

Appendix - 2
Baseline Survey

Appendix 2-1

Roles of DNGRH and ARAs in Water Related Disaster Management

Roles of DNA and ARAs in Water Related Disaster Management

Noritoshi Maehara
Institutional Development Planning
JICA Team

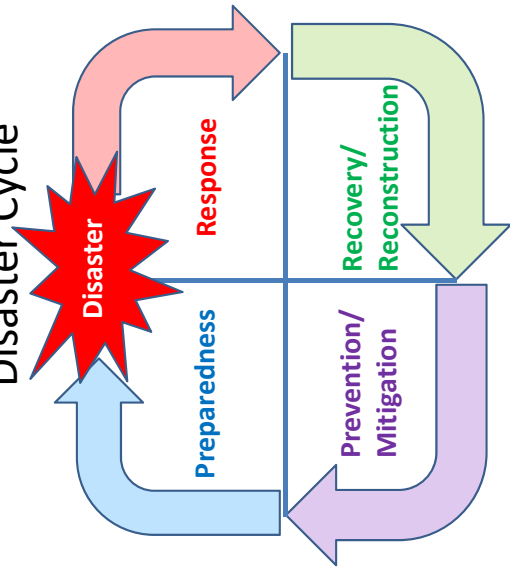
1

Table of Contents

- Disaster Cycle
- Characteristics of Flood Control Measures in Japan
- Disaster Management Matrix
- Major Roles of DNA, ARAs and Other Agencies
- Conclusion
- Challenges

2

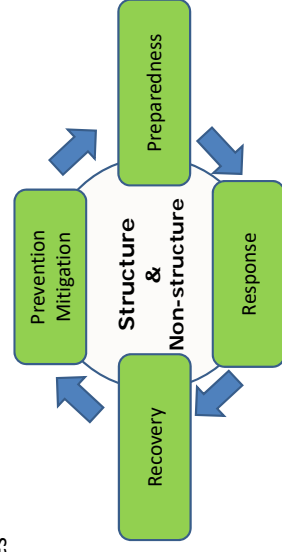
Disaster Cycle



3

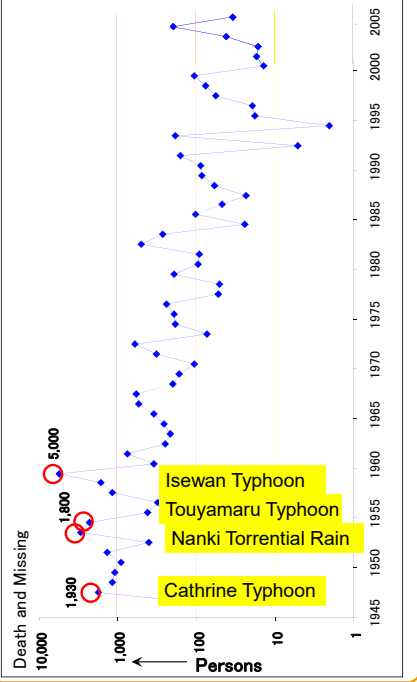
Characteristics of Flood Control Measures in Japan

- Focus on the prevention/ mitigation stage
- Holistic approach from preventive stage to emergency response and recovery/ reconstruction.
- A basin- based comprehensive flood management plan, according to the characteristics of the basin
- Combination of "hard (structural)" and "soft (non-structural)" measures



4

Reduction of Casualties by Continuing Flood Management Efforts in Japan



5

Disaster Management Matrix

Disaster Cycle	Measures	Major Roles		
		DNA	ARAs	INGC, INAM, other
Prevention/ Mitigation	Non-structural			
	Structural			
Preparedness	Non-structural			
	Structural			
Response	Non-structural			
	Structural			
Recovery/ Reconstruction	Non-structural			
	Structural			

6

Disaster Management Matrix

Disaster Cycle	Measures	Major Roles		
		DNA	ARAs	INGC, INAM, other
Prevention/ Mitigation	Non-structural			
	Structural			
Preparedness	Non-structural			
	Structural			
Response	Non-structural			
	Structural			
Recovery/ Reconstruction	Non-structural			
	Structural			

7

Prevention/ Mitigation (Non-structural Measures) 1/2

DNA	ARAs	INGC, INAM, other agencies
<ul style="list-style-type: none"> Support for <u>formulation of flood management plan</u> <u>Support for planning and design of flood management facilities</u> Collect flood information of international rivers from neighboring countries <u>Operation and maintenance of dams and barrages</u> for water utilization. Organizing management committee of stakeholders of river basin (incl. international river basin) 	<ul style="list-style-type: none"> <u>Formulation of flood management plan</u> <u>Planning and design of flood management facilities</u> Collect flood information of international rivers from neighboring countries <u>Operation and maintenance of dams and barrages</u> for water utilization. Organizing management committee of stakeholders of river basin (incl. international river basin) 	<ul style="list-style-type: none"> Land use regulation to prevent flood damage (Ministry of State Administration and Ministry of Land, Environment & Rural Development) Maintenance of dykes (Ministry of Agriculture or water users association) Operation and maintenance of drainage facilities incl. drainage pumping stations (AVAS and municipality)

8

Prevention/ Mitigation

(Non-structural Measures) 2/2

DNA	ARAs	INGC, INAM, other agencies
<ul style="list-style-type: none"> Upgrading flood forecasting model Preparation of project proposals for donor agencies to construct and improve flood management facilities 	<ul style="list-style-type: none"> Upgrading flood forecasting model Preparation of project proposals for donor agencies to construct and improve flood management facilities 	

9

Disaster Management Matrix

Disaster Cycle	Measures	Major Roles		
		DNA	ARAs	INGC, INAM, other
Prevention/ Mitigation	Non-structural			
	Structural			
Preparedness	Non-structural			
	Structural			
Response	Non-structural			
	Structural			
Recovery/ Reconstruction	Non-structural			
	Structural			

10

Prevention/ Mitigation

(Structural Measures) 1/1

DNA	ARAs	INGC, INAM, other agencies
<ul style="list-style-type: none"> Planning and construction of dykes Oversee construction and improvement of dam (large), barrage, sluice, etc. Oversee construction and improvement of flood forecasting and warning system Oversee construction of rain water storage facilities to reduce flood runoff (future task) Oversee improvement of hydrological observation system (rain and water level gauges) 	<ul style="list-style-type: none"> Planning and construction of dykes Oversee construction and improvement of dam (small), barrage, sluice, etc. Oversee construction and improvement of flood forecasting and warning system Construction of rain water storage facilities to reduce flood runoff (future task) Improvement of hydrological observation system (rain and water level gauges) 	<ul style="list-style-type: none"> Construction and improvement of drainage facilities incl. drainage pumping stations (AIAS and municipality) Improvement of meteorological observation system (INAM) Construction and improvement of flood forecasting and warning system (INAM, INGC)

11

Disaster Management Matrix

Disaster Cycle	Measures	Major Roles		
		DNA	ARAs	INGC, INAM, other
Prevention/ Mitigation	Non-structural			
	Structural			
Preparedness	Non-structural			
	Structural			
Response	Non-structural			
	Structural			
Recovery/ Reconstruction	Non-structural			
	Structural			

12

Preparedness (Non-structural Measures) 1/4

DNA	ARAs	INGC, INAM, other agencies
<ul style="list-style-type: none"> • <u>Preparation of contingency plan in hydrological aspect</u> • Preparation of business continuation plan (BCP) of DNA (future task) • Conclusion of MOU for emergency support with related organizations including private construction firms (future task) • <u>Preparation of flood risk maps</u> (future task) • Implementation of routine disaster drills (Join) • <u>Provision of rainfall and water level information</u> 	<ul style="list-style-type: none"> • Setting of <u>standard for issuing evacuation order</u> • Preparation of business continuation plan (BCP) of ARAs (future task) • Conclusion of MOU for emergency support with related organizations including private construction firms (future task) • <u>Preparation of flood risk maps</u> (future task) • Participation to basin committee • Implementation of routine disaster drills (Join) 	<ul style="list-style-type: none"> • Preparation of contingency plan (every ministries and coordinated by INGC and approved by Assembly) • Setting of standard for issuing evacuation order (INGC, INAM) • Preparation of evacuation plan (District, INGC) • Preparation of business continuation plan (BCP) (All administrative levels and agencies) (future task) • Conclusion of MOU for emergency support with related organizations including other local authorities (All related agencies)

Preparedness (Non-structural Measures) 2/4

DNA	ARAs	INGC, INAM, other agencies
<ul style="list-style-type: none"> • <u>Provision of alert information</u> based on hazard level • Participate SENOE and Provincial COE • Maintain database of rainfall, water level and discharge observation • <u>Issuance of "National Hydrological Bulletin"</u> • Preparation of budget for emergency operation 	<ul style="list-style-type: none"> • <u>Provision of rainfall and water level information</u> • <u>Provision of alert information</u> based on hazard level • Participate Provincial COE • Maintain database of rainfall, water level and discharge observation • Patrol and inspection of river and hazardous areas • Rainfall, Water level and discharge observation • <u>Issuance of flood forecast and warning</u> • Preparation of budget for emergency operation 	<ul style="list-style-type: none"> • Preparation and dissemination of hazard maps for community level (INGC) • Organization of disaster management committee (INGC) • Enhancement of community based disaster risk management (CBDRM) (INGC) • Implementation of routine disaster drills (organized by INGC and participation of all related agencies) • Provision of rainfall information (INAM) • Provision of alert information based on hazard level (INGC)

Preparedness (Non-structural Measures) 3/4

DNA	ARAs	INGC, INAM, other agencies
		<ul style="list-style-type: none"> • Establishment of hotline with local authorities (INGC) • Implementation of evacuation (District, Localidad, INGC) • Establishment of SENOE and Provincial COE (INGC) • Patrol and inspection of river and hazardous areas (River basin committee) • Rainfall observation (INAM) • Water level observation (River basin committee) • Issuance of flood forecast and warning (INAM)

Preparedness (Non-structural Measures) 4/4

DNA	ARAs	INGC, INAM, other agencies
		<ul style="list-style-type: none"> • Stockpile of food, water, medical kit for emergency shelter (INGC, Provinces, Districts) • Stockpile of equipment and materials for flood fighting (heavy equipment, tools, sand bags, etc.) (Province, District, INGC) • Preparation of budget for emergency operation (INGC, INAM, Province & District)

Disaster Management Matrix

Disaster Cycle	Measures	Major Roles		
		DNA	ARAs	INGC, INAM, other
Prevention/ Mitigation	Non-structural			
	Structural			
Preparedness	Non-structural			
	Structural			
Response	Non-structural			
	Structural			
Recovery/ Reconstruction	Non-structural			
	Structural			

17

Preparedness

(Structural Measures) 1/1

DNA	ARAs	INGC, INAM, other agencies
<ul style="list-style-type: none"> Improvement of communication system (secure redundancy) to share disaster information among related organizations 	<ul style="list-style-type: none"> Improvement of communication system (secure redundancy) to share disaster information among related organizations 	<ul style="list-style-type: none"> Improvement of communication system (secure redundancy) to share disaster information among related organizations (INGC, INAM and all related agencies) Preparation of evacuation center (District, INGC)

18

Disaster Management Matrix

Disaster Cycle	Measures	Major Roles		
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	Structural			
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	Structural			
Recovery/ Reconstruction	Non-structural			
	Structural			

19

Response

(Non-structural Measures) 1/2

DNA	ARAs	INGC, INAM, other agencies
<ul style="list-style-type: none"> Gather flood and damage information and sorting of the information Information sharing in CENOE Provision of hydrological condition and forecast 	<ul style="list-style-type: none"> Patrol and early detecting of flood condition such as depth and area of inundation Gather flood and damage information and sorting of the information Information sharing in Provincial COE Provision of hydrological condition and forecast 	<ul style="list-style-type: none"> Chronological recording of all the incidents and response conducted (CENOE) Damage assessment (INGC) Information sharing among related agencies (CENOE, all related agencies) Evacuation guidance (INGC, District and local authorities) Search, rescue and support activities (INGC and local authorities) Transport of critical patient (INGC and local authorities) Setting up of COE (INGC and local authorities)

20

Response (Non-structural Measures) 2/2

DNA	ARAs	INGC, INAM, other agencies
		<ul style="list-style-type: none"> • Operation of drainage pumps (AIAs, municipality and local authorities) • Running of accommodation center (District INGC and CENOE) • Securing foodstuffs, drinking water, cloths, medicine, etc. (INGC) • Public relations on damage and response (CENOE and Local Government)

21

Disaster Management Matrix

Disaster Cycle	Measures	Major Roles		
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Prevention/ Mitigation	Non-structural			
	Structural			
Preparedness	Non-structural			
	Structural			
Response	Non-structural			
	Structural			
Recovery/ Reconstruction	Non-structural			
	Structural			

22

Response (Structural Measures) 1/1

DNA	ARAs	INGC, INAM, other agencies
<ul style="list-style-type: none"> • Construction of temporally dykes to prevent spreading of inundation 	<ul style="list-style-type: none"> • Construction of temporally dykes to prevent spreading of inundation (Province) • Dispatch of emergency equipment such as lighting vehicles, water purifier, generators, water supply tanks, etc. (INGC and CENOE) 	

23

Disaster Management Matrix

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	Structural			
Response	Non-structural			
	Structural			
Recovery/ Reconstruction	Non-structural			
	Structural			

24

Recovery/ Reconstruction (Non-structural Measures) 1/3

DNA	ARAs	INGC, INAM, other agencies
<ul style="list-style-type: none"> Formulation of reconstruction plan of damaged flood management facilities 	<ul style="list-style-type: none"> Formulation of reconstruction plan of damaged flood management facilities 	<ul style="list-style-type: none"> Operation of accommodation centers (District INGC and CENOE) Issuance of victim certificate (District, Localidad) Provision of special payment for disaster relief (Province & District) Formulation of rehabilitation plan (MOPHRH, Ministry of Health, Ministry of Education, Province, District)

25

Recovery/ Reconstruction (Non-structural Measures) 2/3

DNA	ARAs	INGC, INAM, other agencies
		<ul style="list-style-type: none"> Supporting rehabilitation works of local authorities (MOPHRH, Ministry of Health, Ministry of Education, Province, District) Control of epidemic (District, RED CROSS) Disposal of flood debris (Municipality and local authorities) Effective use of volunteers (Province, District RED CROSS) Cleaning of public facilities and hygiene activities (Province, District RED CROSS)

26

Recovery/ Reconstruction (Non-structural Measures) 3/3

DNA	ARAs	INGC, INAM, other agencies
		<ul style="list-style-type: none"> Participation for new town planning by collaboration of residents, community and administration (MOPHRH, District, Localidad) Consultation and measures for resettlement of habitation (Province, District) Provide financing for resettlement of habitation (Province, District) Formulation of reconstruction plan (Province)

27

Disaster Management Matrix

Disaster Cycle	Measures	Major Roles		
		DNA	ARAs	INGC, INAM, other
Prevention/ Mitigation	Non-structural			
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	Structural			
Response	Non-structural			
	Structural			
Recovery/ Reconstruction	Non-structural			
	Structural			

28

Recovery/ Reconstruction

(Structural Measures) 1/1

DNA	ARAs	INGC, INAM, other agencies
<ul style="list-style-type: none"> Emergency rehabilitation works of damaged dykes and river facilities Strengthening of river facilities such as dykes 	<ul style="list-style-type: none"> Emergency rehabilitation works of damaged dykes and river facilities Strengthening of river facilities such as dykes 	<ul style="list-style-type: none"> Building temporary houses (Province) Emergency rehabilitation works of damaged levees and river facilities (Province) Early rehabilitation of essential utilities (power supply, water supply, sewerage, etc.) and roads (Province, District) Strengthening of river facilities such as dykes (Province, ARAs)

29

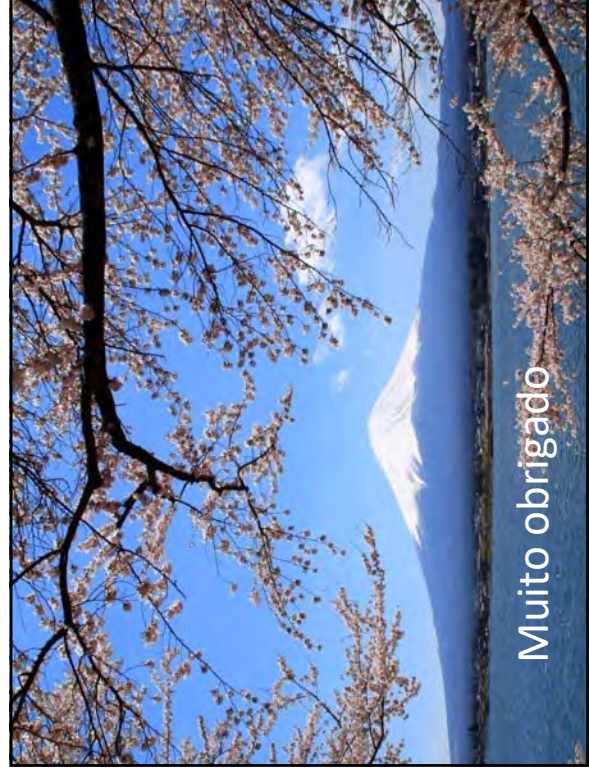
Conclusion

- Major roles of DNA and ARAs are concentrated in Prevention/Mitigation and Preparedness stages of Disaster Cycle.
- Efforts for Prevention/ Mitigation are the most important and efficient to mitigate loss of lives and property damages.
- While promoting infrastructure for flood management from long-term view, it is important to mitigate flood damage by non-structural measures such as improvement of credibility of flood forecasting and warning, etc.

Challenges

- If the description of role of DNA, ARAs and other agencies are not correct, please let us know for update.
- Based on the major roles of DNA and ARAs, capacity development plan including training will be discussed from now on.

31



Muito obrigado

Appendix 2-2

Material of Capacity Assessment Workshop

AGENDA

1) Dia 1 (27 de Maio de 2015 quarta-feira)

Seminário sobre a Gestão de Rios

13:00 – 13:30 Registo dos Participantes

13:30 – 16:00 (S1.1) Gestão de Rios no Japão

Mr. Makoto Kodama, Team Leader/ River Plan, JICA Team

2) Dia 2 (28 de Maio de 2015 quinta-feira)

Workshop de Avaliação das capacidades aplicando o método PCM

Mr. Noritoshi Maehara, Institutional Development Plan, JICA Team

08:30 – 09:00 Registo dos Participantes

09:00 – 09:40 (S2.1) Introdução do Método PCM

09:40 – 10:30 (S2.2) Exercício 1: Análise dos parceiros

Pausa

10:45 – 12:00 (S2.2) Exercício 2: Análise dos problemas

Pausa para o almoço

13:00 – 14:00 (S2.2) Exercício 3: Análise dos objectivos

14:00 – 14:45 (S2.2) Exercício 4 e 5: Selecção do projeto e preparação do PDM

Pausa

15:00 – 16:00 (S2.6) Apresentação: Análise dos parceiros, Análise dos problemas, Análise dos objectivos, Selecção do projecto e da PDM

3) Dia 3 (29 de Maio de 2015 Sexta-feira)

Reverendo a resposta das agências relacionadas para as cheias de 2015 - aplicação Table-top Exercício

Mr. Makoto Kodama, Team Leader/ River Plan, JICA Team

Mr. Noritoshi Maehara, Institutional Development Plan, JICA Team

08:30 – 09:00 Registo dos Participantes

09:00 – 09:30 (S3.1) Outline do Exercício de desastre

09:30 – 10:30 (S3.2) Revisão do Desastre das cheias de 2015

Pausa

10:45 – 12:00 (S3.3) Tabela cronológica dos principais eventos durante o Desastre cheias de 2015

Pausa de Almoço

13:00 – 14:00 (S3.4&3.5) Orientação cenário Tabletop Exercício

Pausa

14:15 – 15:30 (S3.6) Apresentação dos resultados de TTX

(Notas)

1. Em grupo Equipes mistas de várias agências com aproximadamente 6 pessoas será formada
2. Cada grupo terá um Presidente e um Secretário do Grupo a ser selecionado pelos membros do grupo, no início dos trabalhos do grupo.
3. O Presidente presidirá e gerenciar trabalhos de grupo, eo Secretário de Grupo terá registros ou resumir os resultados dos debates a bordo e / ou papel.

ASSISTENCIA
PARA
O FORTALECIMENTO DA CAPACIDADE INSTITUCIONAL
NA GESTÃO DE DESASTRES RELACIONADOS COM ÁGUA
EM
MOÇAMBIQUE

A Gestão de Rios no Japão

May 27, 2015
JICA Team Makoto KODAMA

Outline of the project (2)

JICA Team Member

Policy Advisor: Hitoshi BABA

Technical Advisor: Makoto KODAMA (Team leader/River plan)

Noritoshi MAEHARA (Institutional development)

Hideki ARAKI (River management technology)

Hiroki KAI (Satellite based data)

Coordinator : Arianna BOBBA

Period November 2014 - March 2017 (about 27 months)

Outline of the project (1)

Project Name Assistance for Enhancement of Institutional Capacity to Manage Water Related Disasters in Mozambique

Objective DNA and other related organizations develop water related disaster management plan, and DNA and ARAs enhance river basin management capacity

Activities

Base line survey (major rivers, legal system, policy, organization, donor's projects)

- Transfer technology regarding field and item
- target organization/personnel
- schedule
- goal to be achieved, and others

- Review and advice for HFA and post-HFA
- M/P of disaster prevention and mitigation
- water related disaster management
- human resources and institutional development plan

70

Conteúdos

1. Historia da Gestão dos Rios no Japão
2. Características dos rios no Japão
3. A Gestão dos Rios no Japão

71

Conteúdos

1. **Historia da Gestão dos Rios no Japão**
2. Características dos rios no Japão
3. A Gestão dos Rios no Japão

1-2 Historia da Gestão de Rios no Japão (1)

Era	Gestão de rio e controlo dos rios
Era Prehistórica Tempos antigos (Metade do 3º – 10º século)	<ul style="list-style-type: none"> ➢ Construção de dique para evitar inundações e maré alta (Manda não Tsutsumi no rio Yodo) ➢ Escavação de canal de drenagem do lago Kawachi para a Kawachi Bay ➢ Código Yoro (*) <ul style="list-style-type: none"> • A província era responsável para gestão das inundações. • Políticas do uso da água e controlo das cheias baseada na ideia da água como bem comum. • Os expertos eram deslocado do nível central para o nível local durante as cheias mais severas.

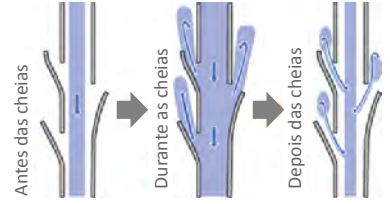
(*) Código Yoro foi um acto básico que descreveu o sistema de governo clássico no Japão. Foi elaborado no 718. E' composto de 10 volumes de código penal e 10 volumes de código administrativo

1-1 Historia do desenvolvimento da terra no Japão

Mais do que 2000 anos atras 3º Seculo	A idade de Yayoi	Começo da cultivação do arroz Expansão dos campos arrosais
O 4º-6º século	A idade do Kofun	Desenvolvimento da terra e da água Desenvolvimento da-fio liso
O 7º século	A idade do Asuka	
O 8º século	A idade de Nara	Desenvolvimento de várzea
O 9º-11º séculos	A idade do Heian	Preservação da terra
O 12º-13º séculos	A idade do Kamakura	Autonomia dos governos locais
O 14º-15º séculos	A idade do Muromachi	Formação em rios
O 16º século	A idade do Sengoku	Sustentabilidade do uso da várzea
Os 17º-19º séculos	A idade do Edo	Industrialização/urbanização
O 20º século	A idade Meiji/Taisho/Showa	Actividades economicas sustentaveis
O 21º século	Heisei (ate hoje)	

1-2 Historia da Gestão de Rios no Japão (2)

Era	Gestão de rio e controlo dos rios
Época Medieval Época de guerras provinciais O 11º - 12º século	Senhores feudais conduziam a gestão das inundações para proteger os seus campos agrícolas e aumentar os rendimentos. Ex. Abertura do dique, anel de diques, etc.



Abertura do dique do Rio Ara

1-2 Historia da Gestão de Rios no Japão (3)

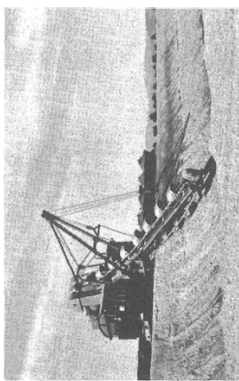
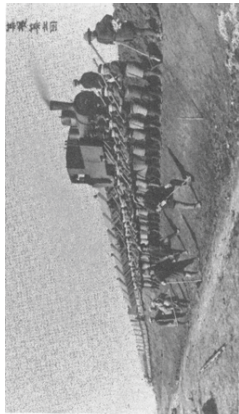
Era	Gestão de rio e controlo dos rios
Época Medieval Época de guerras províncias O 11º - 12º século	Senhores feudais conduziam a gestão das inundações para proteger os seus campos agrícolas e aumentar os rendimentos. Ex. levee aberto, anel de diques, etc.



Anel de diques do Kiso san-sen

1-2 Historia da Gestão de Rios no Japão (5)

Era	Gestão de rio e controlo dos rios
Fim da época moderna (Início 20- século)	Os especialistas convidados da Olanda disseminaram principalmente obras fluviais de baixa-mar que consistem de super dique e leito do rio de escavação. Lei do rio estabelecida no 1896 Trabalhos de rios de grande escala usando máquinas pesantes para o reforço dos curso dos rios, contínuos diques, vias de rios, e barragem de uso múltiplo, etc.



O rio Tone no início do 20º século

O rio Watarase no 1940's

1-2 Historia da Gestão de Rios no Japão (4)

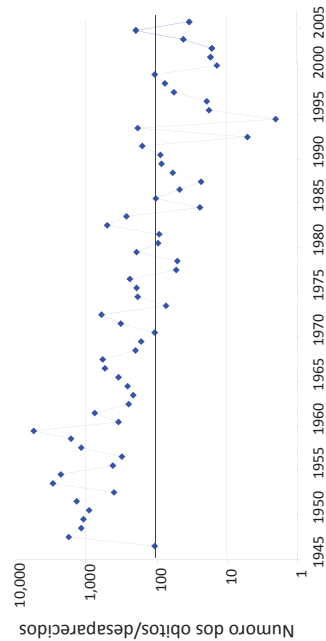
Era	Gestão de rio e controlo dos rios
Início da era moderna (Início 17º – fim 19º século)	Foram realizados grandes projetos de melhoria de rio em grande escala. Ex. Mudança do curso do rio Tone, dique no rio Kiso <ul style="list-style-type: none"> Períodos anteriores: abertura de dique, dique de segunda linha Metade do Período: Continuação da construção de diques dique para transbordar, isenção Últimos período: alisamento de canal do rio, dique consolidados



Mudança do curso do rio Tone, a fim de proteger Tóquio a partir de inundação

1-2 Historia da Gestão de Rios no Japão (6)

Era	Gestão de rio e controlo dos rios
Época actual (Metade-20- século – presente)	O Número dos óbitos por ano chegou a mais de 1.000 pessoas 13 vezes em 15 anos, forma 1945-1959. Depois de 1970, os desastres de grande escala diminuiu.

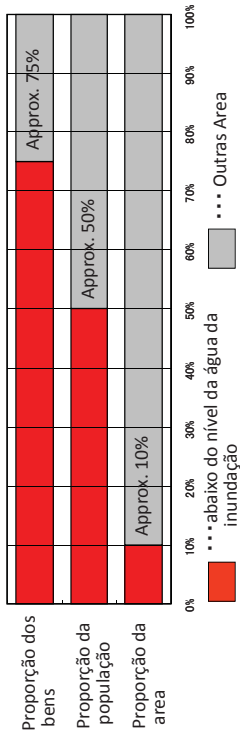


Redução da casualidade e contínuos esforço de gestão das cheias

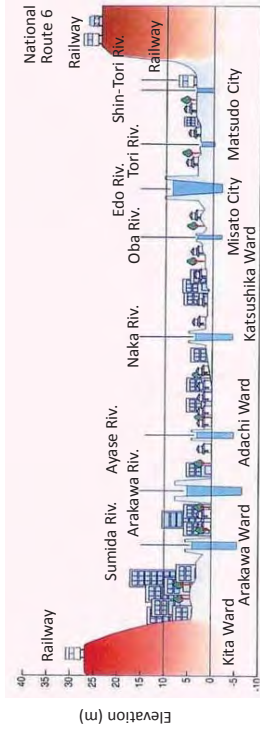
1. Historia da Gestão dos Rios no Japão
2. **Características dos rios no Japão**
3. A Gestão dos Rios no Japão

2-2 Vulnerabilidade do país aos perigos da água

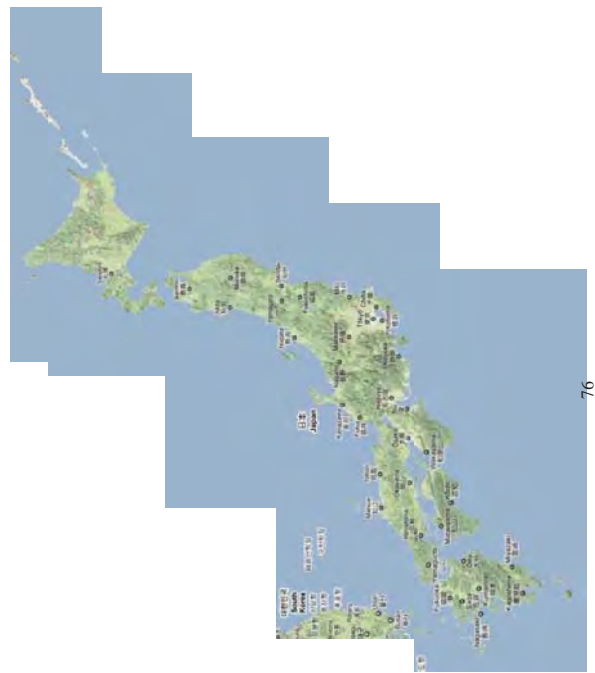
Proporção dos bens e população abaixo do nível da água da inundação



Elevação ground em area central de Tokyo

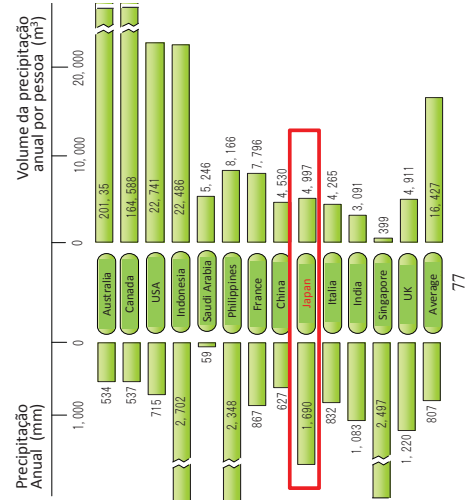


2-1 Japão Um país de Montanhas



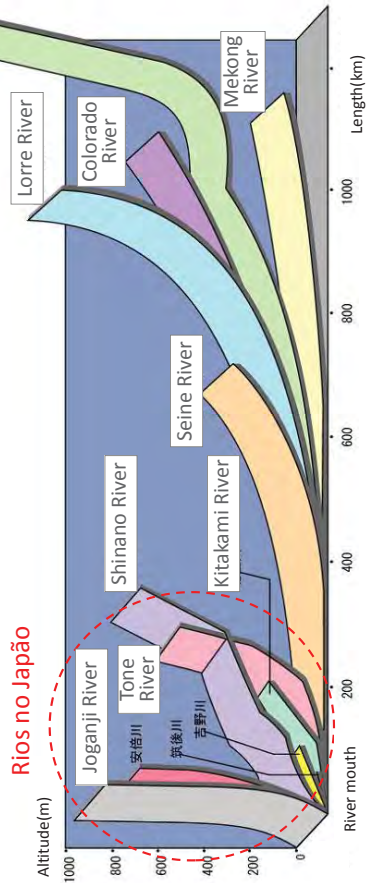
2-3 As precipitações no Japão e no Mundo

Precipitações	Japão	Média mundial
Precipitação Anual	1690 mm	800 mm
Volume da precipitação anual por pessoa	4,997 m ³	16,427 m ³

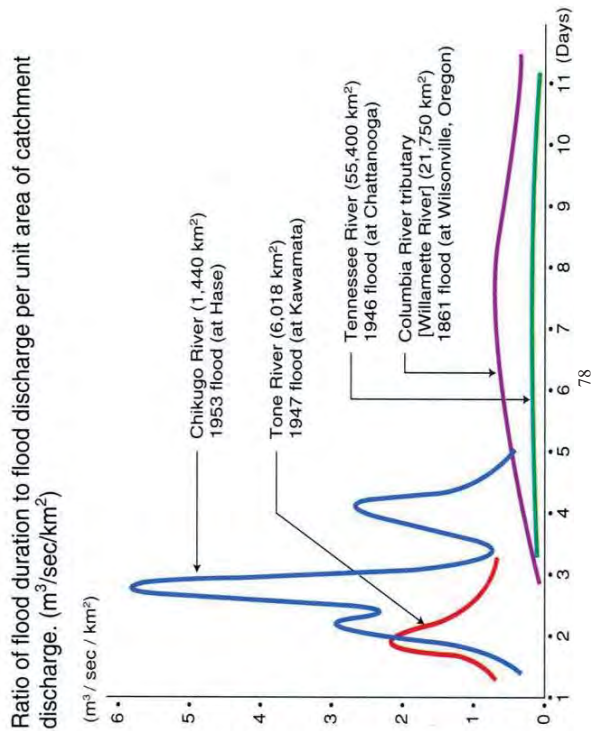


2-4 Rios caudalosos

Muitos rios no Japão são muito inclinados com uma curta distância da fonte até ao mar, consequentemente o fluxo é muito rápido.

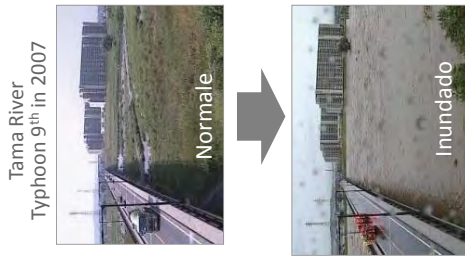
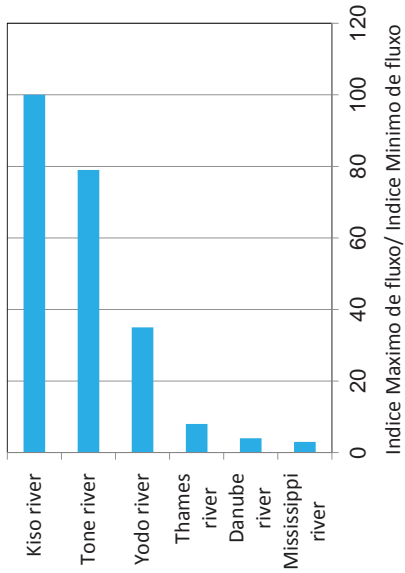


2-5 Nos rios do Japão o aumento do nível de água é muito rápido



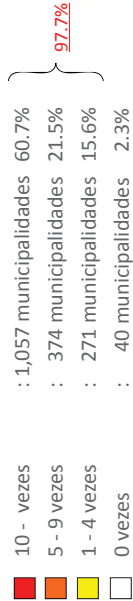
2-6 Diferença de escoamento

Os Rios japoneses têm uma grande diferença de escoamento entre índice máximos e mínimos de fluxo.



2-7 A ocorrência de desastres relacionados com água (1999 – 2012)

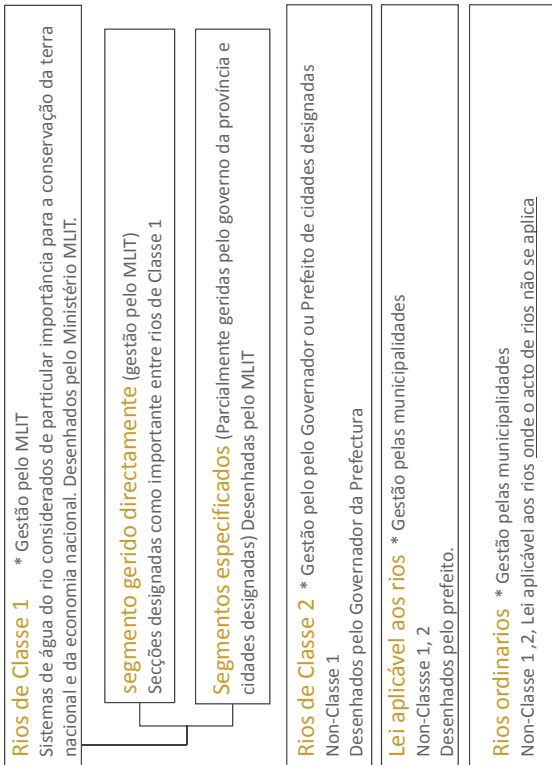
Cheias e desastres relacionados com sedimentos ocorreram em mais de 97% das municipalidades ao longo dos últimos 10 anos no Japão



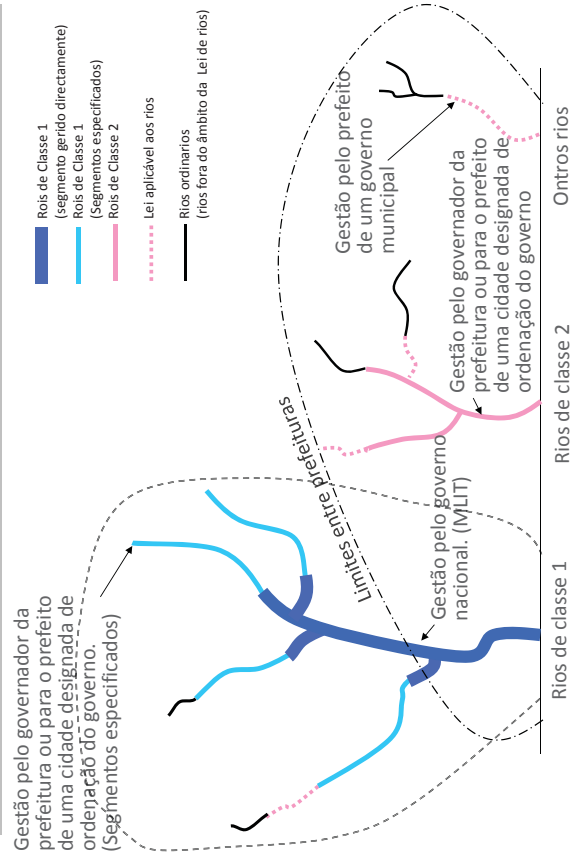
Numero total das municipalidades em 2012
1,742 municipalidades

1. Historia da Gestão dos Rios no Japão
2. Características dos rios no Japão
3. **A Gestão dos Rios no Japão**

3-2 Classificações de gestão de rios

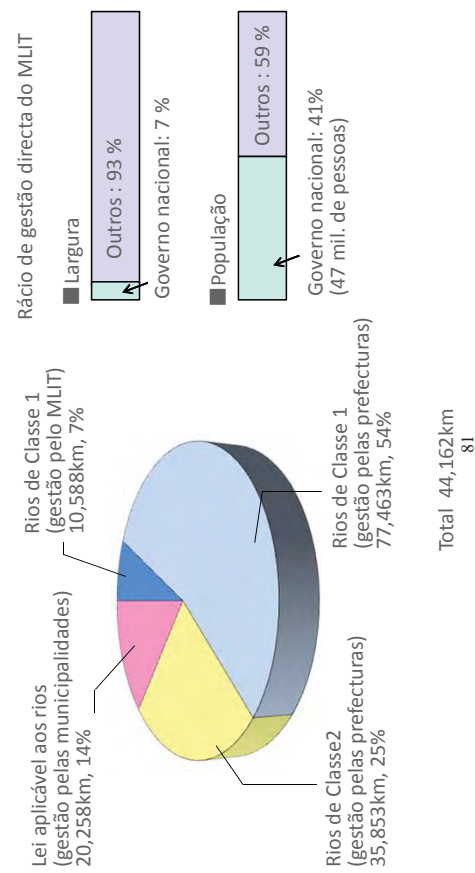


3-1 Gestão do rio pelo governo nacional e local



3-3 Gestão de rios pelo governo nacional

Cerca de 7% dos comprimentos totais dos rios são geridos directamente pelo governo nacional (MLIT).



3-4 Partilha de custos do project rio

Projet pelo governo nacional (MLIT)

Melhoramento	Parte Nacional (2/3)	Parte da prefectura (1/3)
Melhoramento (grande escala)	Parte Nacional (7/10)	Parte da prefectura (3/10)
Manutenção	Parte Nacional (10/10)	

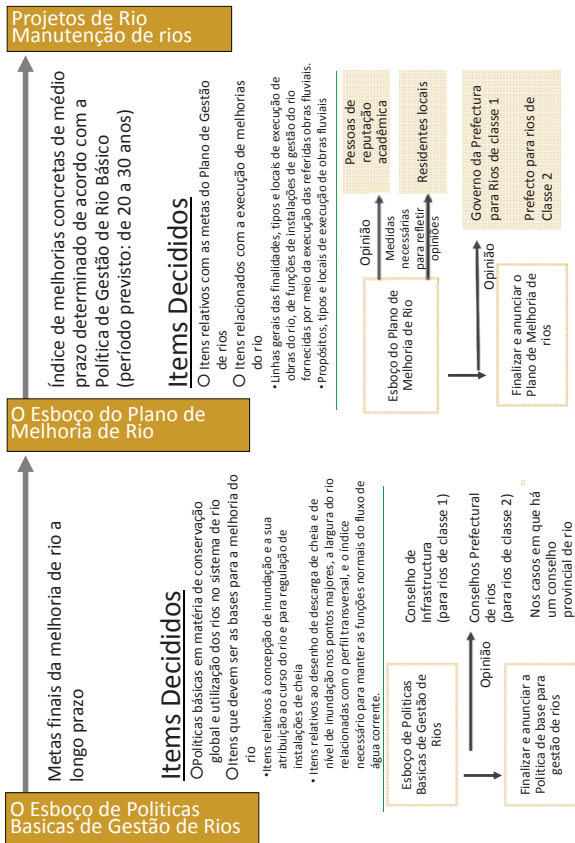
Projet pelas prefecturas

Melhoramento	Parte Nacional (1/2)	Parte da prefectura (1/2)
Melhoramento (grande escala)	Parte Nacional (5.5/10)	Parte da prefectura (4.5/10)
Manutenção		Parte da prefectura (10/10)

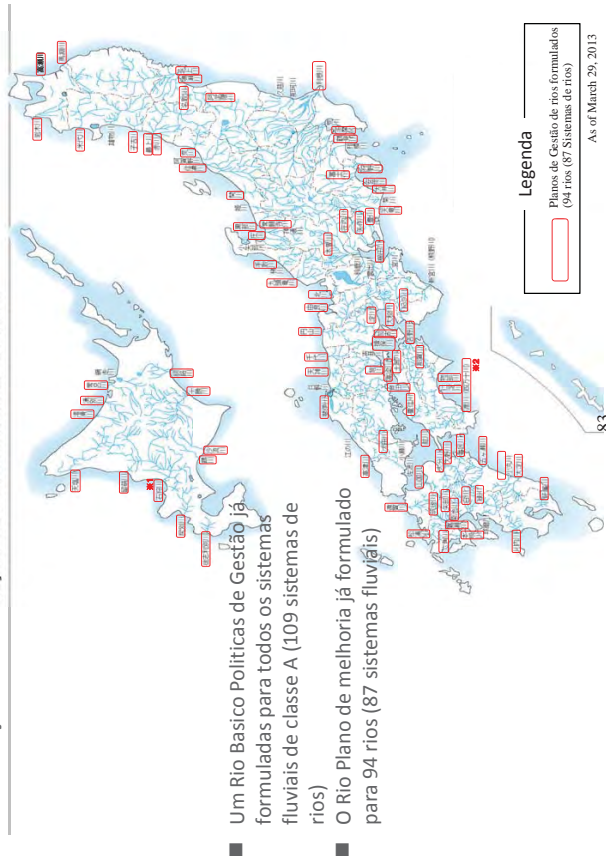
3-5 Gerentes dos rios

- No caso da gestão dos recursos hídricos, incluindo Gestão de Cheias, os gerentes dos rios são designados de acordo com a "Lei de rios".
- As Responsabilidades dos gerentes de rios são: monitoramento, planeamento de gestão de recursos hídricos, e implementação*
* ex; construção de instalações de controlo de inundações, operação e manutenção de instalações, permissão e manutenção de direitos de água, implementação de projetos de desenvolvimento de recursos hídricos, etc.
- Uma vez que ocorre o desastre, os gerentes dos rios são os primeiros a responder para uma rápida recuperação e reconstrução de infra-estruturas fluviais.

3-6 Fluxo de gestão de rios

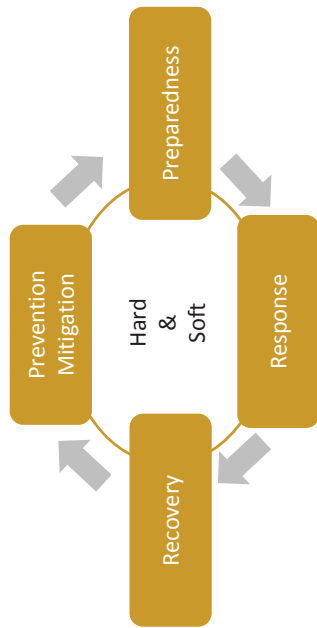


3-7 Situação da formulação da Política Básica e Plano



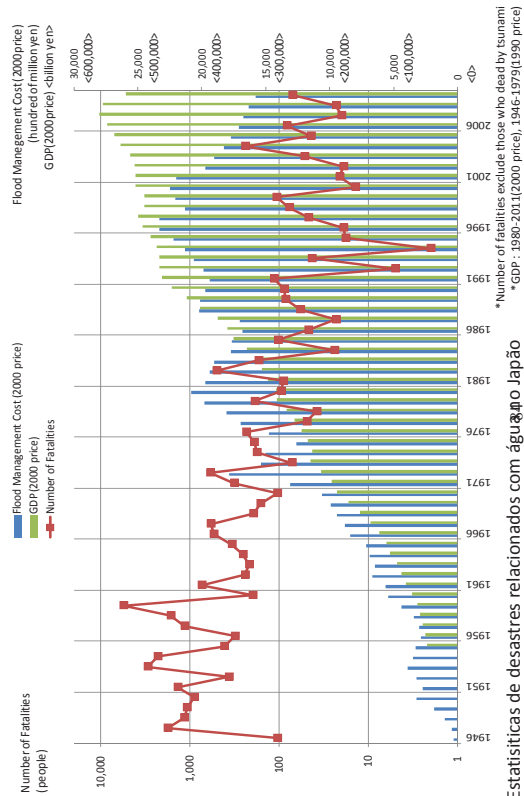
3-8 Water related disaster management in Japan

- Enfoque na fase de prevenção
- Abordagem holística da fase preventiva para a resposta de emergência e recuperação
- Um plano abrangente baseado na bacia para a gestão de inundações, de acordo com as características de cada bacia
- Combinação de medidas "hard" (estruturais) e "soft" (não-estruturais)



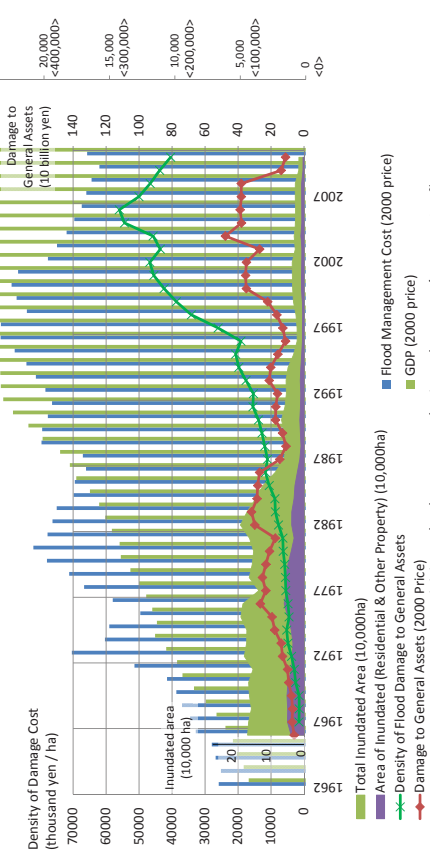
3-9 Efeito do investimento para a Gestão de Cheias no Japão (1)

Numero das fatalidades causadas para desastres relacionados com água
GDP e orçamento para a gestão das cheias (2000 preço)



3-9 Effect of investment for Flood Management in Japan (2)

Intensidade do dmnno para cheia (perdas economicas por area),
GDP e orçamento para a gestão da cheia (2000 preço)

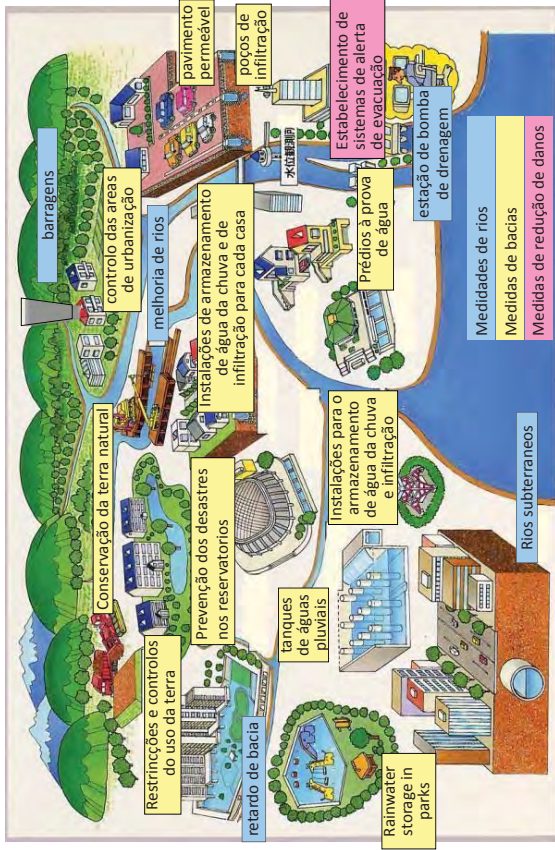


3-10 Medidas de controlo de inundações abrangentes

Medidas de controlo de inundações abrangentes

- Melhoria de canais de rios
- Construção de barragens, bacias de retardamento e canais de descarga, etc.
- Manutenção do controlo das areas urbanas
- Conservação dos campos
- Construção das albufeiras
- A construção de reservatórios de água da chuva
- A construção de pavimentos permeáveis e poços de infiltração
- Estabelecer os sistemas de alerta de evacuação
- Manutenção dos sistemas Suibo
- Promover a conscientização dos moradores locais

3-11 Medidas de controle abrangente de inundações em uma bacia hidrográfica



Muito Obrigado

Workshop de Avaliação das capacidades aplicando as metodologias PCM

Assistência para o Fortalecimento Institucional das Capacidades de Gestão dos Riscos de Desastres relacionados com Água

Noritoshi MAEHARA
JICA Team

Objetivos

- 1 Esclarecer os papéis das partes interessadas na gestão dos rios.....
- 2 Identificar os problemas na implementação de gestão do rio e as suas causas.....
- 3 Considerar medidas eventuais e desejáveis de gestão do rio.....

27/29 Maio de 2015

Workshop de Avaliação das capacidades aplicando as metodologias PCM

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1

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2

1. Perfil da metodologia do PCM

3

O que é a metodologia PCM?

- PCM significa **Gestão do Ciclo de Projecto**
- Uma das ferramentas para gerir todo o ciclo de um projeto

Planificação participativa do Projecto

Monitoramento contínuo da implementação do projecto

Avaliação do projecto na sua conclusão

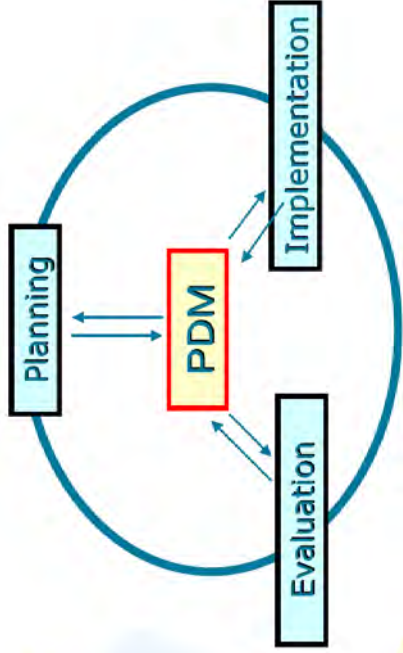
4

O que é um projecto?

- Um projecto é uma serie de actividades com objectivos **específicos**,
- dentro de um **tempo** e
- com um **budget definido**.

5

O que é um Ciclo de Projecto?



6

PDM: Matriz do Projecto

PDM (Matriz do Projecto)

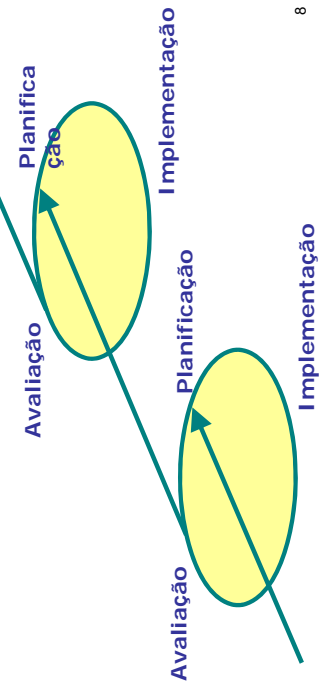
Nome do Projecto _____ Tempo do Projecto _____ Ver.No: _____
 Área alvo: _____ Grupo Alvo: _____ Data: _____

Sumário Narrativo	Indicadores avaliáveis abjectivamente	Meios de Avaliação	Suposições importantes
Objectivo Geral Direção que o projecto deve tomar em seguida	Normas para medir a realização do projeto	As fontes de dados a partir do qual os indicadores são derivados	
Objectivo do Projecto Objectivo que o projeto deve alcançar dentro da duração do projecto			
Outputs Estratégias para alcançar o Objectivo do Projecto			
Actividades Medidas específicas tomadas para produzir saídas	Inputs Pessoal, materiais, equipamentos, instalações, e os fundos requeridos pelo projeto		Pré-condições Condições que devem ser cumpridas antes que um projeto comece.

8

Ciclo de Projecto e Experiencia Passada

O ciclo **Planificação-Implementação-Avaliação** produz experiências e lições a serem aplicadas na planificação das fases de projeto bem sucedidas.



Desenvolvimento da metodologia de PCM

No fim dos anos 1960	A USAID elaborou o quadro logico
1970	As organizações internacionais começam pesquisar/introduzir o quadro logico
Início dos anos 1980	A GTZ desenvolve a Metodologia ZOPP
No fim dos anos 1980	Os países Europeus adoptam a metodologia ZOPP
Início dos anos 1990	A FACID inicia as pesquisas e o desenvolvimento do PCM Metodologias
1994	A JICA começa a introduzir a grande escala a metodologia PCM
1996	A FACID desenvolve um modelo de avaliação
Usado até hoje	A metodologia PCM foi aplicada a nível internacional e para projectos domésticos da JICA

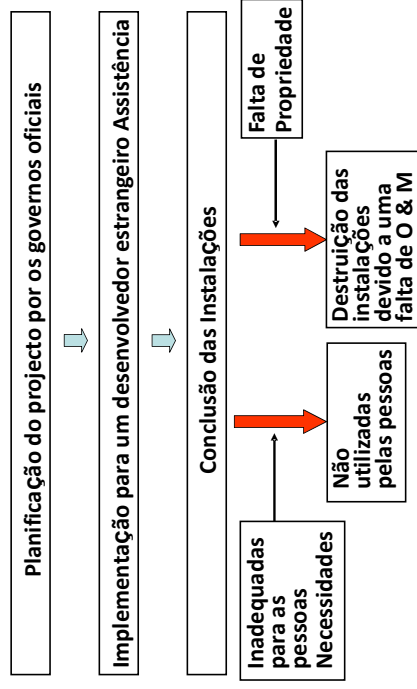
FASID: Foundation for Advanced Studies on International Development, Japan

Características

- **Abordagem participativa**
 - através da implementação de workshop com os parceiros
- **Lógica**
 - Processos analíticos são baseados na lógica da causa-efeito ou da relação meio - fim
 - O PDM é também elaborado de uma forma lógica
- **Consistência**
 - Gestão coerente do ciclo do projeto por um PDM

10

Falha na Assistência ao Desenvolvimento no Passado



11

Porque uma abordagem participativa

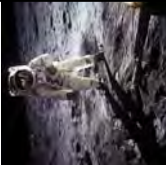
Prof. M. Nagamachi (Hiroshima International University, Emotion-Technology)

- As pessoas não precisam ser ordenadas ou forçadas,
- As pessoas gostam de participar e serem envolvidas nas questões que são a elas relacionadas,
- As pessoas perseguem o que propoem
- A participação faz as pessoas mais responsáveis
- Envolvimento e responsabilidade são ligadas com joia e satisfação



Porque a interecção no grupo é necessária?

"Perdido sobre o Exercício da lua" : A sua nave teve uma aterragem forçada na lua. Você foi programado para encontrar-se com um navio-mãe 200 milhas de distância. So 15 itens são disponíveis para ser usados. A sua tarefa é classificar os itens em termos da sua importância para a sobrevivência.



1º Step: Para classificar os itens individualmente

2nd Step: Para classificar os itens através da discussão de grupo

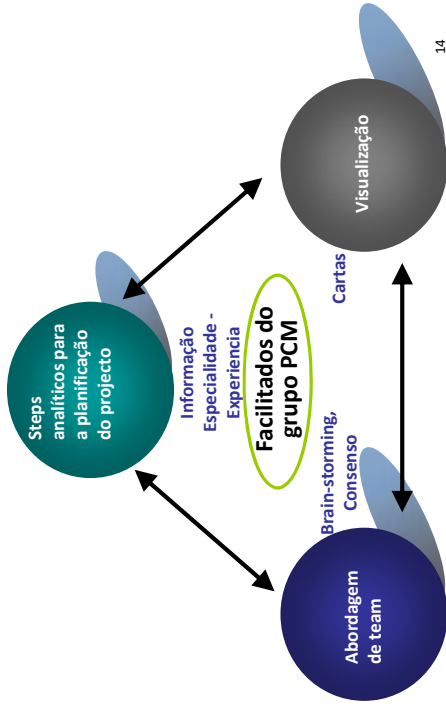
3rd Step: Para comparar as respostas com as respostas correctas da NASA

Descobertas e diálogo através de "Grupos de discussão" pode levar melhor ideia do grupo

As respostas através da discussão de grupo conduzem a melhor resultados da queles individuais.

13

Workshop PCM



14

Workshop PCM



15

Méritos do workshop PCM

Workshop participativos conduzem a:

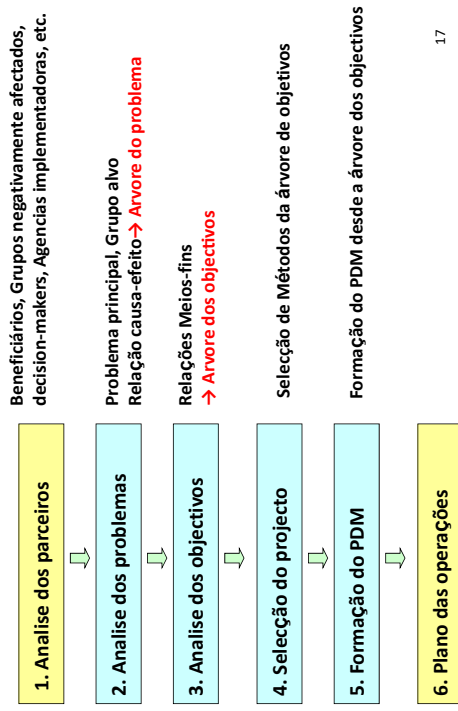
Partilhar e reconhecer as informações

Produzir o consenso baseado no entendimento recíproco

Planificação do projecto em acordo com as necessidades

16

Principais steps na planificação participativa



17

2. Análise dos parceiros

18

Análise dos parceiros

- Para identificar a situação actual das áreas alvo através da análise das **organizações, grupos** interessados.
- Para decidir se os problemas podem ser resolvidos pelo projecto (Grupo Alvo)?

19

Porque a análise dos parceiros é necessária?

- Reconhecimento sobre os problemas, necessidades, factos, etc. difere dependendo do ponto de vista de cada pessoa, grupo ou organização, etc.
- Em alguns casos, a própria diferença não é reconhecida até à fase final de um projecto!

20

Exercício 1

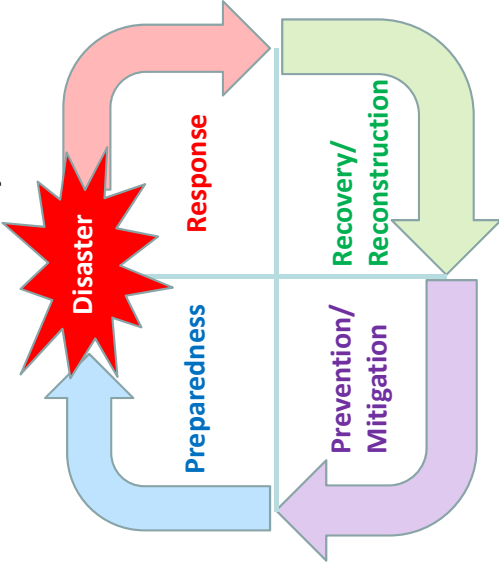
Análise dos parceiros

- Lista dos parceiros relacionados com a gestão dos rios.
- Lista de todos os papéis esperados para cada parceiro na gestão do rio.
- Descrição dos problemas e questões para cada parceiro na gestão do rio.



21

Disaster Cycle



22

Step 1: Please list all the stakeholders related to "River Management (Flood Management)"

(Examples)

DINA	Provincial Government	.....
ARA Centro Norte and its Units	District Government	
ARA Norte and its Units	Localidade Government	
INGC	Community	

23

Step 2: Please list all the roles expected for each stakeholder in disaster cycle (Examples for "Preventio/ Mitigation Stage")

DINA	Collect flood information of international rivers
	Operation and maintenance of flood management infrastructure
	Development and upgrading of flood forecasting model
	Planning and construction of dykes

24

Step 3: Please describe problems and issues for each stakeholder in river management

(Examples for "Preventio/ Mitigation Stage")

DNA	Collect flood information of international rivers	Operation and maintenance of flood management infrastructure	Operation and maintenance has not been properly performed
	Development and upgrading of flood forecasting model		
	Planning and construction of dykes		
		

25

Ponto de vista e identificação dos problemas/questões

a) Recursos Humanos	Capacidades Técnicas: Conhecimentos, habilidades, sistema de partilha das informações, etc. Capacidades centrais: Sistema de incentivos, Sistema do pessoal, etc.
b) Gestão	Estratégia da organização, Liderança e tomada de decisões, políticas de base, comunicações, estrutura organizativa, cultura das organizações, etc.
c) Contexto Externo	A política do governo, instituição, governança, participação cidadã, a posse de partes interessadas, etc.
d) Input	Recursos intelectuais, recursos materiais, recursos fiscais, recursos humanos, de fornecimento firme de recursos, sistema de orçamento, despesas e saída, etc.

26

1 (Exemplo) Fase de Prevenção/Mitigaçã

Parceiros	Papel	Problemas/Questões
ARA Centro Norte	Observar .....	.....
	Observar .....	.....
	Reportar .....	.....
DNA	Supervisionar .....	.....
	Monitorar .....	.....
	Monitorar .....	.....

2 (Exemplo) Fase de Preparação

Parceiros	Papel	Problemas/Questões
ARA Centro Norte	Observar .....	.....
	Observar .....	.....
	Reportar .....	.....
DNA	Supervisionar .....	.....
	Monitorar .....	.....
	Monitorar .....	.....

3 (Exemplo) Fase de resposta a Emergencia

Parceiros	Papel	Problemas/Questões
ARA Centro Norte	Observar .....	.....
	Observar .....	.....
	Reportar .....	.....
DNA	Supervisionar .....	.....
	Monitorar .....	.....
	Monitorar .....	.....

Seleção dos problemas centrais

Faz favor de selecionar os problemas principais que deveriam ser endereçado a sua organização

31

4 (Exemplo) Fase da Reconstrução e Reabilitação

Parceiros	Papel	Problemas/Questões
ARA Centro Norte	Observar .....	.....
	Observar .....	.....
	Reportar .....	.....
DNA	Supervisionar .....	.....
	Monitorar .....	.....
	Monitorar .....	.....

3. Análise dos problemas

32

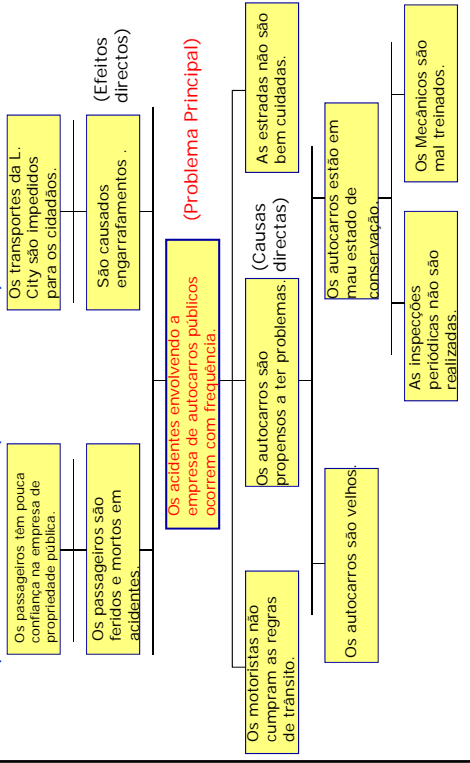
Análise dos problemas

- Para compreender a **situação actual**
- Através da análise dos **problemas existentes** da organização
- Através da **relação causa efeito**
- Para mostrar a forma da **árvore dos problemas**

33

Árvore dos problemas (Exemplo)

Exemplo: The Public Bus Corporation of L.City



Como conduzir a análise dos problemas

- 1) Identificar os problemas principais
- 2) Escrever os problemas que directamente causam os problemas principais (Causas directas)
- 3) Determinar as causas directas das Causas Directas aos problemas (em 2) e como sobra) e repetir o mesmo procedimento
- 4) Escrever os problemas que directamente causam os problemas principais (Causas directas)
- 5) Determinar os problemas causados pelos efeitos directos e repetir o mesmo procedimento

35

Cartões das regras para escrever os problemas (1)

- 1) Indicar os problemas existentes.
- 2) Escrever os problemas → negativos da situação presente.
- 3) Escrever uma problema por cartão.
- 4) Descrever o problema em uma frase.
- 5) Não incluir as ambos as causas e o efeitos do problema em um cartão. e.g.

(x) Capacidades técnicas são inadequadas e os veículos são em mãos condições.

(O) -os veículos são em mãos condições.

(x) Capacidades técnicas são inadequadas e

36

Cartões das regras para escrever os problemas

(1)

6) Experimentar evitar expressões como nenhuma solução/recurso é disponível

Invés, Descrever as condições resultantes da falta ou ausência de soluções ou recursos particulares e.g.

(X) Não tem nenhum hospital.



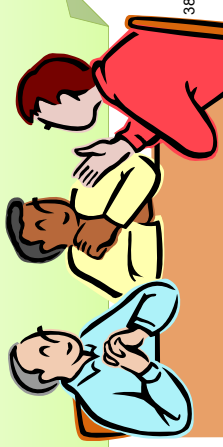
(O) As pessoas não podem receber tratamentos médicos adequados.

37

Exercício 2

Análise dos problemas

- Tentar a análise dos problemas começando para o problema principal selecionado no exercício 1
- Discussão facilitada para um grupo de facilitadores.
- Tempo Útil:



38

4. Análise dos objectivos

39

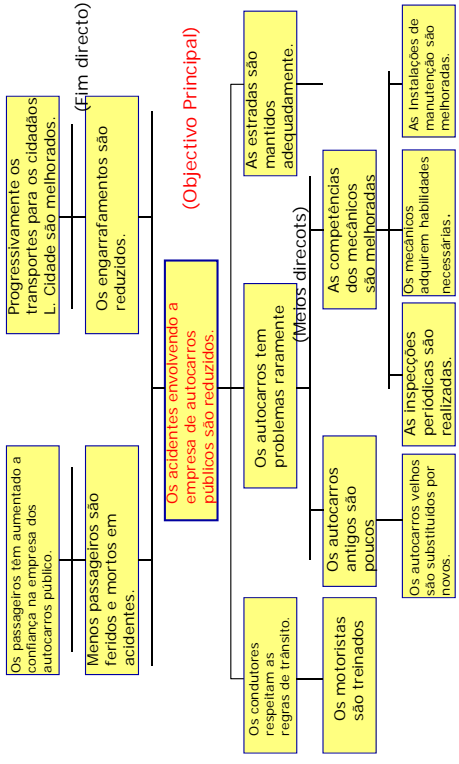
Análise dos objectivos?

- Para mostrar **Soluções desejáveis** uma vez que o problema será resolvido, e **todas as soluções possíveis** foram conseguidas
- Em acordo com **a relação Meios-Efeitos** entre as situações desejáveis que serão atingidas uma vez que os problemas são resolvidos, e as soluções para os mesmos
- E para mostrar na forma da **arvore dos objectivos**

40

Arvore dos objectivos

Exemplo: The Public Bus Corporation of L. City



Como conduzir um análise dos objectivos (1)

- Todos os cartões dos objetivos devem ter frases que descrevem situações desejadas.

- 1) Identificar os objectivos principais
- 2) Escrever os meios directos para o objectivo principal (Meios Directos)
- 3) Determinar meios directos dos Meios Directos aos problemas (em 2) e como sobra) e repetir o mesmo procedimento.

42

Como conduzir um análise dos objectivos (2)

- 4) Escrever os objectivos directos para os objectivos principais (Fins Directos)
- 5) Determinar os objectivos directos para os Fins Directos e repetir o mesmo procedimento

Se necessário,

- Revisão das demonstrações
- Adicionar novos cartões
- Eliminar alguns cartões

43

Exercicio 3

Analise dos objectivos

- Esperimentar a análise dos objectivos baseada na arvore dos problemas preparada no exercicio 2.
- Discussão facilitada para um grupo de facilitadores.
- Tempo Util:



44

Seleção do projecto

- Nem todos os meios sobre os Objetivos da árvore podem ser implementados devido a várias restrições
- É necessária a formulação a partir de projectos de uma parte da árvore.
- As secções "Meios-fins" da árvore formam um grupo que representam um projeto candidato .
- Grupos reunidos em direção ao centro são chamados de "abordagens".
- As abordagens devem ser dados nomes que indicam claramente o que será alcançado em cada abordagem.

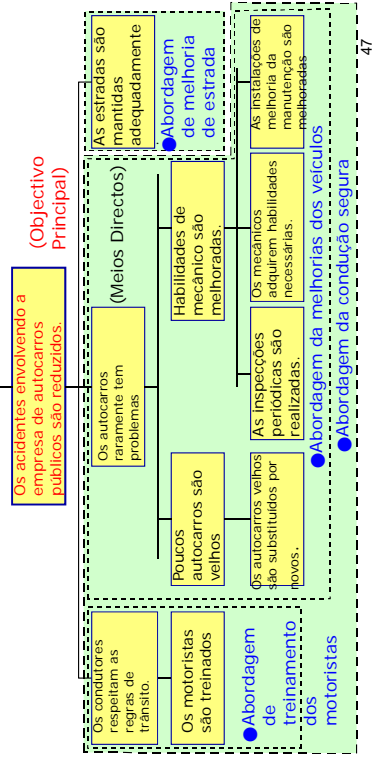
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5. Seleção do projecto

45

Indentificar as abordagens

Exemplo: The Public Bus Corporation of L.City



47

Exercício 4

Seleção do projecto

- Tentar a Seleção de Projetos com base nos objectivos da árvore preparada no Exercício 3.
- Discussão facilitada para um grupo de facilitadores.
- Tempo Útil:



48

6. Formação do PDM

49

O que um PDM

- Um formato para mostrar as componentes essenciais do projeto, como objetivos, actividades, entrada, riscos, indicadores, etc., juntamente com as suas inter-relações lógicas.
- Também chamado como "Um resumo de página" de um projeto
- Semelhante ao Quadro Lógico empregado por muitas agências doadoras

50

Formado do PDM

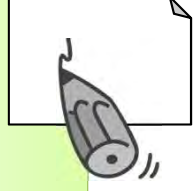
Nome do Projeto _____ Tempo do Projeto _____ Ver.No: _____
 Área alvo: _____ Grupo Alvo: _____ Date: _____

Sumário Narrativo	Indicadores avaliáveis abjectivamente	Meios de Avaliação	Suposições importantes
Objectivo Geral Direção que o projeto deve tomar em seguida	Normas para medir a realização do projeto	As fontes de dados a partir do qual os indicadores são derivados	
Objectivo do Projecto Objectivo que o projeto deve alcançar dentro da duração do projeto			
Outputs Estratégias para alcançar o Objectivo do Projeto			
Actividades Medidas específicas tomadas para produzir saídas	Inputs Pessoal, materiais, equipamentos, instalações, e os fundos requeridos pelo projeto		Pré-condições Condições que devem ser cumpridas antes que um projeto comece.

Exercício 5

Formação do PDM

- Tentar preparar o PDM para a abordagem selecionada no Exercício 4.
- Discussão facilitada para um grupo de facilitadores.
- Tempo Util:

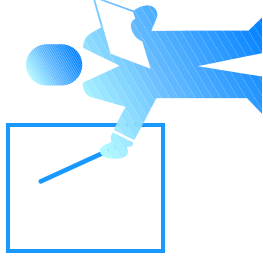


52

Exercício 6

Apresentação

- Arvore dos problemas
- Arvore dos objectivos
- PDM:
- Questões e Respostas
- Tempo: 15 minutos



54

7. Apresentação

53

Referencias

- Project Cycle Management, Management Tools for Development Assistance, Participatory Planning, 5th edition, March 2001, FASID
- Introduction of PCM and Introduction of PCM and Identification of Problems and Identification of Problems and Possible Solutions, UNEP “Sustainable Sanitation Seminar” 15/12/2004, FASID

55

Muito obrigado!

56

Revendo a resposta das agências relacionadas para As cheias-2015

Aplicando a tabelatop exercicio



1. EXERCÍCIO DE DESASTRE



Exercícios de desastres no Japão

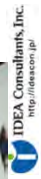


Tipo de Exercício

Exercício no campo

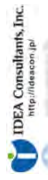


Tabletop Exercise



Exercício no campo

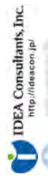
- Para melhorar a proficiência nos procedimentos respondentes e nas operações de equipamento e repetindo-as no campo
- Para confirmar-se as operações do desastres são conduzidas para tomar procedimentos predeterminados.



4

Tipologia do treinamento no campo

- Exercício de evacuação
- Exercício de fogo
- Formação para o resgate
- Formação de construções em sacos de areia
- Formação em informações e comunicação



5

Exercício de Campo e Tabletop Exercise

Exercício no campo

Atingir habilidades

Melhorar a proficiência

Ensaio



Tabletop Exercise

Melhorar a predição das capacidades

Melhorar a tomada de decisão

Simulações



6

1.

TABLETOP EXERCISE

TABLETOP EXERCISE

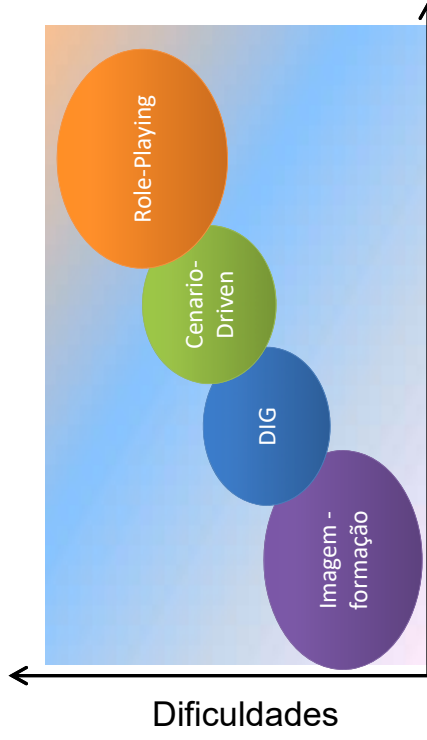


7

1. Tipologia de Tabletop Exercise

- Tabletop O exercício é uma das ferramentas para desenvolver bom senso e verificar os planos contra desastres.
- Existem vários tipos de tabletop Exercises
- Tabletop Exercises podem ser classificados por nível prático e dificuldade.

Tipologia de Tabletop Exercise



2. Imagem - formação

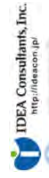
- Capacidade de imaginação de situação de desastre e a resposta necessária pode ser desenvolvida com base em informações fornecidas pela fase de desastres.
- Pode ser realizada facilmente, sem muita preparação.
- Alvo pode ser tanto individual e em grupo.

O que é uma imagem?

- Como o desastre pode acontecer?
- Que danos podem acontecer?
- A imagem mostra as possibilidades concretas (quando, onde, como e que, etc.)
- Quais medidas são necessárias para a situação
- Que obstáculos, dificuldades e preocupações você tem?

3. Disaster Imagination Game (DIG)

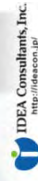
- Um tabletop exercise simples pode ser conduzido para qualquer pessoa
- Através do uso de uma larga escala de mapa e marker (caneta)
- Diversas informações, como lugares perigosos, rota de evacuação segura, lugares de evacuação, etc. são indicadas no mapa através de discussão entre os participantes



12

Características da DIG

- Discussão dos eventos extremos no mapa
- Considera as áreas de inundação, rotas de evacuação, planos de evacuação no mapa



13

4. Cenário-driven Tabletop Exercise

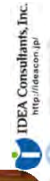
- O exercício é conduzido através da discussão baseada no cenário.
- Este exercício é usado para desenvolver ou melhorar o plano de gestão de desastres para o desastre em grande escala
- Várias contramedidas pode ser considerada com base em um cenário



14

Cenário-driven Tabletop Exercise

- O cenário é providenciado
- Contro-medidas são consideradas baseada no cenário dado



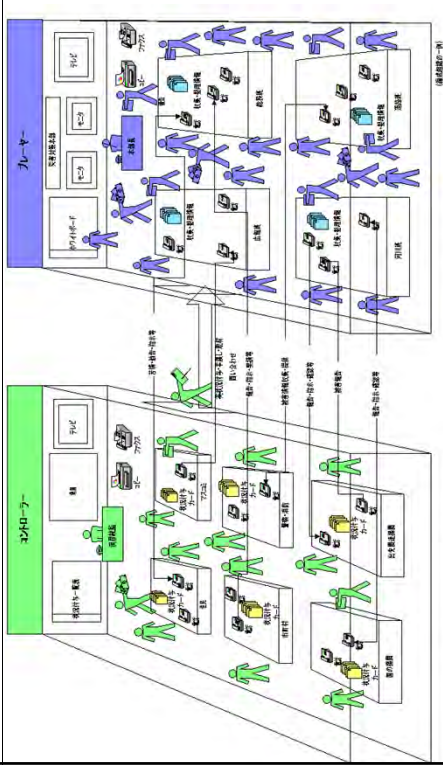
15

5. Role-playing Tabletop Exercise

- O exercício é uma simulação do centro de operações de emergência
- O exercício é conduzido em uma situação de desastre simulada
- Para treinar o tratamento da informação e capacidade de tomada de decisão durante a emergência
- O exercício é realizado dividindo-se em dois grupos "Player" e "Controller"
- Os "Jogadores" não conhecem o cenário do exercício em tudo.

16

Role-playing Tabletop Exercise



17

6. CENARIO-DRIVEN TABLETOP EXERCISE (DETALHE)

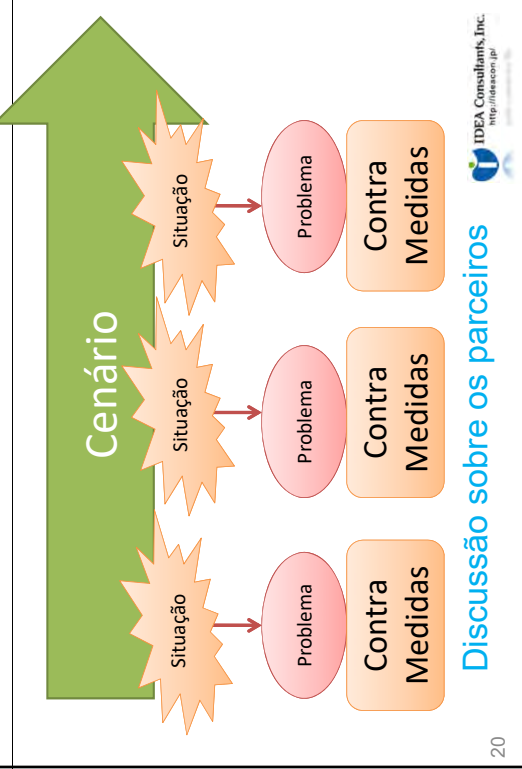
18

Características

- Ideias de várias contramedidas pode ser desenvolvidas com base no cenário de desastre possível
- Plano de ação concreto pode ser preparado para o cenário de desastre possível
- Plano para a Redução do Risco de Desastres podem ser preparados (preparação proativa e obras de contramedidas)

19

Cenário-driven Tabletop Exercise



20

Discussão dos papéis

- Perguntas e Confirmações são bem-vindas
- Críticas são proibidas
- Uma discussão construtiva sem críticas inúteis ou negativas



21

Exercício (Mozambique Cheias 2015)

Se o tempo poderia voltar para atrás, e

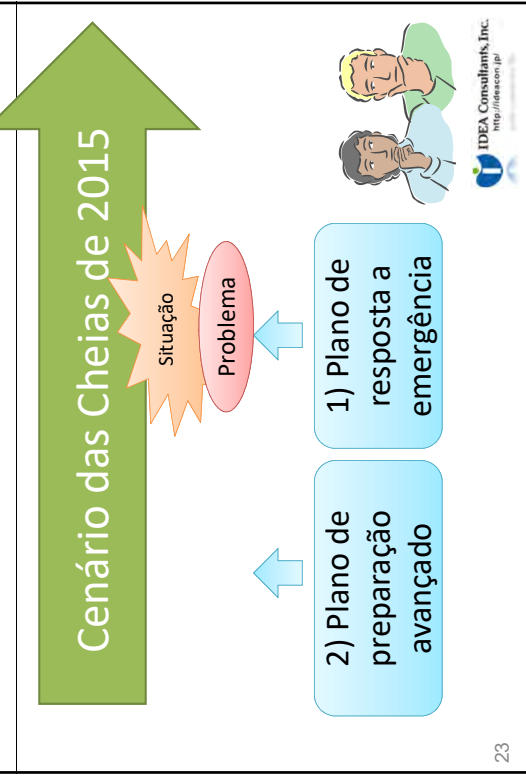
- 1) se foram tomadas medidas A,
- 2) se nos preparamos B,

Os danos podem ser minimizados

IDEA Consultants, Inc.
http://ideascon.jp/

22

Como desenvolver esta ideia?



23

**Procedimentos para o Cenário-driven Tabletop Exercise (TTX)
Sobre o Desastre da cheia de 2015**

1. **Trabalho em grupo** Formar equipes mistas de várias agências com aproximadamente 7/6 pessoas.
 - 1) **Um presidente e um secretário por grupo:** Cada grupo terá um Presidente e um Secretário de Grupo a ser selecionados pelos membros do grupo, no início dos trabalhos de grupo.
 - 2) O Presidente presidirá e gerenciará os trabalhos de grupo, e o Secretário de Grupo terá registros ou resumos dos resultados dos debates.

2. (S3.2) Grupo **de trabalho-1 (3º dia - Manhã):** Revisão do desastre das cheias de 2015
 - 1) **Respostas** Com base na experiência do respectivo grupo, os seguintes são para ser resumidos para as respectivas categorias de trabalho, tais como: 1) Alerta, 2) Prevenção e Operação, 3) Relações Públicas, 4) Comunicação, 5) Doações, 6) Pedido de manutenção da paz, 7) Alívio de Reabilitação e 8) Administração e outros.
 - Resposta efectivas
 - O problema que precisa mais consideração

As respostas obtidas durante o desastre das cheias de 2015

Respostas efectivas obtidas	Problemas e questões deixadas para o futuro
1) Alerta: • • •	• • •
2) Prevenção e Operação: • • •	• • •
3) Relações publicas: • • •	• • •
4) Comunicações: • • •	• • •
5) Doações: • • •	• • •
6) Manutenção da ordem: • • •	• • •
7) Reabilitação do Socorro:	

• • •	• • •
8) Administração e outros: • • •	• • •

【Notas】

- 1) Respostas eficazes efectivamente tomadas e os problemas encontrados devem ser escritos simplesmente em notas (post-it) e estão dispostas no formato mostrado.
- 2) Para respostas eficazes os nomes dos organismos devem ser adicionados no final da descrição.
- 3) Os tempos dos trabalhos devem ser geridos pelo presidente em cada grupo, de modo que a revisão deve passar por itens integrais dentro do período de tempo determinado.

3. (S3.2) Grupo **de trabalho-2 (3º dia - Manhã)**: A tabela cronológica dos principais eventos durante o desastre das cheias de 2015 (cenário) é preparada de acordo com os procedimentos seguintes.
- 1) Preparação dos cartões dos eventos: cada um dos principais eventos durante as cheias de 2015 está escrito em cada cartão com data e hora (se disponível) da ocorrência (Event-Card).
 - 2) Preparação do Cenário: Cartões de eventos são colocados a bordo em ordem cronológico. Os cartões dos eventos devem ser adicionados e / ou modificados, se for considerado necessário depois de olhar através de uma série de eventos-cards. A cronologia dos cartões eventos adicionados e / ou modificados serão usados como um cenário- driven tabletop Exercise.

Eventos Principais durante as cheias de 2015 (Cenário)

Região:			Província:
Período de resposta: Desde			até
Evento N.	Data	Tempo:	Eventos importantes e informação que precisam de respostas por parte das agencias relacionadas
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			

【Notas】

- 1) O evento que ocorreu antes do período de desastre também deve ser incluído no cenário, se está estreitamente relacionado com o evento durante o desastre.
- 2) O evento que ocorreu em outras regiões pode ser adicionado no cenário, se for necessário.

4. (S3.4) Guiões (3º dia Tarde): Antes da implementação do Cenário Tabletop Exercise, são explicados os procedimentos de exercícios, e prós e contras.
5. (S3.5) Scenario-driven Tabletop Exercise (3º dia Tarde):
 - 1) **Exercício:** De acordo com o cenário, as discussões são feitas para propor uma resposta / medida melhor nas respectivas situações de grandes eventos, a partir de três aspectos a seguir.
 - As Respostas a serem tomadas durante o desastre, a fim de prevenir ou atenuar a perda de vidas e danos materiais
 - As Respostas a serem tomadas durante o desastre, a fim de prevenir ou atenuar a perda de vidas e danos materiais

Os resultados do Cenário TTX (Melhores respostas possíveis)

Evento N.	Resposta: Resposta as ser dada Durante o Desastre	Prevenção/Preparação Resposta as ser dada Antes do desastre
1.
2.
3.
.

6. (S3.6) Preparação dos resultados do TTX (3º dia tarde):
 - 1) **Preparação dos resultados do TTX :** Depois do TTX, os resultados dos exercícios serão apresentados a todos os participantes das seguintes forma pelos representantes dos grupos selecionados da seguinte forma.
 - (1) **Presentação dos conteúdos:** (1) esboço do cenário, e (2) as respostas propostas para um ou dois importantes eventos selecionados para fora do cenário. É preferível selecionar um caso em que não é apresentada por outros grupos.
 - (2) **Tempo da apresentação** Por cada apresentador, serão dados _____ minutos para a apresentação

Appendix 2-3

Baseline Survey Report

Presentation of Baseline Survey Result

ASSISTANCE FOR ENHANCEMENT
OF INSTITUTIONAL CAPACITY TO
MANAGE WATER RELATED
DISASTER RISKS IN MOZAMBIQUE

Baseline Survey Report

July 2015

Japan International Cooperation Agency

Table of Contents

Chapter 1	Major Rivers	1
	(1) Overview	1
	(2) Collected GIS Data	2
	(3) DEM Data	6
	(4) Hydrological Data	7
	(5) Related Report on Major River Basins	8
Chapter 2	Law and Regulation.....	10
	(1) Water Law (No.16/1991).....	10
	(2) National Disaster Management Law (No. 15/2014)	11
	(3) Local State Bodies Law (No. 8/2003)	13
	(4) National Service for Public Law (No. 3/2009).....	13
	(5) Ministerial Decree No. 142/2012: Regulation of DNA	13
Chapter 3	Policy and Plan	14
	(1) Water Policy (2007)	14
	(2) National Strategy for Water Resource Management (2007)	15
	(3) Master Plan for Prevention and Mitigation of Natural Disasters	16
	(4) Contingency Plan (2014-2015)	17
	(5) National Progress Report on the Implementation of the HFA (Final version)	19
Chapter 4	Organization	28
	(1) New Government Ministries	28
	(2) Roles of Organizations in charge of Disaster Risk Management	28
	(3) Major Roles of DNA and ARAs.....	40
	(4) Emergency Operations	44
	(5) Flood Monitoring and Warning.....	52
	(6) Human Resources Management.....	54
	(7) Budget of DNA	57
	(8) Capacity Assessment Workshop applying PCM Method	58
	(9) Scenario-driven Tabletop Exercise on the 2015-Flood Disaster	65
	(10) Reorganization of DNA	71
	(11) Donors' Assistance in Water Resources Management	73
	(12) Challenges	75

Chapter 1 Major Rivers

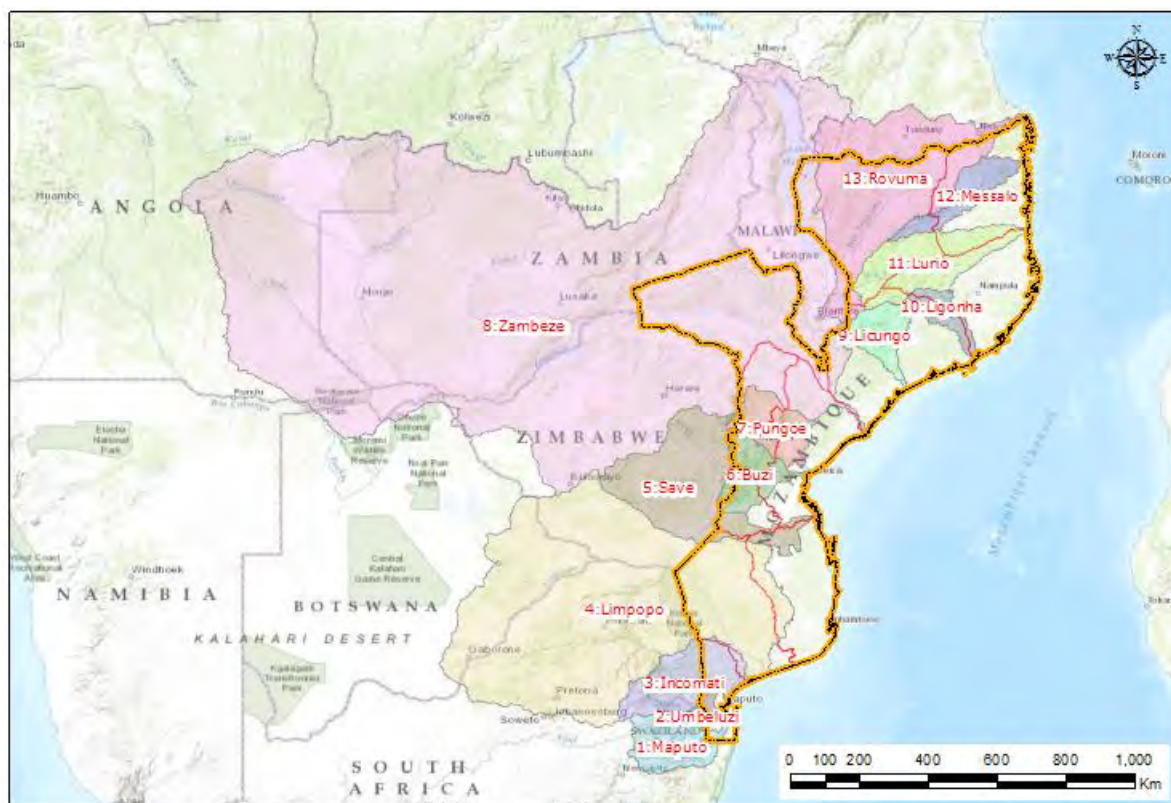
(1) Overview

Baseline data and information on main rivers in Mozambique are corrected mainly from Water Resources Department (DRH), DNA in Maputo.

The following 13 river basins are acknowledged as main river basins in Mozambique, of which 9 river basins are categorized in cross-border rivers.

- | | | | | |
|---------------|--------------|--------------|-------------|--------------|
| 1. Maputo * | 4. Limpopo * | 7. Pungoe * | 10. Ligonha | 13. Rovuma * |
| 2. Umbeluzi * | 5. Save * | 8. Zambeze * | 11. Lurio | |
| 3. Incomati * | 6. Buzi * | 9. Licungo | 12. Messalo | |
- *: cross-border river

Location of 13 main river basins is illustrated in Figure 1.1 by applying USGS HydroSHEDS GIS data. General topographical basin feature of 13 major river basins are also summarized in Table 1-1.



Source data: USGS HydroSHEDS GIS data

Figure 1.1 Location of 13 Major River Basin

Table 1-1 General Topographical Feature of 13 Major River Basins

ARAs	No.	River basin	Basin area (km ²) (*1)			Stream length (km) (*2)			Remarks
			Inside MOZ	Outside MOZ	Total	Inside MOZ	Outside MOZ	Total	
ARA South (Maputo)	1	Maputo	1,700 (6%)	28,600 (94%)	30,300	150 (27%)	415 (73%)	565	Cross-border; South Africa, Swaziland
	2	Umbeluzi	2,300 (42%)	3,200 (58%)	5,500	100 (32%)	214 (68%)	314	Cross-border; South Africa, Swaziland
	3	Incomati	15,300 (33%)	31,300 (67%)	46,600	283 (40%)	431 (60%)	714	Cross-border; South Africa Swaziland
	4	Limpopo	79,400 (19%)	328,500 (81%)	407,900	561 (38%)	900 (62%)	1,461	Cross-border; South Africa, Botswana, Zimbabwe
	5	Save	17,500 (17%)	84,800 (83%)	102,300	330 (45%)	405 (55%)	735	Cross-border; Zimbabwe
ARA Central (Beira)	6	Buzi	24,800 (87%)	3,700 (13%)	28,500	320 (89%)	40 (11%)	360	Cross-border; Zimbabwe
	7	Pungoe	29,500 (95%)	1,400 (5%)	30,900	322 (87%)	50 (13%)	372	Cross-border; Zimbabwe
ARA Zambezi (Tete)	8	Zambeze	157,200 (11%)	1,235,000 (89%)	1,392,200	820 (30%)	1,880 (70%)	2,700	Cross-border; Angola, Zambia, D. P. Congo, Namibia, Botswana, Zimbabwe, Tanzania, Malawi
ARA Central North (Nampla)	9	Licungo	23,100 (100%)	0 (0%)	23,100	336 (100%)	0 (0%)	336	
	10	Ligonha	14,900 (100%)	0 (0%)	14,900	295 (100%)	0 (0%)	295	
	11	Lurio	61,600 (100%)	0 (0%)	61,600	605 (100%)	0 (0%)	605	
ARA North (Pemba)	12	Messalo	24,800 (100%)	0 (0%)	24,800	530 (100%)	0 (0%)	530	
	13	Rovuma	102,900 (63%)	61,200 (37%)	164,100	650 (81%)	150 (19%)	800	Cross-border

Source: (*1): USGS HydroSHEDS GIS data, (*2): Basic Hydrographic Scale 1:2,000,000

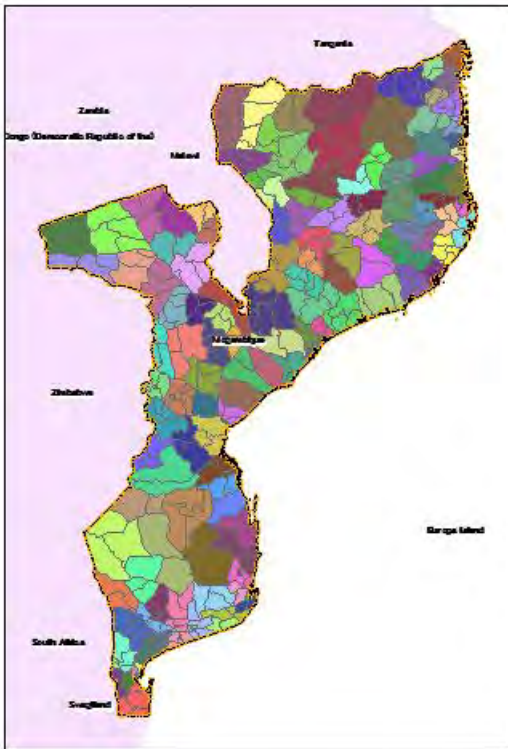
(2) Collected GIS Data

Flowing GIS data were obtained from DNA;

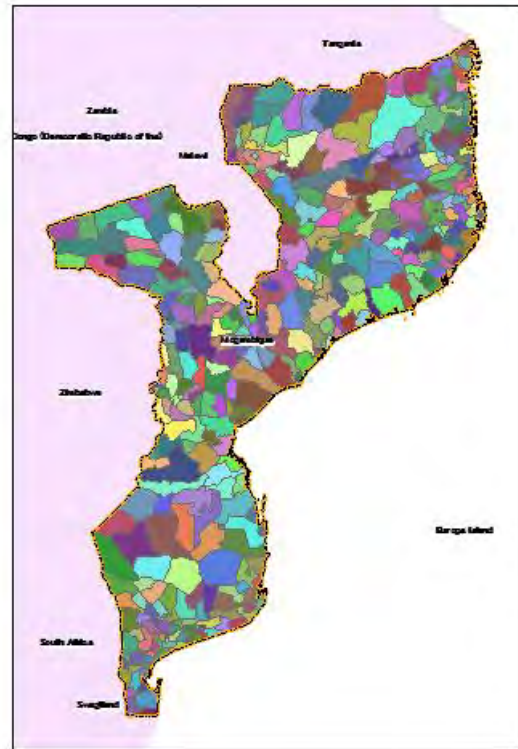
- Administration boulder: 10 provinces, 131 districts, 408 localities including 1997 census data (population, household, religion, electrification, water supply, etc.)
- Road network

- River network
- Geological map
- Land use map
- River basin boundary: 58 river basin in Mozambique
- ARAs boundary:
- Others

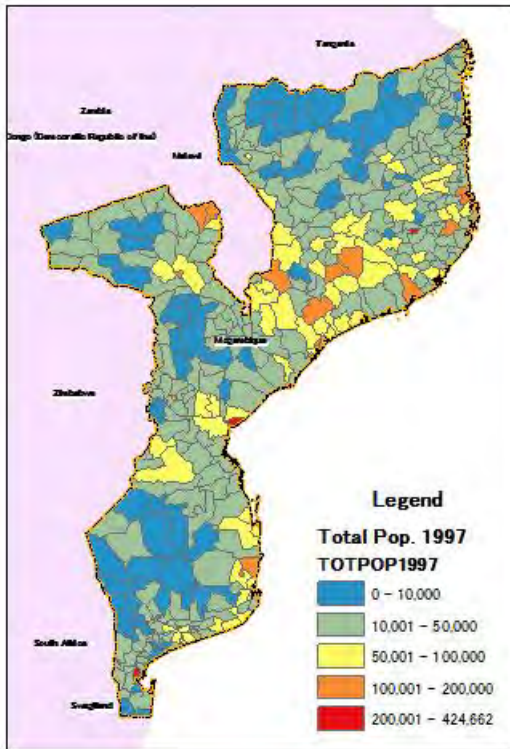
Outline of these data are illustrated below;



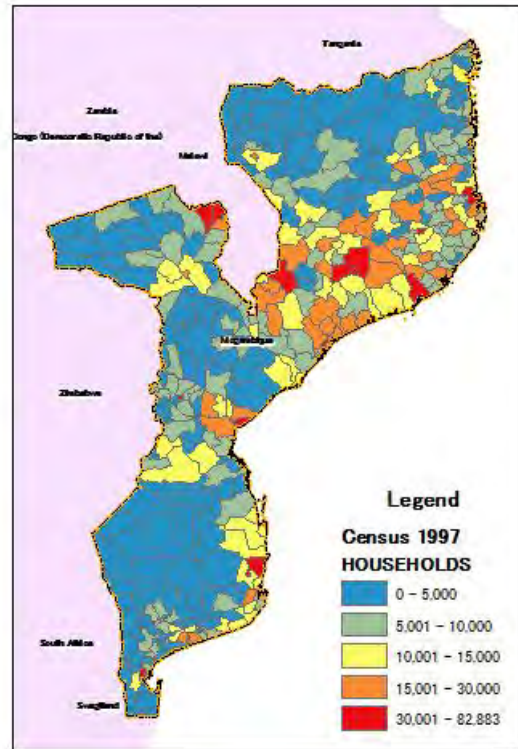
131 Districts



408 Localities



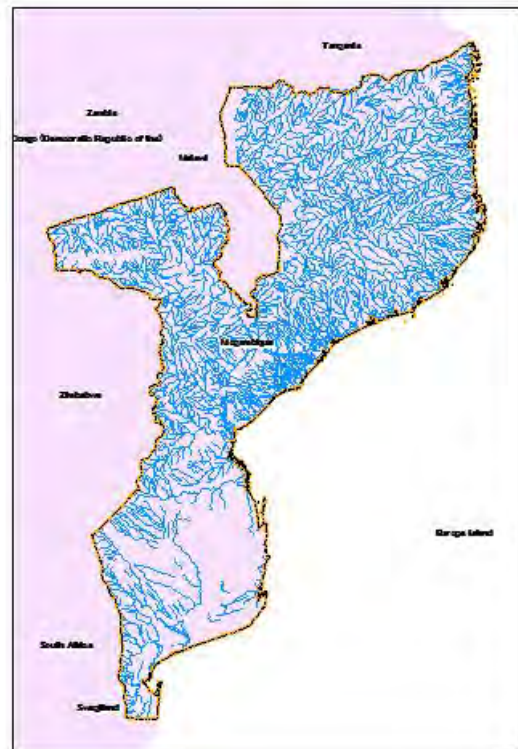
Distribution of Population



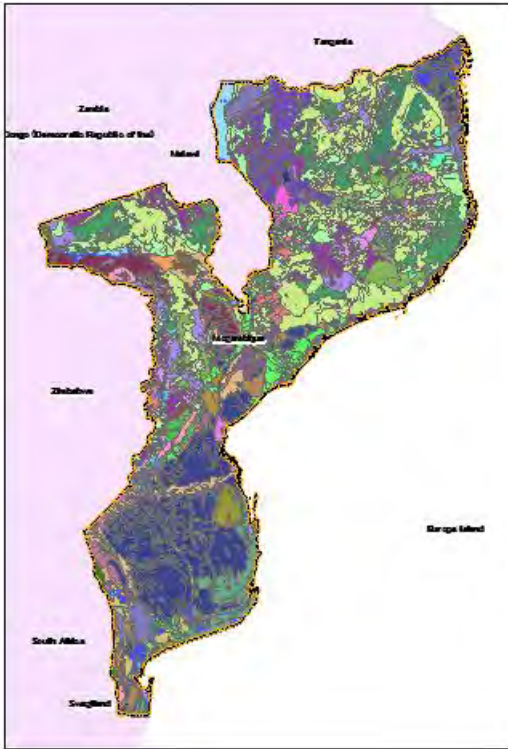
Distribution of Households



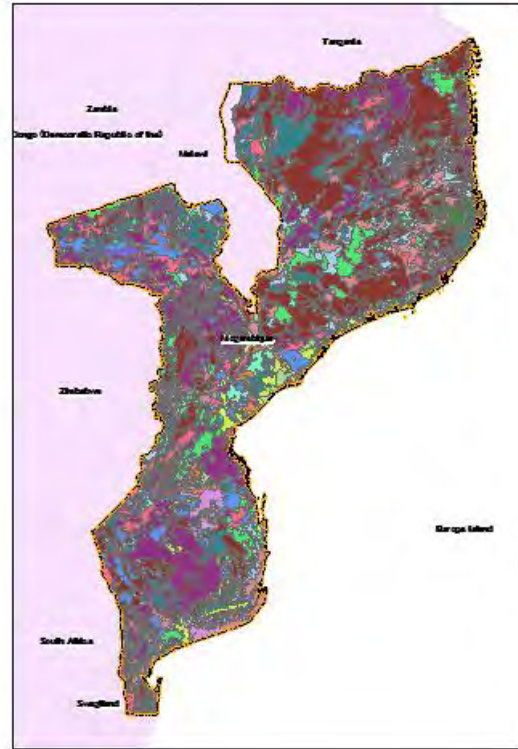
Road Network



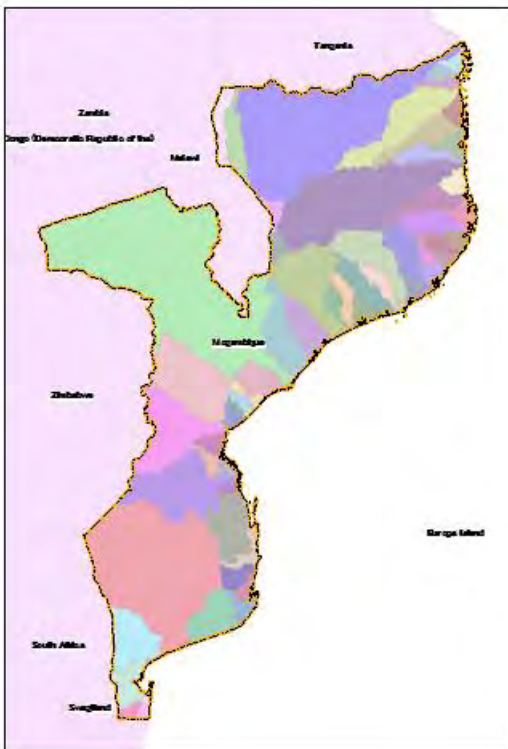
River Network



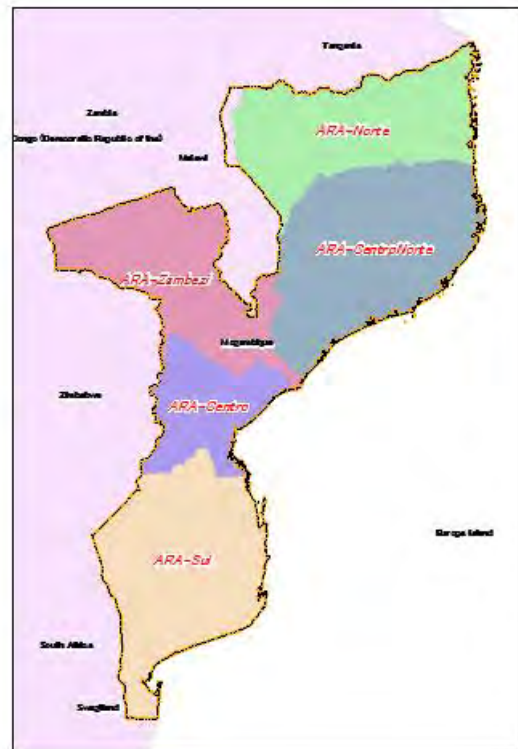
Geological Map



Land Use Map



58 Basin Boundary



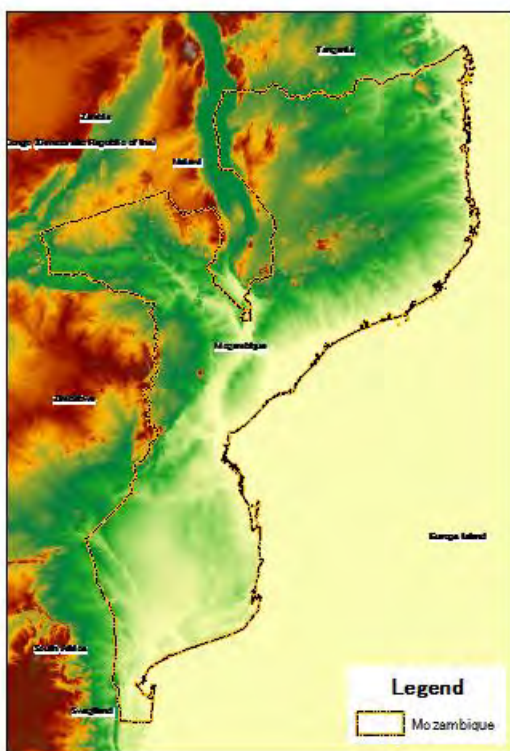
5 ARAs Boundary

Concerns and further activity;

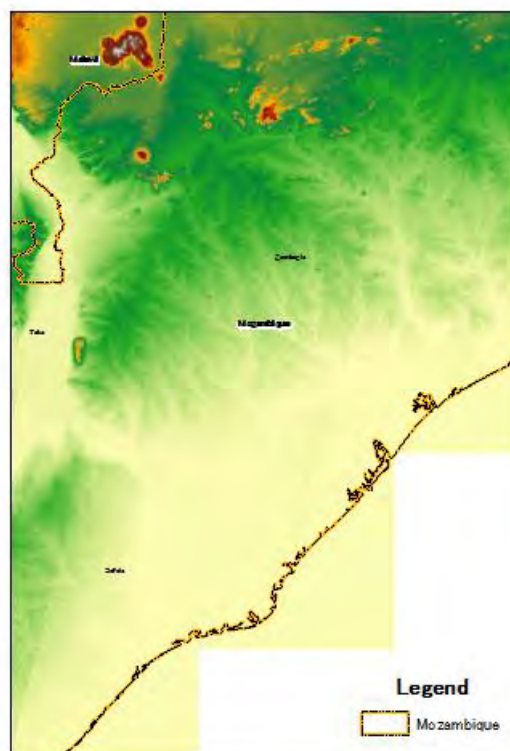
- Several coordinate systems such as GCS_WGS84, UTM 36S, LZ, etc. are applied, but not well managed or not defined as GIS data. Verification and proper definition of available GIS data are required.
- Census data in 1997 are available however that information is rather old. Latest information should be collected.
- Delineation methods for some basin boundaries are not clear. Re-delineation of basin boundary by using latest D available EM is required.

(3) DEM Data

DEM (Digital Elevation Model) data for the basin analysis and modelling were collected from several open web data sources such as SRTM-1Arc (1 arc-second: 30m x 30m), ASTER GDEM (1 arc-second: 30m x 30m), GMTED 2010 (7.5 arc-second: 250m x 250m).



GMTED 2010 (7.5 arc-second)



ASTER GDEM (near Zambezia)

Concerns and further activity;

- Open DEM data can be applied in mountainous area with acceptable accuracy however low accuracy in low-lying/floodplain. Adequate DEM or revising DEM for modeling are required.

(4) Hydrological Data

Water Resources Department (DRH) in DNA is managing DNA's own hydrological data (rainfall, water-level, discharge, discharge measurement records) by using mainly "HYDATA" (hydrological data processing and analysis system).

Over 20 years records are available at 458 rainfall stations, 195 water-level stations and 131 discharge stations. General status of HYDATA database (as of Feb. 2015) is summarized below;

Summary of Registered Stations in Database

(Unit: number of station)

No.	ARA	Station registered			Station with record		
		Rainfall	Water Level	Discharge	Rainfall	Water Level	Discharge
1	ARA Sul	300	181	133	292	169	98
2	ARA Centro	220	97	74	214	90	56
3	ARA Zambeze	353	131	46	277	77	27
4	ARA Centro-Norte	361	140	113	341	124	101
5	ARA Norte	114	71	52	111	58	39
Total		1,348	620	418	1,235	518	321

Outline of Hydrological Record by Station

(Unit: number of station)

Rainfall Station	HYDATA Record (year)				Total
	0	1~10	11~20	21~	
1) ARA-Sul	8	93	60	139	300
2) ARA-Centro	6	90	45	79	220
3) ARA-Zambeze	76	104	88	85	353
4) ARA-Centro-Norte	20	111	102	128	361
5) ARA-Norte	3	47	37	27	114
Total	113	445	332	458	1,348
Water-level Station	HYDATA Record (year)				Total
	0	1~10	11~20	21~	
1) ARA-Sul	12	60	35	74	181
2) ARA-Centro	7	43	17	30	97
3) ARA-Zambeze	54	44	13	20	131
4) ARA-Centro-Norte	16	37	27	60	140
5) ARA-Norte	13	34	13	11	71
Total	102	218	105	195	620
Discharge Station	HYDATA Record (year)				Total
	0	1~10	11~20	21~	
1) ARA-Sul	35	25	33	40	133
2) ARA-Centro	18	18	19	19	74
3) ARA-Zambeze	19	10	7	10	46
4) ARA-Centro-Norte	12	31	17	53	113
5) ARA-Norte	13	22	8	9	52
Total	97	106	84	131	418

Location of rainfall and water-level stations is compiled in GIS data and shown in following Figures.

And detailed status of each station is summarized in Annex.



Location of Rainfall Station



Location of Water-level Station

Concerns and further activity;

- Historically, several hydrological data management system (POP, HYDRO and Hydstra) had been applied. Then, past hydrological data records are compiled in different hydrological databases. So far, DNA can manage those data but it is quite complicated. Updated hydrological data management system and integration of hydrological databases are required.
- Some stations have no location data or inaccurate information. Adequate updates of status of stations are required by using GIS.

(5) Related Report on Major River Basins

Following reports on main river basins are available in DNA.

No.	Title	Style	Remarks
1	[LIMPOPO] Monografia hidrografica da bacia do rio Limpopo (Abril 1996) Hydrographic Monograph of Limpopo river basin (April 1996)	Report	DNA Library (Available for Limpopo basin in Portuguese version only.)
2	Flood Report 1999/2000 (May 2000) Cheias do ano hidrologico 1999/2000 (Maio 2000)	Report	DNA

No.	Title	Style	Remarks
3	【8 major rivers】 Mozambique Flood Risk Analysis Project report (Feb. 2005) Volume 1: Relatório Principal Volume 2: Bacia do Rio Maputo Volume 3: Bacia do Rio Umbelúzi Volume 4: Bacia do Rio Incomati Volume 5: Bacia do Rio Limpopo Volume 6: Bacia do Rio Save Volume 7: Bacia do Rio Púnguè Volume 8: Bacia do Rio Zambeze Volume 9: Bacia do Rio Licungo	Digital PDF	DNA, DRH, (Water Resources Department)
4	【PUNGWE】 Development of The Pungwe River Basin Joint Integrated Water Resources Management Strategy (Feb. 2006)	Digital PDF	DNA
5	【MAPUTO】 Consultancy for the Integrated Scoping Phase of the Water Resources of the Maputo River Basin Joint Maputo River Basin Study, Water Resources Report (Apr. 2005)	Report	DNA Library
6	【MAPUTO】 Consultancy for the Integrated Scoping Phase of the Water Resources of the Maputo River Basin Joint Maputo River Basin Study, Scope of Work for the Assessment of Legal, Institutional and Financial Arrangements (Apr. 2005)	Report	DNA Library
7	【MAPUTO】 Joint Maputo River Basin Water Resources Study Hydrological Investigations (Jul. 2007)	Report	DNA Library
8	【INCOMATI & MAPUTO】 Consultancy Services for the project on Disaster Management in the Incomati and Maputo Watercourses (Jul. 2011) IAAP 5: IAAP, Project 5 IAAP: The Implementation Activity and Action Plan for IIMA (Interim IncoMaputo Agreement) Project 5: Disaster Management in the Incomati and Maputo Watercourses	Digital PDF	DNA DRI (International Rivers Department)
9	【BUZI】 Development of The Buzi River Basin Joint Integrated Water Resources Management Strategy (May 2013)	Digital PDF	DNA
10	【SAVE】 The Save River Basin – a shared water resource The Joint Integrated Water Resources Management Strategy (May 2013)	Digital PDF	DNA
11	WB: Transforming Hydrological and Meteorological Services Project (Ppcr-Hydromet) Third Progress Report 2014	Digital PDF	DNA, DRH

"Hydrographic Monograph of Limpopo river basin" (April 1996) describe the details of Limpopo river and basin situation, such as basin characteristics, water resources, water uses, water management, international basin, etc.). Only information on Limpopo river basin is available and some information needs up-to-date. Similar study reports on each main river basin by DNA are desired.

Related study report on northern river basin (Ligonha, Lurio, Messalo and Rovuma) is limited. General information on other 9 main river basins (Maputo, Umbeluzi, Incomati, Limpopo, Save, Buzi, Pungoe, Zambeze and Licungo) are extracted from the report No.3 and No.9 in the above.

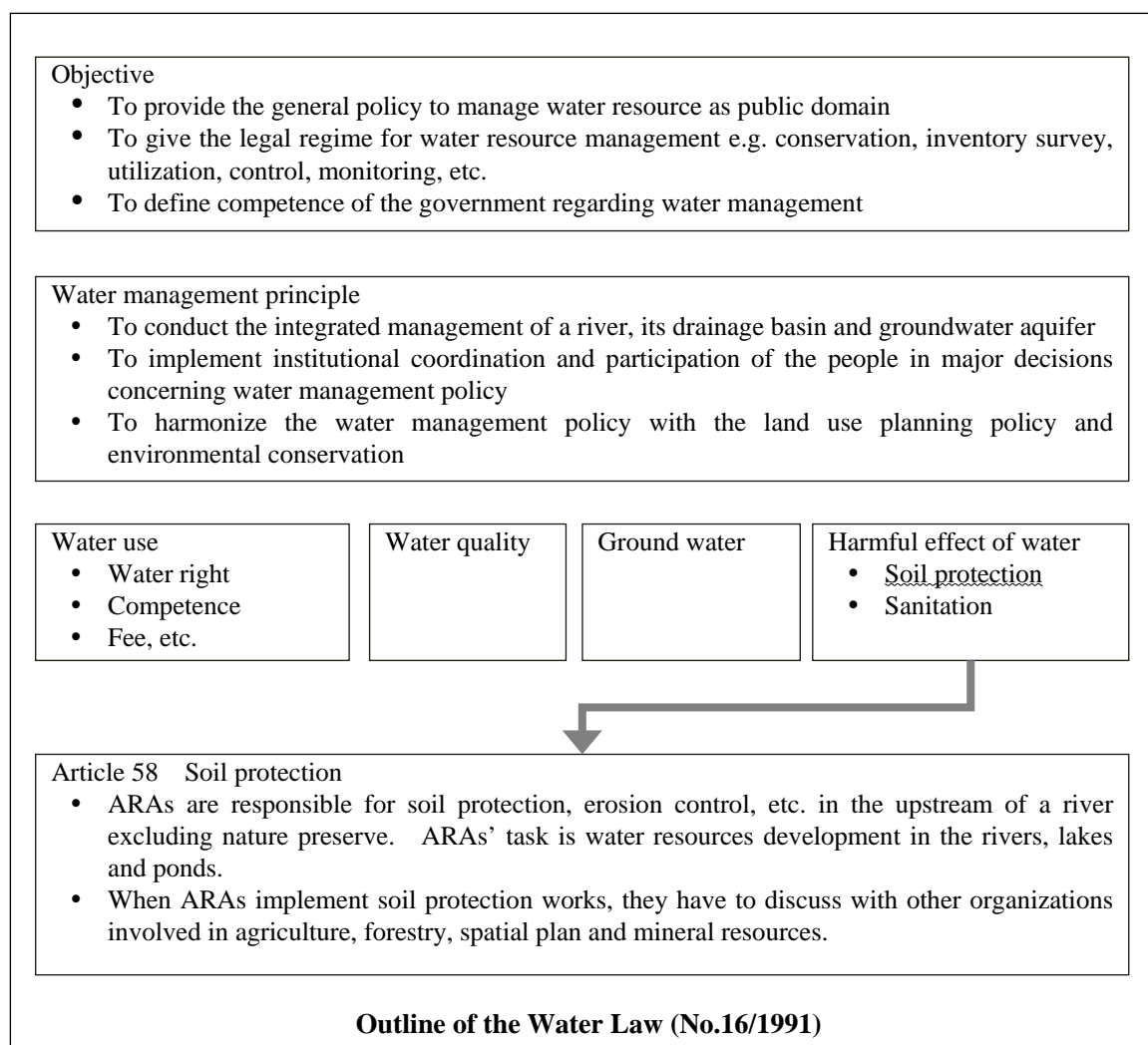
Chapter 2 Law and Regulation

(1) Water Law (No.16/1991)

The Water Law (No.16/1991) was established in 1991 in corresponding to increasing demand on water use for various purpose and necessity of integrated water management. The law defines water as public domain and provides the institutional structure and responsibilities of organization/individual for water management.

Because the law focuses on water utilization as described above e.g. water right, concession, fee, arrangement among various purposes, water quality, it hardly address water related disaster excluding *Article 58 Soil protection in Chapter V Harmful effects of water.*

The law is summarized as follows.



(2) National Disaster Management Law (No. 15/2014)

National Disaster Management Law (No. 15/2014) was established in June 2014. The law consists of 7 chapters including 44 articles as shown in following figure. Contents in each chapter are summarized as follows.

Chapter I (General Provisions) introduces the objective and scope of the law, and definition, principles and inter-organizational cooperation of disaster management. Chapter II (Prevention and Mitigation Measures) includes not only prevention and mitigation, but also preparedness. This chapter describes early warning system, building code and disaster management training as prevention measures, production of crops resistant to drought as mitigation measures, and training of operating plan, public awareness, simulation, securing finance, etc. as preparedness measures. According to the chapter, the government is responsible to demarcation, mitigation and prevention for risk area. Chapter III (Warning System) refers to alert level classified into 3 levels by situation of disaster (approaching, occurring and causing damage). Chapter IV (Disaster Management System) describes the rolls of organizations related to disaster management e.g. government, Cabinet, media, research agencies, etc. After Chapter V (Goods/Service Procurement), Chapter VI (Special Protection of Areas and People) especially focuses on risk area e.g. definition of risk area, building regulation, right and obligation of residents. Article 37 in this chapter deals with vulnerable people such as older persons, women, children and persons with disabilities.

According to the law, definition of risk area is important factor for implementing disaster management. The appropriate countermeasures against disaster should be planed and prioritized depends on the risk level. However, the low does not describe the organization responsible for defining risk area. It is highly important that consideration for vulnerable people such as older persons, women, children and persons with disabilities is mentioned devoting one article (Article 37).

Objective:

- To establish the legal framework for disaster management at prevention, mitigation, response, reconstruction and recovery stages.
- To pursue disaster management through multi-sectoral and multidisciplinary activities.
- To develop the framework of international commitment and cooperation with other countries or international organizations.

Principle:

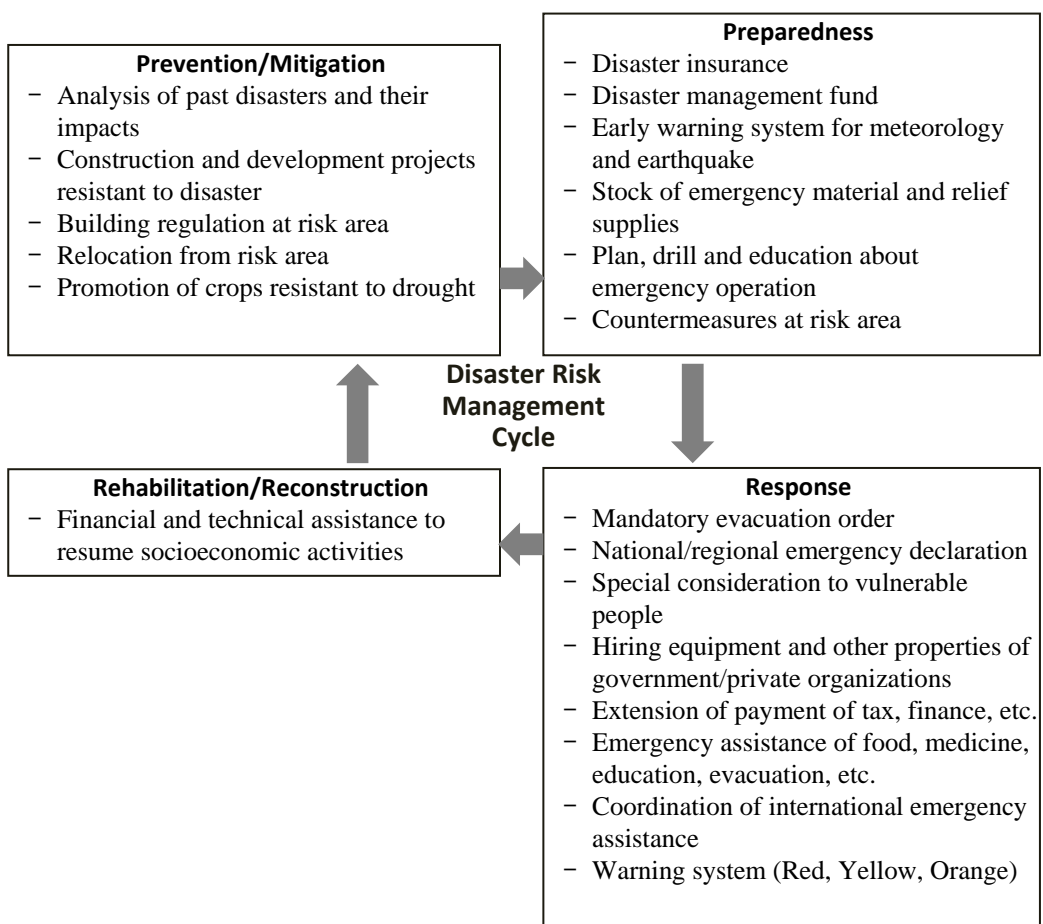
- Solidarity, justice, effectiveness, participation and cooperation.

Role of bodies concerned:

- Government: to define the structure and function of disaster management.
- Resident at risk area: to obey the evacuation order.
- Civil defense services: to conduct search and rescue operations.
- Public officials: to cooperate with INGC
- Media: to disseminate disaster information and warning.

Plan:

- Disaster Management Plan
- Contingency Plan



Outline of National Disaster Management Law

(3) Local State Bodies Law (No. 8/2003)

The central government distributes budget for planning to provincial government in accordance with the Local State Bodies Law (No. 8/2003). INGC provincial offices are under the control of each provincial government not central government (INGC) according to the law. On the other hand, 3 INGC regional offices belong to INGC.

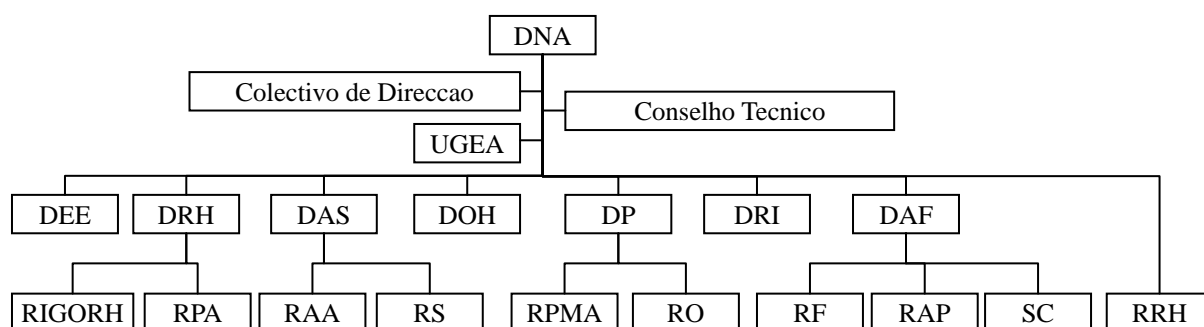
(4) National Service for Public Law (No. 3/2009)

National Service for Public Law (No. 3/2009) was established in April 2009. The objective of the law is to improve the emergency response for national level such as prompt rescue and search during disaster.

(5) Ministerial Decree No. 142/2012: Regulation of DNA

According to this Ministerial Decree No. 142/2012 (Regulation of DNA), the functions of DNA are:

- a) To propose the definition of policies and strategies for development and utilization of water resources, potable water supply and sanitation
- b) To participate in drafting the legislation on waters
- c) To ensure the access to water resources of international hydrographic basins
- d) To monitor compliance with the legislation on waters
- e) To implement programs in the area of water purification and sanitation
- f) To operate the training centers in the area of water resources, water supply and sanitation



UGEA: Management & Execution of Acquisitions Unit	RIGORH: Division of Information and O&M of water resources
ODEE: Department of Strategic Study	RPA: Division of Planning and Environment
DRH: Department of Water Resources	RAA: Division of Water Supply
DOH: Department of Hydraulic Works	RS: Division of Sanitation
DRI: Department of International Rivers	RPMA: Division of Planning, Monitoring and Evaluation
DAS: Department of Water Supply and Sanitation	RO: Division of Budgeting
DP: Department of Planning	RF: Division of Finance
DAF: Department of Administration and Finance	RAP: Division of Administration and Properties
	RRH: Division of Human Resources
	SC: Central Secretary

Organization of DNA

Chapter 3 Policy and Plan

(1) Water Policy (2007)

The Water Policy was revised in 2007 structured into 4 main parts. Part 1 (Chapter 1) shows the vision, objectives and policies. Part 2 (Chapter 2-5) describes the needs of water supply and sanitation for socio-economic activities, environmental aspect, flood and drought. The description about flood in Chapter 5 is summarized in the box below. Part 3 (Chapter 6-7) deals with the integrated water resources management focusing on information, planning and development of water resources. Part 4 (Chapter 8-11) contains cross-cutting issues, i.e. financial aspects, participation of the private sectors, institutional and legal framework, capacity building and education.

For next step, the mid/long-term plan to realize the policies is required.

Chapter 5 Flood and Drought

5.1 Flood

Main objectives

- To prevent loss of life
- To minimize the negative social and economic impacts caused by flood - loss of property, damage to public and private infrastructure, disruption of social and economic life

Policies

Flood warning system will be operated properly and efficiently with close coordination among the water sector, meteorological sector and civil protection institutions.

Inter-sectorial coordination will be established at the highest level of government in order to ensure coordination among government agencies, civil society, NGOs and others.

Annual contingency plans at national, provincial and district levels will be prepared based on a participatory approach to encourage a broad involvement of all stakeholders.

Close cooperation with the upstream countries will be established in order to improve the efficient flood warning systems by exchanging hydrological information in real time before and during the floods.

The mitigation of negative impacts of flooding will be improved through a variety of methods including:

- Zoning of flood plains of major rivers and licensing of permanent occupations in these areas
- Dike to protect urban centers in flood plain
- Appropriate planning and construction of roads, bridges and other infrastructures crossing flood

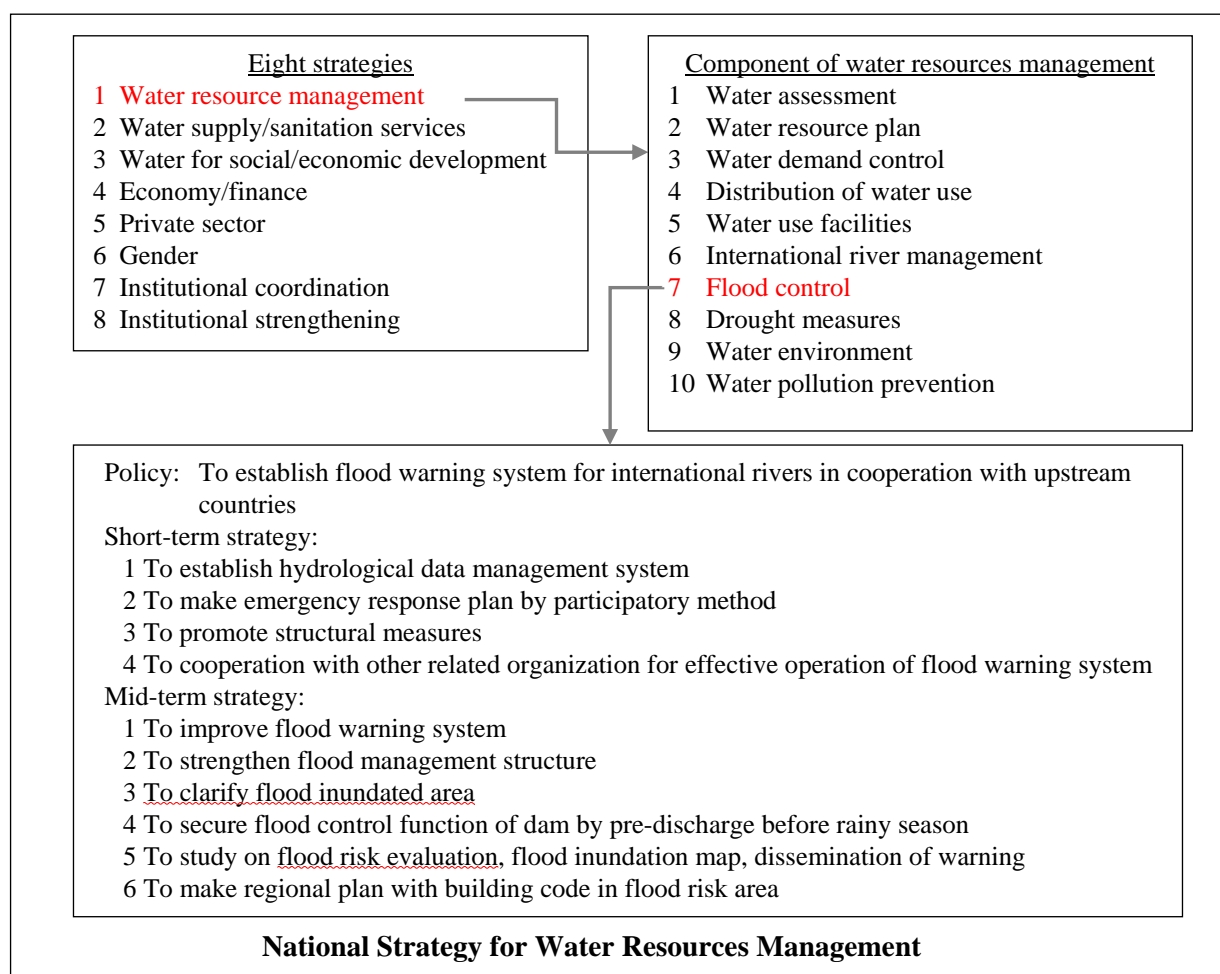
plains

- Regular review of the operation rules for all large dams for appropriate operation during floods incorporating flood forecasting and making adjustments at the beginning of the rainy season.
- Revision of the dam operation rules to prevent small floods
- Including flood mitigation component in new large dam projects

(2) National Strategy for Water Resource Management (2007)

National Strategy for Water Resource Management was approved by Parliament in August 2007. The strategy consists of 8 fields that are water resource management, water supply/sanitation, water development, economy/finance, private sector, gender, institutional cooperation and institutional strengthening, as illustrated in the following figure. It shows the policy, mid-term strategy and short-term strategy for flood management.

The priority of the mid- and short-term strategies needs to be modified in accordance with the national disaster management law. For example, “to clarify flood inundated area” and “flood risk evaluation” listed in mid-term strategy will be ranked as a higher priority because the law describes the land use according to disaster risk.



(3) Master Plan for Prevention and Mitigation of Natural Disasters

2006-2015 version

Master Plan for Prevention and Mitigation of National Disasters (2006 -) was prepared by INGC based on National Policy on Disaster Management (1999) in order to materialize the Hyogo Framework of Action. The objectives of the plan are (a) to reduce vulnerability to drought in arid region, (b) to mitigate human and property damages caused by natural disasters, (c) to minimize the number of affected people by natural disasters and (d) to secure prompt recovery/reconstruction process.

The plan describes promotion of disaster reduction and preparedness including agricultural protection, income increase of non-agricultural sector, water resource conservation, rainwater utilization, water resource infrastructures (dam and dike), etc.

2016 - version

The new Master Plan for Prevention and Mitigation of Natural Disaster is under finalization as of June 2015. It will be released by the end of 2015 according to CENOE.

(4) Contingency Plan (2014-2015)

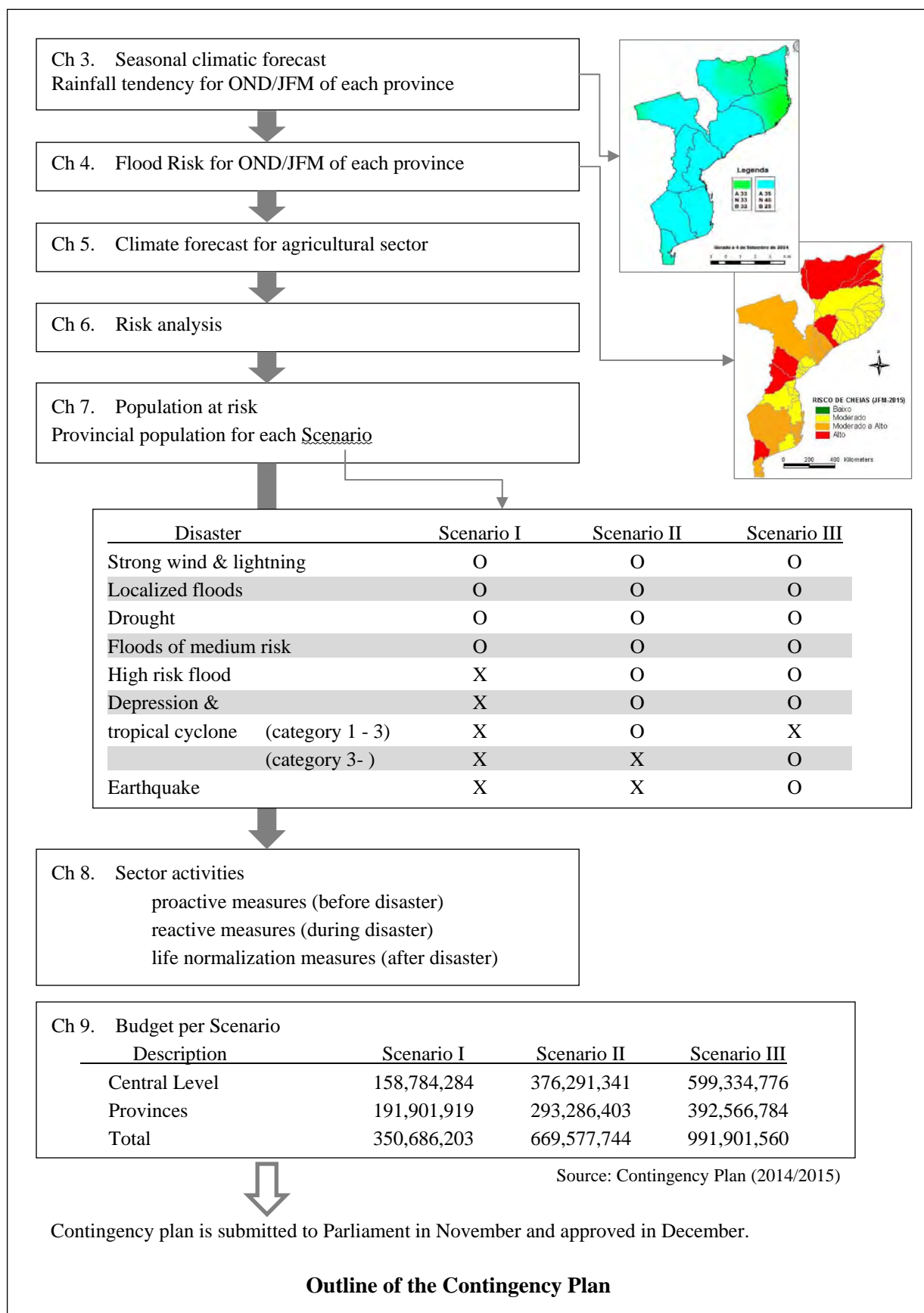
The Government of Mozambique prepares Contingency Plan annually, taking into account that the country is cyclically affected by extreme events i.e. cyclone, floods, droughts, epidemics and earthquakes. The Contingency Plan includes actions and multi-sectorial strategic prevention, management and response to be performed before, during and after the rainy season from October to March.

The objectives of the plan are as follows.

- To identify the main threats of the rainy and cyclones season 2014-2015;
- To find the area at risk and predict the possible impacts by threats;
- To prepare the main activities to be undertaken before, during and after the occurrence of an extreme event;
- To inventory the available materials and necessary equipment for emergency response;
- To define human resources, material and financial resources for intervention in cases of extreme event.

The Contingency Plan is outlined as shown in the following figure. The plan is submitted to Parliament in November and is normally approved in December. Therefore, DNA can use the amount of approved budget after April next year but the rainy season is already over. DNA uses the amount for rehabilitation of damaged structures and prevention measures for next rainy season, and saves the remaining amount for emergency response activities in the next rainy season.

The plan is made based on the seasonal climatic forecast. However, seasonal forecast (rainfall) for 3 to 6 months just shows 3 probabilities that normal rainfall, above-normal rainfall and below-normal rainfall and it is relatively not so accurate. Therefore it is recommended that the plan is prepared targeting definite situation such as 50-year probable flood, the severest past flood, etc.



(5) National Progress Report on the Implementation of the HFA (Final version)

The progress of Hyogo Framework for Action (HFA) in Mozambique is compiled in National Progress Report on the Implementation of the HFA. The report describes achieved level and the reason for each indicator that 4 to 6 indicators are prepared for each priority for action. These indicators, achieved levels and reasons are summarized in the following table.

Priority for Action 1: Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.

Because the National Disaster Management Law was established in 2014, it is considered that the legal framework for DRR has been already set. Following the law, a variety of policies, plans, measures, etc. will be revised and implemented. Regarding lack of budget, they should make efforts to find actions to do under current situation considering priority.

Priority for Action 2: Identify, assess and monitor disaster risks and enhance early warning.

The National Disaster Management Law mentions the activities in the risk area and so improvement of capacity to analyze the risk area is required. In the past there were many hydro-meteorological stations in the country but most of them suspended observation during the civil war. And many stations have not resumed yet. To inspect the current status of stations and to study the new observation network are needed. Reconstruction of database system is also prioritized in order to prevent the loss of past valuable data.

Priority for Action 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels.

DNA has data base system to stored hydro-meteorological data observed by ARAs. However it is not utilized effectively by the relevant organizations due to expiration of the license, delay of data updating, etc. Re-building of database considering sustainability and information sharing is required. Message about DRR should be simplified in order to realize prompt and safe evacuation. This issue was pointed out in the workshop held by the JICA Team in May 28-29, 2015.

Priority for Action 4: Reduce the underlying risk factors.

Limited enforcement of environmental laws, lack of financial resources to improve the existing vulnerable infrastructures, inadequate technical capacity regarding design, construction, maintenance and investment for infrastructures, etc. are listed as the remaining issues. Each organization has to prepare the capacity development plan regarding these issues for the staff. When the training is conducted in the donor's project, it should be designed following the capacity development plan.

Priority for Action 5: Strengthen disaster preparedness for effective response at all levels.

Contingency plans at central and provincial levels are prepared every year before rainy season. However, contingency plans at municipal level are insufficient at even though the many municipalities are located at the floodplains and along the coastline. INGC should give guidance to the municipalities and monitor the progress under the leadership. The leadership and communication through preparation of contingency plans will improve the response activities during at the time of disaster.

Evaluation of Priorities for Action described in “National Progress Report on the Implementation of HFA” is as follows.

Evaluation of Priorities for Action

<p>Priority for Action 1: Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.</p>
<p>Core indicator 1: National policy and legal framework for disaster risk reduction exists with decentralized responsibilities and capacities at all levels. Level of progress achieved: 5 (Comprehensive achievement with sustained commitment and capacities at all levels)</p> <p>Reason</p> <ul style="list-style-type: none"> ⇒ DRM law was approved by the Assembly in April 2014. ⇒ The national climate change monitoring and evaluation framework was established. ⇒ DRR and CCA were integrated into the Health Sector Strategic Plan 2014-2019.
<p>Core indicator 2: Dedicated and adequate resources are available to implement disaster risk reduction plans and activities at all administrative levels Level of progress achieved: 4 (Recognized limitations such as financial resources and/or operational capacities)</p> <p>Reason</p> <ul style="list-style-type: none"> ⇒ Limited financial capacity ⇒ Mobilization of additional budget to local governments is under discussion between Ministry of Planning and Development and Ministry of Finance. ⇒ Limited technical capacity at sector and local levels to formulate and effectively implement DRM and CCA programs and projects.
<p>Core indicator 3: Community Participation and decentralization is ensured through the delegation of authority and resources to local levels Level of progress achieved: 4 (Recognized limitations such as financial resources and/or operational capacities)</p> <p>Reason</p> <ul style="list-style-type: none"> ⇒ The vulnerable resettlements are move to safer locations and development is restricted in unsafe and

<p>risky locations.</p> <ul style="list-style-type: none"> ⇒ Ongoing discussion between Ministry of Planning and Development and Ministry of Finance for setting up a legal provision in the state budget. ⇒ Limited financial capacity for 128 districts and 53 municipalities. ⇒ Limited technical capacity at municipal and district levels to utilize and execute the budget allocated to DRR/DDA interventions
<p>Core indicator 4: A national multi sectorial platform for disaster risk reduction is functioning. Level of progress achieved: 4 (Recognized limitations such as financial resources and/or operational capacities)</p> <p>Reason</p> <ul style="list-style-type: none"> ⇒ No changes were observed in the composition of the national DRR platform – The Technical Council for Disaster management (CTGC) ⇒ The participation of civil society organizations in the national platform remains weak. ⇒ Private sector has limited its engagement in DRR activities. ⇒ INGC will continue to dialogue with the civil society platform (G20) and the private sector platform (CTA), aiming at triggering their passion and engagement in the DRR discussions and decision-making within the CTGC and CENOE.
<p>Priority for Action 2: Identify, assess and monitor disaster risks and enhance early warning</p>
<p>Core indicator 1: National and local risk assessments based on hazard data and vulnerability information are available and include risk assessments for key sectors. Level of progress achieved: 4 (recognized limitations in key aspects, such as financial resources and/ or operational capacities)</p> <p>Reason</p> <ul style="list-style-type: none"> ⇒ National capacity to undertake comprehensive risk assessments is still limited as a result of limited staff with specific training in DRR/Climate change risk assessment methodologies, particularly quantitative risk assessment. ⇒ Financial constraints remains a huge challenge, particularly for quantitative risk assessment as apart from hiring international skilled persons, the procurement of weather data is still costly as these needs to be purchased from INAM.
<p>Core indicator 2: Systems are in place to monitor, archive and disseminate data on key hazards and vulnerabilities Level of progress achieved: 4 (recognized limitations in key aspects, such as financial resources and/ or operational capacities)</p> <p>Reason</p> <ul style="list-style-type: none"> ⇒ Although mechanisms are in place, financial constraints are still limiting the development of sector capacity to monitor the development of hazards covering the whole country, particularly for acquisition of satellite imagery. ⇒ Technical constraints also limit the timely sharing and dissemination of data and information as very often, the data and information formats are not compatible.

Core indicator 3: Early warning systems are in place for all major hazards, with outreach to communities.
Level of progress achieved: 4 (recognized limitations in key aspects, such as financial resources and/ or operational capacities)

Reason

- ⇒ The number of hydro-climatological gauge stations is still limited.
- ⇒ Deficient communication network.
- ⇒ Damage of the GPRS communication system hindering data transmission between the seismological stations and the data processing and analysis centers
- ⇒ Lack of spare parts in-country for the maintenance and repair of seismological stations.

Core indicator 4: National and local risk assessments take account of regional / trans boundary risks, with a view to regional cooperation on risk reduction.

Level of progress achieved: 4 (recognized limitations in key aspects, such as financial resources and/ or operational capacities)

Reason

- ⇒ Technical barriers for timely communication remain an issue, particularly, for timely monitoring of fast growing events such as flooding, particularly, in the southern region when flooding is triggered by a regionally localized weather disturbance.
- ⇒ Communication also poses serious impediment for regional exchange of seismic data between Mozambique, Tanzania, Malawi, all situated along the Rift Valley, and Madagascar.

Priority for Action 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels

Core indicator 1: Relevant information on disasters is available and accessible at all levels, to all stakeholders (through networks, development of information sharing systems etc)

Level of progress achieved: 4 (recognized limitations in key aspects, such as financial resources and/ or operational capacities)

Reason

- ⇒ The access of DRR information at local level remains an issue due to limited internet access, and limited availability of DRR materials in local public places including libraries.

Core indicator 2: School curricula , education material and relevant trainings include disaster risk reduction and recovery concepts and practices.

Level of progress achieved: 4 (recognized limitations in key aspects, such as financial resources and/ or operational capacities)

Reason

- ⇒ The existing limited technical skills to undertake comprehensive risk assessments will remain.

Core indicator 3: Research methods and tools for multi-risk assessments and cost benefit analysis are developed and strengthened.

Level of progress achieved: 4 (recognized limitations in key aspects, such as financial resources and/ or operational capacities)

Reason

- ⇒ The existing tools are still limited in terms of geographic coverage, as of now both LIDAR and FLOMA have been prepared for the Limpopo. There is need to accelerate the expansion of the utilization of these soft-wares to other basins frequently affected by floods, such as the Zambezi, Save, Incomati, Búzi, Messalo, Ligonha and Licungo.
- ⇒ Rapid development of national capacity at INAM to generate reliable weather data along the main river basins needs to be speeded.
- ⇒ Training of staff, particularly of the Regional Water Administration (ARA's) and INGC is critical to improve national and local capacities to explore all the capabilities offered by these two flood management tools.

Core indicator 4: Countrywide public awareness strategy exists to stimulate a culture of disaster resilience, with outreach to urban and rural communities.

Level of progress achieved: 5 (Comprehensive achievement with sustained commitment and capacities at all levels.)

Reason

- ⇒ The country still needs to improve DRR messaging and communication to facilitate the dissemination of DRR contents and messages. For instance, limited technical capacity to translate, simplify and communicate the DRR messages and information in an understandable language to the local communities, including the communication of risk to the urban dwellers remains an issue.
- ⇒ The introduction and systematic conduction of simulation exercises in urban areas should be part of DRR sensitization programs aiming at accelerating the engagement of urban dwellers in DRR activities in their communities.
- ⇒ Much more attention will be required for the strengthening of risk communication in the urban areas as a means to build better understanding and preparedness of the cities to respond to increasing risks as consequence of climate change impacts.

Priority for Action 4: Reduce the underlying risk factors

Core indicator 1: Disaster risk reduction is an integral objective of environment related policies and plans, including for land use natural resource management and adaptation to climate change.

Level of progress achieved: 4 (recognized limitations in key aspects, such as financial resources and/ or operational capacities)

Reason

- ⇒ The enforcement of environmental laws is still limited due to weak institutional capacity to implement a monitoring program targeting all category A and B development projects at all levels.
- ⇒ The lack of adequate financial resources limits capacity development, including the setting up of an environmental laboratory, and also does not allow regular deployment of staff of the Ministry for the Coordination of Environmental Affairs (MICOA) to undertake onsite environmental monitoring of development projects across the country.
- ⇒ Provision of additional resources to MICOA to secure specialized training and environmental field inspections is required.

Core indicator 2: Social development policies and plans are being implemented to reduce the vulnerability

of populations most at risk.

Level of progress achieved: 4 (recognized limitations in key aspects, such as financial resources and/ or operational capacities)

Reason

- ⇒ Lack of adequate financial resources continues to pose a serious limitation for scaling up of micro-insurance to a significant number of farmers and districts with high agro-ecological potential.
- ⇒ At sector level, the dependence on international consultancy for the definition of vulnerability indicators and index applicable to Mozambique and widely acceptable remains.
- ⇒ Leveraging of private sector interest to enter and manage the micro-insurance market needs to be promoted.

Core indicator 3: Economic and productive sectorial policies and plans have been implemented to reduce the vulnerability of economic activities

Level of progress achieved: 4 (recognized limitations in key aspects, such as financial resources and/ or operational capacities)

Reason

- ⇒ Financial constraints to retrofit the entire existing vulnerable infrastructure network as consequence of poor design or inadequate construction standards
- ⇒ Outdated or non-existent adequate building codes and standards adjusted to the current and future sector disaster and climate risk
- ⇒ Limited technical capacity of the Government institutions to enforce the existing building regulations to ensure quality of constructions works in all sectors.

Core indicator 4: Planning and management of human settlements incorporate disaster risk reduction elements, including enforcement of building codes.

Level of progress achieved: 4 (recognized limitations in key aspects, such as financial resources and/ or operational capacities)

Reason

- ⇒ Limited financial resources to speed up:
 - (i) The construction of drainage system designed to cope with the existing floods risk in each municipality
 - (ii) The construction of robust protection infrastructure in all the coastal cities faced with progressive coastal
 - (iii) The design and implementation of a just resettlement program to all families at risk in urban areas
- ⇒ The limited technical capacity to undertake risk assessments emerges as the greater impediment to advance the integration of DRR/CCA actions into the existing and future municipal urban structural plans. The lack of a legal provision to prevent the development of human settlements, including towns and cities along floodplains
- ⇒ Mobilization of additional resources to support investment for construction or expansion of drainage network in vulnerable coastal cities and for training of sector staff on risk assessment is required as a pre-condition for rapid, gradual and consistent adoption of sound DRR measures to protect existing

<p>and projected human settlements across the country.</p>
<p>Core indicator 5: Disaster risk reduction measures are integrated into post disaster recovery and rehabilitation processes</p> <p>Level of progress achieved: 4 (recognized limitations in key aspects, such as financial resources and/ or operational capacities)</p> <p>Reason</p> <ul style="list-style-type: none"> ⇒ Limited financial resources to invest in robust and comprehensive measures (coupling of structural and non-structural mitigation measures) to significantly and adequately reduce the existing risks to all sectors at all levels ⇒ The lack of national and sector capacity to prepare, test and enforce new building codes slows down the real action as the design of building codes is dependent on mobilization of international financial and technical support. ⇒ Continuous investment in the construction of protection infrastructures (e.g. dikes) and training of sector staff to improve infrastructure management and maintenance should remain as national priority to progressively protect all the investment made so far and those projected in future.
<p>Core indicator 6: Procedures are in place to assess the disaster risk impacts of major development projects, especially infrastructure.</p> <p>Level of progress achieved: 4 (recognized limitations in key aspects, such as financial resources and/ or operational capacities)</p> <p>Reason</p> <ul style="list-style-type: none"> ⇒ The limited technical capacity to model the contribution of the witnessed, actual and future land use changes in inducing and amplifying disaster risk impact will remain a serious technical constrain to ensure full safety and risk-free infrastructures. ⇒ In the coming years, the Government should focus its attention to the revision of the EIA regulation to strengthen integration of DRR provisions and training of MICOA staff on risk assessments as a pre-condition for the enforcement of the EIA regulation by all developers and sectors.
<p>Priority for Action 5: Strengthen disaster preparedness for effective response at all levels</p>
<p>Core indicator 1: Strong policy, technical and institutional capacities and mechanisms for disaster risk management, with a disaster risk reduction perspective are in place.</p> <p>Level of progress achieved: 4 (recognized limitations in key aspects, such as financial resources and/ or operational capacities)</p> <p>Reason</p> <ul style="list-style-type: none"> ⇒ Difficulties remain at technical level where limited capacity exists at CENOE to coordinate and deal with complex and extensive emergencies. ⇒ Preparedness planning remains an issue to allow timely and targeted mobilization of adequate number of disasters responders and means for effective emergency response in remote areas across the country. ⇒ Limited capacity exists to handle emergency in the context of simultaneous floods and heavy rains. ⇒ Improvement of preparedness planning based on the worst case scenario for national and local

<p>disasters responders institutions and staff is required to rapidly build national and local capacity to deal with complex and extensive disasters across the country.</p>
<p>Core indicator 2: Disaster preparedness plans and contingency plans are in place at all administrative levels, and regular training drills and rehearsals are held to test and develop disaster response programmes. Level of progress achieved: 4 (recognized limitations in key aspects, such as financial resources and/ or operational capacities)</p> <p>Reason</p> <ul style="list-style-type: none"> ⇒ Technical capacity to undertake adequate preparedness planning for effective and preparedness disaster response is still limited. ⇒ The lack of protocols to guide preparedness planning and disaster response persists. ⇒ The engagement and leadership of sector in CENOE has receded, leaving INGC and CTGC alone in the leadership and coordination of emergency preparedness and response. ⇒ Lack of contingency plans at municipal level, despite the high vulnerability to disasters of all municipalities located along the coastline and floodplains. ⇒ The design and approval of protocols to guide disaster preparedness and response planning and expansion and allocation of contingency plan resources to municipalities and districts in areas at high risk of disasters needs to be considered and prioritized in the coming years.
<p>Core indicator 3: Financial reserves and contingency mechanisms are in place to support effective response and recovery when required. Level of progress achieved: 5 (Comprehensive achievement with sustained commitment and capacities at all levels.)</p> <p>Reason</p> <ul style="list-style-type: none"> ⇒ Financial constraints still limit the decentralization of Contingency funds to districts and municipalities. As consequence, these administrative units has limited capacity to intervened to respond to local emergencies, requiring therefore, the intervention of provincial and central authorities to emergencies that with provision of adequate funding could be handled by the respective local authorities. ⇒ Lack of progress in the discussion for the establishment of the National Disaster Fund, which in principle would act as the financial instrument to support the implementation of the DRM law in all DRM components and phases, with emphasis to disasters prevention and mitigation. ⇒ The Government has to rethink the option of establishing a sustainable post-disaster reconstruction funding mechanism and the introduction of a selective decentralization of DRR resources to specific local governments as a pre-condition for the gradual implementation of the DRM law once this is approved by the Parliament.
<p>Core indicator 4: Procedures are in place to exchange relevant information during hazard events and disasters, and to undertake post-event reviews. Level of progress achieved: 4 (recognized limitations in key aspects, such as financial resources and/ or operational capacities)</p> <p>Reason</p> <ul style="list-style-type: none"> ⇒ The implementation of the information flow policy reform will require removal of current technical

and financial barriers through:

- (i) Capacity building of CENOE staff to work throughout the stages for fully implementation of the information flow system, including feedback from local responders and end-users;
 - (ii) Government commitment to use part of Contingency Plan to fund extra broadcasting time of the provincial radio stations and community radios.
 - (iii) Equipment of all Local Communities for Disaster Risk Management with communication kits, including mobile phones.
- ⇒ Government should focus its attention and efforts in building a multi-sector core team that is regularly trained to lead regular and systematic damages and loss assessment whenever the country is affected by disasters regardless their size and extent.

Chapter 4 Organization

(1) New Government Ministries

The President of the Republic of Mozambique, Mr. Filipe Jacinto Nyusi, named the following members of the Government by Presidential Order on January 16, 2015. The name of Ministry of Public Works and Housing, to which Department of Water Resources (DNA) belongs, has been changed to Ministry of Public Works, Housing and Hydric Resources.

Table 4.1 Names of New Ministers and Ministries

	Name of Minister	Ministry
1.	Adriano Afonso Maleiane	Ministry of Economy and Finance
2.	Oldemiro Julio Marques Baloi	Ministry of Foreign Affairs and Cooperation
3.	Jaime Basilio Monteiro	Ministry of Interior
4.	Atanasio Salvador Mtumuke	Ministry of the National Defence
5.	Jose Condungua Antonio Pacheco	Ministry of Agriculture and Food Security
6.	Carmelita Rita Namashulua	Ministry of the State Administration and Public Functions
7.	Vitoria Dias Diogo	Ministry of Work, Labor and Social Security
8.	Adelaide Anchia Amurane	Minister in the Presidency for Internal Civil Affairs
9.	Agostinho Salvador Mondlane	Ministry for the Sea, Fishing and Internal Waters
10.	Pedro Conceicao Couto	Ministry of Mineral and Energy Resources
11.	Abduremane Lino de Almeida	Ministry of Justice, Constitutional and Religious Affairs
12.	Nazira Karimo Vali Abdula	Ministry of Health
13.	Alberto Hawa Januario Nkutumula	Ministry of Youth and Sport
14.	Cidalia Manuel Chauque Oliveira	Ministry of Gender, Children and Social Affairs
15.	Luis Jorge Manuel Teodosio Antonio Ferrao	Ministry of Education and Human Development
16.	Ernesto Max Elias Tonela	Ministry of Industry and Trade
17.	Carlos Alberto Fortes Mesquita	Ministry of Transportation and Communication
18.	Celso Ismael Correia	Ministry of Land, Environment and Rural Development
19.	Silva Armando Dunduro	Ministry of Culture and Tourism
20.	Eusebio Lambo Gumbiwa	Ministry of Fighters
21.	Jorge Olivio Penicela Nhambiu	Ministry of Science, Technology and Professional Training
22.	Carlos Bonete Martinho	Ministry of Public Works, Housing and Hydric Resources

(2) Roles of Organizations in charge of Disaster Risk Management

In order to cope with potential disasters, annual Contingency Plan for Rainy and Cyclones Season 2014-2015 has been prepared by multi-sectoral agencies and approved by the Council of Ministers. The Contingency Plan defines roles of the agencies in charge of disaster risk management before, during and after emergency. Major roles of the agencies are as described below: It should be noted that the names of the ministries and agencies shown here are as described in the Contingency Plan and are different from the new names since January 16, 2015.

1) Disaster Management Coordination Council (CCGC)

Disaster Management Coordination Council (CCGC) is the highest level decision making council chaired by the Prime Minister, and participated by all members of the Council of Ministers of the sectors directly involved in situations of natural disasters. CCGC is responsible to ensure the coordination of all emergency operations and implementation of the Master Plan for Prevention and Mitigation of Natural Disasters. In emergency, CCGC is organized regularly to review implementation of the contingency plan and provide guidance to all the levels.

2) Disaster Management Technical Council (CTGC)

Disaster Management Technical Council (CTGC) is chaired by the Director General of the National Institute for Disaster Management (INGC) and is composed by the National Directors of relevant sectors, appointed by member ministers of CCGC. CTGC is primarily responsible for coordinating sectorial warning systems and early warning of impending calamities of meteorological origin, hydrological, geological, epidemics and food security and ensure the multi-implementation of the various plans under reducing vulnerability and disaster risk. CTGC normally meets once a month and extraordinarily whenever convened by the Director General of INGC. Representatives of development partners are invited to CTGC, such as the National Humanitarian Team (HCT), civil society and the private sector.

3) Emergency Operation National Center (CENOE)

CENOE is a multi-sectorial coordination structure and decision-making for representatives of institutions, civil society and groups of actors involved directly in disaster response operations. The purpose of CENOE is to provide to all those involved in the prevention, mitigation and response to disasters, a guiding instrument procedures, tasks and scientific technical monitoring actions, warnings issued, control operations, and activation of emergency operations. CENOE is established at the Air Base of Mavalane in Maputo, with possibility to operate in the regions of Vilanculos (Inhambane), Caia (Sofala) and Nacala (Nampula). CENOE has as intervening body, in emergency the National Civil Protection Unit (UNAPROC). Emergency Operations Center (COE) is a deployment of CENOE in the provinces and is coordinated by the provincial INGC.

4) National Humanitarian Team (HCT)

National Humanitarian Team (HCT) is composed by UN agencies, civil society organizations, Red Cross, bilateral and multilateral partners. HCT is organized in specialized working groups, namely education, protection, health, nutrition, safety food, shelter, logistics, emergency telecommunications and initial recovery. These groups are integrated in the four sectors of CENOE (Information & Planning, Communication, Infrastructure, and Social Services) and are aligned with their ministerial counterparts. This alignment helps to reduce overlapping of efforts and resources as well as the preservation of the rights and dignity of people affected and their participation during the whole

disaster management process.

HCT is led by the United Nations Resident Coordinator and complements the Government's efforts in the disaster response actions. HCT through its sectors has provided technical, material and advice on the additional resources to strengthen the responsiveness of government sectors as well as the possibility of mobilizing additional resources, when necessary, respecting the international standards governing the management and response to emergencies.

With the perspective to ensure alignment between the planned activities by the Government and the support of development partners, human resources, material and assistance to be carried out before, during and after the disaster occurrence have been integrated the in government sectors.

5) National Institute for Disaster Management (INGC)

INGC's intervention aims to coordinate and lead the disaster management system, to manage the information flux from the bottom to the central level and vice-versa (including the community level), pre-positioning of the equipment and materials, rescue, lifesaving and prompt humanitarian assistance in the first 72 hours.

Table 4.2 Major Roles of INGC

Organization:	National Institute for Disaster Management (INGC)
Proactive Measures (before disaster)	<ul style="list-style-type: none"> ◆ Realization of emergency simulations, involving the main actors; ◆ Installation and operation of additional communication systems; ◆ Reactivation of the sectorial working groups, including the humanitarian team partners, identified in the CENOE operationalization context. ◆ Organizing and sending of technical supporting team to the Provincial and District governments for preparedness and response; ◆ Provision of physical and administrative logistics involved in the emergency; ◆ Activation of the early warning system for tropical cyclones and floods; ◆ Reorganization and distribution of uniformed forms for data collection during the concurrency of disasters, including capacity building of technicians for humanitarian assistance; ◆ Update and maintenance of occurrences database; ◆ Identification and dissemination of evacuation routes and locations that can serve as temporary shelter; ◆ Check the level of preparedness of schools, hospitals, health centers and other sensitive and essential services (energy suppliers, communications, transport, etc.).
Reactive Measures (during disaster)	<ul style="list-style-type: none"> ◆ Alert level of activation as per magnitude of the disaster; ◆ Search and rescue operations; ◆ Evaluation of the immediate needs of humanitarian assistance, including the disaggregation of data by sex and age; ◆ Coordinate the accommodation of victims in secure locations; ◆ Creating a database of the affected people and the type of response provided; ◆ Ensure supply¹⁴ of basic needs for the affected population; ◆ Implementation of public education activities and social mobilization of the victims, for their participation in the maintenance and hygiene activities in the transit centers; ◆ Preparation and implementation of national/international calls for the mobilization of resources, if necessary;

	<ul style="list-style-type: none"> ◆ Elaboration of rapid recuperation plan, resettlement and reconstruction, in the emergency context; ◆ Identification of spaces for the creation of emergency infrastructures for the reception of sick people, if necessary; ◆ Permanent spread of information to the public.
Normalization measures of the affected people (after disaster)	<ul style="list-style-type: none"> ◆ Evaluation of the damages, needs and the resettlement plan, if necessary, in agreement with the affected population; ◆ Elaboration of rehabilitation and reconstruction infrastructures plans and programs; Allocation of necessary resources and/or their mobilization for the start of the reconstruction program after the disaster; ◆ Monitoring and coordination of integrated reconstruction programs at local level; ◆ Encouraging the register organization, in order to ensure the safe use of land for the resettled communities; ◆ Identification, design and implementation of profitable projects for the socio-economical reintegration of the vulnerable groups affected by the disaster.

6) Information Office (GABINFO)

Before, during and after the extreme events, the INGC in coordination with GABINFO, coordinate the communication sector during the emergency period, articulating with the social communication entities the spreading of the information for the awareness and education of the communities. The coordination includes training of media on the disaster risk reduction.

Table 4.3 Major Roles in Communication of INGC and GOBINFO

Organization:	National Institute for Disaster Management (INGC) and Information Office (GABINFO)
Proactive Measures (before disaster)	<ul style="list-style-type: none"> ◆ Evaluation of the system and communication tools for the spreading of the information; ◆ Identification and designation of a spokesperson for declaration to the Press about the emergency; ◆ Establishment of partnerships with mobile phones for the spreading of the prompt information about the emergency, through Short Message Service (SMS). ◆ Production and spreading of the specific information, to: <ol style="list-style-type: none"> a. Council of Ministers; b. Social Communication entities, namely newspapers, National TV, Social Communication Institute, TVs and Community Radios; c. Public at large; ◆ Conceptualization and elaboration of pamphlet with preventive measures of the main phenomena. ◆ Starting of the movements and pre-positioning of human and material resources for elaboration, delivery of information and preventive measures in risk areas; ◆ Disseminate and share the Contingency Plan with partners; Training for journalists on issues related to natural disasters.
Reactive Measures (during disaster)	<ul style="list-style-type: none"> ◆ Starting information spreading about the phenomenon and about the precaution measures through the available tools, namely: radios and communitarian TVs (see details in the annex), Management Risk Local Committee (CLGRC), chiefs of villages or community leaders. ◆ Management of the information spreading by the Social Communication entities according to the evolution of the phenomena. ◆ Assistance to the Social Communication entities to cover the phenomenon; ◆ Production and spreading of the information about the phenomenon and mitigation action, to: <ol style="list-style-type: none"> a. Council of Ministers;

	<p>b. Social Communication entities c. Public at large;</p> <ul style="list-style-type: none"> ◆ Intensification of the urgent requests to the communities located in the risk areas for the provision of safe sites; ◆ Make aware and maintain the population informed about the activation of the Contingency Plan and of the different level of warning, according to the evolution of the phenomena.
Normalization measures of the affected people (after disaster)	<ul style="list-style-type: none"> ◆ Evaluation of the preparedness and emergency response plan; ◆ Continuation of the civil education actions on the preventive measures, including the elaboration of videos and educational informative bulletins; ◆ Social mobilization of the communities for the participation in the reconstruction process through the Social Communication Institute mobile units, newspapers, TVs and Community radios; ◆ Evaluate and solve the information weaknesses to improve the service in later emergencies.

6) Ministry of Agriculture (MINAG)

Vegetal Health

The intervention in the vegetal health area aims, mainly to ensure the improvement of the management capacities of migratory plagues (Invasive Caterpillar, Red Beak Sparrow) and rats, through the strengthening of the monitoring capacities, control and evaluation of results, in order to guarantee the food security of the products. Since the destructive nature of this group of pests on crops, causing widespread damage and / or loss of crops, actions to combat or control require a high state of readiness and responsiveness to these types of pest (phyto-sanitary campaigns).

Animal health

In animal health issue, it may also occur some diseases and epidemics such as: Carbuncles hematic, symptomatic rabies and Newcastle in the case of dried and Nodular Acne, Rift Valley fever, pest of petits ruminants and other infections in the case of droughts, floods / floods.

Monitoring and Evaluation

Taking into account the weather forecast, the monitoring and evaluation of land will be necessary, with the objective of doing assessment and diagnosis of the situation. MINAG, in order to face the potential disasters mentioned above, needs 232 million of meticais for the areas more important and most at risk, namely it is necessary to make available pesticides and to realize presupposition, agriculture inputs provision, Vegetal Health, Animal Health and Monitoring and Evaluation.

7) Ministry of Transportation and Communication

The National Institute of Meteorology (INAM) of Ministry of Transportation and Communication has mandate for meteorology and it has the following major roles before, during and after disasters:

Table 4.4 Major Roles of INAM

Organization:	National Institute of Meteorology (INAM), Ministry of Transportation and Communication
Proactive measures (before disaster)	<ul style="list-style-type: none"> ◆ Interpretation and dissemination of the seasonal climatic forecasts of Mozambique and the Africa Austral region, interpretation of present rainy and cyclone season, starting from August, this year; ◆ Permanent monitoring of the meteorological phenomena to avoid hazards, Observation strengthening capacity of the different meteorological stations; ◆ Capacity building and training of technician regarding the technical procedures during the emergency phase.
Reactive measures (during disaster)	<ul style="list-style-type: none"> ◆ Continuous follow up of the meteorological phenomena evolution through the elaboration of daily weather forecast of short to medium term (2 to 5 days); ◆ Spread of early warnings with indication of the magnitude of the phenomenon and the risk zone. ◆ Intensification of the meteorological vigilance
Normalization measures of the affected people (after disaster)	<ul style="list-style-type: none"> ◆ Evaluation of the meteorological phenomenon behavior and of its impacts on rain, strong wind and thunderstorm (atmospheric discharge).

8) Ministry of Public Works and Housing (MOPH)

National Directorate of Water (DNA) of the Ministry of Public Works and Housing (MOPH) has very wide mandate for water related disaster management. Water Resources Department of DNA has the following major roles:

Table 4.5 Major Roles of Water Resources Department of DNA

Organization:	Water Resources Department of National Directorate of Water (DNA)
Proactive measures (before disaster)	<ul style="list-style-type: none"> ◆ Publishing and distribution of the Contingency Plan and coordination of actions within DNA, Government, Provinces and Districts, Regional Water Authorities (ARAs) and Cooperation Partners; ◆ Updating of the national and international focal point list; ◆ Verification of the communication tools, namely: Phones and Radios. ◆ Realization of meetings with other management entities of water resources and upstream dam in the country, in particular within ARA-Centro and Zinwa (Zimbabwe), ARA-Zambeze and the similar entities of Zimbabwe and Zambia; ◆ Inspection and maintenance of the Hydrological Flood Warning System (SAC); ◆ Campaign of flow measurement; ◆ Management of reservoirs, taking into account the setting of the affluent torrents and the low water situation of each hydrographic basin.
Reactive measures (during disaster)	<ul style="list-style-type: none"> ◆ Continuous exchange of information with the Regional Water Administrations (ARAs), National Institute of Meteorology (INAM), Hidroeléctrica de Cahora Bassa (HCB), Dam of Chicamba and other national entities collecting hydro-meteorological data; ◆ Continuous communication with other management entities of hydric resources and upstream dam in the country, in particular within ARA-Centro and Zinwa (Zimbabwe), ARA-Zambeze and the similar entities of Zimbabwe and Zambia; ◆ Intensification of systematic monitoring of water levels/flows to ensure a timely information; ◆ Daily emission and dissemination of Hydrological Bulletins at Regional (ARAs) and National (DNA) level from December 1 to April 30, depending on the prevailing hydrological situation; ◆ Issuing of press releases;

	<ul style="list-style-type: none"> ◆ Continuation with the realization of river measuring campaigns;
Normalization measures of the affected people (after disaster)	<ul style="list-style-type: none"> ◆ Elaboration and dissemination of the rainy season 2014/15 evaluation report; ◆ Inspection and renovation of the hydro-climatologic network after the floods;

Water and Sanitation Department of DNA has the following major roles:

Table 4.6 Major Roles in Water and Sanitation Department of DNA

Organization:	Water and Sanitation Department of National Directorate of Water (DNA)
Proactive measures (before disaster)	<ul style="list-style-type: none"> ◆ Reestablishment or water supply (ensuring the availability of the minimum recommended quantities in emergency situation); ◆ Provide equipment & materials for the treatment and distribution of water; ◆ Provide materials for the construction of latrines and technical support for the affected people in the construction of latrines; ◆ Preparation and spreading, in coordination with other sectors, of messages and communication about hygiene, sanitation and a rational use of water (make more with less); ◆ Monitoring the impact of the interventions in coordination with the health sector. ◆ In particular, the sector (Government and its counterpart) will implement the following main activities: ◆ Inventory, repair/maintenance and pre-positioning (in strategic sites) of equipment & emergency material available in the country; ◆ Updating/identification of the existing capacities in the sector and mapping of the emergency counterparts; ◆ Coordination meeting/preparation of emergency response, including all the key counterparts of the sector; ◆ Strengthening the capacity of provinces and districts in the planning, monitoring and timely response to the emergency; ◆ Purchase and allocation of additional materials and supplies for a proper response to the emergency (Certeza - Rol of Plastics - Plastic Stones).
Reactive measures (during disaster)	<ul style="list-style-type: none"> ◆ Prompt analysis of the situation and needs in water, sanitation and hygiene; ◆ Ensure the availability of safe water (respecting the minimum standards) and the sanitation infrastructures; ◆ Provide equipment/materials for (i) treatment, conservation, distribution of water (ii) deposition of human excrement and solid residue (iii) promotion of hygiene best practices; ◆ Spreading, in coordination with other sectors, key messages on prevention of diarrheal disease, including cholera, information about the good conservation of water at home, technical instruction for the construction of latrines; ◆ Reactivation of coordination mechanisms and information sharing systems.
Normalization measures of the affected people (after disaster)	<ul style="list-style-type: none"> ◆ Monitoring the situation and evaluation of the water needs, sanitation and hygiene; ◆ Support water resources rehabilitation and construction with an active involvement of families/communities in order to ensure the sustainability of the interventions; ◆ Support the self-construction of family latrines; ◆ Continuous support in the implementation of the hygiene promotion activities ◆ Monitoring and Evaluation of the implemented activities.

Department of Hydraulic Infrastructure of DNA has the following major roles:

Table 4.7 Major Roles in Hydraulic Infrastructure Department of DNA

Organization:	Hydraulic Infrastructure Department of National Directorate of Water (DNA)
Proactive measures (before disaster)	<ul style="list-style-type: none"> ◆ Installation of flood-gate in the dyke of Xai-Xai and in the drain II and III ◆ Rehabilitation of the dam of Macarretane: <ul style="list-style-type: none"> a) Wing wall of the stilling basin b) Plugging of downstream depressions ◆ Purchasing and installation of hydro mechanical equipment ◆ Rehabilitation of Massingir Dam: <ul style="list-style-type: none"> a) Completion of the auxiliary spillway b) Rehabilitation of the bottom discharger
Reactive measures (during disaster)	<ul style="list-style-type: none"> ◆ Monitoring the operation of water storage and flood control infrastructures.
Normalization measures of the affected people (after disaster)	<ul style="list-style-type: none"> ◆ Monitoring and evaluation of the implemented activities. ◆ Exhaustive evaluation of the probable damages provoked at each basin and elaboration of a renovation plan for the hydraulic infrastructures (dyke, large and small dam).

Other than roles of DNA for water related roles, other departments also have mandate for disaster management as presented below:

Table 4.8 Major Roles of National Directorate of Housing and Urbanism of MOPH

Organization:	National Directorate of Housing and Urbanism of Ministry of Public Works and Housing (MOPH)
Proactive measures (before disaster)	<ul style="list-style-type: none"> ◆ Coordination with the various provinces of the preparation and dissemination of the contingency plan, as well as shared actions between DNHU, provincial governments, related entities and development partners; ◆ Coordination within the provincial departments on the monitoring of safe sites inventory for temporary accommodation in the event of natural disasters; ◆ Coordination within the provincial departments on the monitoring of existing materials and equipment for rapid response shelter construction, its location and its operational condition; ◆ Coordination within the provincial departments to evaluate the capacity of existing resettlement neighborhoods and ensure their expansion to accommodate new families if possible; ◆ Participate in the activities and promptness exercises to face disaster effects.
Reactive measures (during disaster)	<ul style="list-style-type: none"> ◆ Participate in the coordination of accommodation of victims in temporary shelters as well as the construction of temporary shelters in safe places for the affected populations; ◆ Participate in the monitoring of registering and control process of the number of affected families and people; ◆ Coordinate and guarantee the participation of community leaders in actions of prompt transfer of victims in already identified temporary shelters.
Normalization measures of the affected people (after disaster)	<ul style="list-style-type: none"> ◆ Monitoring the implementation (demarcation of sites) of partial plans on expanding new neighborhoods for resettlement, in collaboration with the National Directorate of Planning and Land Management (DINAPOT); ◆ Monitoring the provision of technical assistance in the reconstruction process and or construction of technically improved homes; ◆ Motivate the organization of the provisional / final registration in order to ensure the land insurance property right for the communities settled in a new place.

National Directorate of Road and Bridges of MOPH has the following roles:

Table 4.9 Major Roles of National Directorate of Roads and Bridges of MOPH

Organization:	National Directorate of Roads and Bridges of Ministry of Public Works and Housing (MOPH)
Proactive measures (before disaster)	<ul style="list-style-type: none"> ◆ Participation in all meetings to exchange information regarding the development of the phenomena and mitigation plans.
Reactive measures (during disaster)	<ul style="list-style-type: none"> ◆ Rapid mobilization of contractors for emergency repair actions (drainage structures and some periodic maintenance activities or located improvements as trenching, bulging, repairs platforms, etc.), to ensure the availability of roads; ◆ Inform members of the disaster management technical council and donors about the availability of the roads.
Normalization measures of the affected people (after disaster)	<ul style="list-style-type: none"> ◆ Ensure the restoration of the affected network

9) Ministry for the Coordination of Environmental Action (MICOA)

The Environment sector intends to face during this rainy season, actions relating to the degree of occupation of demarcated plots, the opening of streets and planting shade trees, the expansion process of the resettlement neighborhoods and posterior elaboration of contingency plans. The main action to be carried out are as follows:

Table 4.10 Major Roles of Ministry for the Coordination of Environmental Action (MICOA)

Organization:	Ministry for the Coordination of Environmental Action (MICOA)
Proactive measures (before disaster)	<ul style="list-style-type: none"> ◆ Promotion of recycling by core groups and Environmental Clubs in environmental management in accommodation centers and resettlement neighborhoods;
Reactive and Normalization measures of the affected people (during and after disaster)	<ul style="list-style-type: none"> ◆ Territory planning and accommodation center organization of the resettlement neighborhood regarding the organization of the tents, localization of collective latrines and of water tank; ◆ Demarcation and attribution of plots in partnership with the armed forces and the affected communities; ◆ Building temporary shelters in the accommodation centers and in the resettlement neighborhoods; ◆ Promote the cleaning process of the resettlement neighborhoods and accommodation centers in coordination with the armed forces and the affected community; ◆ Environment sanitation of the accommodation centers and of the resettlement neighborhoods with collocation of garbage containers;

10) Ministry of Education

Ministry of Education is in charge of the following major roles in disaster risk management:

Table 4.11 Major Roles of Ministry of Education

Organization:	Ministry of Education
Proactive measures (before disaster)	<ul style="list-style-type: none"> ◆ Capacity building of the education personnel in the most affected districts regarding Disaster Risk Management (GRD) and creation of School Committees of Disaster Management (CEGC);

	<ul style="list-style-type: none"> ◆ Monitoring of the activities of the Education and Culture Provincial Directorates (DPEC) in the execution of the Operational Emergency Plans; ◆ Risk mapping; ◆ Purchase of different materials for the prepositioning (student teacher kits, school kits and school tents).
Reactive measures (during disaster)	<ul style="list-style-type: none"> ◆ Assessment of the immediate needs for a quick come back to the teaching activities; ◆ Evaluation of the damages of the education infrastructures; ◆ Evaluation of the impact on students and school workers; ◆ Provision of different material for the school functioning; ◆ Coordination with different governmental sectors and cooperation partners to ensure the necessary support for protection and education; ◆ Monitoring the support to the affected schools to ensure their full operation.
Normalization measures of the affected people (after disaster)	<ul style="list-style-type: none"> ◆ Evaluation of the rehabilitation and renovation needs after the emergency and recruitment of teachers; ◆ Rehabilitation and reconstruction of the damaged educational infrastructures; ◆ Regular monitoring of the rehabilitation action, reconstruction of educational infrastructures and guarantee of the frequency attendance to the lessons as well as of the education quality.

11) Ministry of Women and Social Action

Ministry of Women and Social Action has the following major roles in disaster risk management:

Table 4.12 Major Roles of Ministry of Women and Social Action

Organization:	Ministry of Women and Social Action
Proactive measures (before disaster)	<ul style="list-style-type: none"> ◆ Allocate 600 emergency kits in Maputo City, in the WFP stores to be distributed at national level - UNFPA is the Focal Point -; ◆ Training the Provincial and District Focal Points of the Women and Social Action Sectors, MINT, district administrators, chief of administrative sites and implementing protection emergency activities, including prevention components and response to gender based violence - Nampula 20-22 of August 2014, 60 Focal Points and community leaders from districts and provinces of Niassa, Cabo Delgado and Nampula; ◆ Realization of monitoring activities on the flood trend, through the focal points together with the central and regional CENOE's and COEs provincial and district; ◆ Transmit the information using an adequate language, for each type of need. Using as well sign language for people with inability to read information about flood threats.
Reactive measures (during disaster)	<ul style="list-style-type: none"> ◆ Realization of lobby, advocacy and discussion actions, to improve the involvement of the national and international partners in the actions of the Ministry of Women and Social Affairs, namely, in the rescue, assistance and social protection of the vulnerable population affected by the flood; ◆ Implementation of monitoring action of the flood impact, humanitarian assistance and protection of the vulnerable population and targeted groups, in the sector of women and social affairs; ◆ Conducting a sectorial quick evaluation with different disaggregated data as per sex and age, and prioritizing the most vulnerable groups (teenager and pregnant women); ◆ Gather the information and guarantee is ascender flux (regarding the impact and the necessary actions) and descendent (regarding the available resources, criteria and distribution of assistance, necessary actions, etc.); ◆ Activation of the assistance and protection plans, particularly for young girl, including together with other sectors (health) assistance kits for the most vulnerable

	<p>groups;</p> <ul style="list-style-type: none"> ◆ Activation of response and prevention mechanisms against violence and abuses, including spread of information about the attendance for adolescents and women victim of violence; ◆ Support of entrainment activities for adolescent and providing of friend-services for adolescents and youths; ◆ Monitoring the humanitarian assistance and protection of adolescent, youths and pregnant women; ◆ Provide technical support for the Provincial Directorates of Women and Social Affairs (DPMAS) and Health District Services for Women and Social Affairs (SDMAS) in the areas affected by the floods.
Normalization measures of the affected people (after disaster)	<ul style="list-style-type: none"> ◆ Awareness on the gender based violence component, in the resettlement and accommodation neighborhoods; ◆ Organization of monitoring visit in the affected areas to guarantee that all identified vulnerable groups have access to social protection and health services; ◆ Distribution of the information about local services for children and women victims of violence; ◆ Agricultural project promotion for the most vulnerable groups of the resettled neighborhoods.

12) Ministry of Health

Ministry of Health has the following major roles in disaster risk management:

Table 4.13 Major Roles of Ministry of Health

Organization:	Ministry of Health
Proactive measures (before disaster)	<ul style="list-style-type: none"> ◆ Promotion of individual and collective Hygiene measures within the population at large, through awareness actions such as prevention of transmissible diseases. ◆ Perform routine disease surveillance, aimed at early detection of epidemics; ◆ Make sanitation actions in the potential sources of water and food contamination, in coordination with the water and sanitation sector; ◆ Provide in the areas most at risk to emergency treatment, medicament kits, anthropometric and medical material, nutritional supplement, education material; ◆ Provision of medicaments for the continuity of the treatment of chronic diseases such as ◆ HIV and AIDS, diabetes, HTA and tuberculosis; ◆ Ensure the training of health personnel and APEs for the intervention in the emergencies and epidemics, including breastfeeding support, nutritional screening and treatment of acute malnutrition.
Reactive measures (during disaster)	<ul style="list-style-type: none"> ◆ Strengthening the promotion of sanitation measures for the environment, individual and collective hygiene in the affected population, preventing communicable diseases and control of chronic diseases; ◆ Guarantee the continuity of the treatment of chronic diseases such as HIV and AIDS, diabetes, HTA and tubercles; ◆ Ensure the proper monitoring of the nutritional situation in the affected areas; ◆ Ensure the early detection of epidemic diseases as well as the periodic strengthening of provision of basic medicaments; ◆ Ensure the diagnosis and the treatment of common diseases (malaria, diarrhea, respiratory infections and skin diseases, among others) in the accommodation centers; ◆ Ensure the existence of health team trained in emergency, epidemic and nutritional intervention management, creation of spaces for the breastfeeding in the resettlement areas or in other spaces;

	<ul style="list-style-type: none"> ◆ Ensure the forbidden entrance for maternal milk substitution in the resettlement areas and in the other affected areas; ◆ Deworming with Mebendazole to all children of 12 to 59 months and pregnant women that did not receive it in the previous 6 months. Moreover vitamin A supplement for all children of 6 to 59 months, that did not receive it in the previous 6 months; ◆ Give specific assistance to the postpartum women (postpartum consultation, vitamin A and salty ferrous supplement) ◆ Ensure the nutritional supplement for the most vulnerable groups (children of 6 to 59 months, pregnant and breastfeeding women) with BP-5 or CSB; ◆ Start the treatment for pregnant women and children with acute, moderate (DAM) or severe (DAG) malnutrition.
Normalization measures of the affected people (after disaster)	<ul style="list-style-type: none"> ◆ Continue to promote individual and collective prevention measures within the population at large, informing and make awareness on the constant individual and collective hygiene, as a tool to be protected from most of the transmissible diseases; ◆ Continue with the epidemic routine control; ◆ Implement sanitation actions to promote the hygiene, in coordination with the water and sanitation sector; ◆ Maintain the nutritional selection of the vulnerable groups (children of 6 to 59 months, pregnant and breastfeeding women) and the treatment of people with acute malnutrition; ◆ If the food security has not been yet ensured, it is necessary to continue with the supplements alimentation for the most vulnerable groups (children of 6 to 59 months, pregnant and breastfeeding women); ◆ Evaluation, rehabilitation, reconstruction and reactivation of the health affected units

13) Ministry of Industry and Commerce

Ministry of Industry and Commerce has the following major roles in disaster risk management:

Table 4.14 Major Roles of Ministry of Industry and Commerce

Organization:	Ministry of Industry and Commerce
Proactive measures (before disaster)	<ul style="list-style-type: none"> ◆ Rapid evaluation of food availability, resources and other needs; ◆ Mobilization and contact with potential goods suppliers during and after the occurrence of emergency; ◆ Identification, definition and mapping movements of goods, within the areas in excess or with availability for the affected zones.
Reactive measures (during disaster)	<ul style="list-style-type: none"> ◆ Facilitate and support the local buying activities; ◆ Issue evaluations about the entrance of products because of the emergency; ◆ Participation in the selection of donated products (food and others) before of being distributed to the affected populations or sent it to the affected zones.
Normalization measures of the affected people (after disaster)	<ul style="list-style-type: none"> ◆ Participation of the resettled population; ◆ Facilitate and support the activities of local buying; ◆ Evaluation of the entrance of donated products for the emergency; ◆ Assess the trading and industrial infrastructures affected by the flood; ◆ Guarantee the rehabilitation of the damaged commercial network in the affected zones; ◆ Participation and stimulation of transformation actions and enrichment of food products;

(3) Major Roles of DNA and ARAs

As seen in the tables above, it is evident that DNA has very wide responsibility in water related disaster management together with ARAs. But the major roles discussed above do not include prevention/ mitigation measures, which are the most important and efficient in disaster risk reduction (DRR). JICA team has prepared a disaster management matrix focusing on DNA, ARAs, INGC, INAM and other important agencies by using the collected information. It is evident that DNA and ARAs have important roles for implementing prevention and mitigation measures for disaster risk reduction. The disaster management matrix is shown in Table 4.15.

Table 4.15 Major Roles of DNA, ARAs, INGC, INAM and Other Agencies in Disaster Cycle (Water Related Disasters)

Disaster Cycle	Major Roles			
	Measures	DNA	ARAs	INGC/ CENOE
Prevention/ Mitigation				
Non-structure	<ul style="list-style-type: none"> Support for formulation of flood management plan Support for planning and design of flood management facilities Collect flood information of international rivers from neighboring countries Operation and maintenance of dams and barrages for water resources management. Organizing management committee of stakeholders of river basin (incl. international river basin) Upgrading flood forecasting model Preparation of project proposals for donor agencies to construct and improve flood management facilities. 	<ul style="list-style-type: none"> Formulation of flood management plan Planning and design of flood management facilities Collect flood information of international rivers from neighboring countries Operation and maintenance of dams and barrages for water resources management. Organizing management committee of stakeholders of river basin (incl. international river basin) Upgrading flood forecasting model Preparation of project proposals for donor agencies to construct and improve flood management facilities 		
Structure	<ul style="list-style-type: none"> Planning, construction and improvement of dykes Construction, improvement and rehabilitation of dam (large), barrage, sluice, etc. Oversee construction and improvement of flood forecasting and warning system Oversee construction of rain water storage facilities to reduce flood runoff (future task) Oversee improvement of hydrological observation system (rain and water level gauges) 	<ul style="list-style-type: none"> Planning, construction and improvement of dykes Construction, improvement and rehabilitation of dam (small), barrage, sluice, etc. Oversee construction and improvement of flood forecasting and warning system Construction of rain water storage facilities to reduce flood runoff (future task) Improvement of hydrological observation system (rain and water level gauges) 	<ul style="list-style-type: none"> Construction and improvement of flood forecasting and warning system (INAM, INGC) 	<ul style="list-style-type: none"> Improvement of meteorological observation system (INAM) Construction and improvement of flood forecasting and warning system (INAM, INGC)
Non-structure	<ul style="list-style-type: none"> Preparation of contingency plan in hydrological aspect Updating national and international focal point list Preparation of business continuation plan (BCP) of DNA (future task) Conclusion of MOU for emergency support with related organizations including private construction firms (future task) Preparation of flood risk maps (future task) Implementation of routine disaster drills (joint) Inspection and maintenance of Hydrological Flood Warning System (SAC) Management of reservoirs taking into account the heavy rain and drought Provision of rainfall and water level information Provision of alert information based on hazard level Maintain database of rainfall, water level and discharge observation Preparation of budget for emergency operation 	<ul style="list-style-type: none"> Setting of standard for issuing evacuation order (BCP) of ARAs (future task) Conclusion of MOU for emergency support with related organizations including private construction firms (future task) Participation to river basin committee Implementation of routine disaster drills (joint) Provision of rainfall and water level information Provision of alert information based on hazard level Participate Provincial COE Maintain database of rainfall, water level and discharge observation Patrol and inspection of river and hazardous areas Rainfall, Water level and discharge observation Issuance of flood forecast and warning Preparation of budget for emergency operation 	<ul style="list-style-type: none"> Preparation of contingency plan (every ministries and coordinated by INGC and approved by the Council of Ministers) Sending technical support team to Provincial and District governments for preparedness Check the level of preparedness of schools, hospitals, health centers and other Setting of standard for issuing evacuation order (INGC, INAM) Preparation of evacuation plan (District, INGC) Preparation of business continuation plan (BCP) for every administrative levels and agencies Conclusion of MOU for emergency support with related organizations including other local authorities and private construction firms Provision of alert information based on hazard level Maintain database of rainfall, water level and discharge observation Participate Provincial COE Maintain database of rainfall, water level and discharge observation Preparation of budget for emergency operation 	<ul style="list-style-type: none"> Preparation of contingency plan (every ministries and coordinated by INGC and approved by Council of Ministers) Preparation of business continuation plan (BCP) for every administrative levels and agencies (future task) Conclusion of MOU for emergency support with related organizations including other local authorities and private construction firms (All related agencies) Implementation of routine disaster drills (organized by INGC and participation of all related agencies) Activation and deactivation of warnings (Council of Ministers) Implementation of evacuation (District, Localidad, INGC) Patrol and inspection of river and hazardous areas (River basin committee) Water level observation (River basin committee) Stockpile of food, water, medical kit for emergency shelter (INGC, Provinces, Districts) Stockpile of equipment and materials for flood fighting (heavy equipment, tools, sand bags, etc.) (Province, District, INGC)
Preparedness	<ul style="list-style-type: none"> Preparation of contingency plan in hydrological aspect Updating national and international focal point list Preparation of business continuation plan (BCP) of DNA (future task) Conclusion of MOU for emergency support with related organizations including private construction firms (future task) Preparation of flood risk maps (future task) Implementation of routine disaster drills (joint) Inspection and maintenance of Hydrological Flood Warning System (SAC) Management of reservoirs taking into account the heavy rain and drought Provision of rainfall and water level information Provision of alert information based on hazard level Maintain database of rainfall, water level and discharge observation Preparation of budget for emergency operation 	<ul style="list-style-type: none"> Setting of standard for issuing evacuation order (BCP) of ARAs (future task) Conclusion of MOU for emergency support with related organizations including private construction firms (future task) Participation to river basin committee Implementation of routine disaster drills (joint) Provision of rainfall and water level information Provision of alert information based on hazard level Participate Provincial COE Maintain database of rainfall, water level and discharge observation Patrol and inspection of river and hazardous areas Rainfall, Water level and discharge observation Issuance of flood forecast and warning Preparation of budget for emergency operation 	<ul style="list-style-type: none"> Preparation of contingency plan (every ministries and coordinated by INGC and approved by the Council of Ministers) Sending technical support team to Provincial and District governments for preparedness Check the level of preparedness of schools, hospitals, health centers and other Setting of standard for issuing evacuation order (INGC, INAM) Preparation of evacuation plan (District, INGC) Preparation of business continuation plan (BCP) for every administrative levels and agencies Conclusion of MOU for emergency support with related organizations including other local authorities and private construction firms Provision of alert information based on hazard level Maintain database of rainfall, water level and discharge observation Participate Provincial COE Maintain database of rainfall, water level and discharge observation Preparation of budget for emergency operation 	<ul style="list-style-type: none"> Interpretation and dissemination of seasonal climatic forecast of Mozambique Capacity building and training of technician regarding the technical procedure in emergency Preparation of contingency plan Setting of standard for issuing evacuation order (INGC, INAM) Conclusion of MOU for emergency support with related organizations including other local authorities and private construction firms Implementation of routine disaster drills Rainfall observation Provision of rainfall information Issuance of flood forecast and warning Preparation of budget for emergency operation

			<ul style="list-style-type: none"> • Provision of alert information based on hazard level (INGC) • Establishment of hotline with local authorities (INGC) • Implementation of evacuation (District, Localidad, INGC) • Establishment of CENOE and Provincial COE (INGC) • Stockpile of food, water, medical kit for emergency shelter (INGC, Provinces, Districts) • Stockpile of equipment and materials for flood fighting (heavy equipment, tools, sand bags, etc.) (Province, District, INGC) • Preparation of budget for emergency operation (INGC, INAM, Province & District) 	<ul style="list-style-type: none"> • Improvement of communication system (secure redundancy) to share disaster information among related organizations • Preparation of evacuation center (District, INGC) 	<ul style="list-style-type: none"> • Preparation of budget for emergency operation (INGC, INAM, Province & District) • Mapping of the non-affected (safe) areas (Municipality)
Structure	<ul style="list-style-type: none"> • Improvement of communication system (secure redundancy) to share disaster information among related organizations 	<ul style="list-style-type: none"> • Improvement of communication system (secure redundancy) to share disaster information among related organizations • Preparation of evacuation center (District, INGC) 	<ul style="list-style-type: none"> • Improvement of communication system (secure redundancy) to share disaster information among related organizations (all related agencies) • Preparation of evacuation center (District, INGC) 	<ul style="list-style-type: none"> • Improvement of communication system (secure redundancy) to share disaster information among related organizations (all related agencies) • Preparation of evacuation center (District, INGC) 	
Response	<ul style="list-style-type: none"> • Monitoring the operation of water storage and flood control facilities • Gather flood and damage information and sorting of the information • Information sharing in CENOE • Provision of hydrological condition and forecast by National Hydrological Bulletin • Issuing press releases 	<ul style="list-style-type: none"> • Intensification of systematic monitoring of water levels/ flow • Operational management of water resources • Advice to the local government • Management of hydraulic infrastructure • Patrol and early detecting of flood condition such as depth and area of inundation • Gather flood and damage information and sorting of the information • Information sharing in Provincial COE • Provision of hydrological condition and forecast by Regional Hydrological Bulletin • Issuing press releases 	<ul style="list-style-type: none"> • Activation of alert level as per magnitude of the disaster • Chronological recording of all the incidents and response conducted (CENOE, COE) • Sending technical support team to Provincial and District governments for response • Evaluation of the immediate needs of humanitarian assistance • Creation of a database of the affected people and the type of response provided • Ensure supply of 14 basic needs for the affected population • Damage assessment (INGC) • Information sharing among related agencies (CENOE, all related agencies) • Evacuation guidance (INGC, District and local authorities) • Search, rescue and support activities (INGC and local authorities) • Transport of critical patient (INGC and local authorities) • Setting up of COE (INGC and local authorities) • Assistance for affected people • Running of accommodation center (District INGC and CENOE) • Securing foodstuffs, drinking water, cloths, medicine, etc. (INGC) • National/international calls for mobilization of resources if necessary • Public relations on damage and response (CENOE and Local Government) • Issuing press releases • Donation campaigns for affected people • Dispatch of emergency equipment such as lighting vehicles, water purifier, generators, 	<ul style="list-style-type: none"> • Information sharing among related agencies • Continuous follow up of meteorological phenomena • Spread of early warning with indication of magnitude and the risk zones • Issuing press releases 	<ul style="list-style-type: none"> • Dissemination of information (Radio, TVs, media) • Information sharing among related agencies (CENOE, all related agencies) • Evacuation guidance (INGC, District and local authorities) • Search, rescue and support activities (INGC and local authorities) • Transport of critical patient (INGC and local authorities) • Setting up of COE (INGC and local authorities) • Operation of drainage pumps (AIAS, municipality and local authorities) • Running of accommodation center (District and CENOE) • Securing foodstuffs, drinking water, cloths, medicine, etc. (Local Government ,INGC and MASA) • Public relations on damage and response (CENOE and Local Government) • Mapping of damaged infrastructure (DPOPHRH) • Rehabilitation of infrastructure (DPOPHRH) • Management of sanitation (DPOPHRH) • Civil protection (UNAPROC) • First aid, medical assistance and sanitation (MISAU, INGC, DPS) • Environment action coordination (MITADER) • Community education (MITADER) • Distribution of Ceteza (water purifying liquid) (DPS)
Structure	<ul style="list-style-type: none"> • Construction of temporally dykes to prevent spreading of inundation 	<ul style="list-style-type: none"> • Construction of temporally dykes to prevent spreading of inundation 	<ul style="list-style-type: none"> • Construction of temporally dykes to prevent spreading of inundation 	<ul style="list-style-type: none"> • Construction of temporally dykes to prevent spreading of inundation (Province) 	

Recovery/ Reconstruction	Non- structure	<ul style="list-style-type: none"> • Elaboration and dissemination of the rainy season report • Inspection and renovation of the hydro-climatologic network • Formulation of reconstruction plan of damaged flood management facilities 	<ul style="list-style-type: none"> • Inspection and renovation of the hydro-climatologic network • Formulation of reconstruction plan of damaged flood management facilities 	<p>water supply tanks, etc. (INGC and CENOE)</p> <ul style="list-style-type: none"> • Operation of accommodation centers (District INGC and CENOE) • Evaluation of damages, needs and resettlement plan • Infrastructures rehabilitation and reconstruction plan and allocation of necessary resources • Monitoring and coordination of integrated reconstruction programs at local level • Ensuring safe use of land for the resettled communities • Identification, design and implementation of profitable projects for affected groups • Evaluation of the preparation and emergency response plan 	<ul style="list-style-type: none"> • Evaluation of the meteorological phenomenon and its impacts • Continuous provision of forecast and weather information 	<ul style="list-style-type: none"> • Creation of alternative access road (ANE) • Operation of accommodation centers (District INGC and CENOE) • Issuance of victim certificate (District, Localidad) • Provision of special payment for disaster relief (Province & District) • Resettlement of affected population (DPOPHRH) • Formulation of rehabilitation plan (MOPHRH, Ministry of Health, Ministry of Education, Province, District) • Supporting rehabilitation works of local authorities (MOPHRH, Ministry of Health, Ministry of Education, Province, District) • Control of epidemic (District, RED CROSS) • Disposal of flood debris (Municipality and local authorities) • Effective use of volunteers (Province, District RED CROSS) • Cleaning of public facilities and hygiene activities (Province, District RED CROSS) • Participation for new town planning by collaboration of residents, community and administration (MOPHRH, District, Localidad) • Consultation and measures for resettlement of habitation (Province, District) • Provide financing for resettlement of habitation (Province, District) • Formulation of reconstruction plan (Province) • Mapping of the inundated areas (DPA) • Distribution of farm tools (DPA, MASA) • Provision of support materials (DPA) • Evaluation of environmental impact by flood (MICOA) • Active participation in rehabilitation and construction (river basin committee)
Structure		<ul style="list-style-type: none"> • Emergency rehabilitation works of damaged dykes and river facilities • Strengthening of river facilities such as dykes 	<ul style="list-style-type: none"> • Emergency rehabilitation works of damaged dykes and river facilities • Strengthening of river facilities such as dykes 		<ul style="list-style-type: none"> • Building temporary houses (Province) • Emergency rehabilitation works of damaged levees and river facilities (Province) • Resettlement from temporally evacuation center to safe resettlement areas (District, Municipality) • Early rehabilitation of essential utilities (power supply, water, sewerage, etc.) and roads (Province, District) • Strengthening of river facilities such as dykes (Province, ARA's) • Inspection, construction and rehabilitation (MOPHRH) 	

(4) Emergency Operations

In order to cope with various disasters, the Master Plan for Prevention and Mitigation of Natural Disasters (PDPMCN) was formulated and approved by the Council of Ministers in March 2006. In line with the Master Plan, a guideline for establishment and operation of National Center for Emergency Operation (CENOE) has been prepared and was approved in October 2006.

1) Outline of the National Center for Emergency Operation (CENOE)

Mission

The mission of CENOE is to centralize the inter-sectoral, inter-institutional and international coordination to respond quickly, efficiently and effectively to the affected people to safeguard material possessions and rationalizing available resources.

Objective

The objective of CENOE is to provide all those involved in the prevention, mitigation and response to disasters, procedures, tasks and monitoring technical and scientific actions, issuing warnings, control of operations, activation and deactivation of emergency operations.

CENOE is a multi-sectoral coordination and decision-making institution where converge representatives of institutions, organizations and groups of actors directly involved in disaster response operations.

CENOE is activated and directed at central level when the situation goes beyond the responsiveness of provincial levels.

CENOE includes part of the National Civil Protection Unit (UNAPROC) as operation body of search and rescue of disaster victims.

2) Structure and Functioning Levels of CENOE

In normal time, CENOE consists of a coordinator and a small group of INGC employees who work continuously through shifts, operating 24 hours a day throughout the year (the permanent staff system).

In state of alert, depending on the alert level, CENOE is formed by the Government sectors that directly involved in the emergency response processes in addition to the permanent staff system.

Functioning levels of CENOE consists of three levels, i.e. a) Surveillance without alert, b) Partial alert, and c) Total alert.

Surveillance without Alert

In the warning surveillance state, CENOE has permanent staff system officers, exercising the functions of collection, information processing in close coordination with sectors source of information of phenomena monitoring. At this stage, CENOE receives information from: INAM, SETSAN, SARCOF, SADC / EW, DNA, MIREM, MOH, Provincial, District Risk Management

Committees and also from the Operational Regions sections. The permanent staff stays on alert for case of possible incident. The information collected and managed in CENOE is valid for decision making concerning the activation or not of an emergency situation.

Partial Alert

The partial alert is the state in which it is not necessary to declare a national emergency. The partial alert is decided when the resources allocated under the Contingency Provincial Plan are exhausted in the affected province, and the dimensions do not require emergency action by all government sectors. At this level, in addition to the permanent staff system, concerned government sector employees to be engaged in the emergency and appointed for the duration of the all emergency. These employees are called focal points. The focal points are integrated into the operating sectors, part of the planning, information, infrastructure, communication and social sectors in CENOE.

Total Alert

In total alert, CENOE works at its full capacity in accordance with the phenomenon. This alert is decreed by His Excellency the President or by one to whom he delegates when the emergency cannot be controlled with the allocated funds in the overall contingency plan and the situation requires action from all sectors that are part of the Management Disaster Coordination Board (CCGC). In most cases, this alert is activated when the disaster is ongoing. The total alert may, if conditions require, be accompanied by a call to the international community.

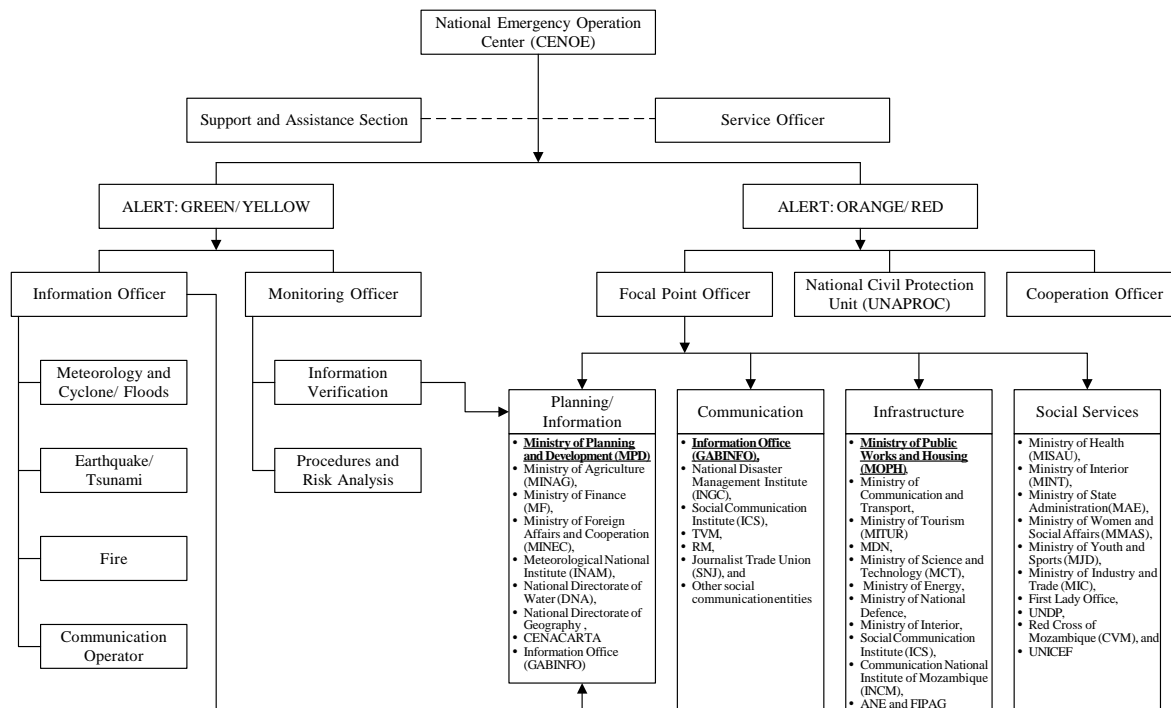


Figure 4.1 Structure of National Emergency Operation Center

3) Alert System

Depending on evolution of the phenomenon that may cause disaster or a negative impact in the country, CENOE is activated with institutional alert system.

Green Alert Level

The green alert level is not any warning. It is a normal surveillance and prevention system, where the following activities take place:

- ◆ Actively participate in the activities of prevention, mitigation and preparedness, within the planned actions by each government institution.
- ◆ Identify threats, vulnerabilities and risk areas at local level.
- ◆ Update and periodically disclose response plans.
- ◆ Make field and headquarters simulations to assess the preparedness and response plans.
- ◆ Create forms and mechanisms to optimize all available resources.
- ◆ Mobilize the population to comply with instructions issued by the competent authorities.

Yellow Alert Level

When the yellow alert is decreed there is a potential emergency to emerge in that location. So the focal points and CENOE Coordinator shall:

- ◆ Activate their delegations and take inventory of the existing resources for the response.
- ◆ Maintain contact with the permanent staff of CENOE, regional, provincial and district authorities.
- ◆ Permanent monitoring of the evolution of the phenomenon and take corresponding decisions.
- ◆ Prepare eventual activation of CENOE, according to the protocol.
- ◆ Coordinate with the involved institutions, dissemination of bulletins to inform the public about the likelihood and / or development of the phenomenon.
- ◆ Coordinate with the involved institutions in carrying out preventive necessary actions in risk areas.
- ◆ Educating the public in accordance with the instructions issued by the INGC or CTGCN authorities.
- ◆ Prepare the National Civil Protection Unit (UNAPROC) to the preparedness status.
- ◆ Create conditions for reception of affected people.
- ◆ Produce regular reports to the Council for Disaster Management Coordinator.
- ◆ Check logistical requirements within CENOE and the operating status of the equipment
- ◆ Activate the Management Risk Committees (CGRC)
- ◆ Prepare the positioning of the intervention teams and resources to meet the needs of the affected areas.
- ◆ Ensure that each employee of the focal points system have a stocked functional car and a mobile phone capable of operating.
- ◆ Verify and update the contact lists.

Orange Alert Level

The orange alert level indicates that the disaster is imminent, but there is a possibility to prevent it. The actions to be undertaken are as follows:

- ◆ Start dislocation of materials and equipment for the risk areas.
- ◆ Call communities located in the affected areas to seek safe places.
- ◆ Coordinate with the institutions involved in the dissemination of bulletins to inform the public about the likelihood and / or development of the phenomenon.
- ◆ Coordinate with institutions involved in carrying out necessary preventive actions in risk areas.
- ◆ Maintain the population in alert to the warning and directions of the authorities.
- ◆ Produce regular reports to the Council of Ministers.
- ◆ Produce bulletin on the evolution of the phenomenon and information operations for media entities.

Red Alert Level

- ◆ Activate partial or total function level of CENOE.
- ◆ Activate National Civil Protection Unit (UNAPROC) and define the incidence control systems.
- ◆ Preparation of the consolidated call document for the donor community if necessary.
- ◆ Coordinate the immediate response, focusing on search, rescue and humanitarian aid.
- ◆ If necessary call all or part of CCGC members.
- ◆ Keep informed people about the response actions;
- ◆ Do a preliminary assessment of the damages.
- ◆ Produce daily information on the evolution of the phenomenon and operations for the Council of Ministers.
- ◆ Produce bulletin on the evolution of the phenomenon and operations to media and information entity.
- ◆ Keep monitoring until the end of the emergency.

4) Declaration of Alert

The declaration of alert is emitted after the technical analysis, monitoring of the event and of the eventual consequences in the national territory; CENOE will be activated if the phenomenon is Yellow (partial activation) or Red (total activation) alert and if the regional response is not enough to cope with the event.

Procedure

1. The institutions source of information such as INAM, ARAs, DNA, Geology, CENACARTA and other international sources provide information to the INGC information management officers.
2. The information management officers, after receiving and processing information send it to the permanent officers.
3. The permanent officers inform the INGC Director about the existence and stage of threat.
4. The Director of INGC considers the issue of the orange or red alert.

5. Considering the predictability of the event and its size, the INGC Director can:
- a) If necessary emit the alert;
 - b) Convene the Technical Council;
 - b) Ask the direct convocation of the Coordination Council for consideration;

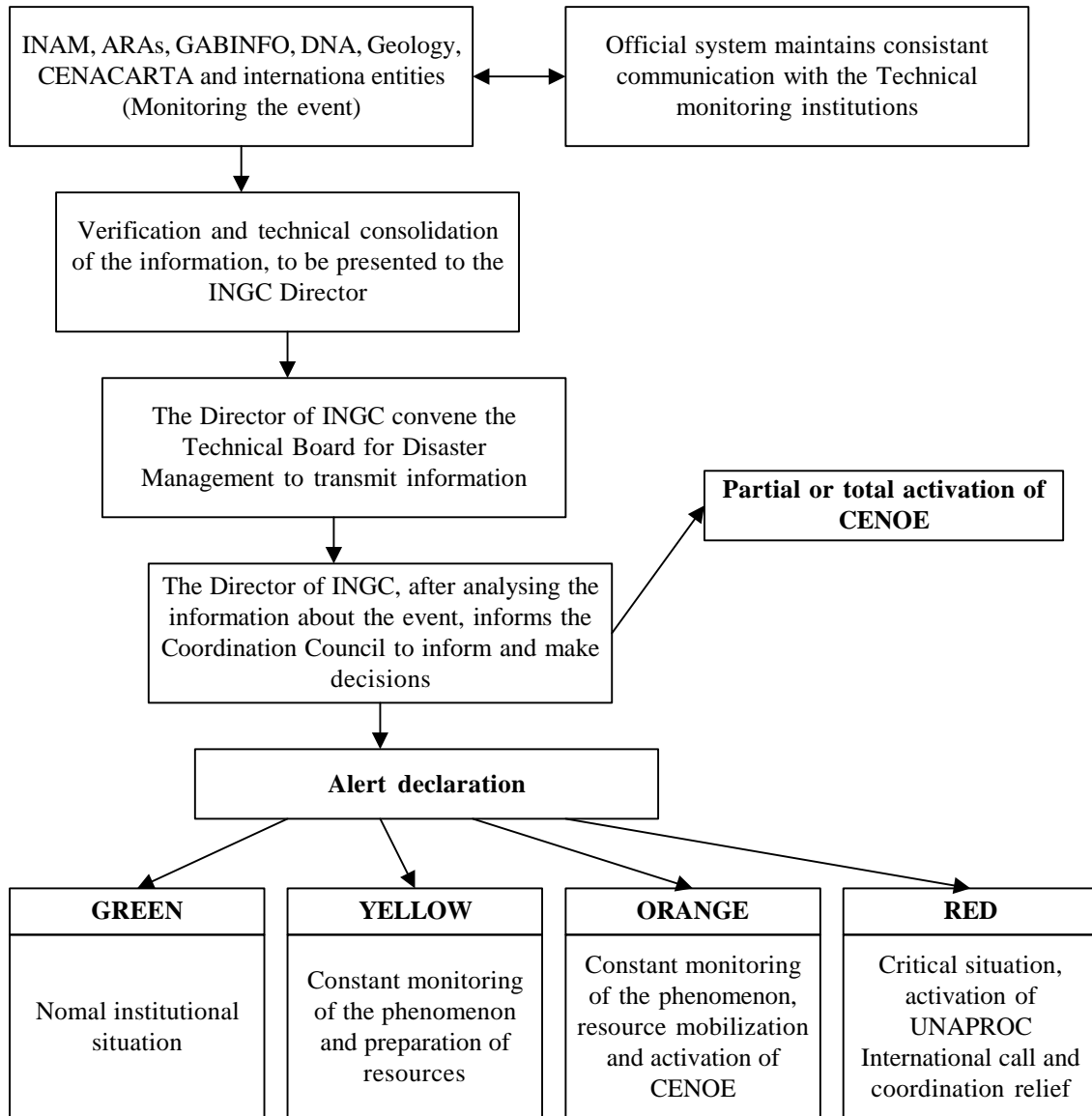


Figure 4.2 Flow of Declaration of Institutional Alert

5) Deactivation of CENOE

The deactivation process aims to formally terminate the CENOE activities and sectors of intervention once the situation and the crisis is normalized.

Procedure

1. The monitoring institutions submit a report of the current situation of the phenomenon to the decision making CENOE group.

2. The Coordinator of CENOE, calls the focal points of the Main Institutions of each sector, to assess the situation.
3. The main institutions present a report of the action taken and outstanding shares at the CENOE Coordinator.
4. The Decision-Making Group performs an analysis of the progress and pending actions in each sector of the COEM Area Operations.
5. The Coordinator of CENOE, decides to disable CENOE partially or totally, according to analysis of the current situation in each sector.
6. Each focal point of the disabled sector must deliver institutional information of activities, while participating in the activation of CENOE.
7. The Director of the INGC declares formal deactivation of CENOE and the deactivation of the alert, and therefore the focal points return to normal activities.

6) Emergency Operation in Regional Level

Provincial Emergency Operation Center (COE)

The Central and Northern regions of Mozambique have suffered from severe floods due to torrential downpours caused by tropical depression since middle of January 2015. According to the latest report of Technical Council for Disaster Management (CTGC), the death toll has risen to 159 as of January 29. Especially, Zambezia province including the Licungo River Basin suffered most severely and the death toll rose 134 in the province. The flooding of the Licungo was described as the worst since 1971.

In order to cope with the severe flood in the Licungo River Basin, the National Center for Emergency Operation (CENOE) has been established in the Government Office of Zambezia Province. The CENOE has been established based on the guideline on establishment and functioning of CENOE, October 2006, approved by the 25th session of the council of Ministers on the 17th of October 2006.

The Director General of INGC has been assigned as the Service Officer of the CENOE and under the Service Officer, five sector groups were formed, i.e. 1) information and planning, 2) communication, 3) infrastructure, 4) procurement and logistics, and 5) social affairs.



Zambezia Provincial Office where EOC is placed

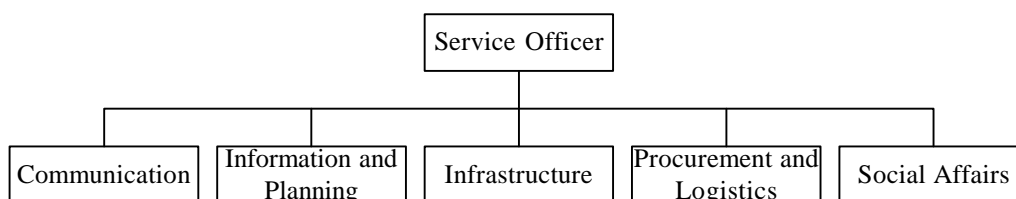


Figure 4.3 Structure of National Center for Emergency Operation (CENOE)

When JICA team visited the CENOE, members from INGC, DNA, ARA, INAM, Red Cross, NGOs, etc. were working in groups depending on their mandate. Layout of the CENOE, equipment and number of staffs were as shown below:

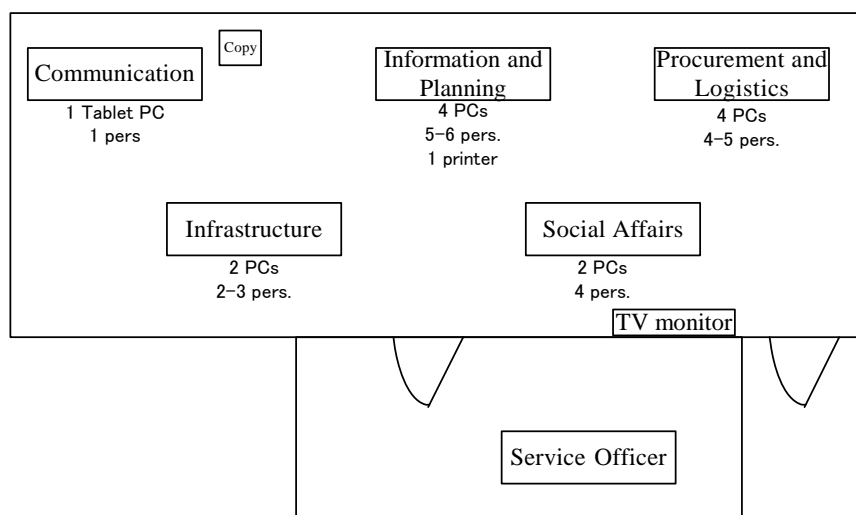


Figure 4.4 Layout, Equipment and Number of Staffs in the CENOE (When JICA team visited)

- Notebook PCs were used to receive, process and share information in the CENOE and they were connected to internet by wireless network adapter. There is no map, message board nor whiteboard in the room when JICA team visited the CENOE. Every information had been shared on PCs. According to the recent interview with Director of the CENOE/INGC, large-scale maps, prepared by INGC HQ, were started to be utilized in the CENOE to share disaster situation among the staff since after a few days.



Courtesy visit to General Director of INGC

- Information on closures of road traffic were indicated on maps in PC network.
- Number of affected people and number of accommodation centers were also indicated on GIS database.

Roles of Mocuba Unit and ARA Central North in Flood Management

- One of the important roles of Mocuba Unit in flood management is to monitor hydrological condition of the river basin and to supply the information to DNA and other stakeholders for both water utilization and flood risk management.
- Observation of water level is performed three times in dry season and five times in rainy season. DNA compiles the hydrological information from all ARAs as National Hydrological Bulletin and supply the information for central authorities such as Ministries, ARAs, INGC, TVs and radios.
- ARA Central North predicted that flooding will occur within 48 hours and issued warning on 10

January through community radio and Technical Department of DNA. DNA issues National Hydrological Bulletin daily basis.

- Based on the flood information of Mocuba Unit, the Police Authority of Mocuba blocked traffic of Mocuba Bridge for securing safety of transport. Although a part of the bridges was washed out by the flood, safety of the traffic was maintained.
- It is important to supply hazard information to the risk people in short time. Therefore, ARA supplies hazard information directly to Disaster Risk Committees of District and Local levels by cell phone or walkie-talkie. Committee members were trained to disseminate warning information to the people in risk areas.

(Issues in Flood Management by Mocuba Unit and ARA Central North)

- Since hydrological observation is performed manually, it is difficult to detect the changes of water levels in short time.
- Due to electricity failure, communicating with the observer (reader) became impossible (backup power supply such as solar power system is needed. Also redundant means of communication should be secured).
- Also due to the electricity failure, the regional hydrological bulletins were not issued after January 13.
- In order to collect contiguous and reliable data, qualification of the observers (readers) is very important. Technical training and compensation to maintain motivation will be needed.

Namacurra District

- Director of Planning and Infrastructure Services of Namacurra District is a member of the Licungo River Basin Committee, which was established two years ago.
- The Licungo River Basin Committee consists of 15 members from various areas of the basin and its president is the Director General of ARA Central North. The members were elected not only from the government officials but also from representatives of civil society in the meeting organized by ARA Central North. The committee meeting is organized three times a year.
- Namacurra District received information of heavy rains at Gurue and Dorocue on 10 and 11 January from ARA Central North. At 6:00AM on 12 January, the water level of Malei was already high. Flood warning was disseminated to the risk communities by telephone and community radio after 6:00AM on 12 January. At 3:00PM on 12 January, flood inundation was already started at some risk areas in Muiribere, Furquia, and Bawa.
- District Disaster Risk Council has been organized every day since 12 January to collect and share information for disaster response.
- Namacurra District manages evacuation center to accommodate flood victims.



At Namacurra District Office

Furquia Administration Post

Furquia Administration Post in Namacurra District is located on the right bank side of the lower Licungo River. 13 villages out of 16 were affected by the flood. 6 villages out of the affected 13 villages have never suffered from flood before.

- Flood warning and evacuation order were issued to residents through the head of Furquia and community leaders through mobile phone and community radio. But many residents did not evacuate because they thought that the flood was normal one or the warning was not credible.
- Flood warnings were issued every rainy season.
- Some people survived on the trees for 4 days.
- This flood was severer than one in 1971, which had been the severest in people's memory.
- Disaster management committee of Furquia conducted evacuation drills for villages on lower land in 2013 and 2014. Committee members were trained by INGC and Red-cross.
- Many of flood victims are staying in temporary evacuation center on the higher ground managed by Namacurra District. Water, tents and tarpaulins were still insufficient.
- Outbreak of epidemic such as malaria and diarrhea has been controlled by the health center.
- Reconstruction of typical house costs approximately 15,000-20,000MT/house. Other than dwelling, people lost motor bike, bicycle, mobile phone, TV, radio, livestock such as chicken, goat and cow due to the flood. There is no bank nearby, people keep their cash at home and it is also washed out.
- Rice production is performed once a year (planting in December and harvesting in June) in this region. Farmers need seeds for replanting of rice and tomato during this rainy season. Other major farm products are cassava, maize, wheat, coconut, sugarcane, butter beans, etc.



Interview with community leaders in Furquia

(5) Flood Monitoring and Warning

1) Rainy Season Monitoring

Rainy season of Mozambique starts from October and lasts until March or early April. During this period, DNA and ARAs continue rainy season monitoring as described below:

- DNA issues National Hydrological Bulletin and ARAs issue Regional Hydrological Bulletin daily during rainy season including Saturday, Sunday and holidays. The bulletins are not issued in other seasons.
- The National Hydrological Bulletin includes 1) situation overview by region, 2) storage of dam reservoirs, 3) forecast of flood and advisories, and 4) observation data of hydrology and dam reservoirs.
- The Regional Hydrological Bulletin includes 1) situation overview including rainfall and water level, 2) situation of the dams in the region, 3) forecast of rainfall and water level, 4) damages of

- infrastructure and houses, 5) data on water level, rainfall and dam situation, and contact persons, email addresses and phone numbers.
- Observation of water level is conducted by units of ARAs three times a day in normal time and five times a day during flood time. Observation hour varies by station.
Normal time: 7:00, 12:00, 17:00 (example)
Flood time: 7:00, 9:00, 12:00, 15:00, 17:00 (example)
 - The observed information is sent from unit to ARA, then ARA to Water Resources Department (DRH) of DNA usually by mobile phone. SMS or message application (WhatsApp) is used to send observed data. Telephone and high frequency radios are used for back up but mobile phone is the main means of communication.
 - Based on the collected data of precipitation, water level, reservoir monitoring, meteorological data from INAM and focal points of neighboring countries, DNA elaborates National Hydrological Bulletin and ARAs elaborates Regional Hydrological Bulletin. The Regional Hydrological Bulletin is sent to DNA for consistency of the information.
 - The National Hydrological Bulletin is disseminated to the central authorities such as ministries, INGC, public press and other registered recipient, and the Regional Hydrological Bulletin is disseminated to regional authorities such as Provincial Government, basin committee members, INGC and DPOPH in local level, District Government, provincial TV channels, community radios, etc.

Flow of rainy season monitoring is presented in Figure 4.5.

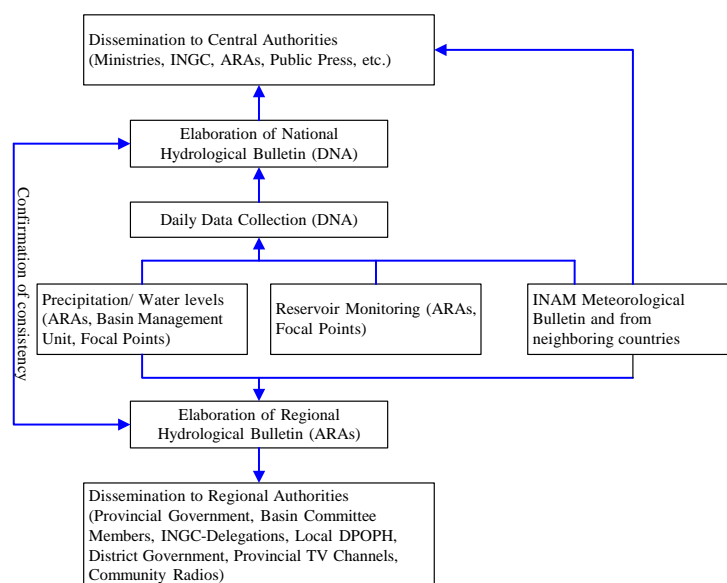


Figure 4.5 Rainy Season Monitoring

2) Emergency Flood Warning

In the case that flood is predicted based on hydrological observation, ARA send the warning information to Provincial and District disaster management committees immediately without waiting to issue the Regional Hydrological Bulletin. The warning information is disseminated to the people

in risk areas through disaster management committee of Administration Posts, community leaders and community radios. The emergency warning information is authorized by CCGC and CENOE afterword in the case of emergency.

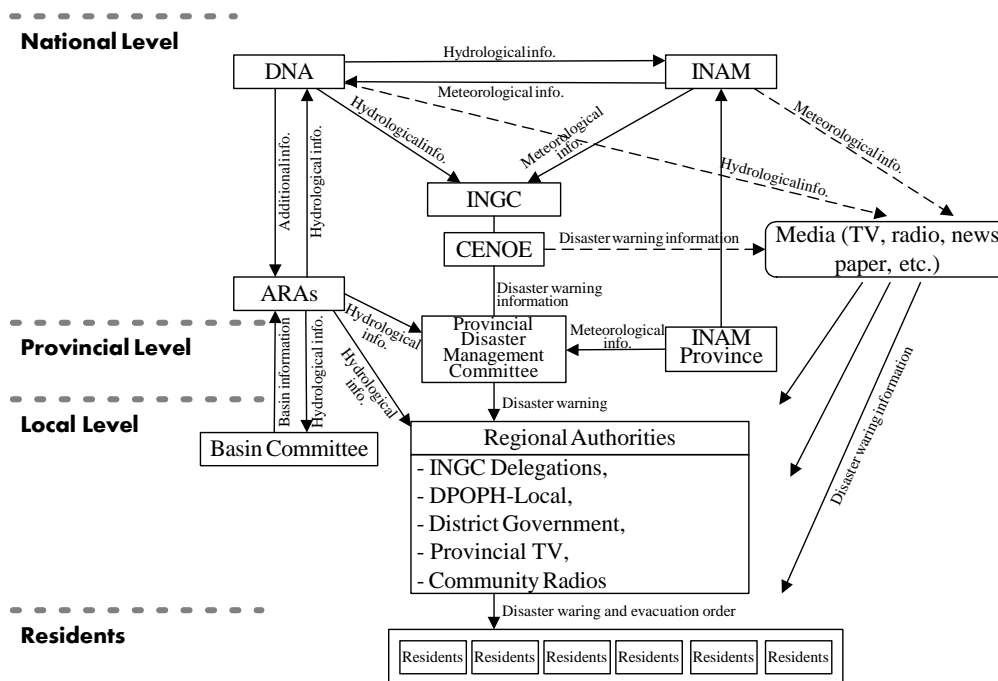


Figure 4.6 Flow of Flood Forecasting and Warning Information

(6) Human Resources Management

1) Role of Human Resources Division of DNA

The Human Resources Division of DNA has the following functions according to its internal regulation:

- a) Collect, analyze and consolidate data on Human Resources, aiming to design a Personnel Table;
- b) Organize and update data on officials and state agents in the water sector;
- c) Coordinate and promote activities relating to evaluation of performance of officials;
- d) Keep updated biographical records of officials;
- e) Collect training needs in water sector in order to plan actions in the training and specialization;
- f) Propose training programs for officials in water sector and monitor their implementation and impact;
- g) Design and develop coordination training models in water sector with professional training centers and other similar institutions;
- h) Continue effective implementation of officials assigned to the National Directorate of Water (DNA);
- i) Promote collaborative studies on legislation and other documents.

2) Training conducted by DNA

Human Resources Division conducts trainings of engineers and technicians of DNA, ARAs and government staff from national to district levels on water and sanitation. The trainings do not include subject on flood management.

Trainings of Staff of DNA and ARAs are conducted by the following Procedure:

- a) Human Resources Division prepare training program of staff by end of fiscal year (Jan. - Dec.).
- b) The training program is presented to Common Fund, which consists of Holland, Swiss, UNICEF, African Development Bank, Islamic Bank and others.
- c) Based on decision, selection and support of the donor group, the training program is finalized. The donors do not conduct training itself and they just support the trainings financially. The trainings are conducted inviting lecturers from university, private sectors and the national training center.

The theme of the trainings is mostly on water and sanitation because the donors are most interested in that issue. To increase supply of safe water for more people is one of the national targets under MDG. Approximately 180 people receive the training course annually on average. In 2014, 500 local leaders and staff of local authorities received the trainings on data collection and analyses. The training will be continued in 2015. At present, since any training is not government priority, it is not allowed to allocate national budget for training. Therefore, all the trainings are conducted by financial support of donors.

3) Training on Water Resources supported by World Bank

Department of Water Resources is the major department working on flood management in DNA. Trainings including flood management for DNA and ARAs' staff have been conducted by support of World Bank since 2012 until 2016. Some of the trainings proposed for the year 2015 are relating to flood management as shown in Table 4.16 and list of proposed training are shown in ANNEX 1. However, the proposed trainings are still like a shopping list and have not been designed to develop the capacity of staff systematically. The trainings do not include any training on flood disaster mitigation.

Table 4.16 Major Proposed Trainings of DNA and ARAs relating to Flood Management supported by World Bank

Item	Contents
Name of course:	GIS and Remote Sensing for Water Resources Management
Type:	Short course (10 days)
Provider:	Universidade Eduardo Mondlane (UEM)
Venue:	Maputo
Beneficiaries:	DNA, ARAs-S, CN, C, Z and N 15 people
Objective:	Strengthening technical capacity of DNA and ARAs staff for improvement of water resource and disaster management through integrated technology
Cost:	US\$20,000.-
Finance:	Pilot Project for Climate Resilience (PPCR), World Bank
Year:	2015

Name of course:	Dam Safety
Type:	Short course (15 days)
Provider:	LINE C/ Universidade Eduardo Mondlane (UEM)
Venue:	Portugal/ Maputo
Beneficiaries:	ARA-Su, ARA-CN, ARA-C, ARA-Z, DOH 10 people
Objective:	Strengthening capacity for disaster management and preparedness
Cost:	US\$40,000.-
Finance:	National Water Development Program (PNDRH), World Bank
Year:	2013 - 2016
Name of course:	Hydrological data collection and processing
Type:	Short course (21 days)
Provider:	UNESCO - IHE
Venue:	Netherland
Beneficiaries:	DRH, ARA-N, ARA-CN 5 people
Objective:	Institutional strengthening by improving skill on hydrological data collection analysis and dissemination
Cost:	US\$30,000.-
Finance:	Pilot Project for Climate Resilience (PPCR), World Bank
Year:	2015
Name of course:	Geophysics Survey
Type:	Short course (15 days)
Provider:	Universidade Eduardo Mondlane (UEM)
Venue:	Maputo
Beneficiaries:	ARA-Su, ARA-CN, ARA-C, ARA-Z, DRH 10 people
Objective:	Strengthening the adaptation capacity and resilience to the climatic changes
Cost:	US\$20,000.-
Finance:	National Water Development Program (PNDRH), World Bank
Year:	2015
Name of course:	Urban Flood Management
Type:	Short Course (5 days)
Provider:	DHI South Africa
Venue:	Johannesburg
Beneficiaries:	ARA-Su, ARA-CN, ARA-C, ARA-Z, DOH 6 people
Objective:	Building adaptation capacity and resilience to the climatic changes
Cost:	US\$15,000.-
Finance:	Pilot Project for Climate Resilience (PPCR), World Bank
Year:	2015
Name of course:	Hydro-Mechanics
Type:	Short Course (15 days)
Provider:	Hidroelectrica de Cahora Bassa (HCB)
Venue:	Songo
Beneficiaries:	ARA-Su, ARA-CN, ARA-C, ARA-Z, DOH 15 people
Objective:	Building adaptation capacity and resilience to the climatic changes
Cost:	US\$15,000.-
Finance:	National Water Development Program (PNDRH), World Bank
Year:	2015

4) Recruitment of Staff in DNA and ARAs

Recruitment of staff for DNA and ARAs are conducted by the Ministry of Public Works, Housing and Water Resources (MOPH) exclusively. A part of hired staff are assigned to DNA in consideration of balance of departments under the ministry. Some of the staff are hired on project basis and will retire upon completion of the project.

Recruitment of staff of ARAs is basically conducted by ARA independently. ARA hire staff based on their own decision. Sometimes transfer of staff from DNA to ARA is conducted.

Number of staff of DNA by department is shown in Table 4.17.

Table 4.17 Numbers of Staff of DNA (As of February 2015)

Department	Number of Staff (person)			
	Engineer	Technician	Other	Total
Directorate	2	0	4	6
Water Resources Dept. (DRH)	10	4	7	21
Planning Dept. (DP)	6	1	2	9
Strategic Studies Dept. (DEE)	4	0	1	5
Water and Sanitation Dept. (DAS)	10	7	6	23
Finance and Administration Dept. (DAF)	2	7	2	11
International River Dept. (DRI)	7	1	0	8
Hydraulic Works Dept. (DOH)	9	1	1	11
Human Resources Division (RRH)	4	1	2	7
Procurement Division(UGEA)	2	1	1	4
Cabinet of Water & Sanitation Project (GIPSA)	2	1	1	4
Total of DNA	58	24	27	109

Source: Human Resources Division of DNA

Number of staff of ARA Central North and its units is presented in Table 4.18.

Table 4.18 Numbers of Staff of ARA Central North and Units

Number	University Degree	Technician Level	Basic Level	Others	Total
Men	10	18	5	17	50
Woman	5	14	4	2	25
Total	15	32	9	19	75

(7) Budget of DNA

Table 4.19 shows the budget and its implementation of DNA from 2010 to 2014 fiscal years. Average annual growth rate of the budget was 31.6% while that of implementation was 46.5% on nominal basis (before adjusting price escalation). The growth rates are very high even considering the price escalation of 5.7% (annual average growth rate of CPI 2010-2013). Sources of budget roughly consist of internal fund of 60% and external support of 40%.

- Table 4.19 Budget of DNA and Actual Implementation

	Unit	2010	2011	2012	2013	2014	Ave. annual growth
Budget	million MT	153.2	184.3	308.4	377.6	556.7	31.6%
Implementation	million MT	112.7	179.1	262.2	377.5	518.6	46.5%
Implementation rate		73.6%	97.2%	85.0%	100%	93.2%	

Source: DNA

The budget of the contingency plan is completely separated from the normal budget. It can be utilized only when emergency situation occur and orange or red alert is declared.

(8) Capacity Assessment Workshop applying PCM Method

The capacity assessment workshop was conducted on May 28, 2015 at ARA Central North with the following participants:

Organization	No. of participants	Organization	No. of participants
ARA Central North	14	DPOPHRH	1
ARA North	4	DPA Nampula	2
INGC Nampula	1	DNA	2
FIPAG	1	Total	25

1) Objectives

The capacity assessment workshop was conducted with the following objectives:

- 1) To clarify the roles of the stakeholders in river management
- 2) To identify the problems in implementing river management
- 3) To consider measures for desirable river management
- 4) To learn PCM method that is useful to identify the problems and to find out solutions for the problems

2) Stakeholders Analysis

Stakeholders analysis was conducted by dividing the participants into four groups by disaster phases, i.e. Group 1: prevention/mitigation, Group 2: preparedness, Group 3: emergency response, and Group 4: recovery/reconstruction. Each group identified the stakeholders and their roles in river management and considered the problems/issues.

a) Prevention/Mitigation Phase

Stakeholders	Roles	Problems/Issues
Council of Ministers	<ul style="list-style-type: none"> ◆ Approval of the contingency plan ◆ Activation/ deactivation of the warnings 	<ul style="list-style-type: none"> ◆ Occurrences of extreme events such as floods/ droughts
INAM	<ul style="list-style-type: none"> ◆ Seasonal climate forecasting 	<ul style="list-style-type: none"> ◆ Floods and cyclones
DNA/ ARAs	<ul style="list-style-type: none"> ◆ Issuance of the national hydrological forecasting ◆ Elaboration of the national contingency Plan ◆ Monitoring and hydrological information dissemination 	<ul style="list-style-type: none"> ◆ Occurrences of floods and inundations
INGC/ CENOE/ COE	<ul style="list-style-type: none"> ◆ Deployment of the national contingency plan ◆ Mobilization of the funds ◆ Monitoring possible threats of emergency events 	<ul style="list-style-type: none"> ◆ Occurrences of floods/ cyclones/ inundations/ droughts

Prevention/mitigation is the most important roles for disaster risk reduction (DRR) and DNA and ARAs have important roles in planning and implementing river management to mitigate flood

disasters. However, the roles considered by the participants are mainly roles for preparedness. Importance of the roles of DNA/ARAs in prevention/ mitigation or disaster risk reduction has not been well understood. Although preparedness and emergency response are also important, investment for prevention/ mitigation is more cost effective. Changing of mindset will be needed.

b) Preparedness Phase

Stakeholders	Roles	Problems/Issues
ARAs	♦ Preparation of the contingency plan	♦ Fuel, communication, allowance and transportation means are insufficient.
DNA	♦ Compilation of the contingency plan	
MOPHRH	♦ Forwarding the contingency plan to the cabinet council	♦ Delay in funds allocation for emergency
Council of Ministers	♦ Approval of the contingency plan	♦ Decrease of the budget
INGC	♦ Preparation of the response plan	

It is an effective approach to prepare annual National Contingency Plan before the rainy season based on the seasonal climate forecast and possible flood scenarios gathering contingency plans from all the concerned ministries and organizations together with budgeting ones. It is also a good preparation to conduct a disaster simulation exercise based on the contingency plan before the rainy season. Problems of budget constraints for preparedness activities cannot be solved in short time. Review of expenditure during preparation stage and reallocation of budget should be considered for effective utilization of the budget.

c) Emergency Response Phase

Stakeholders	Roles	Problems/Issues
DNA	♦ Mobilization of funds ♦ Advice to the Government ♦ Management of policy and strategy	♦ Insufficient fund decentralization
ARAs	♦ Operational management of water resources ♦ Advice to the local governments ♦ Management of hydraulic infrastructure ♦ Information dissemination	
DPOPHRH	♦ Mapping of the damaged infrastructure ♦ Rehabilitation of infrastructure ♦ Management of sanitation ♦ Resettlement after flood disaster	
DPA	♦ Mapping of the inundated areas ♦ Distribution of tools ♦ Provision of support materials for flood	
Medias (Radios, TVs, etc.)	♦ Dissemination of information	
INAM	♦ Weather forecasting ♦ Provision of warning information ♦ Institutional coordination	
INGC, CTGC, CENOE, COE	♦ Assistance of affected people ♦ Distribution of assistance material ♦ Provision of shelter and tents	
National Civil Protection Unit (UNAPROC)	♦ Civil protection	

Government	<ul style="list-style-type: none"> ♦ Inter-sectoral coordination ♦ Mobilization of funds 	
Provincial health authorities (DPS)	<ul style="list-style-type: none"> ♦ Medical assistance ♦ Sanitation actions 	
Ministry of land environment and rural development (MITADER)	<ul style="list-style-type: none"> ♦ Environment action coordination ♦ Community education 	

The roles of the concerned agencies during disaster response phase have been well identified by the participants. However, due to the limited time, the associated problems have not been well analyzed. According to the participants, insufficient fund decentralization is the most important and common problem for emergency response. Review of expenditure for the emergency response and the most effective allocation of budget should be considered.

d) Recovery/Reconstruction Phase

Stakeholders	Roles	Problems/Issues
MOPHRH	<ul style="list-style-type: none"> ♦ Construction ♦ Rehabilitation ♦ Inspection 	<ul style="list-style-type: none"> ♦ Insufficient funds ♦ Human resources are not enough qualified
District Government/ Municipality	<ul style="list-style-type: none"> ♦ Resettlement from temporally evacuation center to safe settlement areas. 	<ul style="list-style-type: none"> ♦ People do not want to move to inconvenient settlement areas.
Ministry of Agriculture and Food Security (MASA)	<ul style="list-style-type: none"> ♦ Distribution of agricultural material 	<ul style="list-style-type: none"> ♦ Poor transportation and road access
INAM	<ul style="list-style-type: none"> ♦ Forecasting and weather information dissemination 	<ul style="list-style-type: none"> ♦ Not enough observation stations.
MICOA	<ul style="list-style-type: none"> ♦ Evaluation of the environmental impact 	<ul style="list-style-type: none"> ♦ Not enough qualified human resources
River Basin Committee	<ul style="list-style-type: none"> ♦ Active participation in the rehabilitation and construction 	<ul style="list-style-type: none"> ♦ Conflict of interest

The roles of the Ministry of Public Works, Housing and Water Resources are important for recovery and rehabilitation but the roles of DNA and ARAs are also important in analysis of the flood, planning and designing for upgrading river facilities in order to prevent and mitigate disaster. It is also important to conduct comprehensive river management training for the staff to enhance the capacity in river management.

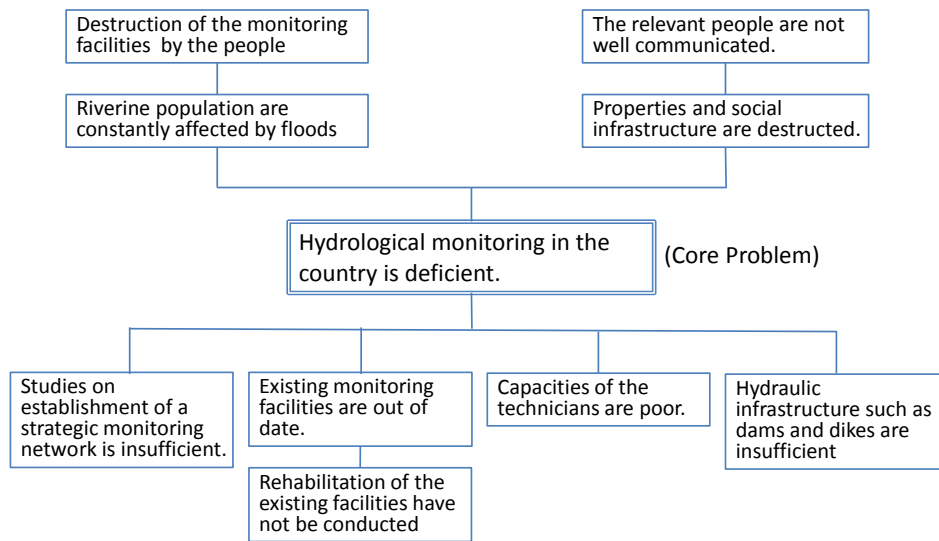
3) Problem Analysis

Problem analysis was conducted to comprehend current existing problems and their causes. Due to time limitation, each group analyzed one core problem in each disaster phase. It is recommended to conduct the problem analysis for the important problems to find out causes of the problems.

a) Prevention/Mitigation Phase and other phases

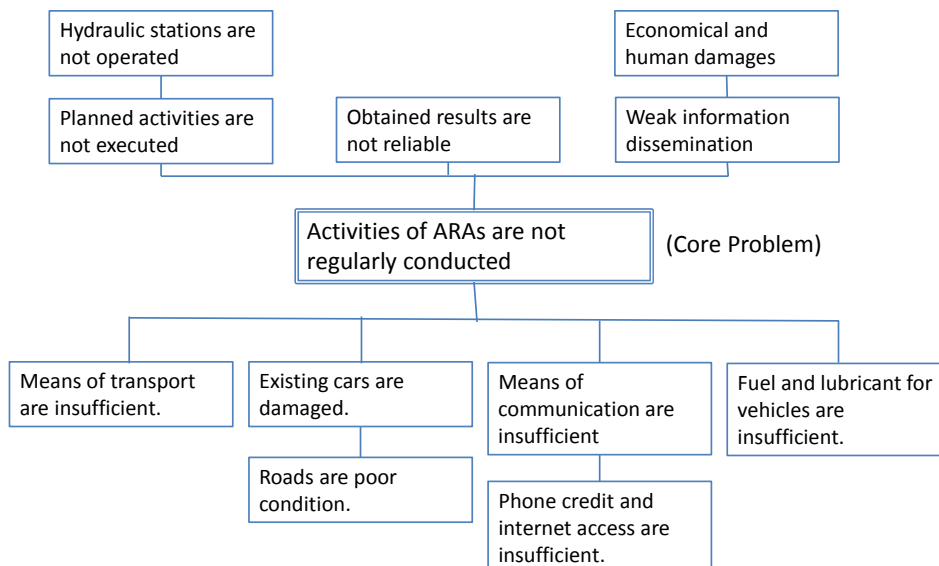
Observation of rainfall is performed by both DNA/ARAs and INAM but the observed data by both parties are not utilized each other effectively. It will be possible for ARAs, DNA and INAM to enhance their hydrological observation network by sharing the observed data each other effectively without increasing the cost. Utilization of satellite-based rainfall data to be introduced in this JICA

assistance will also be one of the solutions to enhance rainfall observation in insufficiently-gauged river basins.



b) Preparedness Phases

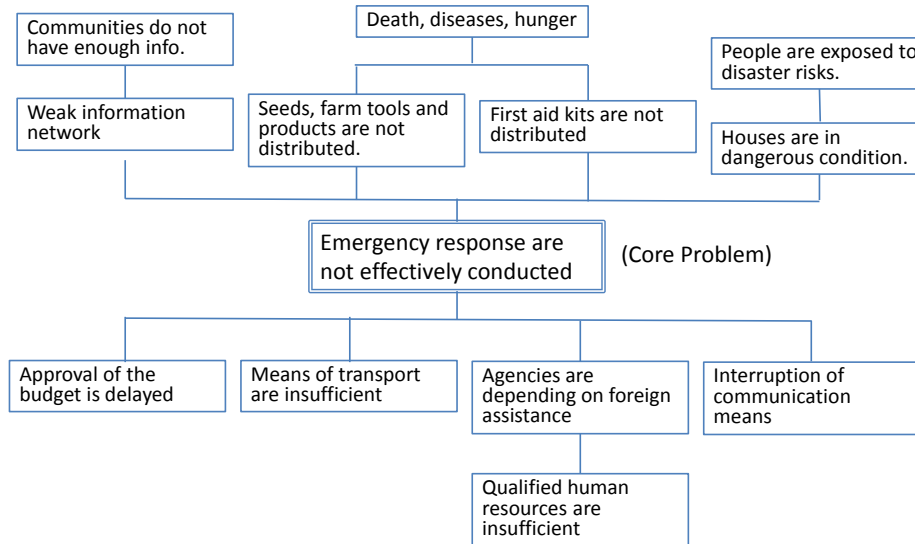
According to the problem analysis, major causes of the above core problem, activities of ARAs are not regularly conducted, is also caused by lack of transport, lack of communication, lack of maintenance of vehicles due to insufficient budget. It is important to reconsider the effective utilization of the budget based on a priority analysis. It is also important to prepare a standard operation procedure (SOP) taking into consideration of effective utilization of the budget. By preparing such practical SOP, it will be much convincing to request necessary budget.



c) Emergency Response Phase

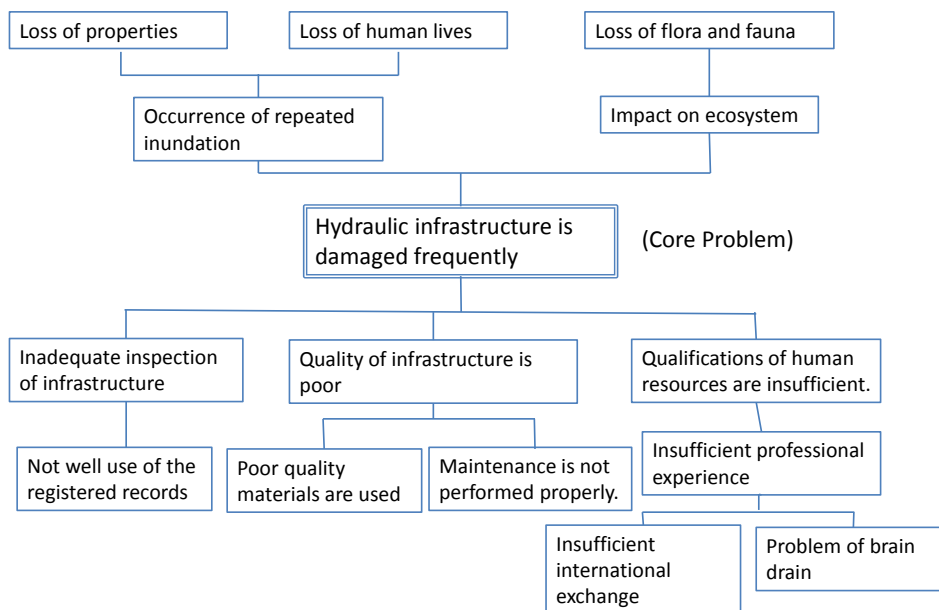
As is the case with the above b), major causes of the above core problem are caused by lack of transport, lack of communication, and delay of budget approval. Since budget approval takes time

and it might delay every year, it is important to prepare an annual activity plan taking the budget delay into account. It is also important to reconsider the effective utilization of the budget based on a priority analysis.



d) Recovery/ Reconstruction Phase

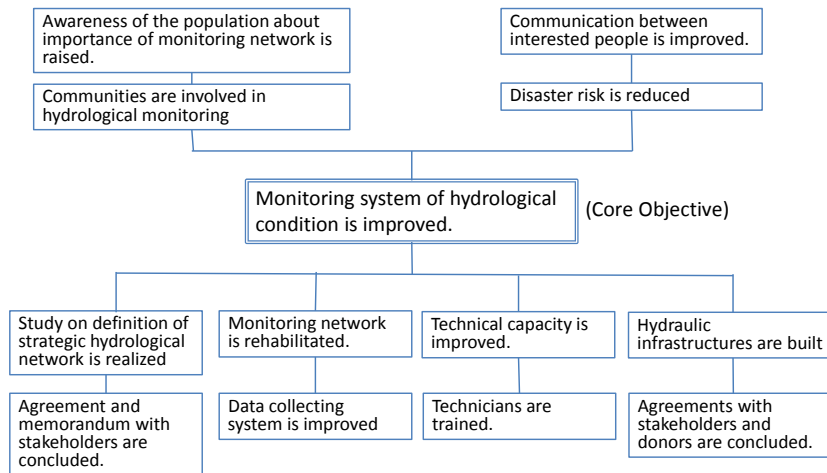
According to the problem analysis, major causes of the above core problem is caused by inadequate inspection of the infrastructure, lack of maintenance and poor quality construction materials, and technical qualification of human resources. It is necessary to develop technical knowledge and capability of staff of ARAs and the units on planning, designing, quality management of construction works, and proper operation and maintenance of the hydraulic structures. It is important to introduce measures to minimize damages of important infrastructure even in case of severe flood events such as reservoir (overflow levee). It is also important for ARAs and the units to get involved in planning of bridges from the view point of river administrator.



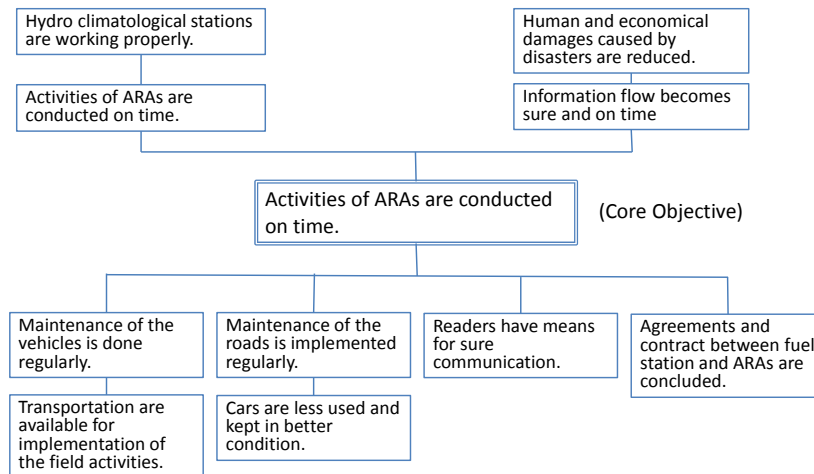
4) Objective Analysis

Based on the problem analysis discussed above, the objective analysis was conducted to find out a desirable future situation once the problems are solved, and all possible solutions for achieving it by applying “means-ends” relationships. The objective trees are presented below:

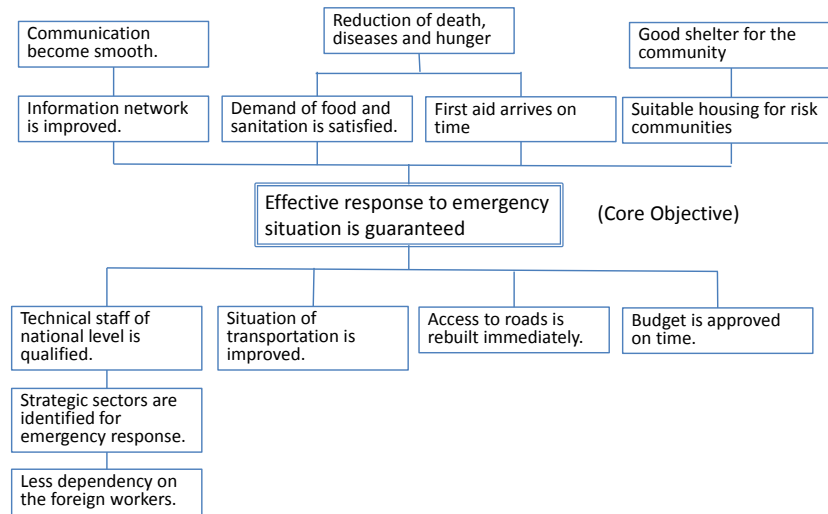
a) Prevention/Mitigation Phase and other phases



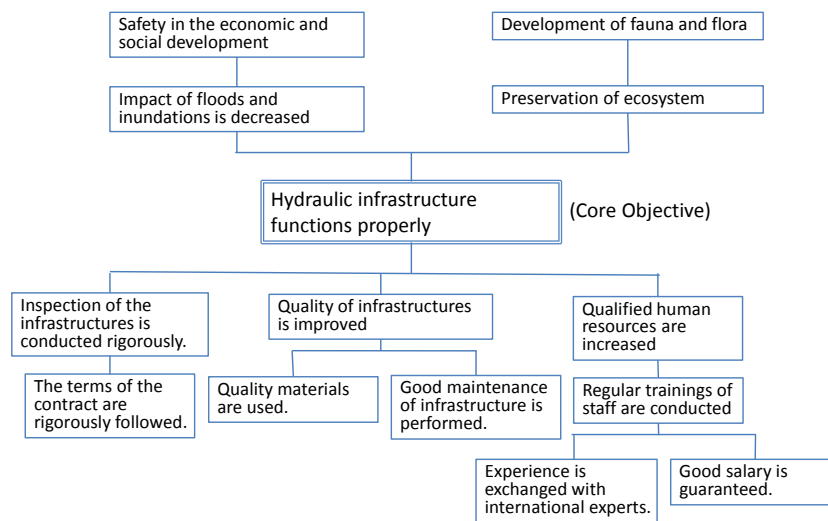
b) Preparedness Phase



c) Emergency Response Phase



d) Recovery/ Reconstruction Phase



As seen in the objective trees presented above, good means were identified to solve the core problems. Due to time limitation, the analyses had not been deep enough, though. It is important to continue the analyses so that the means become concrete activities that can be addressed by ARAs and the units in collaboration with the concerned agencies.

Especially from the viewpoint of river management, improvement of hydrological monitoring and improvement of hydraulic structures are the important tasks that should be addressed by ARAs for disaster risk reduction (DRR).

In the PCM workshop, selection of projects and preparation of project design matrix (PDM) were explained by JICA Team but these processes were not implemented in order to spare more time for the problem and objective analyses that were the most important part of this workshop.

(9) Scenario-driven Tabletop Exercise on the 2015-Flood Disaster

The scenario-driven tabletop exercise on the 2015-Flood Disaster was conducted on May 29, 2015 at ARA Central North with the following participants:

Organization	No. of participants	Organization	No. of participants
ARA Central North	14	DPA Nampula	2
ARA North	4	DNA	2
INGC Nampula	1		
DPOPHRH	2	Total	25

1) Objectives

The scenario-driven tabletop exercise was conducted with the following objectives:

- 1) To share the experience and effective measures taken during the 2015-Flood among the participants.
- 2) To discuss the problems faced during the 2015-Flood
- 3) To prepare a chronological scenario based on the events actually occurred during the 2015-Flood.
- 4) To consider best preparedness or prevention/mitigation measures to mitigate loss of lives and property damages against next large-scale flood events based on the scenario

2) Effective Measures taken and Problems faced during the 2015-Flood

Based on the experiences of the participants during the 2015-flood, effective measures taken and problems faced were discussed and summarized by respective work categories such as 1) warning, 2) prevention/mitigation, 3) public relations, 4) communication among agencies, 5) emergency response, 6) evacuation center management, and 7) community based disaster risk management (CBDRM). Table 1.20 shows the results of group discussion.

Table 4.20 Effective Measures taken and Problems faced during the 2015-Flood

	Effective measures taken during the 2015-Flood	Problems faced during Flood-2015
Warning	<ul style="list-style-type: none"> ◆ Flood warning (INAM) ◆ Dissemination of the National Hydrological Bulletin and press release (DNA/ARAs) ◆ Monitoring of the hydrological situation (ARAs) ◆ Provision and dissemination of warning of the strong rain in the central and northern part of the country (INAM) ◆ Updating of the hydrometric levels in the SAC river basin: Central/ Northern part of the country (DNA-ARAs) ◆ Issuance of warning of flood 72 hours before (INAM/ARAs) 	<ul style="list-style-type: none"> ◆ Difficulty in long-term forecasting ◆ Failure in communications with users ◆ Destruction of bridges in the Zambezia Region ◆ Electric power outage ◆ Hydrometric scale was damaged. ◆ Hydrological information was insufficient ◆ Lack of communication means

Prevention/ mitigation	<ul style="list-style-type: none"> ◆ Elaboration and simulation of hydrological scenarios (DNA/ARAs) ◆ Reactivation of the local level disaster management committee (CGRC) based on the hydrological scenario (INGC/CENOE/COE) ◆ Intervention for the affected areas in Mocuba, Moma, Angoche, Lurio (INGC/ ARAs) ◆ Evacuation of the population of Nante, Mocuba, etc. to safe areas (INGC, local government) ◆ Mapping of the non-affected areas (Municipality) ◆ Building of temporally shelter (INGC, local government) ◆ Awareness of the population to move to safe areas (INGC/ARAs/Agriculture) 	<ul style="list-style-type: none"> ◆ Lack of data in the river basin ◆ Access roads disconnected. ◆ People did not follow the instruction and destroyed a hydrological station.
Public relations	<ul style="list-style-type: none"> ◆ Institutional and inter-sectoral contacts were well prepared (INGC) ◆ Issuance of press release on flood warning (ARAs-DNA-INAM- Media) ◆ Inter-sectoral coordination (CTGC, COE, CENOE) 	<ul style="list-style-type: none"> ◆ Weak sectoral response ◆ People did not follow the information and did not take action.
Communication among agencies	<ul style="list-style-type: none"> ◆ Participation in meeting of CENOE (ARAs-DPA-DPS-INAM-DNA-INGC) ◆ Participation in COE (ARAs-DPA-DPS-INAM-INGC) ◆ Dissemination of the hydrological bulletin daily (ARAs) ◆ Regular meeting of Provincial and District COE (Government/INAM/ DPOPH/ INGC/ ARAs/ Agriculture) 	<ul style="list-style-type: none"> ◆ Warnings through radio and TV were interrupted due to the power outage ◆ Inter-sectoral coordination was insufficient
Emergency response	<ul style="list-style-type: none"> ◆ Provision of use of trucks to communities for reconstruction of houses (District Government) ◆ Distribution of 3000 bottles of the Certeza (water purifying liquid) for the affected areas (DPS) ◆ Distribution of useful tools for recovery and reconstruction (EDM-INGC) ◆ Preparation of boats for rescue of the affected people (INGC) ◆ Preparation of food kits (MASA) ◆ First aid action (MISAU-INGC) ◆ Distribution of technical health kits (DPS) ◆ Donation campaigns for the affected people (INGC) ◆ Creation of alternative access roads (ANE) ◆ Evacuation of the people in risk areas to safe areas (local government/ INGC) ◆ Creation of accommodation center (local government/ INGC) 	<ul style="list-style-type: none"> ◆ Interruption of road access ◆ Destruction of hydraulic infrastructure ◆ Lack of fund mobilization
Evacuation center management	<ul style="list-style-type: none"> ◆ Logistic in the accommodation and resettlement centers (local government/ INGC/ Infrastructure) 	
CBDRM	<ul style="list-style-type: none"> ◆ Activation of local risk committees (INGC) ◆ Activation of the river basin committees (Communities/ ARAs) 	

Note: () indicates the agency in charge.

It was identified that all the concerned agencies took various effective measures to mitigate disaster damages during the 2015-Flood. However, due to the power failure and damages of the roads and bridges, the disaster response operation faced difficulties. Hydrological monitoring could not be continued due to damage of the gauge and also communication problem due to power outage. Another big issue is that people in risk areas did not follow the evacuation order. It is important to improve accuracy of the flood forecast and to establish credibility of the forecast.

3) Scenario-driven Tabletop Exercise on the 2015-Flood Disaster

Based on the events actually occurred during the 2015-Flood, a chronological scenario was prepared by the participants. Then the participants considered the best preparedness or prevention/mitigation measures to mitigate loss of lives and property damages against next large-scale flood events based on the disaster scenario. Table 1.21 shows major events, prevention/preparedness measures, and JICA team's comments. The prevention and preparedness measures were classified into two categories, i.e. 1) measures for disaster risk reduction (DRR) and 2) response (disaster management). Both of them are important to mitigate damages but the measures for DRR are more important and cost effective to prevent/ mitigate disasters.

Table 4.21 Major Events, Prevention/Preparation Measures, and JICA Team's Comments

●: Disaster Risk Reduction (DRR)
○: Response (disaster management)

No.	Date	Major Events based on Scenario	Possible Best Prevention/ Preparedness Measures considered by the Participants	Comments
1.	9 Jan.	Issuance of National Hydrological Bulletin with prediction of flood water level above 8 m in the Licungo River		<ul style="list-style-type: none"> ○ All the relevant agencies should be prepared for the predicted flood water level and potential flood risk. ● ARAs should understand how DNA issues the flood information (input data, simulation model, accuracy, etc.)
2.	10 Jan.	Issuance of forecast of rain above 200 mm in the Licungo River basin.		
3.	10 Jan.	300mm of precipitation was recorded.	<ul style="list-style-type: none"> ○ Mobilization of rescue means. ● Maintain hydrological network active 	<ul style="list-style-type: none"> ○ All the relevant agencies are on the alert assuming severer events than those predicted. ● Rainfall observation data by ARAs and INAM should be utilized each other effectively. ● Hydrological data flow: from Unit => ARA => DNA. Then DNA checks for errors. However, quality control of data should be implemented by the Unit, which is located close to the observation station. ● Water level observation should be continued during night time in flood time. ● Hydrological data is essential and fundamental data for various plans. Therefore, ARAs should use the data for various analysis (probability analysis).
4.	10 Jan.	Issuance of press release on flood warning.	<ul style="list-style-type: none"> ○ Updating of addresses and contacts of the related agencies. 	<ul style="list-style-type: none"> ● Warning messages for various hydrological conditions are prepare and updated.
5.	11 Jan.	Water level was still below the alert level.		<ul style="list-style-type: none"> ○ ARAs and the Units continue watching rainfall in the upstream areas and the changes of the water level carefully.
6.	12 Jan.	Water level increased above 9m and water level gauges become under water. Affected areas: Mocuba, Maganja de Costa, Licungo areas, Furchia, Namacura, Macuse	<ul style="list-style-type: none"> ● Setting water level gauge and telemetric stations 	

7.	12.Jan. Water level continued to increase and the National road No.1 was disconnected by the flood on the left bank.	<ul style="list-style-type: none"> ● Setting of sandbags for the protection of bridges, roads, etc. ● Construction of hydraulic structures to manage flood in the tributaries. 	<ul style="list-style-type: none"> ● In order to stockpile sandbags at appropriate locations; to define the flood risk area, and to prepare the inventory of river facilities including bridges. ● In order to construct appropriate hydraulic structures, river management plan should be prepared. ● Bridges and roads are also structures relating to river management. The Water Policy (5.1 flood) describes that bridges and roads crossing the flood plain are planned and constructed appropriately. DNA/ARAs should be actively involved in such development plans to prevent/mitigate disasters.
8.	12.Jan. Electric power outage occurred and it lasted 45 days. Several bridges, roads and infrastructures were damaged.	<ul style="list-style-type: none"> ○ Dissemination of information on time ● Maintenance and renovation of river banks to be protected from the next floods ● Repositioning electric power station in higher areas ● Maintenance of the electric power stations 	<ul style="list-style-type: none"> ○ ARAs and the Units stock necessities such as food, water, fuel, and lighting to continue their duties. ○ ARAs and the Units should equip with emergency power source to continue communication (solar power, battery, etc.). ● To inspect the river structures after rainy season and to update the inventory of river facilities. ● To upgrade the river structures not just restoring ● To define flood risk area ● The relevant agencies have to take various actions at risk areas according to the disaster management law. Therefore, DNA/ARAs should define flood risk areas promptly.
9.	12.Jan. Emergency National Meetings were organized.	<ul style="list-style-type: none"> ○ Activate COE and local level disaster management committee (CGRC) ○ Organization of meeting before the extreme events according to the forecast. 	<ul style="list-style-type: none"> ● Construction of an alternative electric line for disaster scenarios ● Definition of safe and not vulnerable areas against inundation ● To define flood risk areas

10.	13 Jan.	Temporary accommodation centers were established.	<ul style="list-style-type: none"> ○ Preventive mobilization of people to the buildings in safe areas ○ Building of permanent accommodation centers for temporary accommodation of people. 	<ul style="list-style-type: none"> ● To define the flood risk areas ● To conduct community based disaster risk management (CBDRM), using DIG (Disaster Imagination Game)
11.	13 Jan.	Water intake facility of Mocuba was destructed by the flood.	<ul style="list-style-type: none"> ○ Stock water in tanks ● Construction of protection and resilient measures for water intake facilities against flood, and alternative measures. 	<ul style="list-style-type: none"> ● Public awareness: Emergency action plan should be made in consideration of interruption of electrical power and water supplies during flood. ● To prepare the inventory of the river structures ● To calculate discharges and water levels with various return periods.
12.	14 Jan.	INGC provided boats to help people to evacuate from the inundated areas.	<ul style="list-style-type: none"> ○ Providing and preparing rescue means in advance (boats, helicopters, etc.) ○ Allocation of aviation means for rescue of people ● Strengthen the system of flood warning (SAC) for awareness of people and local communities against flood 	<ul style="list-style-type: none"> ○ ARAs, the Units and local government raise awareness of the residents to evacuate well in advance. ● Risk area map should be understood and utilized in communities.
13.	17 Jan.	INGC transported people and properties to safe areas.	<ul style="list-style-type: none"> ○ Issuance of warning for the communities in advance for their evacuation 	<ul style="list-style-type: none"> ○ It is important to enhance the flood early warning with enough lead time for safe evacuation.
14.	End of Feb.	Water levels became normal.		

As seen in Table 4.21, various preparedness and prevention/mitigation measures were defined for the events of the scenario. If all of the measures are taken before the events, damages may be mitigated considerably. But actually, there are constraints of budget, human resources and time. Also some of the measures may not be economically feasible. Therefore, it is necessary to judge which risk management measure should be taken. There are four risk management principals, i.e. mitigating risk, accepting risk, avoiding risk and transfer of risk. Mitigating risk includes construction of dike, improvement of river channel, etc., accepting risk includes actions based on a contingency plan in case the risk is minor, avoiding risk includes resettlement of people, land use regulation, etc., and typical example of transfer of risk is flood insurances. To consider how to manage the possible risks is the risk management.

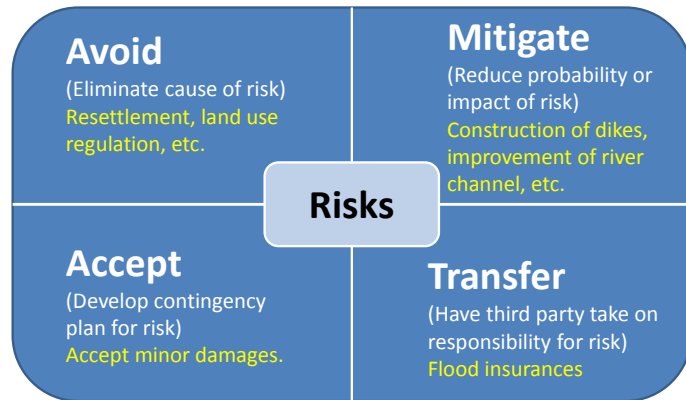


Figure 4.7 Image of Flood Risk Management

During the 2015-Flood, many infrastructures such as bridges, irrigation, water intake, power supply, etc. were severely damaged and it gave strong impact for local economy and people's livelihood. If such large disaster impacts are repeated, the development of a country might not be attained. Therefore, mainstreaming of disaster risk reduction (DRR) in all development sectors is needed. For example, roads and bridges were collapsed at several sites in the Licungo River basin. It might be partially because careful consideration from the viewpoint of river engineering was insufficient during planning and design stage. Also in agricultural sector, the viewpoint of flood risk management is indispensable for planning and designing of irrigation facilities. Multi-sectoral cooperation is very important for implementation of the projects in all development sectors to achieve DRR. DNA, ARAs and the Units should play very important roles in providing proper advice for the planning and design from the viewpoint of river administrator.

(10) Reorganization of DNA

In the middle of June 2015, DNA was making a study on reorganization of DNA. There was an idea that DNA is separated into two directions, one is Direction of Water Resources Management and another is Direction of Water Supply and Sanitation. In the Direction of Water Resources Management, DNA has intention to enhance the function of flood management. Water Resources Department of DNA presented a new organizational plan (proposal) of the Direction of Water Resources Management to JICA Team and requested for advice for the new organizational plan. DNA's new organization plan (proposal) is as shown in Figure 4.8.

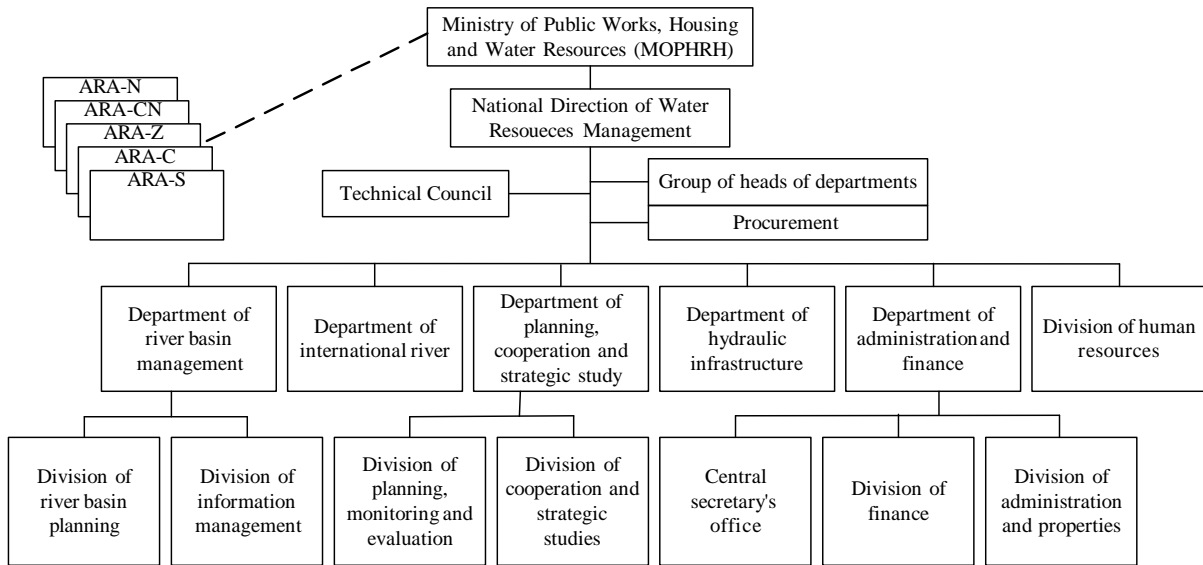


Figure 4.8 A New Organizational Plan of Direction of Water Resources Management

JICA Advisor, Dr. Baba, advised the following:

- ◆ The task of the Division of Human Resources should be specialized in technical training and capacity development of human resources. Administrative works relating to human resources such as contracting, recruitment, retirement, salary adjustment, etc. should be implemented by other administrative division.
- ◆ Department of International River should be integrated as one of the division of the Department of River Basin Management.
- ◆ From the technical viewpoint, DNA should have three major functions, i.e. 1) strategic planning, 2) implementation of the planned measures, and 3) operation and maintenance (O&M).
- ◆ Strategic planning is very important for river management. DNA should have strategic plan for the river basins to flow flood water safely in all development works such as structures, bridges, irrigations, etc.
- ◆ Even though the task of O&M is mandate of ARAs, DNA should have a department of O&M on national level that oversees all the O&M activities of ARAs and makes policy and strategies of O&M. Monitoring of hydrological data, data compiling and archiving, management of the river space, management of the water use lights, approval of water usage are also the important tasks of the department of O&M. The department of O&M should be separated from the department of implementation, because it should have a strong administrative power to oversee and control utilization of water, river space, etc. Water use administration and river space administration are very important function of the department of O&M.
- ◆ The flood unit, proposed by DNA, can be proposed as a new Department of Integrated Flood and Drought Management.

Based on the advices of Dr. Baba, DNA has been studying the new organization.

(11) Donors' Assistance in Water Resources Management

Table 4.22 shows major donors' assistance projects in water resources management.

Transforming Hydrological and Meteorological Service Project of the World Bank includes diagnosis study on the existing national hydro-meteorological services and procurement of equipment to enhance hydrological and meteorological observation. The draft report on the diagnosis study has just submitted to DNA for review. The report illustrates the existing condition of the hydro-meteorological monitoring and the information will be basic information to consider improvement of river management.

Development of a Master Plan for Water Resources Management in Mozambique supported by Korea International Cooperation Agency (KOICA) will be started from the middle of 2015. The Project mainly focuses on development of a master plan for water resources management and capacity development.

Table 4.22 Projects on Water Resources Management

Donor	Item	Description
World Bank	Project Name: Finance: Budget: Executing agency: Project period: Objective: Components:	Transforming Hydrological and Meteorological Service Project Pilot Program for Climate Resilience (PPCR)/WB, NDF USD15 million plus EUR4.5 million from NDF (Grant) DNA, INAM, ARAs Sep. 2013 - Dec. 2018 To strengthen hydrological and meteorological information services to deliver reliable and timely climate information to local communities and to support economic development. 1. Strengthening hydrological information management 1.1 Study on optimization of national hydro-meteorological monitoring and forecasting 1.2 Physical reinforcement of ARAs' monitoring networks (Hydromet equipment) 1.3 Hydro-met mobile data collection system for DNA, ARAs and gauge station readers (Phones) 1.4 Procurement of motorcycles and bicycles for ARAs 1.5 Procurement of pickup field vehicles for ARAs 2. Strengthening meteorological information management 2.1 Procurement of strategic technical assistance to INAM 2.2 Procurement for acquisition of 10 Automatic Weather Stations (AWS) and calibration 2.3 Procurement of acquisition of vehicles for INAM 2.4 Procurement of high capacity IT server for INAM 2.5 Procurement internet broadband for INAM 3. Piloting resilience through delivery of improved weather and water information
Korea International Corporation Agency (KOICA)	Project Name: Finance: Budget: Executing agency: Project period: Components:	Development of a Master Plan for Water Resources Management in Mozambique Government of KOREA USD 5.000.000 millions- (Donation) DNA 2015-2017 - Assess the current & future status of water resources.

	<p>Provision of equipment:</p> <p>Invitational workshop in Korea:</p> <p>On-the-job training in Mozambique</p> <p>The invitational training courses will target policy makers and technicians, and the course details are as follows:</p>	<p>-Develop a master plan for water resources management.</p> <p>-Strengthen the capacity of Mozambican officials and technicians.</p> <ol style="list-style-type: none"> 1- Two (2) 4x4 vehicles 2- Five (5) desktops 3- One(1) Plotter <p>a.High level course for policy makers</p> <p>b.Working level course for technicians and engineers</p> <p>c.The workshops will consist of lectures and discussions on Korea’s water resources management policy and technologies, including field visits. However, the detailed subjects and contents of the workshops will be chosen after further consultation between KOICA and DNA.</p> <p>d.KOICA shall provide round trip airline tickets between Korea and Mozambique, transportation in Korea, per diem, accommodations, and meals for the participants in the workshops in accordance with KOICA’s regulations.</p> <p>a.All detailed matters related to the training in Mozambique will be decided through discussion between KOICA and DNA.</p> <p>b.KOICA shall provide on-the-job training through the project process.</p> <p>c.KOICA shall share its best practices with Mozambican officers so that DNA can accumulate the technology which will enable it to participate in the process of developing a master plan.</p> <p>Module 1</p> <ul style="list-style-type: none"> -International water law -Conflict management in international river -Water allocation <p>Module 2</p> <ul style="list-style-type: none"> -GIS and remote sensing for water resource management -Hydrological data collection process -Flow measurement <p>Module 3</p> <ul style="list-style-type: none"> -Dam safety -Dam operation -Dam investigation and design -Dam construction <p>Module 4</p> <ul style="list-style-type: none"> -Flood forecasting system -Comprehensive flood control scheme <p>Module 5</p> <ul style="list-style-type: none"> -Groundwater modeling and monitoring -Groundwater investigation and development -Groundwater pollution management <p>Module 6</p> <ul style="list-style-type: none"> -Project management and planning
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Other than the projects discussed above, Netherlands will start a technical assistance project to the Water Resources Department of DNA. Netherlands dispatched two project coordinators for two months for preparation of all documents necessary for implementation of the Project.

(12) Challenges

Based on the results of the baseline survey, the following challenges will be supported in this JICA Project.

Regarding hydrological observation and utilization of observed data, inspection of hydrometric stations, guidance for quality control of the observed data, and study on effectiveness of mutual utilization of rainfall data between ARAs and INAM will be implemented.

Regarding facility management, confirmation of inventory of river facilities including bridges, and guidance to maintain the inventory by GIS database will be implemented.

Regarding flood risk management, assistance for enhancement of flood early warning system by applying satellite-based data, assistance for flood simulation analysis, and assistance for flood management planning will be implemented.

Regarding human resources development, assistance for preparation of training curriculum for comprehensive river management training will be implemented.

Table 4.23 Challenges to be Addressed in the JICA Assistance

No.	Item	Challenges
1	Hydrological observation/ utilization of observed data	<ul style="list-style-type: none"> • Inspection of hydrometric stations • Guidance for quality control of the observed data • Mutual utilization of rainfall data between ARAs and INAM
2	Facility management	<ul style="list-style-type: none"> • Confirmation of inventory of river facilities including bridges • Guidance to maintain the inventory by GIS database
3	Flood risk management	<ul style="list-style-type: none"> • Assistance for enhancement of flood early warning system by applying satellite-based data • Assistance for flood simulation analysis • Assistance for flood management planning
4	Human resources development	<ul style="list-style-type: none"> • Assistance for preparation of training curriculum for comprehensive river management training

*Assistance for Enhancement of Institutional Capacity to Manage
Water Related Disaster Risks in Mozambique
Baseline Survey*

ANNEX1: Proposal of the Annual Training Plan for DNA, and ARAs' Staff from Feb.2015 to Dec. 2016 (1/2)

No.	Training Activity	Type of training	Training Provider	Venue	Duration		Beneficiaries		Total Fees (USD)*	Justification (explain shortly on what this is important to the Project and the Institution)	Source of Funds
					Months/Years	No. of Days	Institutions	Total			
1	Project Management and Planning	Short-course	Project Management Organization	Maputo	1 Month	20	DNA, PAMIT, ARA-SulDP	15	25,000	Institutional strengthening, through development of project management skills	PPCR
2	Internal Auditing	Short-course	Vantagem	Portugal	20-Sep-15	15	DP/DAF	2	24,350	Ensure that funds decentralized to provinces and districts are used in correct way for proposed mission	PNDRH
3	Intensive training on MS-Project Software	Short-course	SBS	Maputo	1 Month	15	DNA, PAMIT, ARA-Sul	10	15,000	Institutional strengthening, through development of project management skills, special in usage of the MSP Management software	PNDRH
4	International Water Law and Diplomacy	LLM	McGeorge School of Law	Sacramento, USA	2 Years (Start Feb 2015)	600	DNA-DRH	1	45,622	Institutional strengthening in water resource management, international cooperation and conflict resolution	PNDRH
5	International Environmental Law	LLM	University of Western Cape	South Africa (SA)	1 Year	300	DNADRI & DEE	2	30,000	Institutional strengthening in water resource management, international cooperation and conflict resolution	PNDRH
6	Water Resources Management	MSc	Rhodes University	Grahamstown, SA	2 Years (Start Feb 2016)	600	ARA-Centro Norte/DNA	2	30,000	Institutional strengthening in water resource management and monitoring	PPCR
7	Remote Sensing and Natural Resource Monitoring	MSc	Universidade Catolica	Beira	2 Years (Start Feb 2016)	600	ARA-Norte	1	12,797	Institutional strengthening in water resource management and monitoring	PPCR
8	Information Communication Technology	Short-course	ESAMI	Arusha, Tanzania	Jun-15	25	DP	1	10,000	Improve the process of institutional communication through new technologies of information and communication	PNDRH
9	International Relation	MSc	ISCTEM	Maputo	2 Years (Start Feb 2015)	600	DNA	1	10,000	Institutional strengthening in international relation and cooperation	PNDRH
10	Advanced international financial management and disbursement control	Short-course	ESAMI	South Africa (SA)	Nov-15	13	DAF, ARAs, Financial Officer	7	20,000	Institutional strengthening in project management funded by external bodies	PNDRH
11	Climatic Change and International Cooperation	Short-course	University of Zimbabwe	Harare	Oct-15	5	DR/DRH/DE	6	20,000	Institutional strengthening in international relation and cooperation	PPCR
12	Regulatory Frameworks for Environmental Management and Planning	Short-course	AM/ADI	Mbambane	Nov-15	5	ARA-SUARAC/WARAC/ARA-Z/ARA-NDRH/DOH/DRI	7	25,000	Institutional strengthening in international relation and cooperation	PNDRH
13	Conflict Management	Short-course	AM/ADI	Harare	Sep-15	5	ARA-SUARAC/WARAC/ARA-Z/ARA-NDRH/DOH/DRI	7	18,000	Institutional strengthening in international relation and cooperation	PNDRH
14	English Language	Short-course	African University	Mutare	Jun-15	90	ARA-SUARAC/WARAC/ARA-Z/ARA-NDRH/DOH/DRI	30	45,000	Strengthening capacity for efficient communication with various water users and other stakeholders	PNDRH
15	GIS and Remote Sensing for Water Resource Management	Short-course	UEM	Maputo	Jun-15	10	ARA-SUARAC/WARAC/ARA-Z/ARA-NDRH/DOH/DRI	15	20,000	Strengthening technical capacity for DNA and ARAs toward improving water resource and disaster management through integrated technology	PPCR
16	Communication management (clinic session)	Short-course	WB(TBC) / Consultant to be procured	Maputo - DNA	Jul-15	10	ARA-SUARAC/WARAC/ARA-Z/ARA-NDRH/DOH/DRI	10	15,000	Create basis for the implementation of the communication strategy. The training will also include the development and agreement on the operational yearly communication plan	PNDRH

ANNEX1: Proposal of the Annual Training Plan for DNA, and ARAs' Staff from Feb.2015 to Dec. 2016 (2/2)

No.	Training Activity	Type of training	Training Provider	Venue	Duration		No. of Days	Beneficiaries		Total Fees (USD)*	Justification (explain shortly on what this is important to the Project and the Institution)	Source of Funds
					Months/Years			Institutions	Total			
17	Land access and resettlement, based on the Resettlement regulation	Short-course	MICOIMPACT O/AM/A A.(TBC)	Maputo (TBC)	May-15		5	DOH,DRH, ARA-Sul, ARAC,STA	8	10,000	Build capacity and create a common understanding in regard to the new resettlement legal framework and its operationalization	PNDRH
18	Water Quality Management	Short-course	Rhodes University	Grahamstown	Jun-15		45	ARA-SUARAC/ARAC/ARA-Z/ARA-N/DRH/DOH/DRI	7	60,000	Strengthening capacity for water quality monitoring and management	PPCR
19	Dam Safety	Short-course	LINEC/UEM	Portugal/Maputo	May-15		15	ARA-SUARAC/ARAC/ARA-Z/DOH/	10	40,000	Strengthening capacity for disaster management and preparedness	PNDRH
20	Hydrological data collection and processing	Short-course	UNESCO-IHE	Netherlands	March-2015		21	DRH/AR/ARACN	5	30,000	Institutional strengthening by improving skills on hydrological data collection analysis and dissemination	PPCR
21	Geophysics Survey	Short-course	UEM	Maputo	Apr/15		15	ARA-SUARAC/ARAC/ARA-Z/DRH	10	20,000	Strengthening the adaptation capacity and resilience to the climatic changes	PNDRH
22	Groundwater modelling and monitoring	Short-course	UEM	Maputo	Sep-15		10	ARA-SUARAC/ARAC/ARA-Z/ARA-N/DRH/	15	30,000	Strengthening the adaptation capacity and resilience to the climatic changes	PPCR
23	Pilot Boats	Short-course	Maninha	Pemba	Jun-15		45	ARA-SUARAC/ARAC/ARA-Z/DOH	25	30,000	Capacity building for flood monitoring and water resources and Management	PPCR
24	Advanced Monitoring and Evaluation: Design and Implementation	Short-course	SETYM	Malasya	Aug-15		21	M&E Officer, DNA/P, ARA-Sul	3	30,000	Improvement of M&E skills and techniques.	PPCR
25	Telemetry installation and programming of automatic stations	Short-course	Logoeletronic	Niassa	May-15		15	ARA-SUARAC/ARAC/ARA-Z/DOH/	5	15,000	Strengthening capacity on flood monitoring and Management	PPCR
26	International procurement and Project Management	Short-course	ELUA	Washington	Jun-15		6	DNA (DRH/DOH/GEA) & ARA-Sul	4	60,000	Institutional strengthening in water resource management	PPCR
27	Urban Flood Management	Short-course	DHI-South Africa	Johnsburg	Jun-15		5	ARA-SUARAC/ARAC/ARA-Z/DOH/	6	15,000	Building adaptation capacity and resilience to the climatic changes	PPCR
28	Hydro-Mechanic	Short-course	HCB	Songo	Sep-15		15	ARA-SUARAC/ARAC/ARA-Z/DOH/	6	15,000	Building adaptation capacity and resilience to the climatic changes	PNDRH
29	Public Relation	Short-course	ISA/P	Maputo	Apr-15		45	ARA-Su/DOH/PAMIT	6	8,000	Capacity building for efficient communication with various water users and other stakeholders	PNDRH
30	Water Allocation	Short-course	Rhodes University	Grahamstown	August-15		10	ARA-SUARAC/ARAC/ARA-Z/ARA-N/DRH/	7	40,000	Capacity building on water users and allocation according to the priorities defined in the water law such as: Domestic, irrigation, environmental and other users	PPCR
TOTAL										704,419		

Note: * Tentative Fees include transport, tutorial fees, accommodation and allowances
PPCR: Pilot Project for Climate Resilience, PNDRH: National Water Development Program

Resultados da Pesquisa de Base

**Assistência para o Fortalecimento
Institucional das Capacidades de Gestão
dos Riscos de Desastres relacionados com
Água em Moçambique**

12 de Junho de 2015

Noritoshi MAEHARA
Experto no Desenvolvimento
Institucional
JICA Team

1

Agenda

1. Objectivos da Pesquisa de Base
2. Metodologia
 - (1) Disaster Exercise
 - (2) Tabletop Exercise
3. Resultados da Pesquisa de Base
 - (1) Redução do Risco de Desastre (DRR)
 - (2) Gestão do Risco
 - (3) Desenvolvimento dos Recursos Humanos
4. Desafios

2

1. Objectivos da Pesquisa de Base

Para compreender a situação actual de informações fundamentais relacionadas com a gestão de desastres relacionados com a água em Moçambique.

Para partilhar a consciência comum dos problemas relacionados com a gestão dos rios

3

2. Metodologia

Colecção de Dados e Entrevistas

Gestão do Ciclo de Projeto (PCM) condução da oficina, dirigida com o cenário Table-top Exercício para avaliar Flood-2015.

4

Disaster Exercises

Field Exercise



Tabletop Exercise



5

Disaster Exercises

Field Exercise



Tabletop Exercise



Attaining skills

Improve prediction skill

Increase proficiency

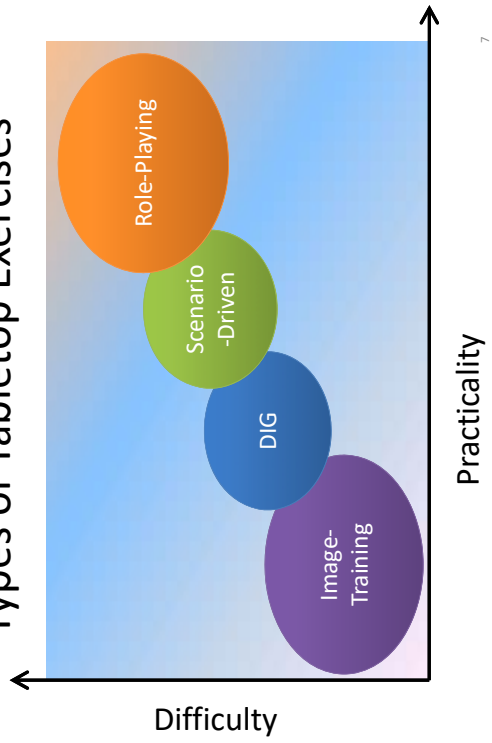
Improve decision-making

Rehearsal

Simulation

6

Types of Tabletop Exercises



7

Tipos de Tabletop Exercises

Imagens da Formação

Imaginação da situação de desastre e a resposta necessária

DIG:

Mapa de perigo feita através de uma abordagem participativa

Scenario-driven:

Contramedidas baseadas no cenário

Role-playing:

Simulação de um centro de emergência operacional

8

Exemplo de um Tabletop Exercises



Mapa do perigo de cheia preparada através do DIG no Belize

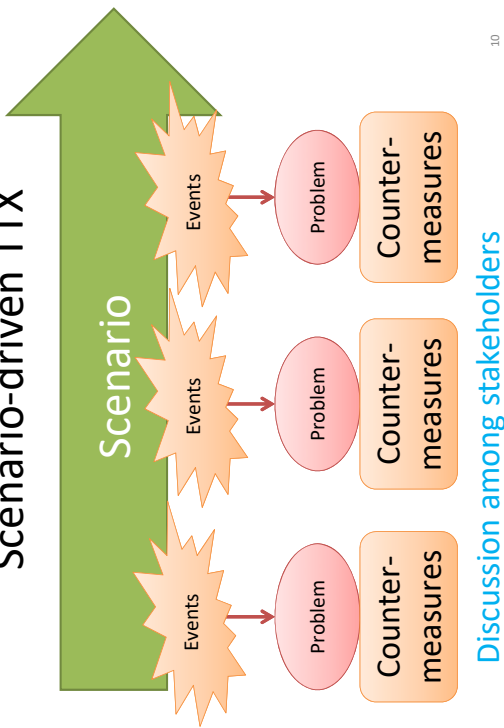


Scenario-driven TTX na Tailândia



Role-playing TTX na Tailândia

Scenario-driven TTX



Scenario-driven TTX

Varias contramedidas para um cenário de desastre

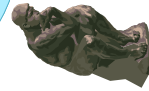
Plano de acção concreto

Redução do Risco de Desastre

Cenário - Cheias 2015 em Moçambique

Se o tempo pudesse voltar para atrás

- 1) Se fossem tomadas as medidas A
 - 2) Se fossem tomadas as medidas B
- os danos poderiam ser Impedidos/Minimizizados



Eventos Maiores Medidas de Prevenção/Preparação (1/5)

N.	Data	Evento Maior	Melhor Prevenção/Preparação Possível
1	9 Jan.	Emissão do Buletin Hidrologico Nacional com predição de cheias com níveis de água superiores aos 8 mt. no rio Licungo	
2	10 Jan.	Emissão da Previsão de chuvas acima de 200 mm na bacia do Licungo	
3	10 Jan.	Registo de precipitações de 300mm.	oMobilização de meios de resgate. ●Manutenção da rede hidrologica activa
4	10 Jan.	Emissão de comunicados de imprensa sobre o aviso de previa alerta de cheias	●Atualização dos endereços e contactos com agencias relacionadas
5	11 Jan.	Nível de água continua abaixo do nível de alerta.	

● : Redução do Risco de Desastre (DRR)
o: Resposta (Gestão do Risco)

13

Eventos Maiores Medidas de Prevenção/Preparação (2/5)

N.	Data	Evento Maior	Melhor Prevenção Possível/Preparação antes Proximas grandes cheias
6	12 Jan.	Os níveis de água aumentaram acima de 9mt. e as escalas de níveis foram superadas pelo nível de água. Áreas afectadas: Mocuba, Maganja de Costa, Licungo areas, Furchia, Namacura, Macuse	● Instalar escalas de nível e estações telemétricas
7	12 Jan.	O nível de água continuou a aumentar e a estrada nacional N.1 foi interrompida para as cheias nos lados esquerdo.	● Instalar sacos de aréia para a protecção das pontes, estradas, etc. ● Contrução de infraestructuras hydraulicas para gerir as cheias nos tributarios

● : Redução do Risco de Desastre (DRR)
o: Resposta (Gestão do Risco)

14

Eventos Maiores Medidas de Prevenção/Preparação (3/5)

N.	Data	Evento Maior	Melhor Prevenção Possível/Preparação antes Proximas grandes cheias
8	12 Jan.	A rede electrica foi abaixo para 45 dias muitas pontes, estradas e infraestructuras foram danificadas.	o Disseminação de informaçãoe em tempo ● Manutenção e renovação das margens dos rios a ser protegidos das proximas cheias ● Reposicionar a estações da energia electrica em áreas mais altas ● Manutenção das estações da energia electrica ● Construção de uma linha eléctrica alternativa para cenário de desastres ● Identificação de áreas seguras e não vulneraveis as inundações
9	12 Jan.	Encontros Nacionais de Emergencia foram organizados	o Foi activado o COE e Comité Locais de Gestão de nível de desastre (CGRC) o Organização de encontros antes do evento estremo em acordo com as previsões.

● : Redução do Risco de Desastre (DRR)
o: Resposta (Gestão do Risco)

15

Eventos Maiores Medidas de Prevenção/Preparação (2/5)

N.	Data	Evento Maior	Melhor Prevenção Possível/Preparação antes Proximas grandes cheias
10	13 Jan.	Foram estabelecidos centros de acomodação temporarios	● Mobilização preventiva de pessoas para os edificios em áreas seguras ● Construção de centros de acomodação permanente para acomodação temporaria das pessoas.
11	13 Jan.	A torre de captação de água de Mocuba foi destruida para a cheia	● Armazenar águas em tanques ● Construção de medidas de protecção e resiliência para a torre de captação contras as cheias, e medidas alternativas
12	14 Jan.	O INGC providenciou barcos para ajudar as pessoas na evacuação das áreas inundadas.	o Providenciar e preparar meios de resgate em antecedencias (barcos, helicopteros, etc.) o Preparação de meios aereos para o resgate das pessoas ● Reforçar o sistema de previa alerta (SAC) para a sensibilização das pessoas e comunidades locais, contra as cheias

● : Redução do Risco de Desastre (DRR)
o: Resposta (Gestão do Risco)

16

Eventos Maiores Medidas de Prevenção/Preparação (2/5)

N.	Data	Evento Maior	Melhor Prevenção Possível/Preparação antes Proximas grandes cheias
13	17 Jan.	O INGC transportou as pessoas e as propriedades para áreas seguras.	oEmissão de alertas para as comunidades em antecedências para a sua evacuação
14	Fim de Fev. 2015	Os níveis das águas voltam ao normal.	

- : Redução do Risco de Desastre (DRR)
- : Resposta (Gestão do Risco)

Gestão do risco de desastre

Mitigar o risco:

Construção de diques, melhorias de rios e canais

Aceitar o risco:

Aceitar danos menores

Evitar o risco

Reassentamentos e regulação do uso da terra etc.

Transferir o risco

Seguro contra cheias

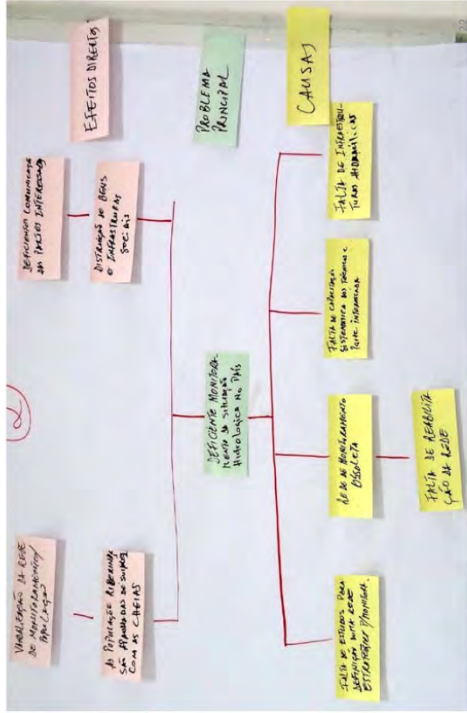
3. Resultados da Pesquisa de Base

(1) Redução do Risco de Desastre (DRR)

Comentários as medidas de DRR (1/5)

N.	Evento Maior	M
1	9 de Jan. 2015 Emissão do Buletin Hidrológico Nacional com predicção de cheias com níveis de água superiores aos 8 mt. no rio Licungo	<ul style="list-style-type: none"> > Dados de observação da precipitação por ARA's e INAMI devem ser utilizados uns aos outros de forma eficaz. > O Fluxo de dados hidrológicos é uma a Unidade => ARA => DNA. Depois a DNA controla os possíveis erros. No entanto, o controle de qualidade dos dados deve ser implementado pela Unidade, que está localizada perto da estação de observação. > A observação do nível da água deve ser mantida durante a noite na época de cheias. > Fundamentais para vários planos. Assim, a ARA deve usar os dados para as suas actividades.
2	10 Jan. 2015 Emissão da Previsão de chuvas acima de 200 mm na bacia do Licungo	
3	10 Jan. 2015 Registo de precipitações de 300mm.	<ul style="list-style-type: none"> o Mobilização de recursos de resgate. ● Manutenção da rede hidrológica activa
4	10 Jan. 2015 Emissão de comunicados de imprensa sobre o aviso de previa alerta de cheias	<ul style="list-style-type: none"> ● Actualização dos endereços e contactos com agências relacionadas
5	11 Jan. 2015 Nível de água continua abaixo do nível de alerta.	<ul style="list-style-type: none"> ● : Redução do Risco de Desastre (DRR) o: Resposta (Gestão do Risco)

Problem analysis on weakness of hydrological observation



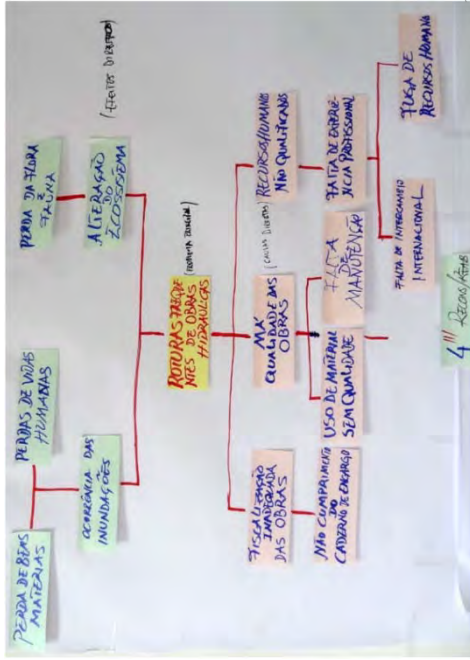
Comentários as medidas de DRR (2/5)

N.	Evento Maior	M	Meio
6	12 Jan. 2015 Os níveis de água aumentaram acima de 9mt. e as escalas de níveis foram superadas pelo nível de água.	Insta	<ul style="list-style-type: none"> Para armazenar sacos de areia's em sítios apropriados; Definir áreas áreas em risco. Preparar os inventários das estruturas de rio
7	12 Jan. 2015 O nível de água continuou a aumentar e a estrada nacional N.1 foi interrompida para as cheias nos lados esquerdo.	<ul style="list-style-type: none"> ● Instalar sacos de areia para a protecção das pontes, estradas, etc. ● Contrução de infraestruturas hidráulicas para gerir as cheias nos tributarios 	<ul style="list-style-type: none"> Para construir estruturas hidráulicas adequadas, o plano de gestão do rio é indispensável. Pontes e estradas também são estruturas relacionadas com a gestão do rio. A Política da Água (5.1 inunadação) descreve que as pontes e estradas que cruzam a planície de inundação são planeadas e construídas de forma adequada. DNA / ARA's devem ser activamente envolvidos em tais planos de desenvolvimento para evitar / reduzir impactos.
<ul style="list-style-type: none"> ● : Redução do Risco de Desastre (DRR) o: Resposta (Gestão do Risco) 			

Comentários as medidas de DRR (2/5)

N.	Evento Maior	M	Meio
8	12 Jan. 2015 A rede eléctrica foi abaixo para 45 dias. Muitas pontes, estradas e infraestruturas foram danificadas.	<ul style="list-style-type: none"> o Disseminação de informação em tempo 	<ul style="list-style-type: none"> ● Manutenção e renovação das margens dos rios as ser protegidos das próximas cheias ● Reposição das estações de energia eléctrica em áreas em risco ● Para inspeccionar as estruturas fluviais após o período de chuvas e de rever o inventário ● Para utilizar as estruturas fluviais não apenas para a produção de energia eléctrica, mas também para a produção de energia eléctrica ● Definir as áreas em risco, e fazer planos de emergência para as áreas em risco como a instalação de estruturas de protecção de rios de acordo com o plano de gestão de desastres. ● Definir as áreas em risco, e fazer planos de emergência para as áreas em risco.
9	12 Jan. 2015 Encontros Nacionais de Emergencia foram organizados	<ul style="list-style-type: none"> o: Redução do Risco de Desastre (DRR) 	

Problem analysis on frequent damages of hydraulic structures



Comentários as medidas de DRR (4/5)

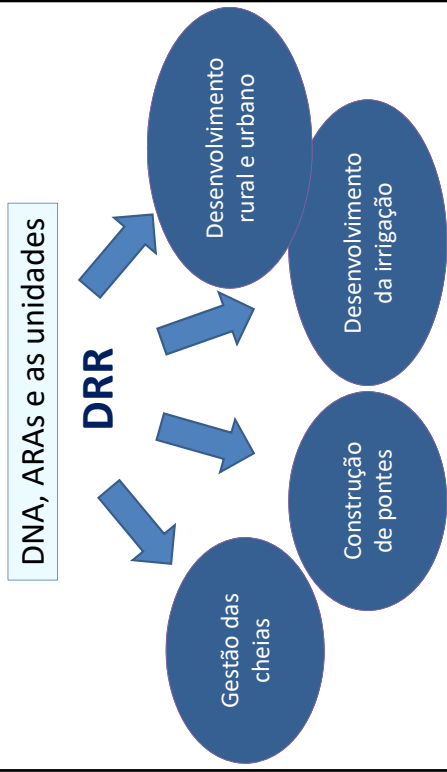
N.	Evento Maior	Meio de Prevenção/Preparação Possível
10	13 Jan. 2015 Foram estabelecidos centro de acomodação temporários	<ul style="list-style-type: none"> Mobilização preventiva de pessoas para os edifícios em áreas seguras Construção de centros de acomodação permanente para definir áreas seguras em risco, <ul style="list-style-type: none"> Conduzir uma gestão de risco de desastres com base na comunidade (CBDRM), utilizando DIG (Disaster Jogo Imaginação) Construção de medidas de protecção e resiliência Sensibilização pública O Plano de acção de emergência deve ser feito tendo em consideração a intervenção da energia e água elétricos durante a inundação
11	13 Jan. 2015 A torre de captação de água de Mocuba foi destruída para a cheia	<ul style="list-style-type: none"> Preparar os inventários das estruturas de rio Calcular as descargas e os níveis de água para as probabilidades de chuva como os valores do plano.

Comentários as medidas de DRR (5/5)

N.	Evento Maior	Meio de Prevenção/Preparação Possível
12	14 Jan. 2015 O INGC providenciou barcos para ajudar as pessoas na evacuação das áreas inundadas.	<ul style="list-style-type: none"> Providenciar e preparar meios de resgate em antecedências (barcos, helicópteros, etc.) Preparação de meios aéreos para o resgate das pessoas <ul style="list-style-type: none"> Reforçar o sistema de alerta (SAC) para a sensibilização das pessoas e comunidades locais, contra as cheias
13	17 Jan. 2015 O INGC transportou as pessoas e as propriedades para áreas seguras.	<ul style="list-style-type: none"> Emissão de mapas para as comunidades em <ul style="list-style-type: none"> Mapa da área de risco deve ser compreendido e utilizado em comunidades.
14	Fim de Fev. 2015 Os níveis das águas voltam ao normal.	

- Redução do Risco de Desastre (DRR)
- o: Resposta (Gestão do Risco)

Integração da DRR em todos os sectores de desenvolvimento



(2) Resposta (Gestão do desastre)

29

Comentários a resposta (1/3)

N.	Evento Maior	Comentários
1	9 de Jan. 2015 Emissão do Buletin Hidrologico Nacional com predição de cheias com níveis de água superiores aos 8 m. no rio Licungo	<ul style="list-style-type: none"> As ARAs devem entender como o DNA emite a informação sobre as cheias (dados de entrada, modelo de simulação, precisão, etc.)
2	10 Jan. 2015 Emissão da Previsão de chuvas acima de 200 mm na bacia do Licungo	<ul style="list-style-type: none"> Todas as agências relevantes estão em alerta assumindo eventos severos do que aqueles previstos.
3	10 Jan. 2015 Registo de precipitações de 300mm.	<ul style="list-style-type: none"> oMobilização de meios de resgate. ●Manutenção da rede hidrologica activa
4	10 Jan. 2015 Emissão de comunicados de empresa sobre o aviso de previa alerta de cheias	<ul style="list-style-type: none"> ●Actualização dos endereços e contactos com agencias relacionadas
5	11 Jan. 2015 Nível de água continua abaixo do nível de alerta.	<ul style="list-style-type: none"> ● : Redução do Risco de Desastre (DRR) o: Resposta (Gestão do Risco)

30

Comentários a resposta (2/3)

N.	Evento Maior	Comentários
8	12 Jan. 2015 A rede electrica foi abaixo para 45 dias Muitas pontes, estradas e infraestruturas foram danmificadas.	<p>Meior Prevenção/Preparação Possível</p> <ul style="list-style-type: none"> oDisseminação de informação em tempo oportuno ●Manutención renovação das margens dos rios as ser necessário ● As ARAs e as unidades necessitam de armazenar comida, água, combustível, e continuamente esclarecer as suas tarefas ● As Aras e as unidades deveriam equipar recursos de energia durante a emergência, para uma continua comunicação. ● inundações
9	12 Jan. 2015 Encontros Nacionais de Emergencia foram organizados	<ul style="list-style-type: none"> oActivar o COE e Comité Locais de Gestão de nível de desastre (CGRC) oOrganizaçãp de encontros antes do evento extremo em acordo com as previsões.

● : Redução do Risco de Desastre (DRR)
o: Resposta (Gestão do Risco)

31

Comentários a resposta (3/3)

N.	Evento Maior	Comentários
12	14 Jan. 2015 O INGC providenciou barcos para ajudar as pessoas na evacuação das áreas inundadas.	<p>Meior Prevenção/Preparação Possível</p> <ul style="list-style-type: none"> oProvidenciar e preparar meios de resgate em antecedencias (barcos, helicopteros, etc.) oPreparação de meios aereos para o resgate das pessoas ●Reforçar o sistema de previa alerta (SAC) para a sensibilização das pessoas e comunidades locais, contra as cheias
13	17 Jan. 2015 O INGC transportou as pessoas e as propriedades para áreas seguras.	<ul style="list-style-type: none"> oEmissão de alertas para as com unidades em antecedencias para a sua evacuação.
14	Fim de Fev. 2015 Os níveis das águas voltam ao normal.	<ul style="list-style-type: none"> It is important to enhance the flood early warning with enough lead time for safe evacuation.

● : Redução do Risco de Desastre (DRR)
o: Resposta (Gestão do Risco)

32

Plano de Contingência

Planos de contingência Nacionais e Regionais com os planos de orçamento



Exercícios de desastres antes da época chuvosa



Rever os problemas e as lições aprendidas durante a época de cheias



Melhoria do plano de contingência para as futuras épocas chuvosas

33

(3)Desenvolvimento dos Recursos Humanos

Quase todas as formações da DNA são enfocada no abastecimento e saneamento de água



É necessária uma Gestão compreensiva de rio



Promover a Redução do Risco de Desastre

34

4. Desafios

N.	Item	Desafios
1	Observação hidrologica/utilização dos dados observados	<ul style="list-style-type: none"> Confirmação das estações hidrologicas Linhas guias para o controlo da qualidade dos dados observados Estudo sobre a utilização reciproca dos dados de precipitação entre as ARAs e INAM
2	Serviços para a gestão	<ul style="list-style-type: none"> Confirmação dos inventarios dos serviços de rios incluindo rios Linhas guias para manutenção do inventario para a base de dados de GIS
3	Gestão do risco de cheia	<ul style="list-style-type: none"> Assistencia para o fortalecimento do sistema de aviso de previa alerta aplicando os dados baseados no satellite Assistencia para a analise da simulação de cheia Assistencia para a planificação de gestão de cheia
4	Desenvolvimento dos Recursos Humanos	<ul style="list-style-type: none"> Assistencia para a preparação de curricula de formação para uma formação da gestão compreensiva de rio

35

Muito obrigado!

36

Appendix - 3

Hyogo Framework for Action/Sendai Framework for DRR

Appendix 3-1

Summary of Post-HFA (Zero Draft)

THE ZERO DRAFT OF THE POST-2015 FRAMEWORK FOR DISASTER RISK REDUCTION

February 19, 2015
JICA Team Makoto KODAMA

1

1. BACKGROUND

1st World Conference on Natural Disaster Reduction in 1994 [The Yokohama Strategy for a Safer World]

Guidelines for natural disaster prevention, preparedness and mitigation and its plan of action, was adopted.



2nd World Conference on Natural Disaster Reduction in 2005 [The Hyogo Framework for Action (HFA)]

The 10-year international disaster risk reduction plan for building the resilience of nations and communities to disasters was adopted.



3rd World Conference on Natural Disaster Reduction in 2015 [The Post-2015 Framework for DRR]

2

1. BACKGROUND

The Yokohama Strategy (1994)

United Nations fixed the 1990s as the International Decade for Natural Disaster Reduction. The 1st World Conference on Disaster Risk Reduction was held in 1994 at the mid-point of the decade, and made the Yokohama Strategy for a Safer World as the guidelines for natural disaster prevention, preparedness and mitigation.

Principles

- ✓ Risk assessment
- ✓ Disaster prevention and preparedness
- ✓ Capacity to prevent, reduce and mitigate disasters
- ✓ Early warning
- ✓ Preventive measures
- ✓ Appropriate education and training of the whole community
- ✓ Sharing of technology to prevent, reduce and mitigate disaster
- ✓ Environmental protection
- ✓ Primary responsibility of each country for protecting its people, infrastructure and other national assets

3

1. BACKGROUND

The Hyogo Framework for Action (2005)

Expected Outcome

The substantial reduction of disaster losses, in lives and in the social, economic and environmental assets of communities and countries.

Strategic Goals


- 1) The more effective integration of disaster risk considerations into sustainable development policies, planning and programming at all levels, with a special emphasis on disaster prevention, mitigation, preparedness and vulnerability reduction;
- 2) The development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards;
- 3) The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programs in the reconstruction of affected communities.

4

1. BACKGROUND

Priorities for Action


- 1) Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation;
- 2) Identify, assess and monitor disaster risks and enhance early warning;
- 3) Use knowledge, innovation and education to build a culture of safety and resilience at all levels;
- 4) Reduce the underlying risk factors; and
- 5) Strengthen disaster preparedness for effective response at all levels.



5

2. OUTLINE OF ZERO DRAFT

Draft version of Post-2015 Framework for DRR, “Zero-Draft”, is prepared.



6

2. OUTLINE OF ZERO DRAFT

Expected Outcome

- The substantial reduction of disaster losses, in lives, and in the social, economic and environmental assets of persons, communities and countries.

Goal

- The prevention of disaster risk creation and the reduction of the existing disaster risk through economic, social, cultural and environmental measures which address exposure and vulnerability, and thus strengthens resilience.

Priorities for Action

- Actions will focus on local and national levels as well as on regional and international levels. There are four priorities for action as follows.

7

3. PRIORITIES FOR ACTION

Priority 1: Understanding disaster risk

Policies and practices for disaster risk management should be based on an understanding of risk in all its dimensions of vulnerability, capacity and exposure of persons and assets and hazards characteristics. This requires an all-states and all stakeholders effort on a number of areas for action, such as collection, analysis and dissemination of information and data, advancement of research, and the development and sharing of open-source risk models, as well as continuous monitoring and exchange of practices and learning.

8

3. PRIORITIES FOR ACTION

Priority 2: Strengthening governance and institutions to manage disaster risk

Governance conditions the effective and efficient management of disaster risk at all levels. Clear vision, plan, guidance and coordination across sectors and participation of all stakeholders, as appropriate, are required. Strengthening the governance of disaster risk management is therefore necessary.

9

3. PRIORITIES FOR ACTION

Priority 3: Investing in economic, social, cultural and environmental resilience

Investing in risk prevention and reduction through structural and nonstructural measures is essential to enhance the economic, social, cultural resilience of persons, communities, countries and their assets as well as the environment. Such measures are cost-effective and instrumental to save lives and prevent and reduce losses. A continued integrated focus on key development areas, such as health, education, agriculture, water, ecosystem management, housing, cultural heritage, public awareness, financial and risk transfer mechanisms, is required.

10

3. PRIORITIES FOR ACTION

Priority 4: Enhancing preparedness for effective response, and building back better in recovery and reconstruction

The steady growth of disaster risk, including the increase of people and assets exposure, combined with the learning from past disasters, indicate the need to further strengthen preparedness for response at all levels. Disasters have demonstrated that the recovery and reconstruction phase needs to be planned ahead of the disaster and is critical to building back better and making nations and communities more resilient to disasters.

11

4. ROLE OF STAKEHOLDERS

Stakeholders play a critical role as enablers in providing support to States, in accordance with national policies, in the implementation of this framework at local, national, regional and global levels. Their commitment, goodwill, knowledge, experience and resources will be required.

12

5. INTERNATIONAL COOPERATION AND GLOBAL PARTNERSHIP

Disaster-prone developing countries, in particular least developed countries, small island developing States, and landlocked developing countries, and Africa, warrant particular attention in view of their higher vulnerability and risk levels, which often greatly exceed their capacity to respond to and recover from disasters. Such vulnerability urgently requires the strengthening of international cooperation and ensuring genuine and durable partnerships at the regional and international levels in order to support developing countries to implement this framework in accordance with their national priorities and needs.

13

To be continued on Dr. Baba's presentation !

14

Appendix 3-2

JICA's contributions to HFA and Post-HFA

Post-2015 Framework of UNISDR for DRR and JICA's contribution

Dr. Hitoshi BABA

Ph.D. Environment and Resource Engineering
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Summary of the HFA2 2015-2025

To be adopted at World Conference on Disaster Risk Reduction (Sendai, 2015)

Expected outcome

The substantial reduction of disaster losses, in lives, and in the social, economic and environmental assets of persons, communities and countries.

Goal

The prevention of disaster risk creation and the reduction of the existing disaster risk through economic, social, cultural and environmental measures which address exposure and vulnerability, and thus strengthens resilience.

Priorities for Action

Priority 1:
Understanding disaster
risk

Priority 2:
Strengthening
governance and
institutions to manage
disaster risk

Priority 3:
Investing in economic,
social, cultural and
environmental
resilience

**Priority 4: Enhancing
preparedness for
effective response, and
building back better in
recovery and
reconstruction**

Role of Stakeholders

Business, professional
associations, private sector
financial institutions and
philanthropic foundations

Academia
and
research

Social groups, volunteers, and civil society and
faith-based organizations, in particular:
children, women, persons with disabilities,
older persons and indigenous peoples

Media

International cooperation and global partnership

Summary of the previous Hyogo Framework for Action (HFA) 2005-2015

Adopted at World Conference on Disaster Risk Reduction (Hyogo, 2005)

Three Strategic Goals:

The integration of disaster risk reduction into sustainable development policies and planning

Development and strengthening of institutions, mechanism and capacities to build resilience to hazards

The systematic incorporation of risk reduction approaches into the implementation of emergency preparedness, response and recovery

Five Priorities for Action:

1. Ensure that DRR is a national and a local priority with a strong institutional basis for implementation

2. Identify, assess and monitor disaster risks and enhance early warning

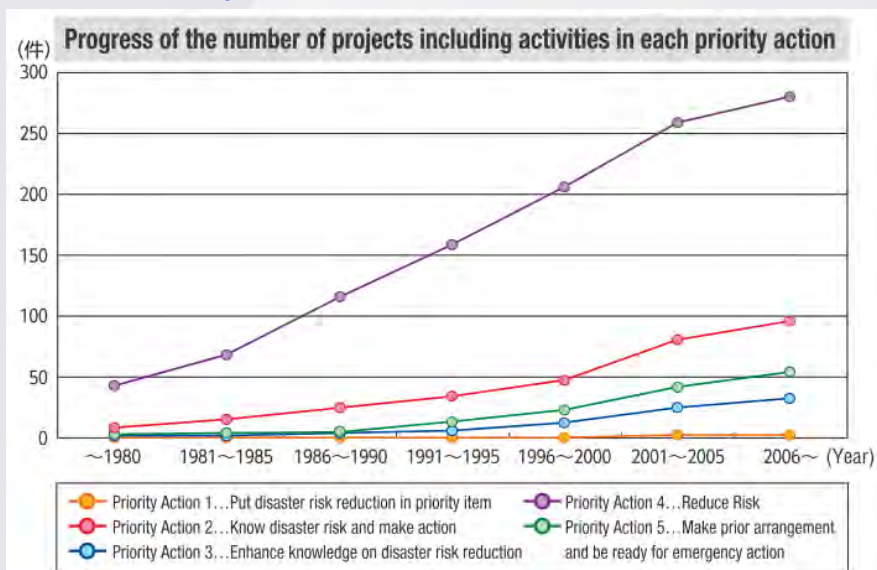
3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels

4. Reduce the underlying risk factors

5. Strengthen disaster preparedness for effective response at all levels

JICA's contribution

Investment of JICA's DRR assistance for PA1 to PA5 of HFA, directed particular in "PA 4: Reduce Risk Factors"



Aiming to end "vicious cycle of poverty and disaster" then generate sustainable development by DRR

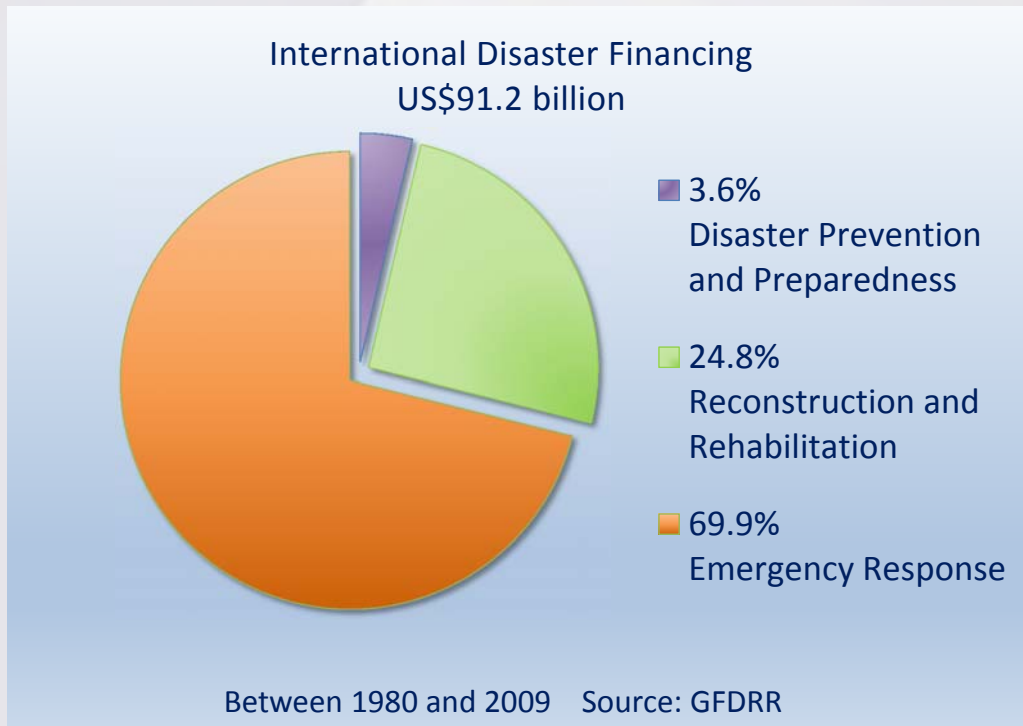
JICA's Development Strategic Goals focusing on Disaster Risk Reduction



From vicious cycle of disaster and poverty to positive cycle of resilient development by balanced investment of DRM



Disaster Risk Management Investment



Our mission

1. **Investment for DRR**
 - Benefit analysis of DRR
 - Planned investment for DRR
2. **Build Back Better**
 - Reinforcement for resilient society
3. **Mainstreaming DRR: into all development interventions**
 - Contributing in discussions on mainstreaming DRR
 - Conducting Disaster Risk Assessment in all projects
4. **Seamless Approach**
 - Linking emergency assistance and development
 - Comprehensive cooperation: Effective combination of structural and non-structural measures, approaching all layers, multi-sector.
5. **Response for New Needs**
 - Stand-by Emergency Credit for Urgent Recovery
 - Area Business Continuity Plan (BCP) and Area Business Continuity Management (BCM)
 - Strengthening Economic Resilience, by introducing the Area BCM
 - Space technology, flood modeling technology, Urban Resilience, Climate Change Adaptation

Appendix 3-3

Establishing fundamentals for improved flood prevention and mitigation through Integrated Water resource Management and Integrated Flood Management as a systematic process in Mozambique

Establishing fundamentals for improved flood prevention and mitigation through Integrated Water resource Management (IWRM) and Integrated Flood Management (IFM) as a systematic process in Mozambique

Dr. Hitoshi BABA

Ph.D. Environment and Resource Engineering
Senior Advisor, Japan International Cooperation Agency
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In order to improve flood prevention and mitigation capacity it is needed to establish fundamental system of Disaster Risk Management with constant consideration of;

1. Current capacity and future direction
2. Affirming concept of IWRM and IFM
3. Process of Disaster Risk Management

Current Capacity of Flood Management in Mozambique “Responding to Climate Change in Mozambique, Synthesis Report. October 2012”

1. Upper catchments are strongly deteriorating, promoting increased run-off and more peaky floods
2. Operational rules for large dams are not targeted at flood retention with low operational levels but rather at maintaining high supply levels
3. Small dams and weirs along the tributaries are not numerous enough and are too small to play a significant role in flood retention
4. No land development policies that would prevent settling and construction in flood-prone areas are in place or enforced.
5. The data and monitoring situation at the local level is not sufficient to conduct detailed flood risk assessments and gain thorough information on local flood conditions.
6. Neither is a making-room-for-water concept with holistic approaches followed nor is the retention function of the floodplains for basin-wide flood prevention maintained; preference is, instead, given to local approaches.
7. Structural defenses are mostly not in place (these would likely be recommendable for only a few key locations)
8. Monitoring and early-warning systems are not sufficiently in place
9. Preparedness activities and adaptation through flood-resilient construction are not promoted broadly but are, instead, carried out only locally by a few non-governmental organizations

Road Map Interventions for Integrated Land and Water Management, “Final Report, Flood Mitigation Mission Team, The Netherlands, Maputo, 15 June 2013”

- a. Agree on strategy of relevant parties (INGC, MICOA, ZVDA) to avoid overlap with mandates of other institutions (DNA, ARAs, Agriculture, Fisheries);
- b. Agree on policies to improve culture of data sharing between relevant institutions and stakeholders and provide this information free to stimulate economic development;
- c. Formalize position DNA in MSP/SEA implementation and include IWRM as cross-cutting element;
- d. Agree on procedures and guidelines to strengthen cooperation between different stakeholders (example: urban drainage-municipalities and AIAS);
- e. Strengthen the process of including the needs and requirements from the districts in the definition of development priorities;
- f. ZVDA to develop a meta-data information system to facilitate data exchange between stakeholders and avoid duplication of data collection;
- g. Clarify responsibilities for operation & maintenance of dikes.

Recommendations from JICA base line survey, 2015

- a. On DRR (Flood Prevention and Mitigation) measures;
 - “DNA has very wide responsibility in water related disaster management together with ARAs. But the major roles defined in the current disaster management system do not include prevention/mitigation measures, which are the most important and efficient in disaster risk reduction (DRR)”.
 - Define flood risk area to make safer land use and resilient development
 - Prepare inventory of river space, hydraulic structures, bridges and roads lying in the river space to prevent/mitigate flood disaster
 - Construct protection and take measures for water facilities resilient against flood
- b. On Flood Response;
 - Effectively share hydrological information among all relevant agencies
 - Enhance business and function continuity of disaster management organizations in case of disaster
 - Enhance flood early warning capacity in coordinated organizational networks
 - Empower community based disaster management capacity to make effective evacuation

Prospected roles of DNA and ARAs in Flood Disaster PREVENTION and MITIGATION

	DNA	ARAs
Structural	<ul style="list-style-type: none"> • Planning, construction and improvement of flood prevention facilities • Construction, improvement and rehabilitation of dam (large), barrage, sluice, etc. • Oversee construction and improvement of flood forecasting and warning system • Oversee construction of rain water storage facilities to reduce flood runoff (future task) • Oversee improvement of hydrological observation system (rain and water level gauges) • Administrative resilient development plans n actions 	<ul style="list-style-type: none"> • Planning, construction and improvement of dykes • Construction, improvement and rehabilitation of dam (small), barrage, sluice, etc. • Oversee construction and improvement of flood forecasting and warning system • Construction of rain water storage facilities to reduce flood runoff (future task) • Improvement of hydrological observation system (rain and water level gauges)
Non-structural	<ul style="list-style-type: none"> • Support for formulation of flood management plan • Support for planning and design of flood management facilities • Collect flood information of international rivers from neighboring countries • Operation and maintenance of dams and barrages for water resources management. • Organizing management committee of stakeholders of river basin (incl. international river basin) • Upgrading flood forecasting model • Preparation of project proposals for donor agencies to construct and improve flood management facilities 	<ul style="list-style-type: none"> • Formulation of flood management plan facilities • Collect flood information of international rivers from neighboring countries • Operation and maintenance of dams and barrages for water resources management. • Organizing management committee of stakeholders of river basin (incl. international river basin) • Upgrading flood forecasting model • Preparation of project proposals for donor agencies to construct and improve flood management facilities

Discussion

- Can you acknowledge the evaluations and recommendations pointed out?
- What are the steps to take?
- Who will do what?

1. Current capacity and future direction
2. Affirming concept of IWRM and IFM
3. Process of Disaster Risk Management

Concept of Integrated Water Resource Management

- IWRM is the process to promote coordinated development and management of water, land and related resources in river basins, to maximize the economic benefits and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.
- Integration of Water Resources Management at River Basin Scale, in
 - Spatial Integration: Geographical /Environmental interaction
 - Water use and Flood protection in consideration of correlation between upstream and downstream, beneficial areas of river right and left, impact between main stream and tributaries
 - Sector Integration: One Administration
 - Disaster prevention, Water use, Environmental protection, Industry, Forestry, etc.
 - Stakeholder Integration: Optimized Benefit
 - Government at national and local, Water users, Private and public organizations, Communities, Individuals, etc.

Integrated Water Resource Management

- Water,
- Moving in the globe, re-circulating eternally
 - Resourceful when it flows, not in stock
 - Sustainable flow, to sustainable use
 - Local resource, maldistributed, fluctuating
 - The use of water can take the other people's opportunity to use by means of quantity and quality
 - Lack of water, not by environment nor climate, but mostly because of social discrepancy, uneven resource management and poverty

Integrated Water Resource Management

Principles in IWRM

1. To understand society, history, & culture
2. To respect and to help other water users
3. To promote public welfare
4. To manage water resources based on science and technology
5. To consider environmental function of water
6. To strengthen government capacity
7. To integrate flood management into water resources management

The River Law,

-Legal Framework for River and Water Management in Japan-

- Some subjects under river administration by the Law
 - River Works
 - The fundamental river management policy
 - The river improvement plan
 - Regulation and Restrictions for River and River Use
 - River water use
 - Occupancy in river zone, structures, etc.
 - Extracting earth, stone, etc.
 - Emergencies
 - Flood and sediment disaster management
 - River councils

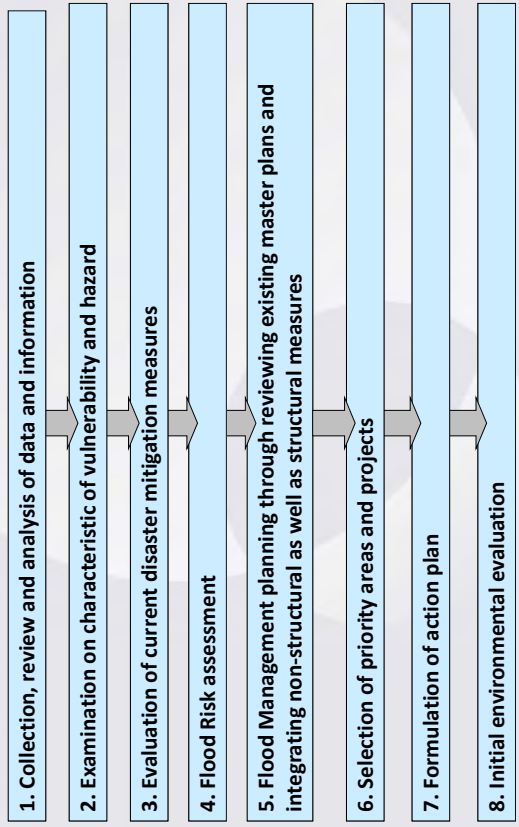
Integrated Flood Management

- Most important component of IWRM
- IFM requires:
 - Clear and Objective Policies Supported with Legislation and Regulations
 - The Need for a Basin Approach
 - Institutional Structure through Appropriate Linkage
 - Community-Based Institutions
 - Multidisciplinary approach
 - Adaptive management
 - Information Management and Exchange
 - Appropriate Economic Instruments

Basic Project Components for Integrated Flood Management

- IWRM
 - Basin scale management
 - Sector wide integration
 - Involvement of all stakeholders
- Structural IFM measures
 - River structures for flood control
 - Flood water retention and infiltration
 - Flood proofing
- Non-structural measures
 - EWE System
 - Land Use Regulation
 - Community-Based Disaster Management
- Capacity Development
- Monitoring, O/M
- Poverty alleviation and consideration on vulnerable group, gender

Integrated Flood Management Planning



Japan International Cooperation Agency

General Flood DRM process

- 1. Understanding Flood Hazard**
 1. Type and cause
 2. Probability
 3. Flood hazard assessment
- 2. Understanding Flood Impact**
 1. Direct impact
 2. Indirect impact
 3. Vulnerability and Risk assessment
- 3. Considering structural options**
 1. Conveyance
 2. Flood storage
 3. Drainage systems
 4. Infiltration
 5. Wetland and environmental buffers
 6. Flood proofing, resilience/resistance
 7. Flood defense
- 4. Considering non-structural options**
 1. Flood zoning, land use planning
 2. Flood awareness campaigns
 3. Health awareness
 4. Solid and liquid waste management
 5. Community based resilience improvement
 6. Flood insurance
 7. Early warning
 8. Evacuation
 9. Emergency response
 10. Flood recovery and reconstruction
- 5. Evaluating alternative risk reduction options**
 1. Evaluating cost and benefit
 2. Defining "target protection level"
 - Acceptance of risk 'As Low As Reasonably Practical' principle
 - Opportunity cost
 - The value of a life
 - Demands of insurability
 - Benchmarking and regional cross-cooperation
 - Decisions under uncertainty
 - No regret solutions
 - Flexible solutions
 - Decision Trees
- 6. Implementing and managing**
 1. Implementation
 2. Sustainable maintenance
 3. Community engagement
- 7. Reviewing and improving the management system**
 1. Benchmarking and monitoring
 2. Reviewing and improving

jica

Japan International Cooperation Agency

Discussion

- To what extent we have achieved the requirements of real IWRM and IFM?
- What is the next priority step to take?
- Who will do what?

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EWE System installation

- 1. Collection, review & analysis of data & information**
- 2. Institution, law, and regulation survey**
- 3. Concept of EWE system**
- 4. Designing of EWE system**
- 5. Project implementation in the target basin**
- 6. Support to establishing flood EWE system in Rivers**
- 7. Support CBDM activities and evacuation drills**
- 8. Formulation of action plan**

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Comprehensive Flood Control Measures

In-stream Measures	<ul style="list-style-type: none"> Channel Normalization Flood way, Diversion, Polder Dam, Reservoir
Watershed Measures	<ul style="list-style-type: none"> Storm Water Retention Surface Water Infiltration Land Use Regulation Flood Proofed Building
Information Measures	<ul style="list-style-type: none"> Flood Forecasting, EW Public Response

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1. Current capacity and future direction
2. Affirming concept of IWRM and IFM
3. Process of Disaster Risk Management

What is Disaster Risk Management ?

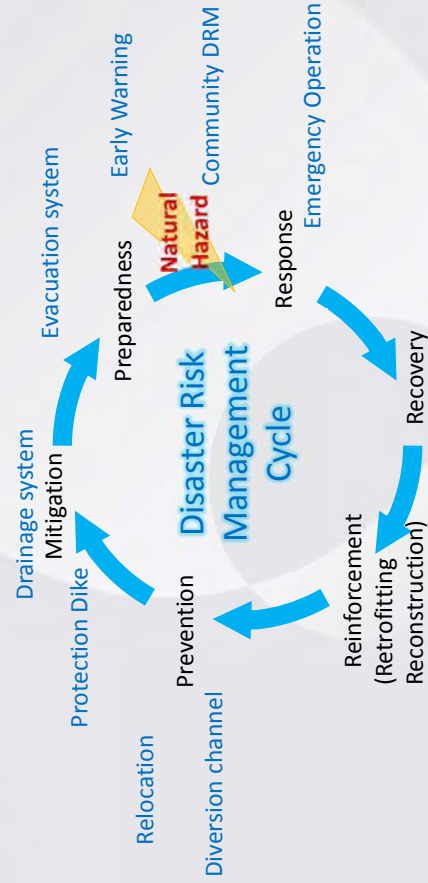


Disaster Risk Management Cycle

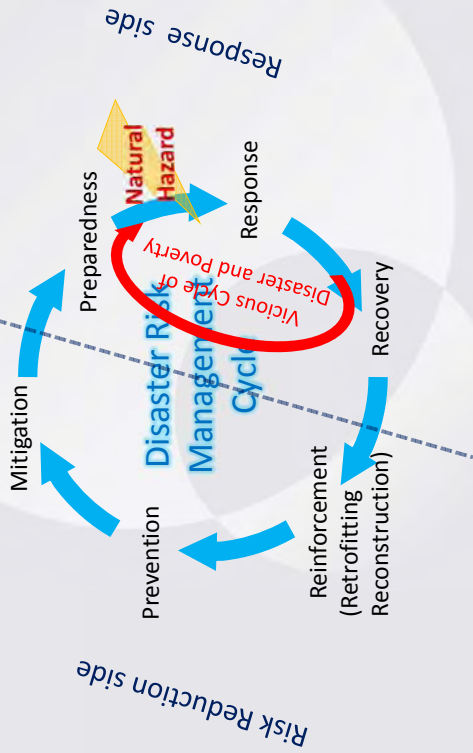


"New political trends, inspired by the Aarhus convention and the recent jurisdiction of the EC court of human rights, demand more participation of civil society in governmental decision processes concerning environmental and social agendas. Governmental institutions in Austria dealing with risk or catastrophe management (concerning sediment-related disasters) have to take into account and face these new trends and adapt existing processes and measures to the new requirements." (Maria Patek MBA, Head of the Austrian Service for Torrent & Avalanche Control.)

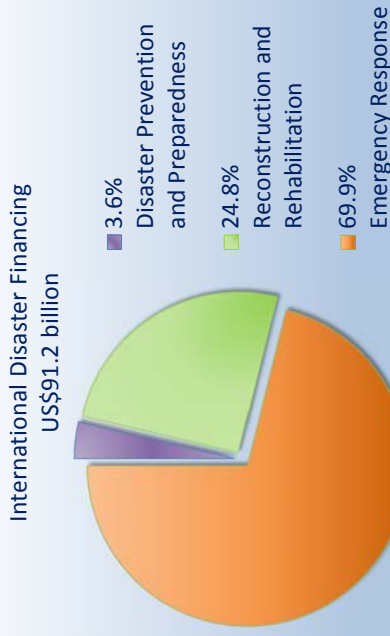
Examples of Flood related activities in stages of DRMC



Unbalanced investment of DRM actions in developing countries



Disaster Risk Management Investment



Between 1980 and 2009 Source: GFDRR

Can we shift more DRM activities from Response to Risk Reduction?



Discussion

- In which stage of DRMC you are regularly contributing to?
- Does any strong authority oversee and direct the balanced conducts of DRMC?
- Who will do what?

Challenges in moving from reaction to prevention

- Technical difficulty in hazard and risk assessment, data processing and archiving, DRM planning and engineering for risk reduction activities
- Political tendency to take responsive actions, which are civic popular and leading to vote, rather than risk reduction ones that are time-consuming and intangible
- Institutional weakness in systematic integration of DRR into development processes of different sectors

1. Current capacity and future direction
 2. Affirming concept of IWRM and IFM
 3. Process of Disaster Risk Management
- └── FLOOD ─┘

Process of Flood Disaster Risk Management

1. Understand Flood Hazard
2. Understand Flood Impacts
3. Deliberate Management Options: Structural Measures
4. Deliberate Management Options: Non-structural Measures
5. Evaluate and Determine the appropriate Management Options
6. Implement Integrated Flood Risk Management
7. Review and improve the Management System

Understanding Flood Hazard and Impacts

Flood Hazard

- Hazard events have a probability of occurrence within a specified period within a given area and have a given intensity.
- Flood hazard mapping is an important step for
 - 1) understanding the probable hazard situation,
 - 2) planning development activities, and
 - 3) supplementary decision making of recovery/reconstruction and prevention measures in an area.
- Flood hazard maps normally are prepared based on specified flood frequencies or return periods, for example, 1:10 years, 1:25 years, 1:100 years, 1:1000 years, or to more extreme events such as the 1:1000 year return period for different scales
- The identifiable flood hazards under multiple scenarios (flood recurrence interval) should also be converted into digitalized data that can be easily put into geographic information systems to dynamically process with other information such as vulnerability and susceptibility of an area so that the hazard information is used in order to further analyze disaster risks and impacts.

Understanding Flood Hazard and Impacts

Flood Impacts

- Dynamic impacts of flooding
 - The impacts of flooding on a rural agricultural area, urban industrial and commercial area and slum area will be very different.
 - Impacts are also changing and dynamic due to development including urbanization. For example harness would be turned into an impact for farmers by transferring their traditional farming to modern farming.
- Direct and indirect impacts of flooding
 - Direct impacts of flooding will be imposed on people, the urban and rural built environment, infrastructure, utilities, industrial, commercial and family assets, and farming areas.
 - Indirect effects include loss of industrial or business processes through supply chains, damage to premises, equipment and fittings, loss of stock, reduced customer visits and sales as well as disruption to business activities.
- Other effects of flooding
 - Complex interactions within the natural environment and the human use of resources.

Understanding Flood Hazard

Definition of Flood

- "Any condition, meteorological or otherwise in which normally dry land is covered by standing or moving water." (Pacific Disaster Center)
- "Significant rise of water level in a stream, lake, reservoir or coastal region." (EM-DAI)
- "An overflowing or irruption of a great body of water over land in a built up area not usually submerged." (Oxford English Dictionary)
- "A great flowing or overflowing of water, especially over land not usually submerged, or any great outpouring of stream." (The Random House Dictionary)
- Flood is usually resulted from a combination of meteorological, hydrological and hydraulic extremes, such as precipitation (rainfall), infiltration into the ground, runoff from ground surface and underground and flows in and/or over river channels, lakes, ponds, ground surface, etc.
- Flood can also be impacted from human activities such as unplanned growth and development in flood plains, or from the breach of dams, miss operation of reservoir operation or overtopping of an embankment that fails to protect planned development.

Understanding Flood Hazard

Types and Causes of Flooding

Source: Cities and Flooding 2012, pp. 56-57

Types of flooding	Causes		Onset time	Duration
	Naturally occurring	Human induced		
Urban flood	Fluvial Coastal Flash Pluvial Groundwater	Saturation of drainage and sewage capacity Lack of permeability due to increased concretization Faulty drainage system and lack of management	Varies depending on the cause	From few hours to Days
Pluvial and overland flood	Convective thunderstorms, severe rainfall, breakage of ice jam, glacial lake bursts, earthquakes resulting in Landslides	Land used changes, urbanization. Increase in surface runoff	Varies	Varies depending upon prior conditions
Coastal (Tsunami, storm surge)	Earthquakes Submarine volcanic eruptions Subsidence, Coastal erosion	Development of coastal zones Destruction of coastal natural flora (e.g., mangrove)	Varies but usually fairly rapid	Usually a short time however Sometimes takes a long time to recede
Groundwater	High water table level combined with heavy rainfall Embedded Effect	Development in low-lying areas; interference with natural aquifers	Usually slow	Longer duration
Flash flood	Can be caused by river, pluvial or coastal systems; convective thunderstorms; GLOFs	Catastrophic failure of water retaining structures Inadequate drainage infrastructure	Rapid	Usually short often just a few hours
Semi-permanent Flooding	Sea level rise, land subsidence	Drainage overload, failure of systems, inappropriate urban development, Poor groundwater Management	Usually slow	Long duration or permanent

Understanding Flood Hazard

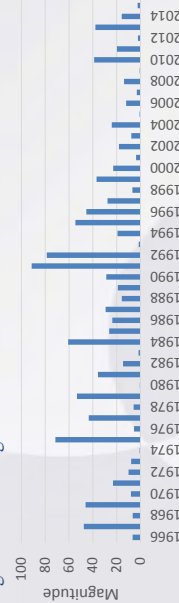
Probability of Flood Hazard

- A sound understanding of the likelihood of occurrence of a flood hazard is a fundamental step in dealing with flood risk.
- The Probability in itself can be a difficult concept to translate from the purely scientific generation of hydro-meteorological models into a description of hazard that lay people often comprehend and decision makers can use it to evaluate their real options.
- To fully evaluate flood risk, the degree of exposure and the nature of exposed receptors and their potential to sustain or resist damage also need to be considered.
- It is important to distinguish between the probability of occurrence of a weather event and the probability of occurrence of a flood event. Flooding is primarily driven by weather events which are hard to predict due to what is termed their chaotic nature. In other words, despite the great advances in weather forecasting, it cannot be determined with certainty when and where rain will fall or storms will form. This means that it is impossible to know exactly when and where a flood will occur in the future, nor how high (either in water level or discharge) the next flood will be. Hazard predictions are commonly given in terms of probabilities, computed using historical data for the area of interest.

Understanding Flood Hazard

Probability of Flood Hazard

- Recurrence interval
- The recurrence interval or return period is defined as the average time between events of a given magnitude assuming that different events are random.



- Flood Probability

- The probability of occurrence is the inverse of the return period $p=1/T$
- Relationship between return period T and flood probability P, it is clear that a flood discharge that has a 100-year recurrence interval has a one percent chance of occurring
- Discharge, Stage and Inundation area
- are commonly used to describe the severity of a flood
- The relationship between discharge and stage at a particular location is empirical and usually represented graphically by a rating curve (non-linear).
- Once stage is known, the next step is to determine the corresponding inundation area. This is not straightforward but we have a good tools using latest technology.

Understanding Flood Hazard

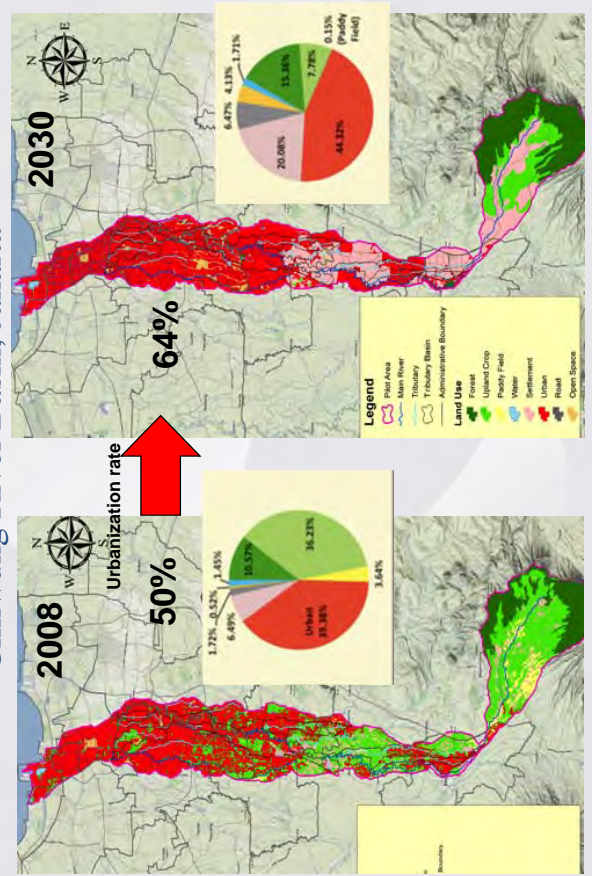
Probability of Flood Hazard

- Prediction of weather event and flood event in terms of probability
- Hazard predictions are commonly given in terms of probabilities, computed using historical data for the area of interest.
- Uncertainties involved in recurrence interval
 - The recurrence interval or return period of floods of different heights varies from catchment to catchment, depending on various factors such as the climate of the region, the width of the floodplain and the size of the channel.
 - Scarce record of hydrological data poses a limitation to the calculation of recurrence intervals which must be taken into account when evaluating and communicating uncertainties in flood probability estimations.
- Uncertainties involved in flood probability estimations
 - Recurrence interval for any discharge (and not just those present in the observational record) can be inferred. In short various uncertainties are involved in flood probability estimations.
 - Difference of recurrence interval and flood probability
 - The recurrence interval, as discussed above, refers to the past occurrence of floods, whilst flood probability refers to the future likelihood of events.

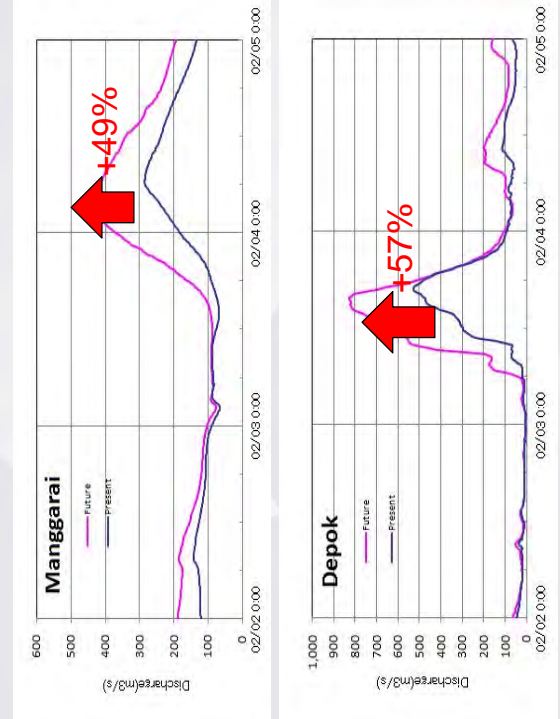
Assessment of Flood Hazard

- Basic Conditions of Flood Hazard Identification
 - Output of the flood hazard identification should be displayed on any Geographic Information System (GIS) or on printed maps.
 - The flood hazard information, identifying inundation risk areas, should be designated by the relevant, national, state or provincial government in accordance with the disaster management law and then notified to the municipal governments concerned.
 - If an inundation risk area lies across multiple municipalities, the municipal governments concerned may need to jointly conduct flood hazard identification and mapping with relating municipalities in a wide area.
 - Evacuation sites and routes for instance, in addition to the information of inundation risk areas and intensities, can be indicated on the hazard maps in a case that the flood hazard maps are used at the time of evacuation.
- Flood Hazard Mapping Process
 1. Data collection and integration for generation of digital terrain and surface models
 2. Calculation of return period of flooding
 3. Modeling flood scenarios using 1D, 2D or 1D2D hydraulic models (flood modeling software required)
 4. Model result validation
 5. Flood maps prepared and distributed to different user groups
 6. Monitoring and regular updating of maps

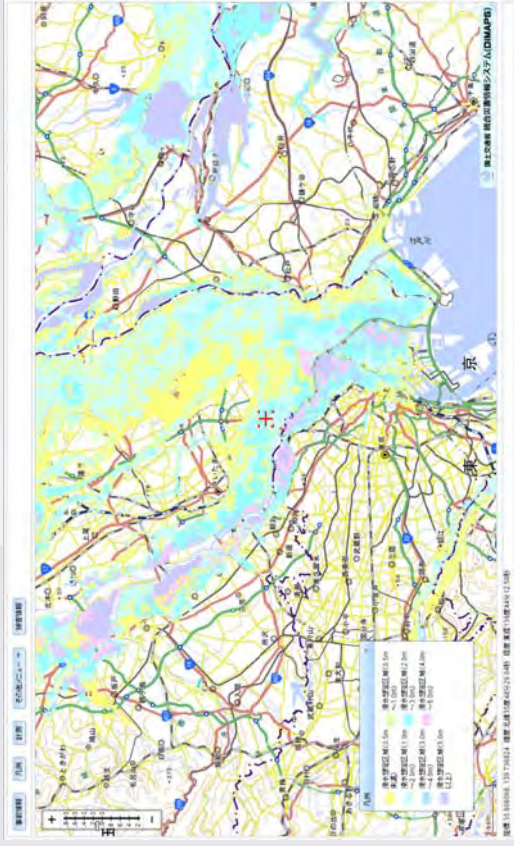
Future Projection of Land Use in Cilliwung River Basin, Jakarta



Flood hazard assessment, increasing discharge



Another example, flood hazard of 1/200 probability in Tokyo metropolitan area, open for public



Probabilistic Flood Hazard Assessment



1% probability flood hazard. Ciliwung River, Jakarta.

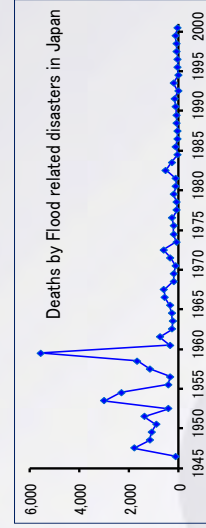
Simulation by Dr. BAIBA

Modeling Software : IRIC +Nais2DFlood

Understanding Flood Impacts

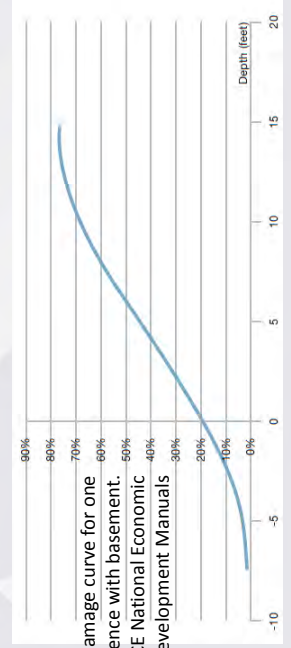
Direct Impact of Flooding

1. People (life, health and well-being)
2. Buildings and contents
3. Animals and crops
4. Cascading impacts



Example of a depth-damage curve for one story residence with basement.

Source: USACE National Economic Development Manuals



Understanding Flood Impacts

Post Disaster Damage Assessment

Flood loss assessment can be carried out at various points:

- During the flood (thus informing the emergency response and relief coordination);
- Immediate aftermath of a flood (around one to three weeks after the flood peak); or
- Three to six months after the event (to provide a more in-depth assessment of the full economic impact)

The purpose of Damage Assessment are:

- to provide mitigation or warning systems produce a sound return on the investment;
- to have a common measuring tool for assessing alternative mitigation plans; and
- to assist with post-disaster recovery planning and management.

General method of Flood Damage Assessment:

1. Initial reconnaissance survey
2. Habitat mapping
3. Village transect
4. Property-level survey
5. Photographic documentation
6. Classification of buildings

Understanding Flood Impacts

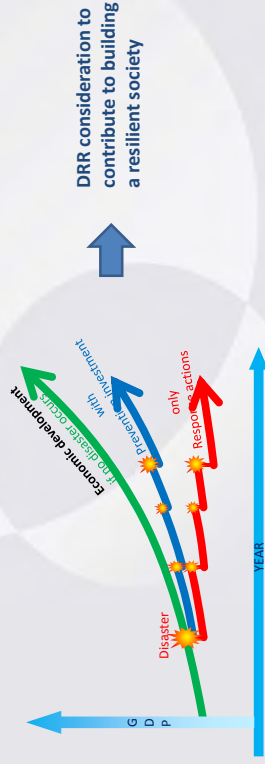
Indirect impacts and other effects of flooding

- Human and social impacts
 - Physical health problems, outbreak of disease, epidemics
 - Psychological effects, PTSD, depression or anxiety
 - Demographic change (age structure) may cause family displacement or community break
- Environmental Impacts
 - Erosion and landslides can change local geography, vegetation and forest cover which further affect environmental functions such as infiltration to the soil and higher levels of rainfall runoff
 - Sediment and debris may change land use particularly revision of agriculture production
- Economic and financial impacts
 - Recovery and reconstruction cost of damaged or destroyed items prevents country's growing economy from escaping poverty (refer the next pages)
 - Impact on long-term economic growth and on development goals
 - Business interruption
- Political and institutional issues
 - Damage caused to public buildings such as of critical government organizations, hospitals, schools, and significant cultural sites such as churches can lead to further indirect impacts; for example, the disruption to education, which over a long term period can lead to children suffering academically

Tool to link DRR investment to Sustainable Development

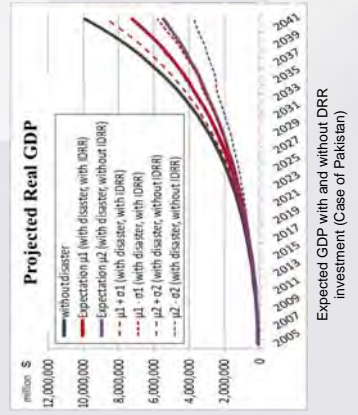
Dynamic stochastic macroeconomic model of income distribution and growth, named "DR²AD Model" that visualizes

- Economic growth under long-term disaster risk with or without DRR investment, and
- Decrease in the Gini coefficient in consequence of DRR investment.

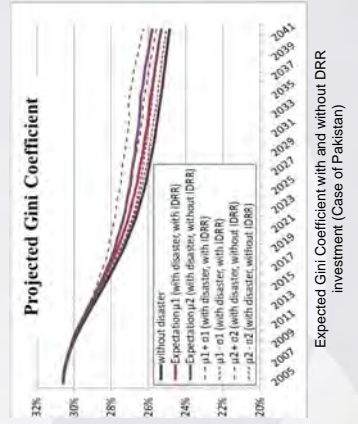


DR²AD Model (DRR investment Accounts for Development)

The Model has been verified with the case of Pakistan, and was confirmed applicable. With DRR investment, approximately 25% more economic growth (real GDP) and 0.5% lower Gini coefficient are realized at the year 2042 compared to the case without DRR investment.



Expected GDP with and without DRR investment (Case of Pakistan)



Expected Gini Coefficient with and without DRR investment (Case of Pakistan)

Understanding Flood Impacts

Vulnerability and risk mapping

- Assessing vulnerability
- Factors Required to Estimate Flood Risk
- Various purposes and applications of Flood Risk Assessment

Assessment of Vulnerability

Type of vulnerability and the Factors Affecting Their Rate of Exposure

Types of Vulnerability	Exposure Factors
Individual or household vulnerability	Education, age, gender, race, income, past disaster experience
Social vulnerability	Poverty, race, isolation, lack of social security services
Institutional Vulnerability	Ineffective policies, unorganized and non-committed public and private institutions
Economic Vulnerability	Financial insecurity, GDP, sources of national income and funds for disaster prevention and mitigation
Physical Vulnerability	Location of settlement, material of building, maintenance, forecasting and warning system
Environmental Vulnerability	Poor environmental practices, unprecedented population growth and migration
System Vulnerability	Utility service for the community, health services, resilient system
Place Vulnerability	Mitigation and social fabric

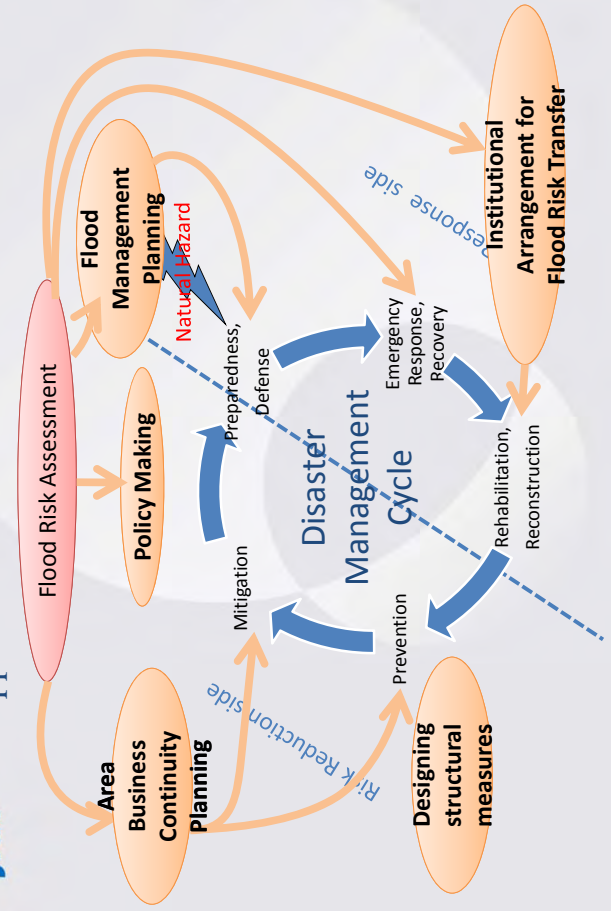
Factors Required to Estimate Flood Risk

Factor	Definition	Key Indicator
A. Hazards	Potentially damaging event of flooding	Water depth (mainly), water velocity, inundation period
B. Vulnerability	Conditions determined by physical, social factors to the impact of flood hazard	Susceptibility or Resilience; 0 (no) to 1 (highest) or $B = E - D$
C. Probability of hazard	Extent to which an event is likely occur	Return period, probability of occurrence; 0 (no occurrence) to 1 (100% occurrence)
D. Value of the elements at risk (or exposure)	Aggregate value of assets, operational indirect products, intangible assets of the elements at risk	Monetary value (\$), death toll, etc.
E. Damage of the elements at risk by an event of hazard	Aggregate value of direct and indirect damages to the elements impacted by an event of flooding	Damage (\$, death toll, etc.) = $B \times D$ or Value of damage measured by surveys
F. Risk	Combination of the probability of an event (%) and its consequences (\$, death toll)	Risk = C x E or C x B x D

Purposes of Flood Risk Assessment

Purpose	Description
Policy Making	Formulation of national and regional development policy on strategic areas for disaster prevention, identification of model areas and budgetary arrangements; development and/or update of comprehensive plans, future land use maps, and zoning regulations
Flood Management Planning	Preparedness for emergency actions (evacuation and rescue) and relief actions; develop hazard mitigation projects; planning for continuity of operations plans, continuity of government plans, and emergency operations plans
Preparedness and Emergency Actions	Information for disaster mitigation and prevention planning, and river basin flood control master plan; re-evaluate and prioritize mitigation actions in local hazard mitigation plans; to communicate with property owners, business owners, and other citizens about flood risks
Damage Analysis	Damage analysis for investment on regional industrial clusters and insurance on factories, buildings and utilities; risk assessment on economic corridors such as roads, ports, and railways

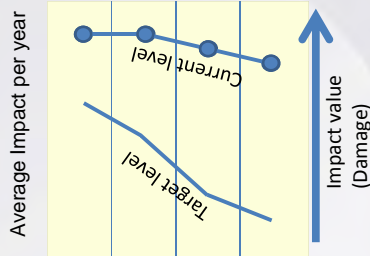
Application of Flood Risk Assessment



Damage potential and impact assessment

Magnitude of hazard	Damage potential and impact	Probability per year
Extreme	Severe damage, need comprehensive works	x 0.1%
Large	Heavy damage, must be controlled	x 1%
Medium	Damage on livelihood, no casualty	x 10%
Small	Little damage, avoidable	x 100%

Impact assessment based on wide range of hazard projections



An example of flood risk assessment for structural measures planning

Source : Yodo River Master Plan

Average annual Flood Disaster Loss

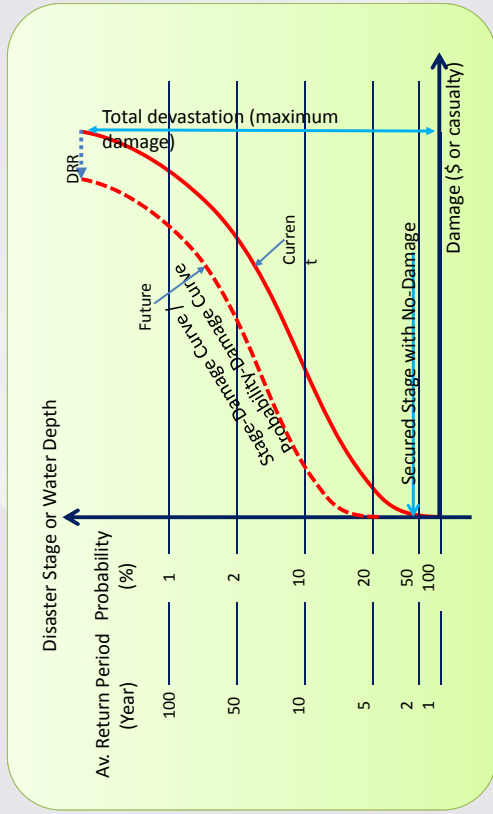
Calculated by return period of 10, 20, 30, 50, 80, 100, 150 years, overlaid the inundation simulation with vulnerability maps, using stage-damage rating curve of structures and buildings.

The resulted average annual flood disaster loss of the river basin is 133,082 million Yen/year

洪水規模	年平均超過確率	被害額		年間平均被害額④	区間平均被害額⑤	区間平均被害額⑥
		①現状	②整備後			
1/10	0.1000	841,096	4,024	837,072	1,094,190	0.0500
1/20	0.0500	1,367,909	16,802	1,351,307	1,514,040	0.0167
1/30	0.0333	1,710,738	33,966	1,676,772	2,176,979	0.0133
1/50	0.0200	3,397,779	70,594	2,677,185	2,044,875	0.0075
1/80	0.0125	4,330,017	2,917,453	1,412,564	1,403,546	0.0025
1/100	0.0100	4,603,027	3,208,499	1,394,528	1,580,217	0.0033
1/150	0.0067	5,276,242	3,556,772	1,819,470		5.267

年平均被害軽減期待額: 区間年平均被害額⑥の累計
133,082百万円

Stage-Damage Curve with probability



To Reduce the Flood Disaster Risk and Impacts, we need to;

- Ensure the priority of risk reduction among decision makers particularly those standing on development side,
 - Realistic understanding of flood risk and impact,
 - Risk minded spatial planning,
- Clearly identify and quantitatively assess the uncertain but probable risk and impact in order to get the decision makers acknowledged,
 - Vulnerability assessment, risk and impact analysis,
 - Damage cost estimation, DRR investment cost versus benefit,
- Effectively reflect the lessons from recent disasters and from precedents into the policy, strategy and planning of development,
 - Good practices, models of advanced nations,
 - Standard methodology and technology,
- Practice the risk reduction under coordinated manner with stakeholders
 - Institutional strengthening, legal framework,
 - Community participation, conflict management,

Management Options: Structural Measures

- Conveyance (increasing the flow-carrying capacity of a river at a particular location, but increase it further downstream)
 - Modification of rivers (by increasing the flow area or altering the line, protecting the banks from erosion, increasing the height of banks)
 - Relief channels, cutoff of meandering channels
 - Flood plain restoration
 - Reopening culverts
- Flood storage
 - Online storage (by dams, cross dikes, etc.)
 - Offline storage (by retarding basin, planned inundation areas, etc.)
 - Temporary storage (by rain water tanks, paddy field storage, etc.)
- Barrier and embankment systems
- Drainage systems (sewers and drains)
- Infiltration and permeability control (by infiltration devices, vegetation, paving, etc.)
- Groundwater management (land subsidence control, rainwater harvesting)
- Wetlands and environmental buffers
- Building resilience and resistance
- Flood defenses

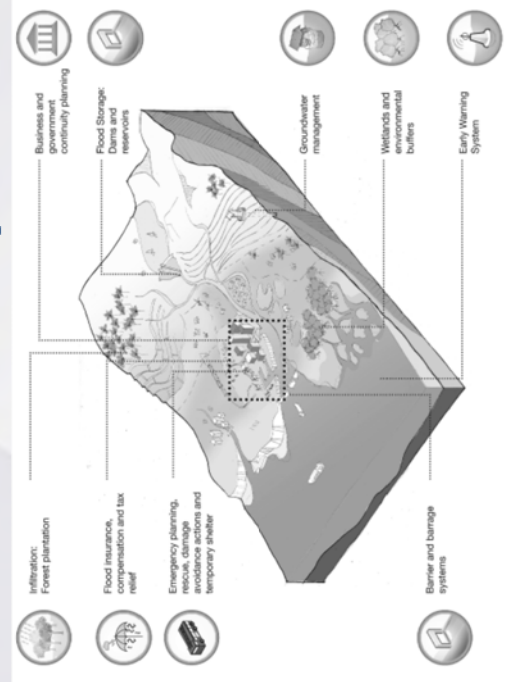
Management Options: Non-structural Measures

- Land use planning and flood zoning (integrating risk management and land use planning)
- Flood risk awareness raising (risk information and communication)
- Health planning and awareness campaigns
- Early warning systems
 - Risk information management system
 - Organizational capacity enhancement
 - Appropriate message content
- Evacuation planning and facility enhancement
 - Evacuation facilities and functions
 - Evacuation route and management
- Emergency planning, rescue, damage avoidance actions and temporary shelter
- Business and government continuity management
- Solid and liquid waste management
- Flood recovery and reconstruction (build back better)
- Flood insurance, risk financing, compensation and tax relief

Evaluate and Determine the appropriate Management Options

- Management option selection in consideration of IWRM concept
- Balanced measures on DRMC
- Cost Benefit performance
- Multi-Criteria Analysis of cost benefit and socio-environmental issues
- Determining the appropriate target levels of protection measures (ALARP)
- Robustness of flood management options
- **Disaster Risk Governance**
 “Systemic approach of risk management processes through identification, assessment, risk reduction and impact mitigation, based on the principles of cooperation and participation by public, private, community and academy, incorporating such criteria as accountability and transparency within the procedures.”

Management option selection in consideration of IWRM concept



Overview of flood risk management options, catchment scale, Source: Baca Architects

An example of B/C estimation in FRM using flood risk assessment

Source : Yodo River Master Plan

Average annual Flood Disaster Loss

Calculated by return period of 10, 20, 30, 50, 80, 100, 150 years, from inundation simulation, vulnerability maps, stage-damage rating curve, etc. The result is 133,082 million Yen/year

洪水規模 超過確率	1観空 0.1000	2観空 0.0500	3観空 0.0333	5観空 0.0200	10観空 0.0125	20観空 0.0075	30観空 0.0067	50観空 0.0050	80観空 0.0042	100観空 0.0038	150観空 0.0033
被害総額 千円	1,841,096	1,367,806	1,170,726	920,384	630,017	403,027	335,672	231,104	162,622	131,307	101,617
年間平均 被害総額 千円	13,308	10,100	8,666	6,544	4,622	2,984	2,467	1,643	1,179	911	739

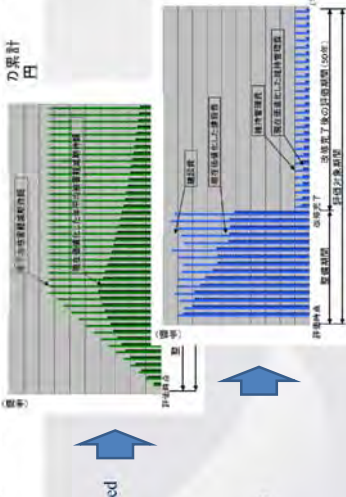
Provisional benefit of DRR investment

Calculated from future value of DRR, represented by accumulation of yearly decreased Disaster Losses by prevention measures. Result is 1,420 billion Yen

Provisional Cost of DRR investment

The planned flood prevention investment including yearly maintenance and operation is 370 billion Yen

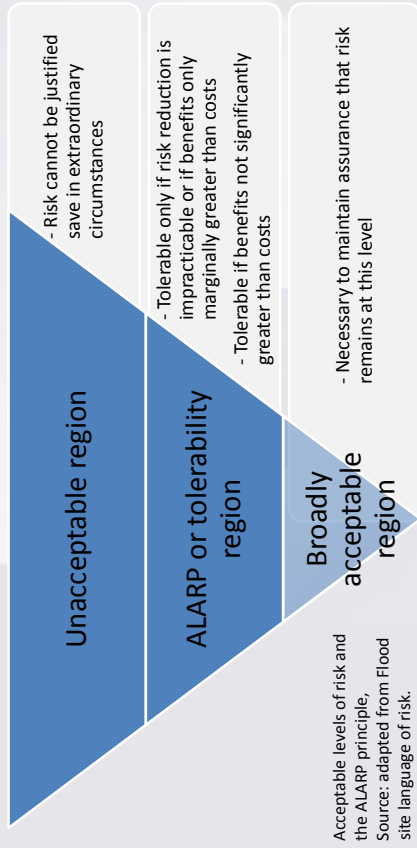
B/C = 1,420 / 370 = 3.8



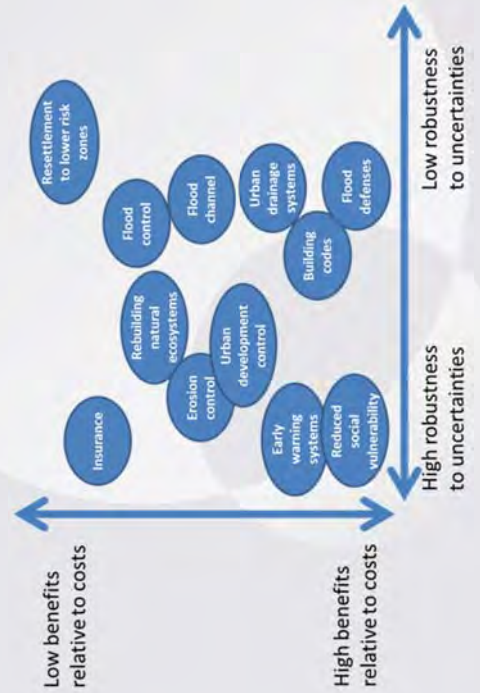
Defining “target protection levels”

Source: Integrated Urban Flood Risk Management for the 21st Century: A Practitioner's Handbook, THE WORLD BANK, GFDRR, 2011, Chapter 5.3.1.

In deciding on an acceptable level of disaster risk for populations to bear, the concept of As Low As Reasonably Practical (ALARP) can be adopted.



Robustness of flood management options



(Modified from source: Adapted from Ranger and Garbett-Shields, 2011)

Implement Integrated Flood Risk Management Options

- Effective institutions and stakeholders framework
 - Clear roles of institutions
 - Allocation of stakeholder responsibilities for flood risk management
 - Public-private cooperation
- Community engagement
 - Understanding local knowledge and capacities
 - Sharing risk information and knowledge
- Financing flood risk management
 - Risk sharing and cost sharing in basin level integration
 - Public private partnerships
 - Incentives for individual private investment

Review and improve the Management System

- Effective monitoring system and protocols
- Evaluation
- Gender and cultural aspects: the distribution of benefits
- Planning regulation, enforcement and integration of policies and activities

Discussion

- Can you clearly distinguish the difference between Flood Response and Flood Prevention and Mitigation?
- What is the gap between current capacity of FDRM in Mozambique and future fundamentals to establish for improved flood prevention and mitigation ?
- Who will do what?



12 principles of Flood Management

A Guide to Integrated Urban Flood Risk Management for the 21st Century

1. Every flood risk scenario is different; there is no flood management blueprint.
2. Designs for flood management must be able to cope with a changing and uncertain future.
3. Rapid urbanization requires the integration of flood risk management into regular urban planning and governance.
4. An integrated strategy requires the use of both structural and non-structural measures and good metrics for “getting the balance right”.
5. Heavily engineered structural measures can transfer risk upstream and downstream.
6. It is impossible to entirely eliminate the risk from flooding.
7. Many flood management measures have multiple co-benefits over and above their flood management role.
8. It is important to consider the wider social and ecological consequences of flood management spending.
9. Clarity of responsibility for constructing and running flood risk programs is critical.
10. Implementing flood risk management measures requires multi-stakeholder cooperation.
11. Continuous communication to raise awareness and reinforce preparedness is necessary.
12. Plan to recover quickly after flooding and use the recovery to build capacity.



Japan
International
Cooperation
Agency

Thank you

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Appendix - 4

2015 Licungo River Flood

Appendix 4-1
2015 Flood Report

Assistance for Enhancement of Institutional Capacity to Manage
Water Related Disaster Risks in Mozambique
Makoto KODAMA

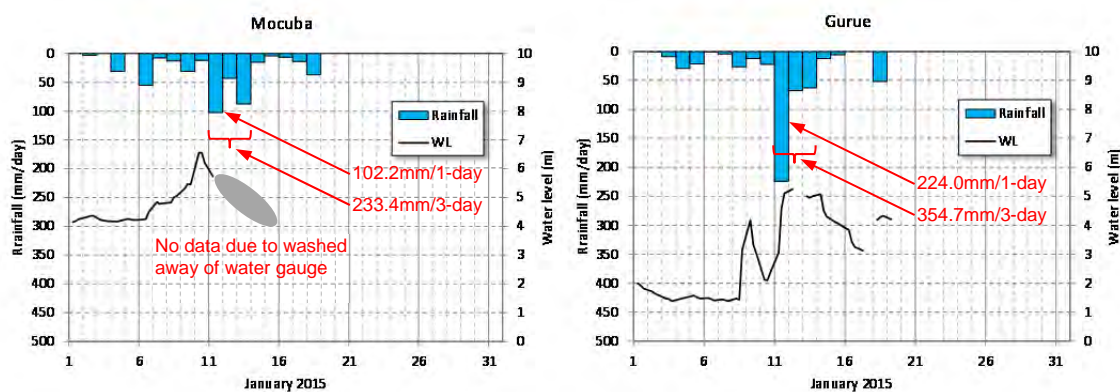
In order to grasp flood situation of Licungo River, we conducted the field survey as shown in the table below.

Date	Activities
2015/1/1/ 21	Move (Maputo – Quelimane) Courtesy call to Provincial Department of Water & Sanitation of Zambezia Province and Emergency Operation Center (EOC) in Quelimane
22	Site visit Route 226 bridges: Licungo II, III and other 2 bridges Mocuba : Intake facility, Lugela River bridge, Licungo River bridge Interview with Mocuba Unit, ARA central north
23	Site visit: Furquia Post, Namacurra District Interview with EOC in Quelimane
24	Site visit by helicopter from river mouth to Mocuba Move (Quelimane – Maputo)

1. General of the flood

Main hydrological stations in Licungo River Basin are located in Mocuba and Gurue.

Rainfall and water level of the both stations in January 2015 are recorded as below.



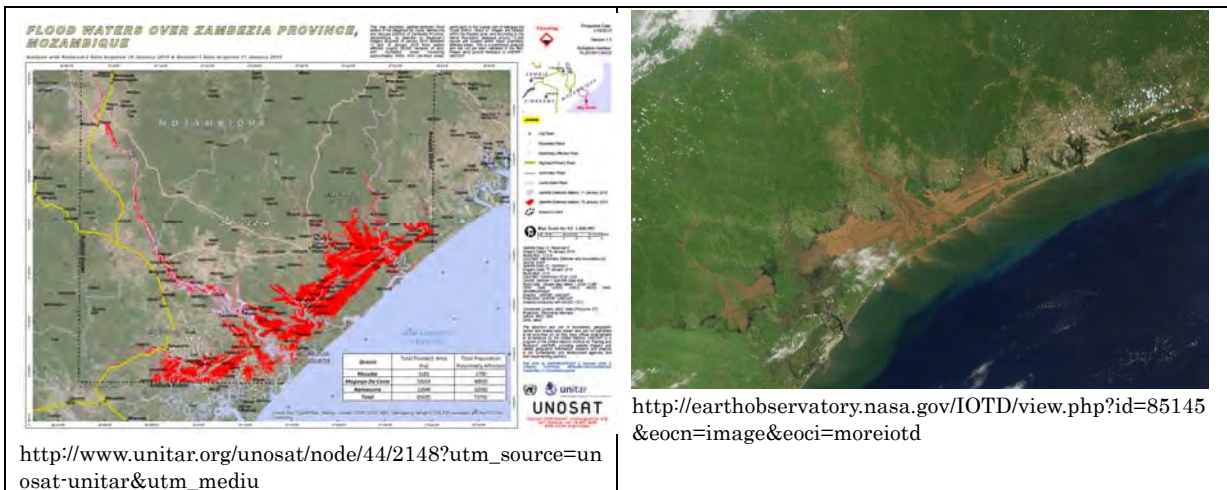
Hydro-hyeto Graph of Mocuba & Gurue Stations

Torrential rainfall occurred from 11th January to 13th. Recorded rainfall volumes are 102.2mm for 1-day and 233.4mm for 3-day in Mocuba station, 224.0mm for 1-day and 354.7mm for 3-day in Gurue, respectively. Probabilities of these rainfall amounts are evaluated as follows.

Probability of rainfall

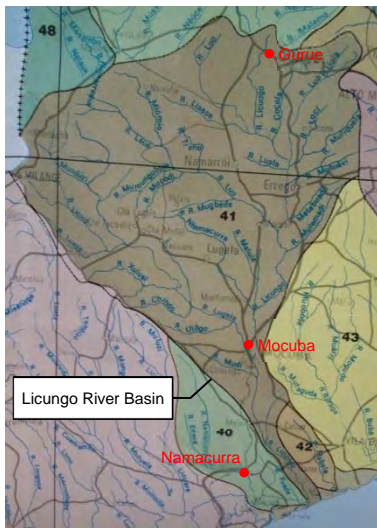
Station	n-day	Rainfall	Probability
Mocuba	1-day	102.2 mm	XX-year
	3-day	234.4 mm	XX-year
Gurue	1-day	224.0 mm	XX-year
	3-day	354.7 mm	XX-year

Inundation maps were produced by some organizations as below.



2. Mocuba

Mocuba unit, which is a branch office of ARA central north, is located in Mocuba (another branch is in Gurue). The catchment area of Licungo River widely spread toward upstream from Mocuba. Licungo River and Lugela River join at Mocuba. After joining, Licungo River widens its width and flow toward downstream. Because hinterlands of the both rivers at this reach are relatively high, flood flow is restricted within riparian area without wide spreading inundation. Damages caused by this flood are riverbank erosion on the outer bank at the curved reaches, destruction of intake facility, washed away houses at riparian zone, washed away embankment at Licungo River bridge site.



Location Map of Mocuba



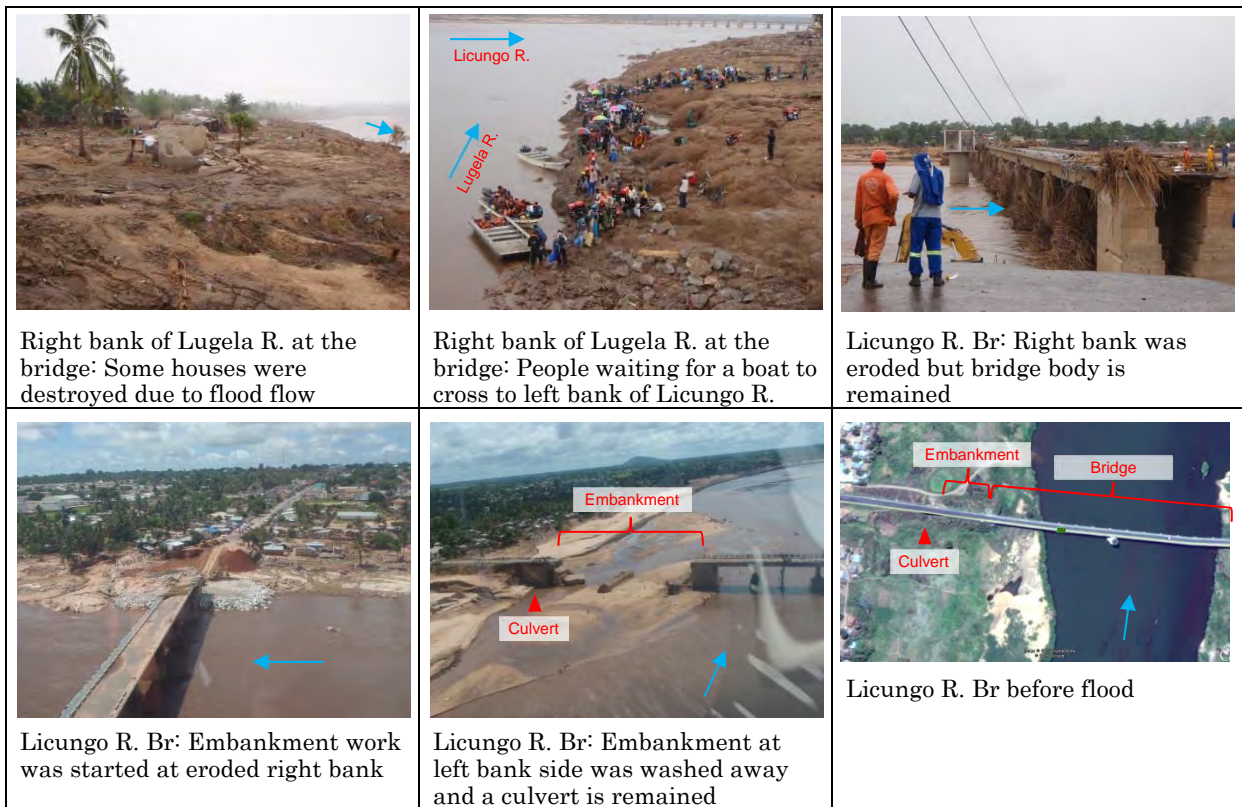
Intake facility for water supply on right bank of Lugela River was damaged



Riverbank erosion at upstream of intake facility (Lugela River)



Lugela R. Br: Some railings were washed away due to overflow but traffic is secured after cleaning the debris on the bridge



3. Route 226 bridges (Licungo II, III and other 2 bridges)

This route links Malei with Maganja da Costa. The route across Licungo River consists of 4 bridges as shown below. These bridges and riverbanks are connected with embankments of approach road. The embankments obstructed water flow and then rose up water level during flood. As a result, embankments were eroded and washed away due to overflow or turbulent flow, and bridges were collapsed due to water pressure increased by driftwoods.



Location Map of Route 226 Bridges



Approach road to Br-1: Crown of embankment was eroded due to overflow



Approach road to Br-1: Crown of embankment was eroded due to overflow



Br-1: Main body is remained but approach roads of the both side were washed away



Br-1: Eroded approach road on right bank side



Br-2: Abutments are remained but other portions were washed away



Br-2: Dropped bridge beam



Br-3: 6 spans of right bank side are remained but beams and piers of other 3 (?) spans were washed away



Br-3 (Licungo II): Bank on right bank side was eroded



Br-3 (Licungo II): Abutment on right bank side

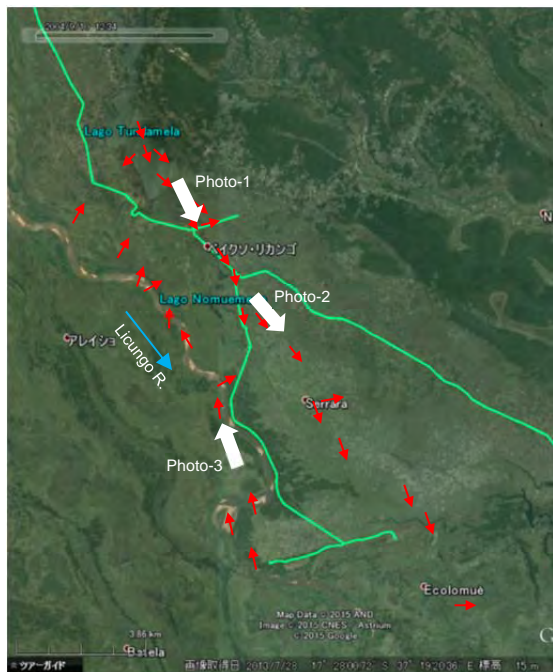


Br-4 (Licungo III): Portions except abutments were washed away and embankment between Br-3 and Br-4 was also washed away



Approach road to Br-4 completely disappeared

4. Nante



Nante, Maganja da Costa is located on the left bank side of the lower Licungo River and is a grain-producing area. The land in the downstream reach is flat and so Licungo River flows down through meandering course created by repeating floods. Because of the flat land, inundated water cannot drain promptly to Licungo River or the sea.



5. Furquia

Furquia, Namacurra district is located on the right bank side of the lower Licungo River. 13 villages out of 16 were damaged by the flood. 6 villages out of the damaged 13 have never suffered from flood before. Results of the interview with community leaders are summarized below.

- Flood warning and evacuation instruction were issued to residents through the head of Furquia and community leaders. But many residents did not evacuate because they thought that the flood was usual or the warning was not credible.
- Flood warning has been issued every rainy season.
- Some people evacuated on the trees for 4 days.



Location Map of Furquia

- Flood damage this time was severest since 1971. This flood was severer than one in 1971.
- Disaster management committee of Furquia conducted evacuation drills for villages on lower land in 2013 and 2014. Committee members were trained by INGC and Red-cross.



Interview with community leaders in Furquia



Evacuation center



Inundated area: Grass fell in the same direction due to flooding water flow

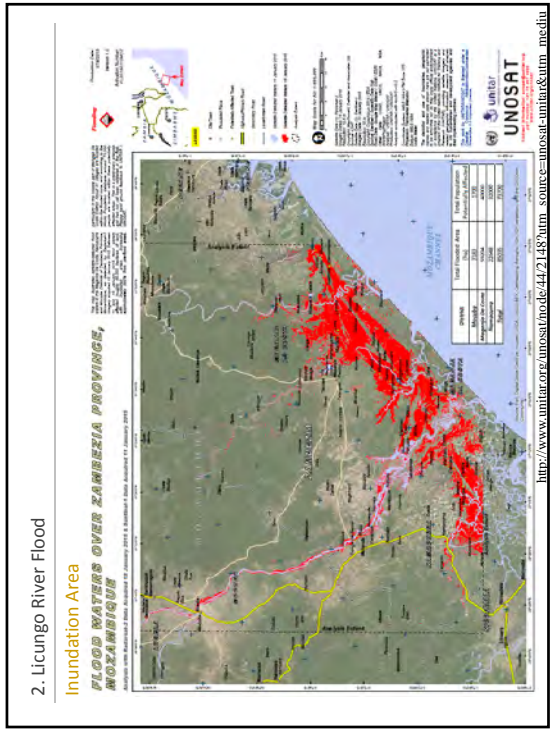
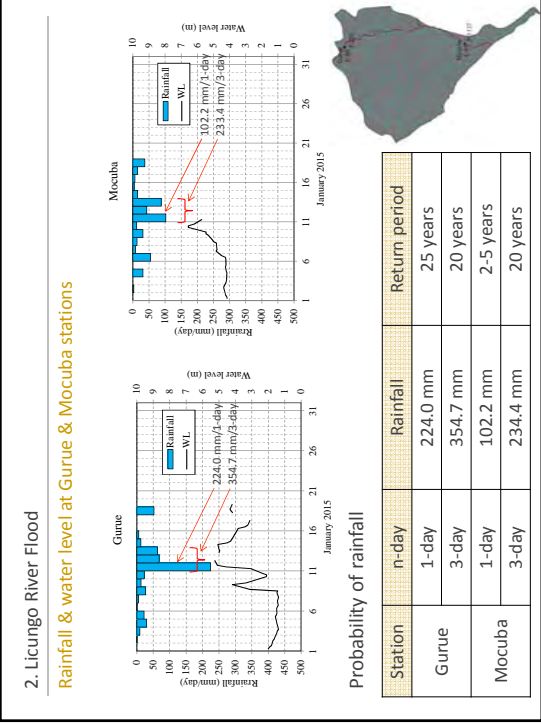
Appendix 4-2

Licungo River Flood

**ASSISTANCE
FOR
ENHANCEMENT OF INSTITUTIONAL CAPACITY
TO MANAGE WATER RELATED DISASTER RISKS
IN
MOZAMBIQUE**

WRAP-UP MEETING

February 26, 2015
 JICA Team Makoto KODAMA



2. Licungo River Flood

Intake facility

Intake facility for water supply on right bank of Lugela River was damaged.

- Appropriate location for river structures
- How to protect a river structure / river bank located at outside of curve portion

2. Licungo River Flood
Riparian Houses

Riparian houses were destroyed and washed away.

- Identification of flood risk area
- Lane-use regulation/restriction of building/promotion of moving to safer place

2. Licungo River Flood
Bridge (Mocuba Bridge)

2. Licungo River Flood
Bridges (Malele Bridges)

2. Licungo River Flood
Bridges

Mocuba Bridge: Right riverbank was eroded and embankment for approach was washed away.

Malele Bridge: Some bridge beams and piers were destroyed and embankments between bridges were washed away.

- Evaluation of water level raising due to bridge and embankment in the river
- Hydraulic condition for bridge design
- Protection of river bank connecting with a bridge

2. Licungo River Flood

Dike in Nante, Maganja da Costa District



Dike was eroded in many places.

- How to decide height, width and side slope of dike
- Target flood for dike planning

2. Licungo River Flood

Warning & Evacuation

Interview in Furquia Post, Namacurra District

Flood warning and evacuation instruction were issued to residents but many residents did not evacuate because they thought that the flood was usual or the warning was not credible.

Risk management committee of Furquia conducted evacuation drills for villages on lower land in 2013 and 2014.

- More accurate early warning system
- Early warning message stimulating people to evacuate promptly



3. Topics To Be Focused On

Political aspect

- Land use regulation
- Discussion between river and road administrators on bridge plan
- Introduction of river management in Japan

Technical aspect

- Identification of flood risk area
- Evaluation of influence of bridge and embankment in the river on water level
- Early warning (accuracy, alert level, message)
- Hydraulic condition for plan of dike, bridge and other structures
- Runoff modeling and flood simulation modeling
- Rainy Season Report

4. Next Activities

Base line survey

To grasp fundamental information of the Assistance

- Main rivers
- Legal system
- Policy
- Organization
- Donor's projects

~ June 2015

Based on the result, review and advice regarding followings are implemented.

- HFA and post-HFA
- M/P of disaster prevention and mitigation
- water related disaster management
- human resources and institutional development plan

Based on the result, transfer technology is designed.

- field and item
- target organization/personnel
- schedule
- goal to be achieved, and others

