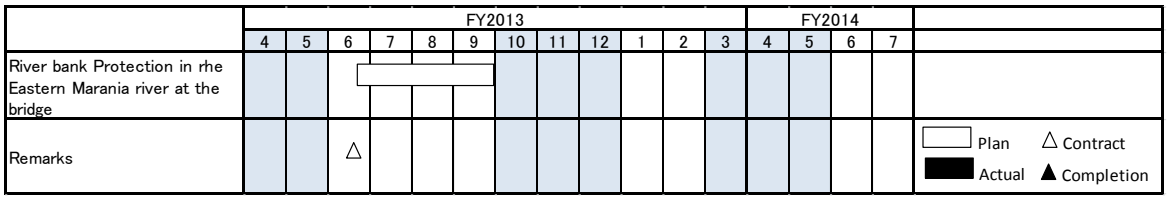


Figure 4.3.1 Tentative Time Schedule of Pilot Project

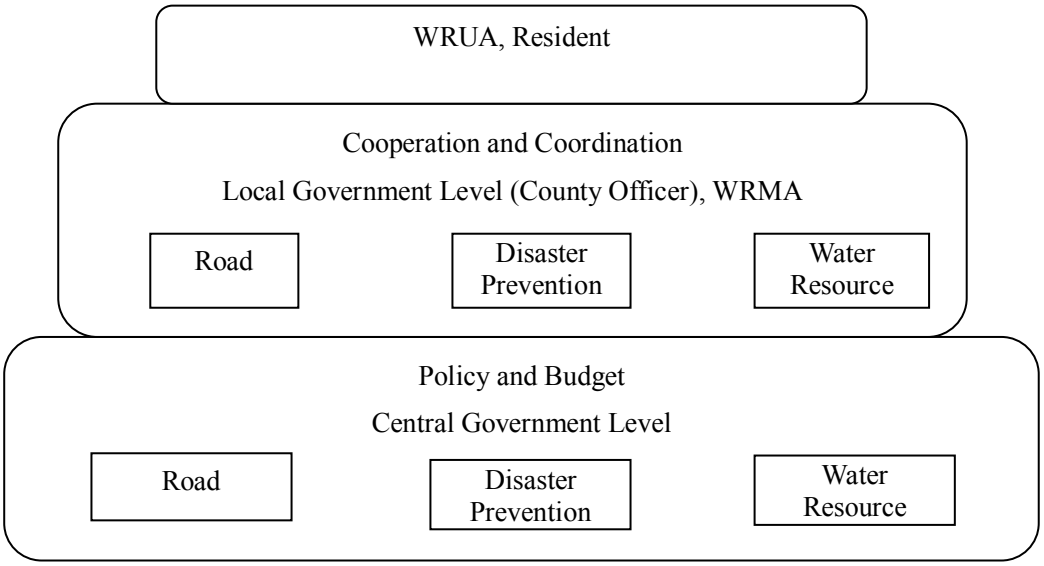
4.4 PROCUREMENT METHOD OF EQUIPMENT AND MATERIAL

Basically, locally available construction materials and equipment will be used in this project. It is preferable that average grain diameter which is filled material of mattress is 15-20cm, wire diameter of gabion is 3.5mm.

4.5 ORGANIZATION AND PROJECT IMPLEMENTATION AND MAINTENANCE FOR PILOT PROJECT

(1) Stakeholder

エラー! 参照元が見つかりません。 presents the structure of stakeholders that is concerned the pilot project of the river bank protection. Stakeholders of this project are the Ministry of water and Irrigation (Water sector), the Ministry of Roads and Public works (Road Sector) and country officers in the local governments who are linking to the central governments. WRUA and WRMA are required functions that coordination with these stakeholders and also fund-raise from each sector as necessary.



Source：JICA Project Team

Figure 4.5.1 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 4.5.1 Assumable Stakeholder for Pilot Project

Stakeholders	Functions
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.
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	Land owner of the river bank and road for construction
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 Road Officer	Officer in charge of road dispatched from the central government
County/ District Planning Officer	Officer in charge of planning 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 for 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 Committee, 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 of the cost proposal from more than 3 firms. The Contractor for goods and

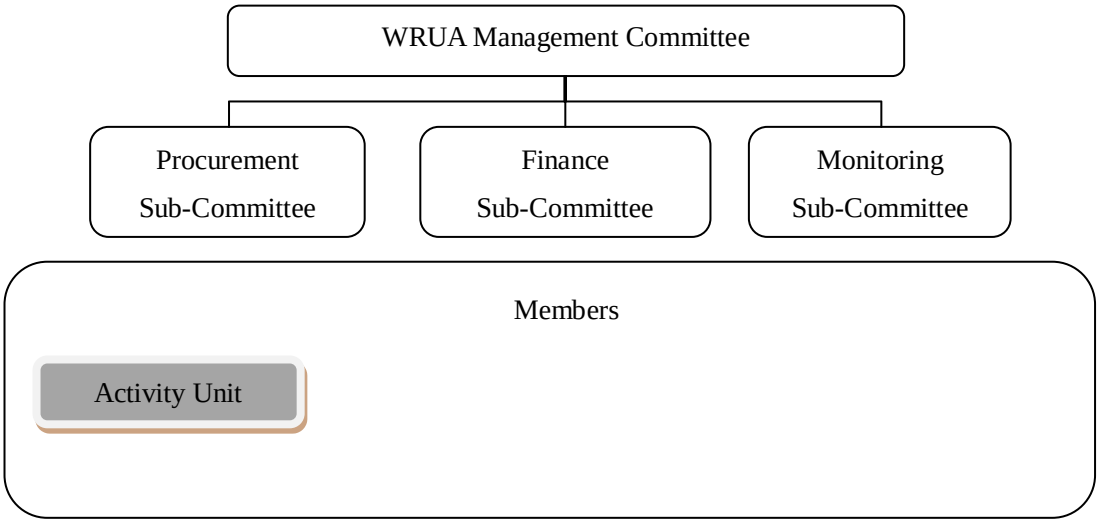
	services are selected based on the price and amount. Quality and volume of the materials are, once procured, checked and stored.
Finance Sub-Committee	**Finance Sub-Committee** is responsible for all of the financial transactions, and it is reported independently in the general assembly about how the 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 is 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 this river bank protection 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 Isiolo WRUA side.



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

Figure 4.5.2 Project Implementation Organization inside WRUA (Draft)

(3) Maintenance Management Organization

Gabion mattress is a common countermeasure of river bank protection. However, iron wire gets rusted and it is likely to be damaged by aged deterioration. In addition, since iron wire which is used to gabion mattress is very thin, gabion mattress might be damaged by floodwood and boulder. Moreover, the section in the river where bank erosion is occurred is curved, river bed might be scouring. Although, foot protection would be installed deeply in this pilot project, a foundation of river bank protection works might be damaged.

Therefore, periodic visual monitoring is needed and maintenance and repair work is also required when minor problem happened. In order to work of monitoring and maintenance, the activity unit and project team in WRUA will have necessary training programs.

(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 4.5.2 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	- To be done 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.

4.6 MEANING AND PURPOSE OF IMPLEMENTATION OF PILOT PROJECT

Meaning and purpose to develop bank protection in Isiolo River Basin as a pilot project is following:

(1) From the viewpoint of implementation of structural measure

- A large number of places in Isiolo River Basin requires countermeasure against bank erosion. After implementation of the pilot project, WRUA and WRMA are expected to implement the same countermeasure at necessary part of the river.
- From viewpoint of capacity development of WRMA, WRMA is expected to understand key points of planning, design and construction of bank protection as a countermeasure against bank erosion.
- It is expected that the importance of cooperation framework with WRMA as a water resource and river administrator and KeNHA and other government offices as a road administrator.

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

- WRUA has not been implemented structural measure yet.
- It is expected to make sure to function procurement system of WDC manual and add missing system to the manual.
- It is not easy that WRUA applies procurement system to other project based on experience of one pilot project only. Therefore, JICA project team expects that WRUA implements the same project by the same process over and over again in Isiolo River Basin. Bank Protection is the most required countermeasure in the river basin and can be repeated as training.
- WRUA is expected to acquire actual experience and capacity to apply to 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 3-17

MOU-Procurement-Com-Isiolo

MEMORANDUM OF UNDERSTANDING (MOU) OF
PCDEFM PROCUREMENT COMMITTEE
FOR
THE ISIOLO 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 andfeedback to it.

2. Member

Membership of this PCDEFM Procurement Committee for Isiolo Pilot Project is as

follows;

- Isiolo WRUA Procurement Sub Committee members
- WRMA Middle EwasoN'giro 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 Isiolo 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 SubCommittee.

4. Cost

Necessary costfor 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 Mutubwa
Head, Flood Management Unit
Water Resources Management Authority
Date:

Eng. Katsuro Kondo
Chief Advisor
JICA Project Team
Date:

Mr. David Ochilo
Regional Manager, EwasoNgiro North Regional Office
Water Resources Management Authority
Date: 20/9/2013

Mr. Hideki Sawa
Team Leader
JICA Project Team
Date: 20

Mr. John Kinyanjui
Sub Regional Manger, Middle EwasoNgiro North Sub Regional Office
Water Resources Management Authority
Date: 20/9/2013

Mr. Felix Karimba
Chairman
Isiolo Water Resource Users Association
Date: 20/9/2013

付属資料 3-18

Minutes-Procurement-Com-Isiolo

MINUTES OF MEETING

OF

THE FIRST PCDEFM PROCUREMENT COMMITTEE MEETING

FOR

THE ISIOLO PILOT PROJECT

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

The attendants built consensus upon the following.

1. Purpose of the meeting

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 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. Discussion for the Isiolo Pilot Project

The Project Supervisor for Isiolo Pilot Project Site explained in summary the scope of the construction works, process of identification of eligible contractors, criteria of short listing of contractors, the bidding process and the bidding documents. Since there was no Prequalification advertisement to contractors to submit their Prequalification documents, the Supervisor explained that there was a consensus between WRMA and JICA Project Team to write to an Expression of Interest (EoI) letter to all eligible contractors who are registered either with MWENR and other Government

entities. The EoI letters were drafted to include requirements submissions of documents for preliminary and technical capabilities of the interested firms.

The attendants discussed on the evaluation criteria for shortlisting and established it. Based on the established criteria five (5) contractors were qualified as shortlisted contractors. Detailed process of it is shown in the evaluation report of **Attachment 2**.

Attachment list

Attachment 1: Attendance list.

Attachment 2: Evaluation Report on Short listing of Contractors

WRMA HQ Nairobi, 20th September 2013

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

Mr. Katsuro Kondo
Chief Advisor
JICA Project Team

Mr. John Kinyanjui
Sub-Regional Manager, Middle Ewaso N`giro Sub regional Office
Water Resources Management Authority

Mr. Hideki Sawa
Team Leader
JICA Project Team

Mr. Peter Mwongera
Chairperson, Procurement Committee
Isiolo Water Resources Users Association

Attachment 2

Evaluation Report on Short listing of Contractors

EVALUATION REPORT FOR THE SHORTLISTING OF CONTRACTORS FOR RIVERBANK PROTECTION WORKS IN ISIOLO

JICA Project Team
WRMA – Middle Ewaso N`giro Sub-Region
Isiolo WRUA

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 Riverbank Protection works by using gabion mattress in Eastern Marania River. The eroded riverbank to be protected is forty (40) meters long and four and half (4.5) meters high.

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 for Short listing of Contractors

2.1 List of Eligible Contractors

The JICA Project Team and WRMA obtained a long list of eligible contractors registered with MEWNR and other Government entities. The eligible list for contractors to carry out construction works for Riverbank Protection works was obtained from District Procurement office. The total number of eligible contractors provided by the District Procurement office was twenty four (24) in number.

(Attachment I; List of Eligible Contractors).

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

The JICA Project Team in consultation with WRMA and WRUA Procurement sub committee wrote EoI letters to all the twenty four (24) eligible contractors. The letters were requesting for submission of documents from the contractors. The minimum requirements for submissions included; 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 EoI letters were distributed to contractors on September 10, 2013. The deadline for submission of EoI documents was September 17, 2013.

Eleven (11) contractors submitted their Documents by the deadline of September 17, 2013.

(Attachment II- sample EoI letter)

2.3 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 short listing

Short listing procedure is, in principle, required for selecting potential contractors. The objectives of short listing 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 those 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 in conducting bidding procedure and evaluation, when a large number of bidders are expected to participate.

3.2 Evaluation Criteria of Short listing

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 riverbank construction works. The WRUA Procurement sub committee was trained on the stages involved in evaluation to avoid awarding contractors to the lowest bidder who otherwise has insufficient technical capacity.

3.2.2 Stage-2

Priority of each evaluation criteria

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

(1) Status of the Company

The WRUA Procurement sub committee was informed that the status of the company, i.e, Certificate of incorporation, Class of Registration, and KRA- certificate of compliance must accompany other documents failure of which results in the company to be dismissed at this stage of evaluation. The weighted marks for status of the company was a maximum of fifteen (15) marks which was distributed as follows;

- Copy of Certification of incorporation = 5 marks

- Copy of Class of Registration with Public Works, National Construction Authority and Ministry of Water and Irrigation = 5 marks
- Copy of Valid KRA certificate of Compliance = 5 marks

(2) Financial Position

The documents which were considered to show the financial position of the company was; Audited Accounts for the last three (3) years and Bank statements. The weighted marks for this evaluation criterion were a maximum of fifteen (15) marks. The award of marks was distributed as below;

- Audited Accounts for the last three (3) years = 15 marks
- Bank statements = 5 marks

(3) General Experience

In this evaluation criterion, an interested company was to submit documents showing experience in similar works, i.e, related water works for the last three (3) years. The weighted marks for these evaluation criteria was forty (40) marks. General experience in similar works was considered as a critical required to qualify for short listing. The weighted marks were distributed as below;

- Minimum of three (3) similar works = 40 marks
- Minimum of two (2) similar works = 30 marks
- Minimum of one (1) similar works = 20 marks
- No similar works = 0 marks

(4) Personnel capacity

For the contractor to be shortlisted it was necessary to submit list of personnel together with CVs. The weighted marks for this evaluation criterion was a maximum of thirty (30) marks. The marks were distributed as below;

- Site Manager = 10 marks
- Surveyor = 10 marks
- Artisans = 5 marks
- Storekeeper = 5 marks

4 Evaluation results

4.1 Evaluated Firms

The following Eleven firms were evaluated

1) Soelleta General
2) Wagumi Contractors
3) Baretu General Construction Co.
4) Center Star Co. Ltd
5) North Gate Investments Ltd

6) Shibli Enterprises
7) Imenti Construction Company
8) Waso Building & Road Works Co. Ltd
9) Modogashe Agencies Ltd
10) Isiolo Mwangaza Co. Ltd
11) Times Tec Construction

4.2 First Level Evaluation

The evaluation was done at two levels. The first level was done together with WRUA procurement sub committee on the basis of marking system explaind in 3.2 above. The first level evaluated each submission and gave marks to the company. Then it was agreed among participants that those companies whose total score were above 70 points should be shortlisted for the final stage for bidding. The four short listed companies in the first level evaluation were;

1) Imenti Construction Company
2) Soelleta General
3) Baretu General Construction Co.
4) Waso Building & Road Works Co. Ltd

4.3 Final Evaluation

However, on further discussion and analysis of the evaluation results by the JICA Project Team and WRMA Headquarter FMU member, it was judged important to consider the most critical evaluation criteria and possibly rank them. 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 of the results, there were companies who did not submit all three documents shown in 3.3.3 (1) above were judged unsatisfactory and should be eliminated. All documents aforementioned on the status of the company must be submitted in totality.

The next criteria which was considered critical was the experience of the company in similar works for the last three (3) years. This was priority number two, and a company with no similar work experience should be eliminated at this stage. Financial position for the company came third in the priority of the criterion and finally the personnel. It was reached on the consensus that companies who qualified in the first two critical criteria to be given chance to participate in the next and final stage of the bidding where the information on the financial status and personnel plan will be submitted again for final evaluation. The evaluated firms and result of evaluation are as shown.

4.4 Qualified Firms

As a result of the evaluation of the short listing procedure, the following five (5) companies passed the screening as they provided the required documentation, and had experiences in similar works for the last three years. These companies that failed either did not provide the required documentation or did not have similar experiences:

1) Imenti Construction Company
2) Soelleta General
3) Baretu General Construction Co.
4) Waso Building & Road Works Co. Ltd
5) Times Tec Construction

(Attachment III- Evaluation checklist and results, list of participants)

4.5 Approval of the Evaluation results

The WRUA Procurement committee, WRMA Sub –Regional Office assisted by JICA Project Team prepared this evaluation report on short listing of companies for bidding for construction of Riverbank Protection works. 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) The WRUA Procurement sub committee did not seem to be familiar with the key documents to be verified during the evaluation process;
2) The WRUA procurement sub committee members did not actively participate in evaluation process, probably because of unfamiliarity with such tasks as the evaluation;
3) For proper transfer of knowledge to the entire community youths should be included in the procurement committee and other sub-committees within the WRUA set up.
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.

Attachment I

List of Eligible Contractors

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.D.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 29/8/13

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, 2729048(?)
Fax: +254-20-2729050

NEWJEC Inc.
International Operations
5-7, Kameido 1-chome, Koto-ku
Tokyo 136-0071, JAPAN
Tel: +81-3-5628-7408 Fax: +81-3-5628-7205
Mobile: +254-704-206-184 (Kenya), +81-80-2480-5854 (Japan)

Date: September 10, 2013

Contractor Address

Attn: Managing Director,

Subject: **Request for Expression of Interest in Riverbank Protection Works**

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 a riverbank Protection Works using Gabions at Eastern Marania River along Isiolo – Nanyuki Highway next to Lewa Conservancy.

The Contractors who have had similar past experience in river works and other related water 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 Isiolo Office on or before **September 17, 2013 at 12:00 a.m. EAT.**

Thank you very much for your kind cooperation.

Best Regards,

Mr. John KINYANJUI
ATCM,
Middle Ewaso Ngiro Sub- Region
Water Resources Management Authority (WRMA)

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

Attachment III

Evaluation checklist, results

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

付属資料 3-19

MOU-Riverbank protection works-Isiolo

MEMORANDUM OF UNDERSTANDING
FOR
THE PROJECT FOR CAPACITY DEVELOPMENT FOR EFFECTIVE FLOOD MANAGEMENT IN FLOOD PRONE AREAS
WRMA ISIOLO SUB-REGION OFFICE, ISIOLO WRUA
AND JICA PROJECT TEAM
UNDER
RIVERBANK PROTECTION WORKS

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 agree as follows;

1. WRMA to take responsibilities regarding legal matters concerning the Project, such matters are not limited to, land use, approval from Kenya National Highways Authority, National Environment Management Authority ;

2. Based on WDC manual, Isiolo 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 ;

3. Isiolo WRUA and the community have agreed to contribute construction materials to support the Project implementation. The Isiolo WRUA and the community members shall collect the boulders for riverbank protection works. Such boulders shall be transported by the contractor who shall be identified by competitive tendering;

4. Isiolo WRUA to negotiate with the Church members and the individual farmers around the Project site to allow for access to the site;

5. JICA Project Team to sign contract agreement for construction works for riverbank protection 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, Isiolo WRUA, the Community and the JICA Project Team agreed to honour the MOU in respect to the Pilot Project on Riverbank Protection works whose duration is within 2-3 months.

WRMA, Isiolo WRUA, the community and JICA Project Team mutually agreed that:

This Memorandum of understanding will form part of the contract for Riverbank Protection 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: Drawings
- Attachment 2: Attendance List

SIGNED BY: _____

Mr. John KINYANJUI

Assistant Technical Coordination Manager

WRMA Isiolo Sub – Regional Office

P.O. Box, 171 Isiolo , Kenya

Date: 2/9/2013

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: 2/9/2013

SIGNED BY: _____

Mr. Felix KARIMBA

Chairman

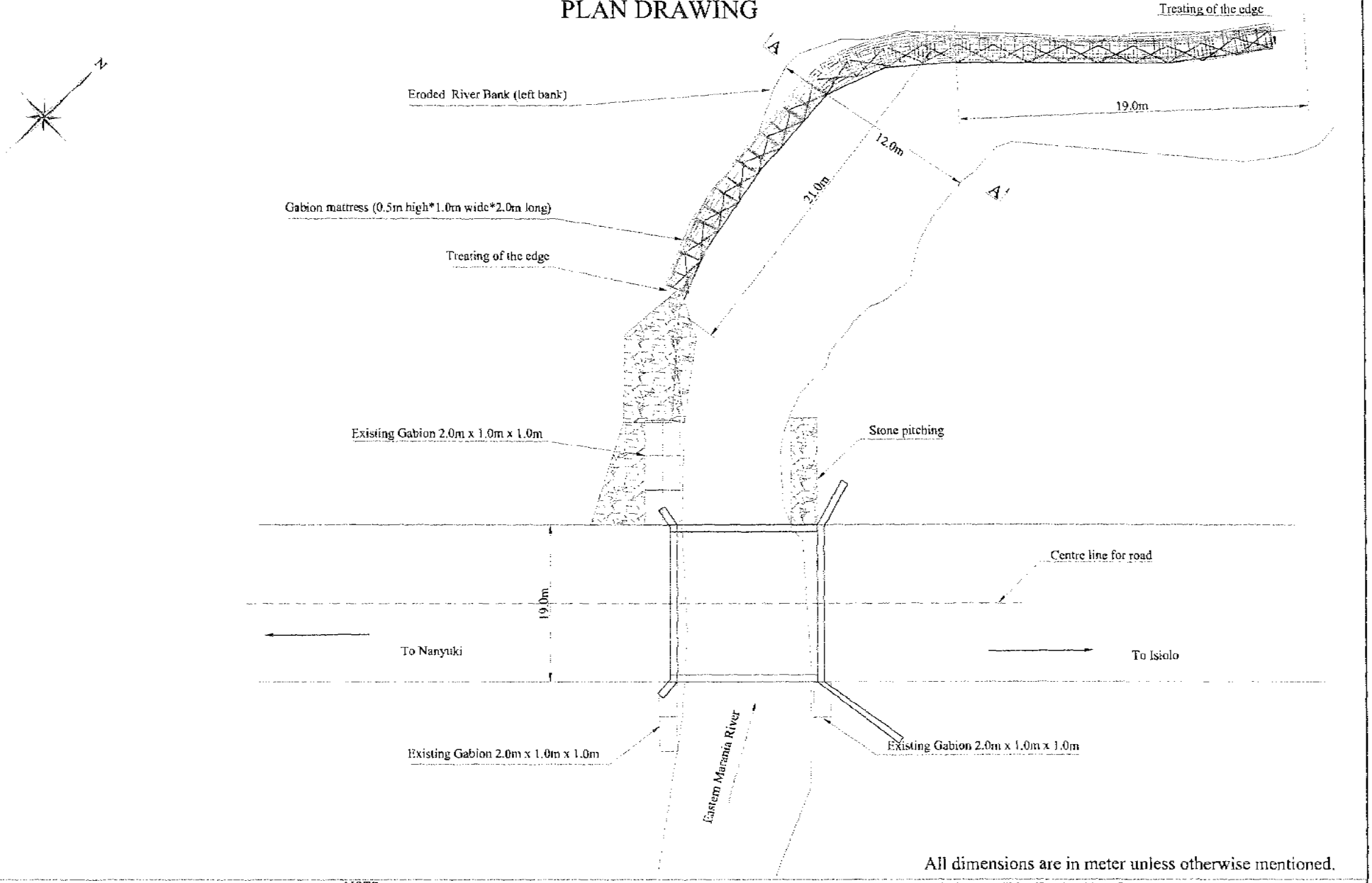
Isiolo Water Resource Users Association (WRUA)

P.O. Box 472 , Isiolo, Kenya

Date: 2/9/2013

Attachment 2

PLAN DRAWING



All dimensions are in meter unless otherwise mentioned.

JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)

MINISTRY OF WATER AND IRRIGATION
WATER RESOURCES MANAGEMENT AUTHORITY

NOTE:

PROGRAMME ON CAPACITY DEVELOPMENT FOR EFFECTIVE FLOOD MANAGEMENT IN FLOOD PRONE AREAS (PCDEFM)

NEWJEC INC.

	PREPARED BY	CHECKED BY	APPROVED BY
NAME			
SIGNATURE			
DATE			

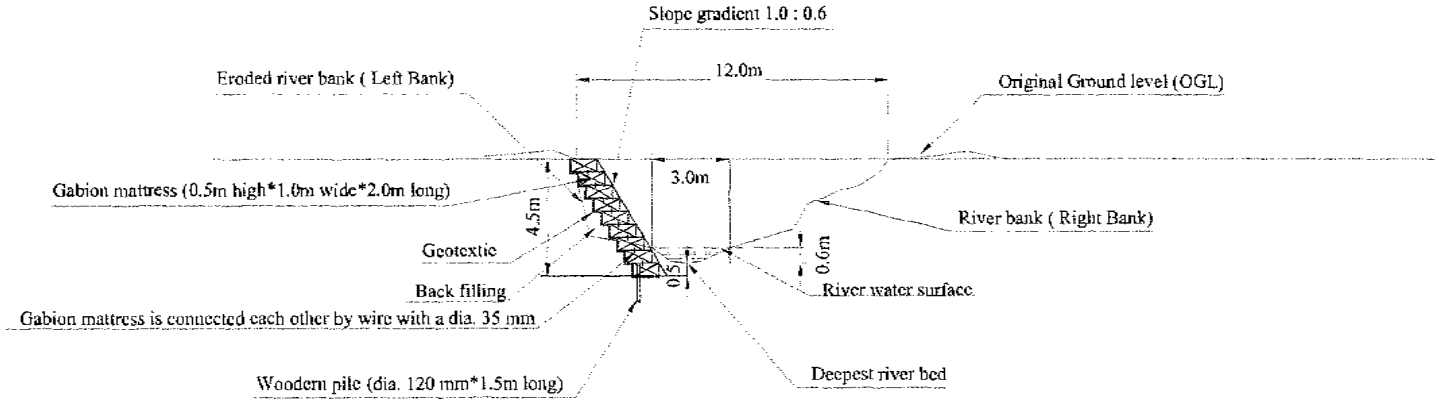
DWG. TITLE: PLAN

RIVER BANK PROTECTION ISIOLO SUB CATCHMENT

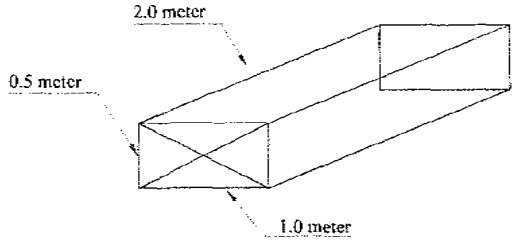
SCALE	SHEET NO.	REV. NO.
AS SHOWN		

SECTION DRAWING

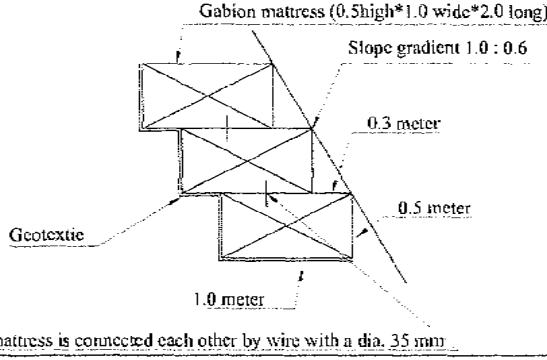
SECTION A - A



Gabion size



Close up



All dimensions are in meter unless otherwise mentioned.

JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)

MINISTRY OF WATER AND IRRIGATION
WATER RESOURCES MANAGEMENT AUTHORITY

NOTE:

PROGRAMME ON CAPACITY DEVELOPMENT FOR EFFECTIVE FLOOD MANAGEMENT IN FLOOD PRONE AREAS (PCDEFM)

NEWJEC INC.

	PREPARED BY	CHECKED BY	APPROVED BY
NAME			
SIGNATURE			
DATE			

DWG. TITLE: SECTION

RIVER BANK PROTECTION ISIOLO SUB CATCHMENT

SCALE	SHEET NO.	REV. NO.
AS SHOWN		