Appendix A

Results of Official Meetings and Seminar

RESULTS OF OFFICIAL MEETINGS AND SEMINAR

1. Kick-off Meeting on Inception Report

1.1 Outline

In order to discuss on the Inception Report (Draft), the Kick-off Meeting was conducted. The Study Team presented key issues of the Inception Report, namely, survey objective, target areas, survey schedule, survey items, staffing schedule and reports to be submitted, etc. The outline of the Kick-off Meeting is as follows:

(1) Date/ Venue

- Date : March 12, 2013, Tuesday, 13:40 – 16:40
- Venue : Amihan Conference Room, PAGASA Science Garden Complex, Diliman, Quezon City

(2) Participants

Total of 45 persons (PAGASA, NIA, NPC, DPWH-FCSEC, DPWH-MFCDP, OCD, MWSS, MMDA, JICA Philippine Office, JICA Long-term Experts, JICA Study Team, etc.)

1.2 Results

The results of discussions are compiled in Appendix E with agenda and attendance sheets. After the Kick-off Meeting, the Study Team has received the comments from PAGASA HMD by March 22, 2013. The Final Version of the Inception was officially submitted to JICA Philippine Office on March 25, 2013 incorporating due correction in accordance with the comments of PAGASA.

2. Seminar at Tuguegarao (Cagayan River Basin)

2.1 Outline

In the course of the preparation for the Seminar, its outline was substantially discussed among PAGASA, JICA Philippine Office and the Study Team. As a result, the following were set (actual status):

(1) Objective

1) To extract crucial issues/future strategy for elaboration/ strengthening of existing FFWS in the Cagayan River basin
2) To verify crucial issues for expansion of existing FFWS to other river basins (ex. Davao River basin in Mindanao)

(2) Date/venue

- Date : April 11, 2013, Thursday, 8:30 – 17:00
- Venue : Multi-function room, Holiday Plaza Hotel, Tuguegarao City, Cagayan Province

(3) Participants

Total of 46 persons (including local media consisting of three persons and the Study

Team) from PAGASA HMD, Cagayan River Basin Flood Forecasting and Warning Center (CRBFFWC), Agno River Basin Flood Forecasting Center (ARBFFWC), Pampanga River Basin Flood Forecasting and Warning Center (PRBFFWC), DOST-Region 2, OCD Region 2, DPWH Region 2, NIA-Magat River Integrated Irrigation System (MARIIS), Provincial/Municipal/ City Governments, the Embassy of Japan, and JICA Philippine Office.

2.2 Methodology

To achieve the objectives of the Seminar, the "SWOT" ("Strengths, Weaknesses, Opportunities and Threats") analysis method was applied. In fact, the Seminar was more appropriately a style of workshop with the participation of all attendees. The SWOT is one of the common tools in framework planning widely applied for policy making of the government and private sectors, urban/regional planning and social development, etc.

First of all, the Study Team provided brief guidelines on the methodology with the explanation of some references for the group discussions for the participants. In the light of the objectives of the Seminar, two groups were assigned to discuss the different aspects of the Cagayan River basin and one group, for the other river basins. Details are as follows:

(1) Group A (Cagayan-A)

- Topic : Hydrological monitoring and analytical tools
- Number of Members : 15 persons

(2) Group B (Cagayan-B)

- Topic : Equipment and information sharing
- Number of Members : 12 persons

(3) Group C (Other River Basin: Davao River basin in Mindanao)

- Topic : Overall items for FFWS to be considered in new river basin
- Number of Members : 8 persons

The sequence of the discussions and allocated time frame for each element of SWOT can be summarized as follows (time varied a little in each group):

(1) Brain storming : 30 min.
(2) Analyses of internal and external environments (factors) of existing FFWS : 60 min.
(3) Cross SWOT Analysis : 70 min.
(4) Wrapping-up of future actions and strategy : 20 min.
(5) Presentation to the participants : 30 min.
(6) Evaluation : 15 min.

(A quick evaluation of the Seminar results was made and addressed by Dr.S.R.Espinueva (Chief, PAGASA HMD) and Mr.Y.Motoki (Team Leader, JICA Study Team)

2.3 Major Outputs

The results of Cross SWOT analyses of the three groups are presented in Tables 2.1 to 2.3. Based on the results of the discussions, findings (required future actions identified) are analyzed as below:

(1) In case of Cagayan, the demand for utilization of advanced technology and its training is rather high due mainly to conducting IFAS training in 2012 by ICHARM and flood drills under the former JICA TCP, etc. Therefore, expectation on further development and application of advanced technology might be common in the personnel of LGUs concerned.

(2) Many participants noted that the importance of capacity building of the personnel engaged in FFWS and close coordination between central government and LGUs. Further, penalize the people connected pilferage of FFWS facilities, etc. is widely acknowledged very important.

(3) Increase of monitoring stations, real time flood forecasting, effective utilization of radar rainfall and IEC for LGUs will be the key in the Davao River basin. Further, the river basin (or stretches) involve urban areas at hinterland, special attention will be required to protect facilities from vandalism with proper coordination with LDRRMCs.

2.4 Other Activities

Aside from the program of the Seminar for the three group discussions, the current crucial issues were explained by the representatives of the PAGASA Agno River Basin FFWC (ARFFWC) and the Pampanga River Basin FFWC (PRFFWC) respectively. Their points can be summarized as follows:

Mr. Nestor B. Nimes, Senior Weather Specialist of the PRFFWC noted that although the Pampanga Office is performing well as acknowledged by Dr. Susan R. Espinueva, certain issues require attention. These consist of: 1) faster internet and efficient telephone connections, 2) linkage of LGU to river basin data for more speedy transfer of information, 3) additional technical personnel and experts, and 4) lightweight boat with motor for ease in discharge measurement.

Mr. Hilario G. Esperanza, OIC of the ARFFWC, specified two (2) main concerns: 1) lack of personnel to conduct verification of flood forecasting information and 2) outdated equipment or no equipment at all to effectively compute the total capacity of the channel, among others.

3. Preliminary Meeting on Interim Report (Draft)

The Preliminary Meeting to discuss the Interim Report among PAGASA, JICA Philippine Office and the Study Team was held as follows:

(1) Date/venue

- Date : April 26, 2013, Friday, 9:30 – 11:00
- Venue : Amihan Conference room, 2nd FL, PAGASA Science Garden, BIR Road, Diliman, Quezon City

(2) Participants : Total of 34 persons (PAGASA, JICA Philippine Office, JICA long-term experts, Study Team)

4. Final Meeting

The meeting for discussion on the Final Report was conducted with participation by PAGASA and JICA Philippine Office as follows:

(1) Date/venue

- Date : September 13, 2013, Friday, 13:00 – 16:30
- Venue : Amihan Conference room, 2nd FL, PAGASA Science Garden, BIR Road, Diliman, Quezon City

(2) Participants : Total of 23 persons (PAGASA, JICA Philippine Office, JICA, NWRB, NPC, DPWH, OCD, MWSS, Long-term expert, Study Team)

Table A.1 SWOT Analysis Output of Grpup A (Cagayan – A)

INTERNAL FACTORS / EXTERNAL FACTORS	**STRENGTHS**	**WEAKNESSES**
	S1. Willingness of Academe and LGUs to support FFWS **S2.** Existing 5% Calamity Fund for LGUs **S3a.** Established radio communication to all agencies **S3b.** Existence of 3 experts in operational hydrology **S4a.** Established 4 Magat FFWS and PAGASA **S4b.** Existing Flood Monitoring Station along Cagayan River **S5a.** Existing Flood Model (Stage to Stage Correlation Method; very soon, LIDAR Data available) **S5b.** Updated Manual for Magat FFWS	**W1a.** No permanent personnel for LGU DRRMO **W1b.** Lack of Experts in Hydrology, Telecommunications Engineering, IT, and Flood Modeling **W2.** Inability to access fund sources due to limited know how and staff **W3.** No analytical tools for Inundation Model **W4.** Very limited Monitoring Stations in tributaries of Cagayan River **W5.** Lack of alternative communication during extreme calamities
OPPORTUNITIES **O1a.** Availability and understanding of FF Models (Others which can be accessed by PAGASA) **O1b**. Application of Remote Sensing Data for river management **O1c.** Relevant and applicable technologies **O2a.** Availability of funds from ODA and GOP **O2b**. High priority of DRR-CCA budget allocation **O2c.** Availability of projects **O3.** Intensive IEC on data interpretation, etc. **O4.** Enhance personnel in the different training/seminars/workshops attended **O5.** Establishment of the Cagayan River Basin Authority	S1 x O1; S2 x O2; S1 x O1b: Training on FF Models S1 x O5; S2 x O5: Initial meeting; convene stakeholders; utilization of funds S3b x O4; S3a x O4: Capability-building of personnel **Action Points** 1. Tap into the knowledge, skills, and experience of the academe in proposal preparation to access ODA and GoP funds and projects related to FFWS. 2. Conduct training and capability building among PAGASA Staff on FF Models and hands-on application of remote sensing data for river management, among others. 3. Hold extensive consultations and focus group discussions among various stakeholders while processing the establishment of the Cagayan River Basin Authority to ensure an integrated framework which contains complementary policies and implementation procedures. 4. Develop relevant and easy-to-understand IEC materials to involve a broader avenue for action especially among the LGUs.	W1a x O2a W1b x O2b: Increase number of technical personnel W3 x O1: Trainings/seminars on Inundation Model W4 x O1b: Training on application on remote sensor W4 x O2c W5 x O1c W3 x O2c: Procurement of inundation model **Action Points** 1. Explore the possible existence of ODA and GoP projects and funds which will provide: - initial support to the LGU DRRMOs until these are able to access internal local funds as stipulated by the law, - for the setting up of monitoring stations in tributaries, - short and long term education on hydrology, telecommunications, IT, and flood modeling, and - intensive training on proposal preparation. 2. Seek relevant and applicable technologies to respond to the lack of alternative communication

		during extreme calamities.
THREATS **T1.** All installed ARG and WL will be outdated and there will be a lack of spare parts **T2.** Constant change in political leadership **T3.** Lack of staff to implement prospective projects **T4.** Inaccessibility of ideal site **T5.** Overlapping of projects	S2 x T1: Procurement of equipment S2 x T3: Capacity building S3b x T5: Hiring of additional experts S1 x T3: Support of Academe/LGU to implement prospective projects **Action Points** 1. Establish a stronger and long-term relationship with State Universities and Colleges so as to: - influence the setting up and/or strengthening of courses related to FFWS and - access on a regular basis skills needed to train/build capability of staff as well as implement projects. 2. Procure equipment with the local funds available; study sustainability of equipment procured and explore possibility of local fabrication (as may be engaged in by non-governmental organizations or NGOs) so as to avoid the problem of non-availability of spare parts. 3. Identify and develop an inter-agency team of regular staff at the LGU level so as to sustain projects even if there is a change in political leadership. 4. Organize a Review Team to process incoming projects so as to prevent or minimize overlapping.	W1a x T3: Staffing of LGU DRRMO W4 x T4: Improve accessibility **Action Points** 1. Work on the staffing of the LGU DRRMO initially with personnel from other units of the province/municipality until such time a regular budget is in place. Further, encourage volunteerism among civic organization to support LGU efforts. 2. Coordinate with the Barangay in the selection of sites and the installation of any equipment. Solicit their commitment and agreement to be responsible for the security of what will be set up. Negotiate some type of compensation/trade off for the task of securing facilities. 3. Seek means of alternative/indigenous communication systems during extreme calamities through brainstorming with the local residents. Some systems could be suggested by the communities which often experience events of disaster.

Source: Study Team

Table A.2 SWOT Analysis Output of Group B (Cagayan-B)

INTERNAL FACTORS / EXTERNAL FACTORS	STRENGTHS	WEAKNESSES
	S1. Presence of a regional surveillance radar (doppler) and Flood Forecasting and Warning Center **S2.** Existence of operational metro-hydro equipment **S3.** Presence of flood control structures/ continuing projects on dike/ flood control structures **S4.** Presence of small water impounding projects (SWIP) between LGUs and the Department of Agriculture (DA) **S5.** Functional DRRMCs and DRRMOs **S6.** Functional network of information dissemination **S7.** Updated comprehensive land use plan (CLUP)/ local government code (RA 7160)	**W1.** Inadequate dedicated communication network **W2.** Redundant power supply **W3.** Limitations of IEC at the grass-root level and simulation of flood drills **W4.** Inadequate technical know-how on data interpretation **W5.** Personnel limitations on DRRMOs **W6.** Budgetary constraints for flood control structures/ non-structural measures
OPPORTUNITIES **O1.** All-out support of LCEs and the national government **O2.** Utilization of DRRM funds for pre-disaster **O3.** Conduct of periodic capacity building **O4.** Assistance of other funding agencies for FEWS/ LFEWS **O5.** JICA studies on river characteristics **O6.** Extensive IEC not only on pre-disaster, but also considering the environmental aspects	S1, S2, S3, and S4 x O1: - Continuing cooperation with the LCEs and LGUs on all activities undertaken relative to DRM as this will bridge the gap between the warning agency and the end user. S5 and S6 x O1 and O2: - Encourage the community to set-up an information platform S7 x O6: - Continuing IEC at the grassroot level. Reaching the community through IEC could strengthen their ability to identify high risk areas to disaster, improve their capacity to identify appropriate developmental efforts and at the same time identify appropriate/applicable pre and post disaster measures. **Action Points** 1. Ensure that there is always constant communication with the LCEs and LGUs. 2. Disseminate posters, ads, etc. showing pre and post disaster measures. 3. Include the community in flood drills/ disaster prevention activities.	W1 and W2 x O1: - Include the participation of private sectors - Seek assistance of TelCos in the provision of an emergency hotline W3, W4, and W5 x O3: - Training and IECs must be an integral part of DRM activities and should be earmarked as priority activities for both the warning agencies and the community. - Conduct Trainor's training for community leaders who can provide the "spread effect" (pass what they have learned to the community). - Incorporate DRM in school curricula - Networking with the other sector (health, environment, etc.) and even the private sector in the conduct of trainings and pre-disaster activities, including multi-hazard mitigation exercises/ drills (flood, earthquake, and even fire). Important component for the flood drill is a thorough understanding of the flood warning levels as this will define the relevant and effective actions that will be undertaken by the threatened communities. - Encourage participation of volunteers W6 x O4 and O5: - Synergize the activities of all funding agencies in a specific area to ensure no duplication of similar undertakings and maximization of resources. **Action Points** 1. Coordinate with focus personnel for the conduct of training and capacity building activities. 2. Scope of Works and Terms of References of Projects related to flood control/ DRM should be carefully scrutinized/ closely examined in order to avoid overlapping of activities. 3. Allot budget for generator sets which may come in handy in times of disaster and power outage.
THREATS **T1.** Continuous siltation of river systems **T2.** Lack of will to implement CLUP **T3.** Not full implementation of the Solid Waste Act (RA 9003) **T4.** Uncontrolled urbanization	S7 x T2, T3, and T4: - Application of the participatory approach which may encourage responsibility and commitment from the community. **Action Points** 1. The national/ provincial level can work together with the community in coming-up with initiatives or actions that would address the provisions of the CLUP or Local Government Code. Provisions for the code may include charges against violators.	W6 x T1: - Enjoin the LGUs to include desilting as part of their DRM activities. **Action Points** 1. Desilting of river stretches through the required survey sounding works as part of DRM activities

Source: JICA Study Team

Table A.3 SWOT Analysis Output of Group C (Davao River Basin)

INTERNAL FACTORS / EXTERNAL FACTORS	**STRENGTHS** **S1.** Typhoons have never landed and hit the river basin **S2.** Requirement of FFWS is high for proper river management **S3.** Presence of synoptic/weather and upper air station **S4.** PAGASA's recent policy (priority in Mindanao) **S5.** Favorable relationship between LGUs and province/city	**WEAKNESSES** **W1.** Flood river models are only at experimental/research stage **W2.** No sufficient WLS and RS **W3.** No historical WL data **W4.** Limited human resources **W5.** High population density downstream
OPPORTUNITIES **O1.** Davao airport caters international flights with available seaports (touristic destination) **O2.** Development by private sector is possible; developing commercial area **O3.** Collaboration with DPWH may be strengthened for river management **O4.** Stable political condition with no planned projects **O5.** CDRRMC may be strengthened	S1 x O1, O2: Socio economic development has great potentitial that needs to be protected, particularly in the business, agriculture, and tourism sector S1 x O1, O2: Highly recommended for the establishment of FFWS center to monitor the hydromet parameters in collaboration with other agencies, LGUs and stakeholders S2, S3 x O3: Strenghten 'regionalization' by access to innovative customized products using radar technology and satellite technology S2, S3 x O3: Establish FFWS involving other agencies and private sectors **Action Points:** 1. Promote socio-economic activities (such as forums, conferences, etc.) which demonstrates the benefits of the different sectors of society in relation to FFWS. 2. Implement the use of modern radar and satellite equipment technology in weather monitoring at the Davao River basin. 3. Promote the establishment of a FFWS center in the river basin with collaboration and participation of LGUs and the private sector.	W1 x O4: Establish dedicated communication link between PAGASA and OCD for forecast/warning dissemination and verification W2, W3 x O4: Installation of sufficient FFWS in Davao River basin and increasing WL and rainfall gauging station W4 x O4: Recruit new young engineers to be trained in technical know-how, especially in FFWS W4 x O5: Conduct IEC for CDRRMC , LGU personnel and other stakeholders W4 x O5: Training of CDRRMC line agencies and personnel, hiring new staffs to increase the capacity of human resources **Action Points:** 1. Development of an online flood warning system which posts real time weather data to be shared between PAGASA, OCD and other LGUs. 2. Install additional water level and rainfall gauging stations in the Davao River basin for flood monitoring. 3. Hiring and training of technical personnel to facilitate FFWS activities, such as hydrologists, engineers, IT specialists, etc. 4. Increase the involvement and knowledge of CDRRMC and LGUs by conducting information education communication seminars and trainings.
THREATS **T1.** Typhoon occurence are getting nearer recently in the area **T2.** Some people chose to live in low level land and have preffered to stay there **T3.** Awareness of people on flood is low **T4.** Informal settlers occupied the drainages/waterways **T5.** Vandalism and pilferage is possible	S4 x T1, T3: Increase people's awareness on flood through LGUs, IEC; including flood drill S4 x T3: Conduct constant flood information to the affected residents S5 x T2, T3: FFWS center establishment is the answer to PAGASA policy on upgrading for the impending threat on typhoon frequency of occurence **Action Points:** 1. Constant dissemination of flood warning information to local residents through advertisements, pamphlets, posters, etc. 2. Promote regular flood drill activities to increase the knowledge of residents in disaster management. 3. Construction/placement of evacuation sites at strategic places for easy accessibility of residents living near flood prone areas.	W5 x T4: Promulgation of policies preventing the construction of structures at/near drainages and waterways W5 x T4: Relocation project for informal settlers to reduce/prevent opportunities for vandalism and pilferage W5 x T5: Proper fencing for weather equipments against vandalism **Action Points:** 1. Coordinate with the local government in the enforcement of policies which prevent the construction of structures near drainages and waterways. 2. Resettlement of informal settlers away from riversides, drainages, waterways, as well as away from monitoring stations. 3. Strategic placement of weather equipments to prevent vandalism/pilferage; with proper fencing and staffing to monitor and guard the equipment.

Source: JICA Study Team

Appendix A-1

Output of Kick-off Meeting

Japan International Cooperation Agency

Department of Science and Technology
Philippine Atmospheric, Geophysical and
Astronomical Services Administration (PAGASA)

DATA COLLECTION SURVEY
ON
SITUATION OF NATIONWIDE FLOOD FORECASTING AND WARNING SYSTEM

Kick-off Meeting

March 12, 2013
Conference Room, 4th FL., PAGASA,
Diliman, Quezon City, Metro Manila

Nippon Koei Co., Ltd.

Session 1

Outline of the Survey

Basic Recognition

Page 2-1~5, IC/R

- Expectation to expansion of existing FFWS to nationwide to cope with habitual floods and disasters
- Rapid increase of assistance provided by the donors and international cooperation organizations in conformity with national projects, such as DREAM/NOAH project, aiming at reducing casualties due to typhoon and flood disasters
- Appropriate services of FFW by PAGASA meeting with the acute demand for strengthening in-house human resources, tools for hydrological analysis, monitoring equipment, etc.
- Needs on introduction / coupling in FFWS with contemporary technology in monitoring system/analytical tools and telecommunication systems, etc.

"Data Collection Survey on Situation of Nationwide Flood Forecasting and Warning System"

Objectives

Page 1-2, IC/R

- To identify the crucial issues on rapid expansion of work territories in five river basins where FFWS already exists,
- To clarify the current conditions and prospects on future development in 13 major river basins,
- To identify the crucial issues in the river basin that does not belong to the major river basin, and
- To clarify needs on capacity development in the aspects of policy making, planning, organization, equipment, technology, finance, etc., in all 19 target river basins through above activities.
- To prepare the Priority Lists

Target Areas (1/2)

Page 1-2, IC/R

- **Five river basins** being equipped with FFWS
  - Luzon Island: Agno, Bicol, Cagayan, Pasig-Marikina and Pampanga
- **13 river basins** being not equipped with FFWS
  - Luzon Island : Abra and Abulug
  - Visayas : Panay, Jalaul, Ilog-Hilabangan
  - Mindanao Island : Agusan, Agus-Lake Lanao, Buayan-Malungon, Cagayan De Oro, Mindanao (Cotabato), Davao, Tagoloan, Tagum-Libuganon
- **One river basin** where has been hit by recent devastated flood
  - Mindanao Island : Mandulog (Iligan City)

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Location of Study Area

Target Areas (2/2)

Page 2-5, IC/R

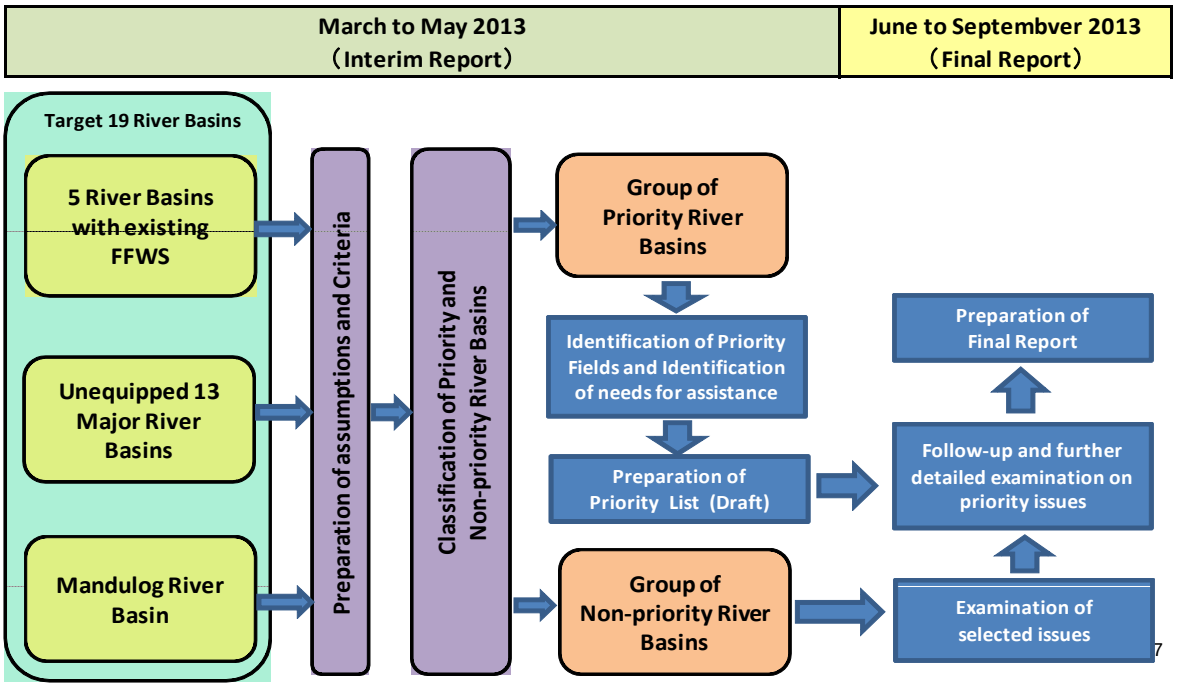

5 River Basins with Existing FFWS


19 Target River Basins

6

Methodology (1/3)

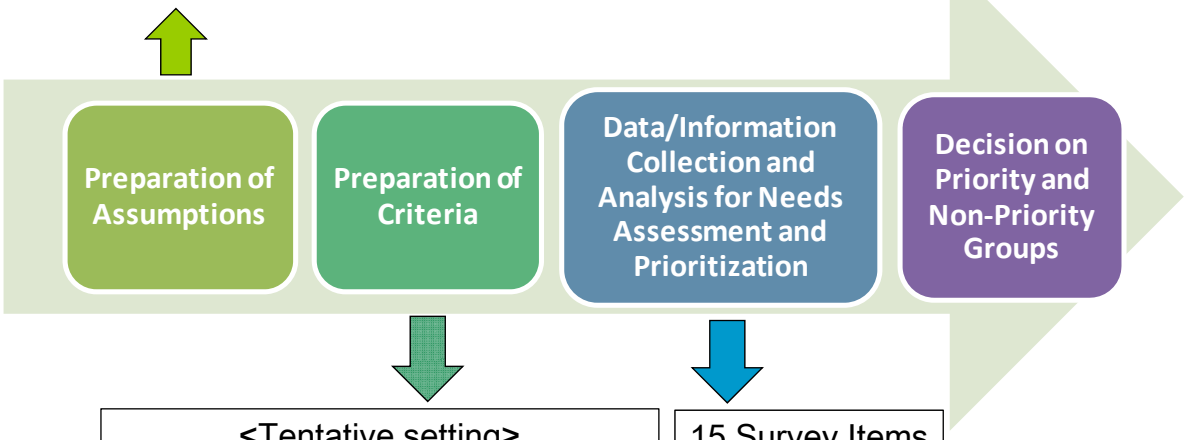
Page 2-8~9, IC/R



Methodology (2/3)

Page 2-9~11, IC/R

◆ Needs of FFWS are high ⇨ ・ Many casualties and affected residents by floods in past
・ Big population and frequent occurrence of flood inundation

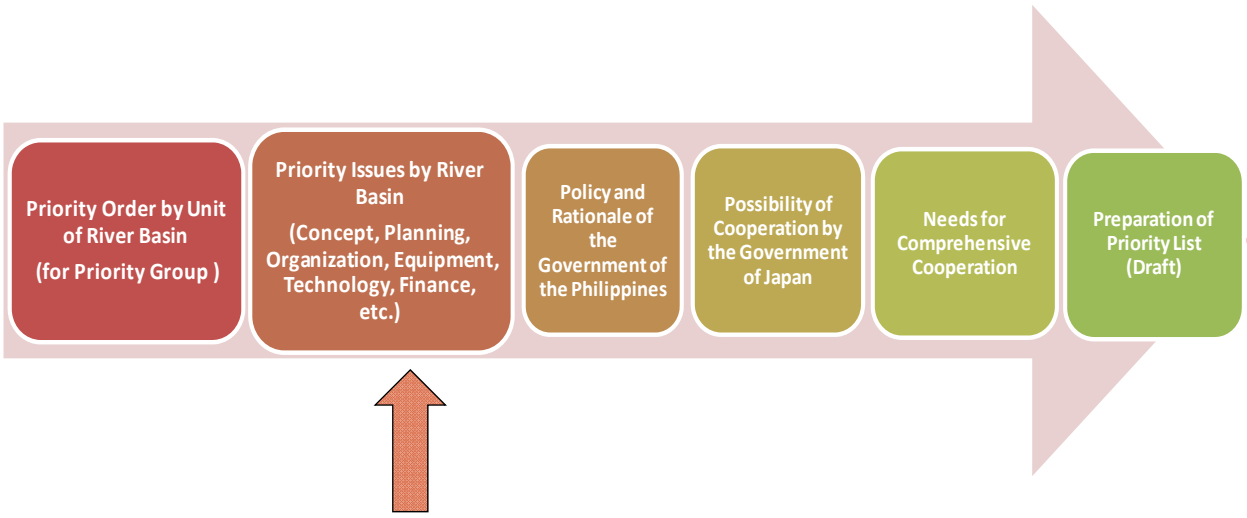


<Tentative setting>
◆ Number of deaths and casualties
◆ Population in flood prone areas
◆ Seriousness of inundation

15 Survey Items

Methodology (3/3)

Page 2-11~13, IC/R



Contemporary advanced technology for observation/ analysis and information dissemination/sharing in Japan

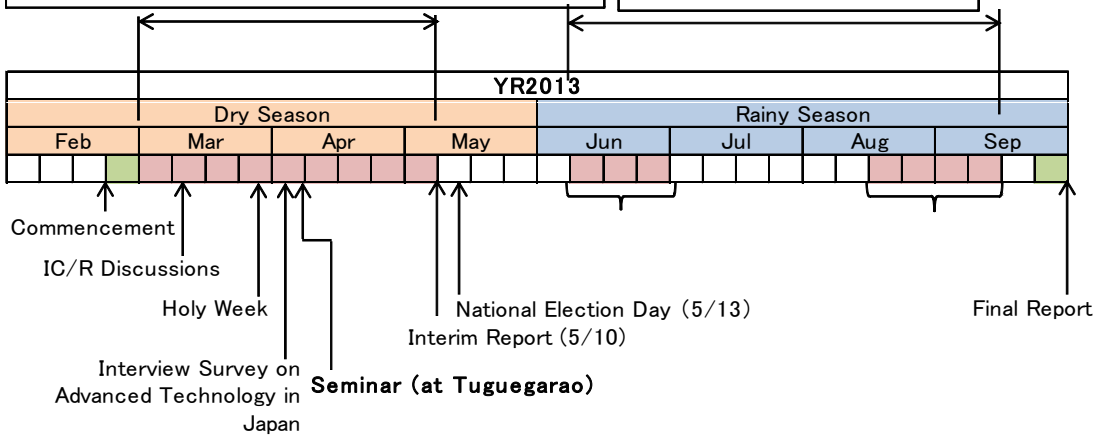
9

Overall Work Schedule

Work Flow Chart

- Collection and analysis of related data and information
- Identification of Priority River Basins
- Stage-wised procedure for formulation of Priority List
- Identification of priority field
- Identification of needs in integrated support
- Needs assessment on application of Advanced technology in Japan
- Formulation of Priority List (Draft)

- Priority River Basins: Follow-up and further detailed examination on priority issues
- Non-Priority Basins: Examination on only selected issues



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Survey/Study Contents (1/2)

Page 3-3~10, IC/R

1. Current Policy, Plan and Program of the Government of the Philippines and on-going/ Future Projects by Donors and by the Government of the Philippines
2. Current Status of Utilization of Existing FFWS
3. Current Status of Utilization of Flood Runoff Models
4. Current Status of Accumulation and Utilization of Meteorological and Hydrological Data
5. Current Status of Accumulation and Utilization of River Cross Sections
6. Current System for Issuance of Flood Warning
7. Current Status of Coordination System among Concerned Agencies
8. Current Procedure of Transmission of Monitored Data and Flood Information to the Concerned Agencies
9. Current Status of Communication Systems

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Survey/Study Contents (2/2)

Page 3-3~10, IC/R

10. Current Condition of Existing Equipment and Plan for Adoption of New Equipment for FFWS
11. Current System for Operation and Maintenance of Existing Equipment
12. Current Condition of Inundation Analysis, Data Accumulation and Updating System
13. Current and Future Issues and Risks related to All Aspects
14. Needs for Cooperation by Degree of Priority
15. Flood Damage Potential in Flood Prone Areas

12

On-going Donor's Projects/Programs (1/2)

Page 2-2, IC/R

No.	Name of Project	River Basins	Period	Responsible Agencies	Naitons
1	GMMA Risk Assessment Project (RAP)	Metro Manila area	2010-2013	AusAID/Gov. of Australia	Australia
2	Strengthening of Flood Forecasting and Warning System in the Bicol River Basin ("Bicol Project")	Bicol River basin	2010-2013	Gov. of Japan	Japan
3	Strengthening of Flood Forecasting and Warning System on Magat Dam Downstream Communities ("NORAD Project")	Magat River basin	2010-2013	NORAD	Norway
4	Building Community Resilience and Strengthening Local Government Capabilities for Recovery and Disaster Risk Management ("Resilience Project")	Metro Manila area	2010-2013	UNDP/CIDA	United Nations/ Canada
5	UNDP Ready for GMMA Project	Laguna, Cavite, Rizal and Bulacan	2010-2013	UNDP/AusAID	United Nations/ Australia
6	Applying Remote Sensing Technology in River Basin Management in the Philippines	Cagayan River basin	2013	ADB/JAXA	ADB/Japan
7	Establishment of an Early Warning and Monitoring System for Disaster Mitigation in Metro Manila	Metro Manila area and Rizal Province (Pasig-Marikina River basin)	2010－2012	KOICA/DOST-PAGASA	Korea
8	Integrated Disaster Risk Reduction and Climate Change Adaptation (DRR/CCA) in Local Development Planning and Decision-making Process	13 Regions and 82 Provinces	To be confirmed	UNDP/AusAID/ & NZAP/NEDA	United Nations/ Australia/ New Zealand

Note: This list covers only HMD related projects/programs.

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On-going Donor's Projects/Programs (2/2)

Page 2-2, IC/R

No.	Name of Project	River Basins	Period	Responsible Agencies	Naitons
9	Enabling the Cities of Cagayan de Oro and Iligan to Cope with Climate Change (Project Climate Twin Phoenix")	Cagayan de Oro and Mandulog River basins River basin	2013-2014	UNDP/AusAID	United Nations/ Australia
10	Resilience Capacity Building for Cities and Municipalities to Reduce Disaster Risk from Climate Change and Natural Hazards ("ReBUILD Project")	Region 2 (Cagayan), Region 3 (Pampanga River), Region 6(Jalaur, Acran, Panay and Ilog-Hillabangan)	2013-2015	UNDP/NZAP	United Nations/ New Zealand
11	Establishment of a Pilot Automatic Warning System (AWS) in Cagayan de Oro River Basin	Cagayan de Oro River basin	2013	NDMI/MOPAS, Korea	Korea
12	Counter plan for Extra-ordinary Flood	Pampanga River basin	2012-2014	UNESCAP/ WMO/TC/KICT	—
13	Data Collection Survey on Situation of Nationwide Flood Forecasting and Warning System	All major river basins and Mandulog River basin	2013	JICA	Japan
14	Operationalization of KOICA 2 Project	Pasig-Marikina River basin	2013	KOICA	Korea
15	Disaster Preparedness & Response Project	Benguet, Cagayan, Laguna and Sorsogon Provinces	2013	UN-WFP	United Naitons
16	FAO-A MICAF Project (Modeling System for Agricultural Impacts of Climate Change)	—	2012-2013	FAO/GOV (Min. of Agriculture and Fishery)	Japan
17	Philippine Climate Change Adaptation Project (PhilCCAP)	Region 2 and Region 6	2011-2015	World Bank	—

Source：PAGASA Website

Legend: This Survey

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Contemporary Advanced Technology (Example)

- Meteorological and Hydrological Observation and Analysis
  - IFAS (Integrated Flood Analysis System)
  - X-band MP (multi-parameter) rainfall radars
  - GSMap (Global Satellite Mapping of Precipitation)
  - LIDAR (Light Detention and Ranging) Technology, etc.

- Information dissemination/sharing and networking
  - Big data storage and database system with cloud computing
  - Terrestrial Digital Broadcasting
  - LTE (Long Term Evolution) system for telecommunication
  - Social Networking Service (SNS), etc.

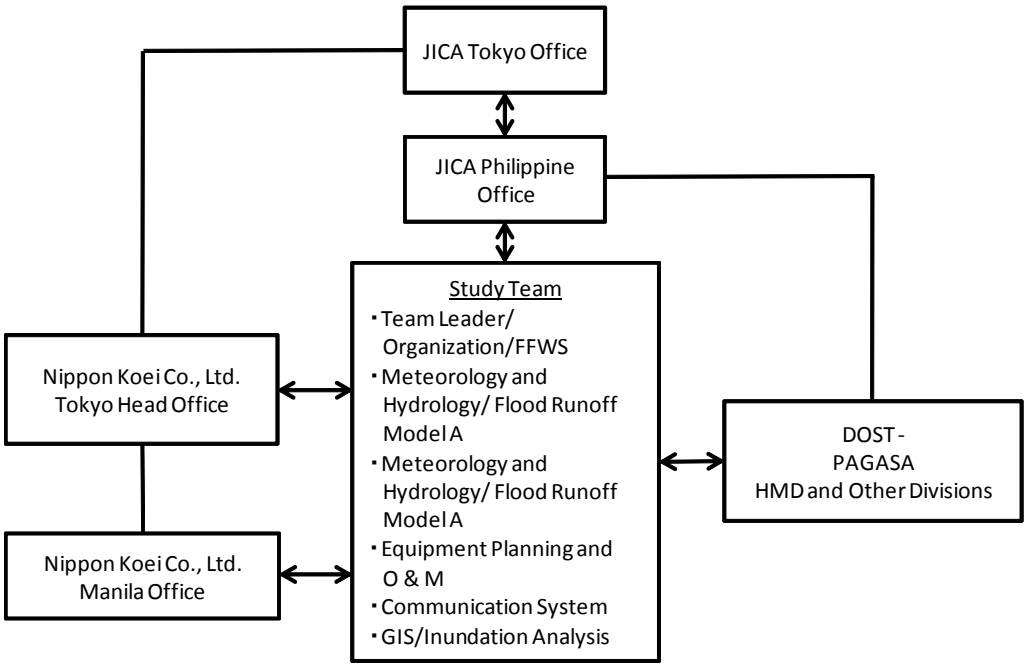
Outputs

Page 4-2, IC/R

Name of Report	Main Contents	Schedule of Submission	Nos. of Volume
Inception Report (IC/R)	Background, objectives, plan of approach, contents of the Study, Plan of Operation, composition of the Study Team, assignment schedule and tasks of the consultants, reports to be submitted, role of the counterparts, and required data/information, etc.	Beginning of March 2013	10 copies with CD-ROM
Interim Report (IT/R)	Outline of the Study, results of the Study in the duration up to Interim Report, superiority of assistance of Japan, minutes of the official meetings, list of collected data/information, and required information ,etc.	Beginning of May 2013	15 copies with CD-ROM
Final Report (F/R)	Outline of the Study, actual assignment schedule of the Study Team, methodology of the Study, outputs, minutes of the official meetings and list of collected data/information, etc.	End of September 2013	20 copies with CD-ROM

Organization

Page 5-1, IC/R



Staffing Schedule

Page5-2, IC/R

	Position	Name	Company	2013 2	3	4	5	6	7	8	9	Man-month Field	Home
Japanese Consultants	Team Leader/ Organization/Flood Warning	Yoshihiro MOTOKI	Nippon Koei Co., Ltd.		3/4 (70)		5/12	(20)			(30)	4.00	
	Meteorology and Hydrology/ Flood Runoff Model A	Shuji HIROTA	Nippon Koei Co., Ltd.		3/4 (30)	4/2						1.00	
	Meteorology and Hydrology/ Flood Runoff Model B	Morihiro WASA	Nippon Koei Co., Ltd.		3/4 (70)		5/12	(10)			(16)	3.20	
	Equipment Planning and O & M	Yasushi AZUMA	Nippon Koei Co., Ltd.		3/4 (70)		5/12	(10)			(10)	3.00	
	Forecasting and Warning System	Hiroyuki SHINJI	Nippon Koei Co., Ltd.			4/14 (28)	5/12	(10)			(16)	1.80	
	GIS/Inundation Analysis	Ahmad AL-HANBALI	Nippon Koei Co., Ltd.		3/25 (49)		5/12	(10)			(16)	2.50	
											Sub-total of Field Work	15.50	
Local Consultants	Organization/Flood Warning	Daisy Morales	PKII		3/6 3/15 4/1		5/12						
	Meteorology and Hydrology/ Flood Runoff Model	Karl Pangan	PKII		3/6		5/12						
	Equipment Planning and O & M	Jerel Celadina	PKII		3/6		5/12						
	Forecasting and Warning System	to be named	PKII			4/14	5/12						
	GIS/Inundation Analysis	Kiko Baltazar	PKII			4/1	5/12						
	Administrator	Percy Novido	Individual		3/4		5/12						
	Reports				Inception Report (IC/R)		Interim Report (IT/R)				Final Report (F/R)		
	Survey Stage and Total of MM					Seminar	Field Work					15.50	
					First Home Work						Second Home Work	15.50	

Field Work
Home Work

Session 2

Required Data and Information

Flood Runoff Model and Hazard Map

Data Category	Relevant Information	Data Source
Rainfall (Existing and Plan)	1) Name of Station	PAGASA, NPC, NIA, MMDA
	2) Type of Station	
	3) Data Transmission Route	
	4) Coordinate	
	5) Elevation	
	6) Available Data Period (Years)	
	7) Data Quality Check (Yes or No)	
River Water Level (Existing and Plan)	1) Name of Station	PAGASA, NPC, NIA, MMDA, DPWH
	2) Type of Station	
	3) Data Transmission Route	
	4) Coordinate	
	5) Catchment Area (km^2)	
	6) Available Data Period (Years)	
	7) Data Quality Check (Yes or No)	
	8) Discharge Measurement Data	
	9) H-Q Curve	

Flood Runoff Model and Hazard Map

Data Category	Relevant Information	Data Source
Dam/Weir	1) Name of Dam/Weir	PAGASA, NPC, NIA, MWSS
	2) Coordinate	
	3) Data Transmission Route	
	4) Catchment Area (km^2)	
	5) Available Inflow Data Period (Years)	
	6) Available Outflow Data Period (Years)	
	7) Available Water Level Data Period (Years)	
	8) Data Quality Check (Yes or No)	
Flood Runoff Model (Existing and Plan)	1) Availability	PAGASA, NPC, NIA, MMDA, DPWH
	2) Establish Year	
	3) Current Status of Utilization	
River Cross Section (Existing and Plan)	1) Name of River	PAGASA, NPC, NIA, MMDA, DPWH
	2) River Length (km)	
	3) Location of Upstream and Downstream End	
	4) Number of Cross Section	
Hazard Map	1) Hazard Map	PAGASA, Ready Project, NOAH, DPWH

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Hydrology and Meteorology

Data Category	Content of Data	Data Source
Weather Information	1) Satellite images 2) Weather forecasting	PAGASA
Rainfall Radar	1) Number, name, location, status, interval 2) Plan of installation/rehabilitation 3) Data sharing/transmission	PAGASA
Flood Information	1) Frequency and effectiveness (basin flood bulletin, basin general flood advisory, region flood advisory, basin hydrological forecast, dam hydrological situationer)	PAGASA

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National Policy, Strategy and Flooding Conditions

Data Category	Related Documents	Data Source
National Development Policy and Strategy in terms of FFWS	Mid-term Development Plan/Program, etc.	NEDA, DOST-PAGASA
Donor's strategy and directives	Development Policy Papers, Assessment Reports, Country Reports, etc.	JICA, UNISDR, UNDP, AusAID, CIDA, NORAD, etc.
Current status on establishment of NWRMC	Documents for assessment on current status	Task Force in DPWH, National Cabinet, etc.
Flood Damage conditions in 19 target river basins	Statistics of significant disasters, Post-Flood Reports, human casualties and damage	OCD-NDRRMC, PAGASA, EM-Net, etc.

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Current System for Issuance of Flood Warning

Data Category	Related Documents	Data Source
Kinds and contents of flood warning issued by responsible agencies	Rules, regulations, manuals and standard forms, etc.	PAGASA, Other concerned agencies (OCD, MMDA, etc.)
Detailed demarcation of responsibilities/ tasks in the agencies	Operation rules and mandates	PAGASA HMD
Detailed status in non-telemetered river basins	Operation records, post-flood reports, etc.	PAGASA HMD and 5 Regional Centers
Evidences/documents of flood warning issued during recent significant floods	Forms and messages actually issued (for selected events only)	PAGASA HMD, Sub-centers and Regional Centers

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Current Status of Coordination System among concerned Agencies

Data Category	Related Documents	Data Source
Responsibilities for transmission of flood information in respective agencies concerned to FFWS	Rules and regulations, executive orders, etc.	PAGASA, OCD, and LGUs
Communication network in target 19 river basins	Disaster Contingency Plan, Flood Operation Manuals and MOA, etc.	PAGASA, OCD, LGUs and other related agencies
Current status of JOMC after JICA TCP Project completed	Minutes/records of JOMC meetings	PAGASA HMD
Stakeholders to be shared flood information in target 19 river basins	Through interviews	PAGASA HMD, OCD and LGUs

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Equipment Plan and O & M (1/1)

Data Category	Content of Data	Data Source
Status Report of Equipment	Operational Status of Equipment for FFWS	PAGASA, Other concerned agencies (MMDA, NIA, NPC)
Status Report of AWS	Operational Status of AWS in 13 River Basins	PAGASA
Inventory List of AWS	1) Equipment name 2) Manufacturer name 3) Model 4) Serial number 5) Manufacturing date	PAGASA
Record of O & M of Equipment	Result/Record of O & M Equipment for FFWS	PAGASA, Other concerned agencies
Record of O & M of AWS	Result/Record of O & M	PAGASA

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Forecasting and Warning Information Dissemination (1/2)

Data Category	Content of Data	Data Source
Communications between PAGASA, OCD and Regional Offices etc	Dedicated Lines, FAX, Telephones, etc	PAGASA, OCD
F/S Report (new project)	Meteorological Hydrological Communication System in 2012 by found of USTDA	PAGASA
Emergency Communications among Government Entities Concerned When Disaster Occurs	Manuals if available	PAGASA, OCD, NPC, NIA, DPWH,etc

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Forecasting and Warning Information Dissemination (2/2)

Data Category	Content of Data	Data Source
Frequency Allocation Plan	Available of frequency bands for radio communications	NTC/DOTC
Guidelines and Technical Requirements	Guidelines and Technical Requirements for Satellite Communications	DOTC, IP Star, Philsat, Mabuhay, etc
Guidelines and Technical Requirements	Guidelines and Technical Requirements for Access to Internet	DOTC, Globe, Smart
Networks of Long Distance and Access Network	Microwave, Optic fibers, Metallic Lines and Cellular phone	NGCP, DOST, DOTC, Globe, Smart

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Comments on IC/R (Draft) and Schedule Onward

- Deadline

  12:00 March 15 Friday , 2013

  Please submit to JICA Study Team (by written forms)
- Final Version of Inception Report

  March 22, 2013 (target)
- Seminar
  - Date: 2nd week of April (tentative)
  - Place: Tuguegarao, Cagayan
  - Purpose: To confirm current status/issues of FFWS activities and to confirm needs on future expansion to other river basins, etc.
  - Anticipated participant: Approx. 60 persons

Data Collection Survey
on
Situation of Nationwide Flood Forecasting and Warning System
in the Republic of the Philippines

Minutes of Kick-off Meeting[1]

1. Date/Time : March 12, 2013 (Tuesday), 13:40 – 16:40
2. Venue : Amihan Conference Room, 2nd FL, Main Office Bldg., PAGASA Science Garden Complex, BIR Road Diliman, Quezon City
3. Agenda : Refer to Attachment A
4. Participants : Refer to Attachment B
5. Materials Distributed :
   - 5.1 Copy of the Power Point Presentations (Attachment C)
   - 5.2 Inception Report (Draft)
6. Highlights/Conclusion :

The Kick-off meeting was devised into two sessions, namely (i) Outline of the Study (presentation on Inception Report (Draft)) and (ii) Required data and information, which are both explain by the Study Team. After the two sessions above, succeeding discussions clarified and confirmed the following points as follows:

(1) Basic Policy of the Study

The Study aims at the expansion of the assistance to other river basins, however, the support of Japan is not unlimited. Therefore, the Study needs to set the priority fields and priority river basins with focusing on advanced technology, but it is also important to look at basic technology. The Project will improve the capability of PAGASA, complementing advanced and solid technologies. It is also important to clarify the current status of the five river basins with existing FFWS.

(2) Project NOAH

There is the Project NOAH which will put up 1,000 monitoring facilities in the river basins nationwide. PAGASA's concern with Project NOAH covers communication systems for the expansion of FFWS. It is important to shift more efficient technologies for better operations and implementation of FFWS.

(3) Expansion of FFWS to Nationwide

If PAGASA will set up FFWS in 13 or more river basins, more manpower will be definitely needed to operate the facilities and equipments. Expansion would also requires the capacity to support technical needs such as communication and advanced monitoring systems. Therefore, the need for capacity building in concerned organizations is obvious to efficiently operate the FFWS. With collaboration among the agencies concerned, this could be responded to. This is why the Study will compile and analyze data so as to establish priorities.

[1] Ms. Nancy Lance, PPDS Chief of PAGASA, served as the Meeting's Emcee.

(4) Rationale of 13 River Basins

The rationale for focusing on the 13 major river basins is out of the 18 major river basins except five river basins which are equipped by telemetry system. Major river basins are categorized as having catchment area of 1,400 km^2 or more, which are particularly taken as target river basins for expansion of FFWS by DOST-PAGASA after Typhoon Pedring in September 2011.

(5) Communication System through Satellite

It seems that satellite communication system has many advantages in particular in the areas being lack of terrestrial infrastructure such as in the Cagayan river basin. However, it might have advantages and disadvantages as well. The Study will assess the needs from different aspects, such as operation and maintenance cost, interval time, and data collection method, etc.

(6) Satellite Technology (forecasting of rainfall and real-time sharing)

The Study will investigate current trend and examine possibility of applicable technology of satellite in forecasting rainfall through verification of current activities/training in PAGASA (collaboration with JAXA) as well as interview to associate companies/key agencies in JAPAN.

(7) Appropriate Contents and Manner in Flood Information/Warnings

A NGO reported that in Typhoon Pablo the flood warning issued was not understood by the affected communities. The warning message shall be disseminated in more understandable manner (lay-man's language) by the concerned agencies. Information dissemination at the National and local levels are handled by the OCD. Current status of communication flow or linkage will be clarified in the target 19 river basins by the Study.

(8) Information Literacy among Local Communities/People

As for appropriate actions of the people affected by flooding, information literacy will be the crucial matter. It is expected that OCD discuss to cope with the issues and orientation by the warning agencies to DILG is carried out. Closed coordination among the agencies concerned is prerequisite so that flood information and warning can reach to the communities affected.

(9) Scope of the Study in Equipment Aspect

The Study will identify priorities for extension of assistance by the Japanese government for future expansion of FFWS to the target 14 river basins. Definite plan of equipment installation is not included and recommended in the Study. However, a conceptual image of the assistance in the equipment aspect (in priority river basins) will be delineated in the Study.

(10) Flood Damage Potential

From economic aspects, flood damage potential will be looked into in the 19 target river basins. Economy is an objective indicator to assess priority of FFWS in the river basins. Development policies of the agency for future FFWS would serve as another indicator. Discussions with

PAGASA and other agencies will be continued with reference to the indicators to be used for prioritization.

At end of presentation by the Study team, the deadline of comments in the Inception Report (Draft) was announced by the Team and accepted by the Philippine side as follows:

- Deadline of comments :12:00 am, March 15, 2013

It was confirmed that, after revisions based on the comments, the final version of the Inception Report would be submitted before March 22, 2013 among the participants.

REPUBLIC OF THE PHILIPPINES
Department of Science and Technology
Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)
Science Garden, Agham Road, Diliman, Quezon City 1100

KICK-OFF MEETING

The Project for Data Collection Survey on Situation of Nationwide Flood Forecasting and Warning System

4th Floor Conference Room, PMOB, Science Garden, Agham Rd., Diliman, Q.C.
12 March 2013

ATTENDANCE

	NAME	SIGNATURE
1	Mr. Yasushi AZUMA / Consultants Team	
2	Shuji HIROTA / Consultants Team	
3	Karl Pangan / consultant team	
4	JEREL CELADIÑA / CONSULTANT TEAM	
5	RODRIGO I. DELAS REYES - DPWH - MFCP	
6	F HILARIO	
7	Yoshihiro MOTOKI / Consultant Team	
8	Akihisa Okuda / JICA-DPWH	
9	Hayato Nakamura / JICA	
10	Kessy A. Reyes	
11	Sun Paat	
12	ADELAIDA C. DURAN	
13	SONIA SERRANO	
14	ROY A BADILLA	
15	Nathaniel Servando	
16	LEONIDA S. SANTOS / AMD	
17	SRESPINOSA	
18	MPBAUTISTA	
19	NESTOR B. NIMES	
20	Sheila S. Schneider	

"tracking the sky... helping the country"

Postal Address: P.O. Box 3278 Manila   Tel No. (63-2) 929-4865 (w/Fax) & 434-9040

	NAME	SIGNATURE
21	MAXIMO PERALTA	
22	Edna L. Juanillo	
23	REMILIO BAUTISTA	
24	RCPAGULAYAN	
25	ROMUALDO BELTRAN	
26	JESUS R. ESPIRITU	
27	MICHAEL G. DICCION	
28	Josse C. Solirere	
29	[illegible] I. [illegible]	
30	Nivenzi [illegible]	
31	Jose D. Duro	
32	REA ADORA	
33	Porcy Novido	
34	PAJARILLO, MA. TERESA	
35	CRISPINA B. ABAT	
36	[illegible] S. [illegible]	
37	DAISY N. MORALES	
38	Morihiro WASA	
39	Madonne Kaye M. Payarilla OJT	
40	Marie Joy Hadok OJT	
41	Louie M. Romero	
42	Willie X. Dañas	
43	Flaviana D. Hilario OIC, DA for RD	
44	Nancy T. Lance Chief, PPDS	
45	ROSALITA M. BARDE, EFCOS MMDA	
46		
47		
48		

Appendix A-2

Output of Tuguegarao Seminar

Data Collection Survey on Situation of Nationwide Flood Forecasting and Warning System

Handout for the Seminar

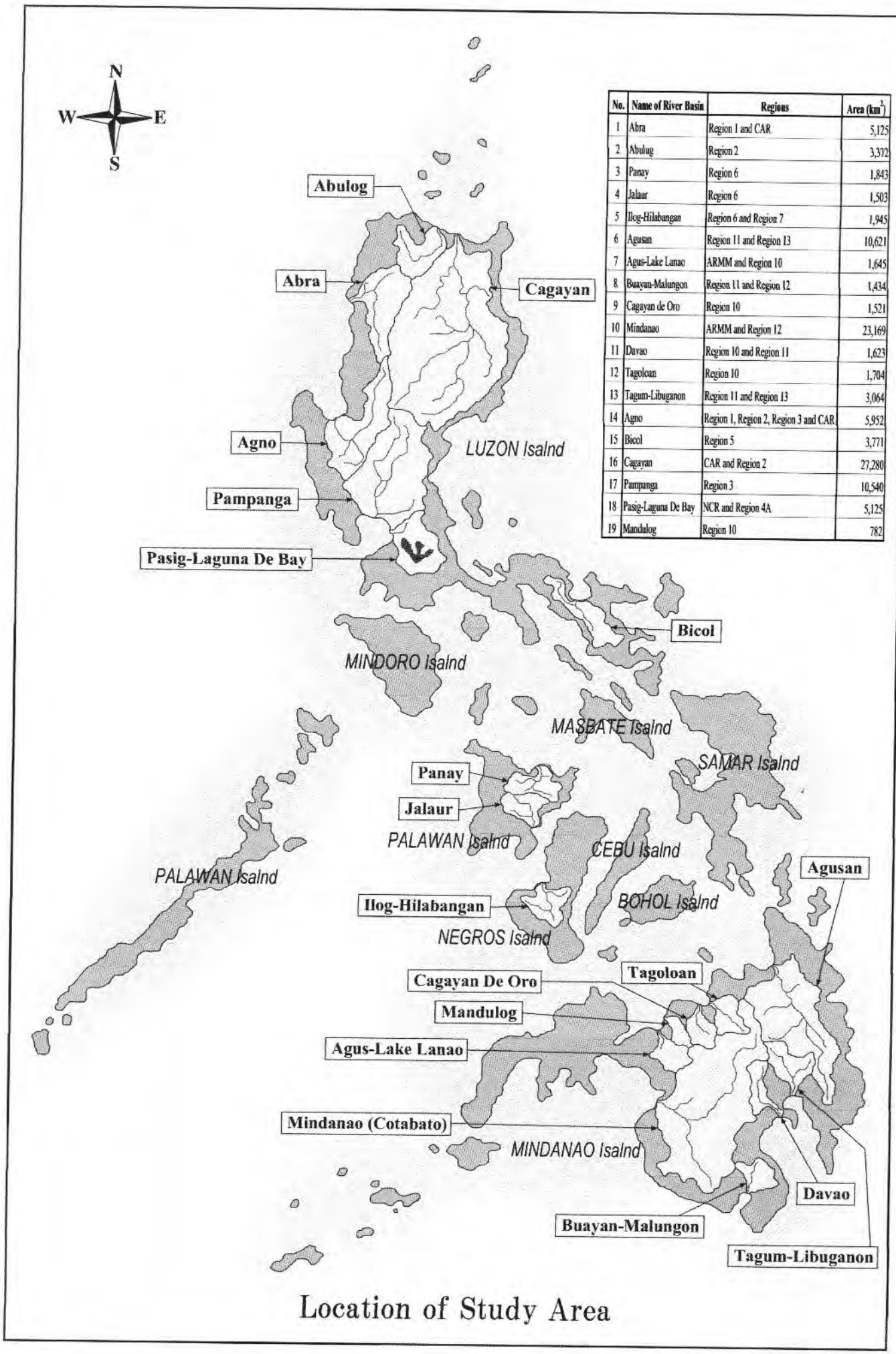
April 11, 2013

Holiday Plaza Hotel,
Tuguegarao, Cagayan

Japan International Cooperation Agency

Department of Science and Technology
Philippine Atmospheric, Geophysical
and Astronomical Services Administration
Republic of the Philippines

Nippon Koei Co., Ltd.



No.	Name of River Basin	Regions	Area (km^2)
1	Abra	Region 1 and CAR	5,125
2	Abulug	Region 2	3,372
3	Panay	Region 6	1,843
4	Jalaur	Region 6	1,503
5	Ilog-Hilabangan	Region 6 and Region 7	1,945
6	Agusan	Region 11 and Region 13	10,621
7	Agus-Lake Lanao	ARMM and Region 10	1,645
8	Buayan-Malungon	Region 11 and Region 12	1,434
9	Cagayan de Oro	Region 10	1,521
10	Mindanao	ARMM and Region 12	23,169
11	Davao	Region 10 and Region 11	1,623
12	Tagoloan	Region 10	1,704
13	Tagum-Libuganon	Region 11 and Region 13	3,064
14	Agno	Region 1, Region 2, Region 3 and CAR	5,952
15	Bicol	Region 5	3,771
16	Cagayan	CAR and Region 2	27,280
17	Pampanga	Region 3	10,540
18	Pasig-Laguna De Bay	NCR and Region 4A	5,125
19	Mandulog	Region 10	782

Location of Study Area

Japan International Cooperation Agency
Data Collection Survey on Situation of Nationwide Flood Forecasting and Warning System

PROGRAM OF SEMINAR

1. **Date/Time** : Thursday, April 11, 2013 09:00 – 16:00
2. **Venue** : Holiday Plaza Hotel, Tuguegarao, Cagayan
3. **Objective** : To clarify the crucial issues on the existing FFWS and to identify the needs (focal points) for expansion of FFWS to the other target river basins
4. **Participants** : As shown in the Attachment (to be confirmed)

5. Program (tentative)

0830 - 0900	Registration	
Introduction		
0900 – 0910	Welcome address, etc.	PAGASA HMD
0910 – 0920	Opening remarks	JICA Philippine Office
0920 – 0930	Message	DOST-Region 2
0930 – 0940	Outline of the Survey	Study Team
0940 – 0950	Outline of the Seminar	Study Team
0950 – 1000	Grouping of participants	All
	~~ Coffee Break ~~~~~~	
Seminar Proper		
1015 – 1030	Guidance for SWOT analysis and briefing of technical references	Study Team
1030 – 1100	Brain storming (each group)	All
1100 – 1200	Analyses of Internal and External Environments of Existing FFWS (each group)	All
	~~ Lunch ~~~~~~	
1300 – 1400	Cross SWOT Analysis (each group)	All
1400 – 1500	Wrapping-up of Future Development Strategy of FFWS (each group)	All
1500 – 1530	Presentation to the participants (each group)	Representatives
1530 – 1545	Wrap-up of the Seminar	PAGASA HMD
Individual Discussion with Focal Group (as required)		
1600 – 1700	(free style discussions)	PAGASA HMD, JICA & Study Team
1700	Adjourn	

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Seminar at Tuguegarao and Associated Activities
(Aprol 10 to 12, 2013)

	Study Team			JICA Philippine Office		
Date	Time	Activities	Remarks	Time	Activities	Remarks
Apr.10 (Wed)	11:00 – 12:15	Manila–Tuguegarao	PR–0014	11:00 – 12:15	Manila–Tuguegarao	PR–0014
	12:30 – 13:30	Lunch in downtown		12:30 – 13:30	Same as Study Team	
	14:00 – 16:30	Preparation of Seminar		14:00 – 16:30	Same as Study Team	Mr.Kusakabe will visit OCD–R2
	16:30 – 18:00	Pre–discussions with PAGASA Staff	Topic shall be fixed in advance with PAGASA.	16:30 – 18:00	Same as Study Team	
Apr.11 (Thu)	09:00 – 16:00	Seminar Proper	Program shall be fixed.	09:00 – 16:00	Same as Study Team	
	16:00 – 17:00	Supplemental interview and data/information collection	Focus Group shall be selected.	16:00 – 17:00	Same as Study Team	Ms.Takeda will join the Seminar from afternoon.
Apr.12 (Fri)	08:30 – 10:30	To accompany with J. Embassy and JICA Staff	Detailed inspection route shall be coordinated with PAGASA and DPWH.	08:30 – 10:30	Site inspection of FRIMP target areas and PAGASA/ASTI gauging stations	
	10:30 – 11:00	Coffee break		10:30 – 11:00	Coffee break	
	11:00 – 11:30	Moving to Airport		11:00 – 11:30	Moving to Airport	
	12:35 – 13:50	Tuguegarao–Manila	PR–0015	12:35 – 13:50	Tuguegarao–Manila	PR–0015
	13:50 – 15:00	Moving to PAGASA		13:50 – 15:00	Moving to JICA	

Study Team
Y.Motoki
M.Wasa
Y.Azuma
Y.Shinji
A.Al–Hanbali
D.Morales
K.Pangan
J.Celadiña

J. Embassy and JICA Staff
A.Yonezawa
S.Takeda
H.Nakamura
K.Reyes
A.Okuda
T.Kusakabe

Expected participants for the Seminar "Data Collection Survey on Situation of Nationwide Flood Forecasting and Warning System in the Philippines" (confirmed as of 12:00 April 11, 2013)
Date of Seminar : 11 April 2013, Thursday
Venue: Holiday Plaza Hotel, Tuguegarao City, Cagayan

Name		Agency	Designation
1.	Mr. Mariano C. Dancel	NIA-MARIIS	Operations Manager
2.	Mr. Florentino Baniqued	NIA-MARIIS	Department Manager
3.	Mr. Saturnino T. Tenedor	NIA-MARIS	Chief of FFWSDO
4.	Mr. Wilfredo C. Gloria	NIA-MARIS	Division Manager A
5.	Mr. Ryan Valentin	NIA-MARIIS, Magat Dam	Hydrologist
6.	Mr. Ben Roger Lucas	NIA-MARIIS	Telecom Engineer
7.	Ms. Norma M. Talosig	OCD Region 2	Director
8.	Mr. Phillip Labugen	OCD Region 2	Civil Defense Officer II
9.	Dr. Urduja A. Tejada	DOST Region 2	Director
10.	Mr. Sancho A. Mabborang	DOST Region 2	Asst. Reg. Dir. for Field Operations
11.	Mr. Benjamin L. Nicdao II	DOST Region 2	Science Research Specialist I
12.	Dir. Melvin N. Navarro	DPWH Region 2	Director
13.	Eng'r. John Aldrin A. Umoquit	DPWH Region 2	Engineer II
14.	Mr. Edmond Guzman	Isabela PDRRMO	Executive Officer
15.	Mr. Sebastian Manuel	San Pablo MDRRMO (Isabela)	Officer-In-Charge
16.	Ms. Edna Junio	Cagayan PDRRMO	Executive Officer
17.	Ms. Rosanna G. Ibarra	Enrile MDRRMO	Project Development Officer
18.	Mr. Fernando B. Cadangan	Enrile MDRRMO	Administrative Aide IV/IT Designate
19.	Mr. Noriel Marc L. Dela Cruz	Amulung MDRRMO	Administrative Aide III
20.	Mr. Reynaldo C. Floria	Alcala MDRRMO	Municipal Planning and Development Coordinator
21.	Atty. Segundo Urata	Tuguegarao City DRRMO	Executive Officer
22.	Mr. Joisen P. Callo	Tuguegarao City DRRMO	Community Affairs Assistant
23.	Ms. Ophelia Eduardene M. Parallag	Public Information Office	Officer-In-Charge
24.	Dr. Susan R. Espinueva	HMD, PAGASA	Chief
25.	Ms. Fredolina D. Baldonado	NL-PRSD	Officer-In-Charge
26.	Mr. Leo L. Buñag	PAGASA-CRBFFWC	AWSC/CMO
27.	Mr. Berlin V. Mercado	HMD, PAGASA	Sr. Weather Specialist
28.	Ms. Rosalie C. Pagulayan	HMD, PAGASA	Weather Specialist II
29.	Ms. Amor C. Benitez	PAGASA-CRBFFWC	Weather Specialist II
30..	Mr. Antonio C. Pagalilauan	PAGASA-CRBFFWC	Weather Specialist II
31.	Mr. Hilario G. Esperanza	PAGASA-ARBFFWC	Weather Specialist I/OIC
32.	Ms. Nivagine C. Nievares	HMD, PAGASA	Weather Specialist I
33.	Ms. Rhonalyn Vergara	HMD, PAGASA	Weather Specialist I
34.	Mr. Akio Yonezawa	Second Secretary	Embassy of Japan
35.	Mr. Sachiko Takeda	Deputy Representative	JICA Phil. Office

36.	Mr. Hayato Nakamura	Project Formulation Advisor	JICA Phil. Office
37.	Mr. Kessy Reyes	Program Officer	JICA Phil. Office
38.	Mr. Akihisa Okuda	River Management Expert	DPWH
39.	Mr. Takaaki Kusakabe	Disaster Management Expert	OCD-NDRRMO
40.	Mr. Yoshihiro Motoki	JICA Study Team	Team Leader
41.	Mr. Morihiro Wasa	JICA Study Team	Team Member
42.	Mr.Yasushi Azuma	JICA Study Team	Team Member
43.	Mr. Yoshiyuki Shinji	JICA Study Team	Team Member
44.	Mr. Ahmad Al-Hanbali	JICA Study Team	Team Member
45.	Ms. Daisy Morales	JICA Study Team	Team Member
46.	Mr. Karl R. Pangan	JICA Study Team	Team Member
47.	Mr. Jerel V. Celadiña	JICA Study Team	Team Member

Japan International Cooperation Agency

Data Collection Survey on Situation of Nationwide Flood Forecasting and Warning System

GUIDELINE OF SEMNAR AT TUGUEGARAO

(Draft)

1. Specific Objective

<<<We will accomplish "Zero Casualty" through further elaboration of FFWS/FFWSDO in the Cagayan River basin (or other river basins) within 3 years. >>>

(Through identification of crucial issues on present status of FFWS and appropriate direction of improvement and enhancement of the present FFWS in the Cagayan River basin)

2. What is SWOT?

SWOT is the acronym for (i) Strengths, Weaknesses, Opportunities, and Threats. It is an easy-to use tool that has been mainly established for framework planning and business management purposes.

3. Analyses of Internal and External Environments of FFWS

Image of SWOT Analysis

Internal Environment	Strengths (強み) 強みをより強く	Weaknesses (弱み) 弱みを顕在化させない
External Environment	Opportunities (機会) 機会を逃すな→機敏な対応	Threats (脅威) 脅威を機会に転じる→発想の転換

Hints for thinking of Internal Environment:

What are the accumulated resources developed through projects/training programs, etc. in the Cagayan River basin? Or, What kind of resources (for FFWS) do we have at present?

Following aspects will be covered:

(a) Human resources and organization

(b) Monitoring data, manual, technical guidelines and flood forecasting tools, etc.

(c) Equipment for monitoring, data processing and accumulation, data transferring and communication

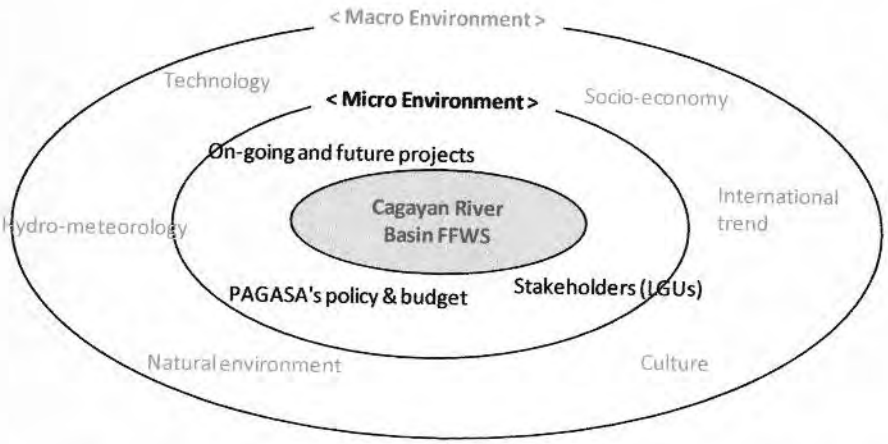
(d) Coordination and communication network system among the agencies concerned with FFWS

Hints for thinking of External Environment:

What are the external **opportunities and threats** outside FFWS that could affect the specific objectives as mentioned above?

The external environments can be considered divided into Micro and Macro Environments as illustrated below:

Image of Surrounding FFWS



Then, the extracted external environment will be separated the opportunities and threats.

4. Cross SWOT Analysis

In order to further elaborate the existing FFWS, strategy and/or required actions

Image of Cross SWOT Analysis

Internal Environment / External Environment	Strengths（強み） ● ● ● ● ●	Weaknesses（弱み） ● ● ● ● ●
Opportunities（機会） ● ● ● ● ●	強みを生かしてチャンスをものにする方法は？	弱みを克服してチャンスを逃さないにする方法は？
Threats （脅威） ● ● ● ● ●	強みを生かして脅威の影響を受けないようにする方法は？	弱みを克服して脅威の影響をできるだけ受けないようにするには？

5. Wrapping-up of Future Development Strategy/Visions

Based on the results of Cross SWOT analysis, future development strategy/visions of the Cagayan River basin FFWS will be delineated.

6. References for Supporting Discussions (as attached)

(1) Location map of existing monitoring stations (rain gauges and water level gauges)
(2) FFWS network diagram
(3) Dam discharge warning and flood information network for Magat Dam
(4) River Basin Flood Bulletin issued by CRBFWC
(5) Recommendation (presented in the Completion Report of former JICA TCP)
(6) Others

7. Time Frame

Time is approximately allocated to each activity as follows:

(1)	Guidance for SWOT analysis and briefing of technical references	: 30 min.
(2)	Analyses of Internal and External Environments of Existing FFWS	: 90 min.
(3)	Cross SWOT Analysis	: 60 min.
(4)	Wrapping-up of Future Development Strategy	: 60 min.
(5)	Presentation to the participants	: 30 min.
	Total	**: 4.5 hrs.**

8. Grouping (Tentative)

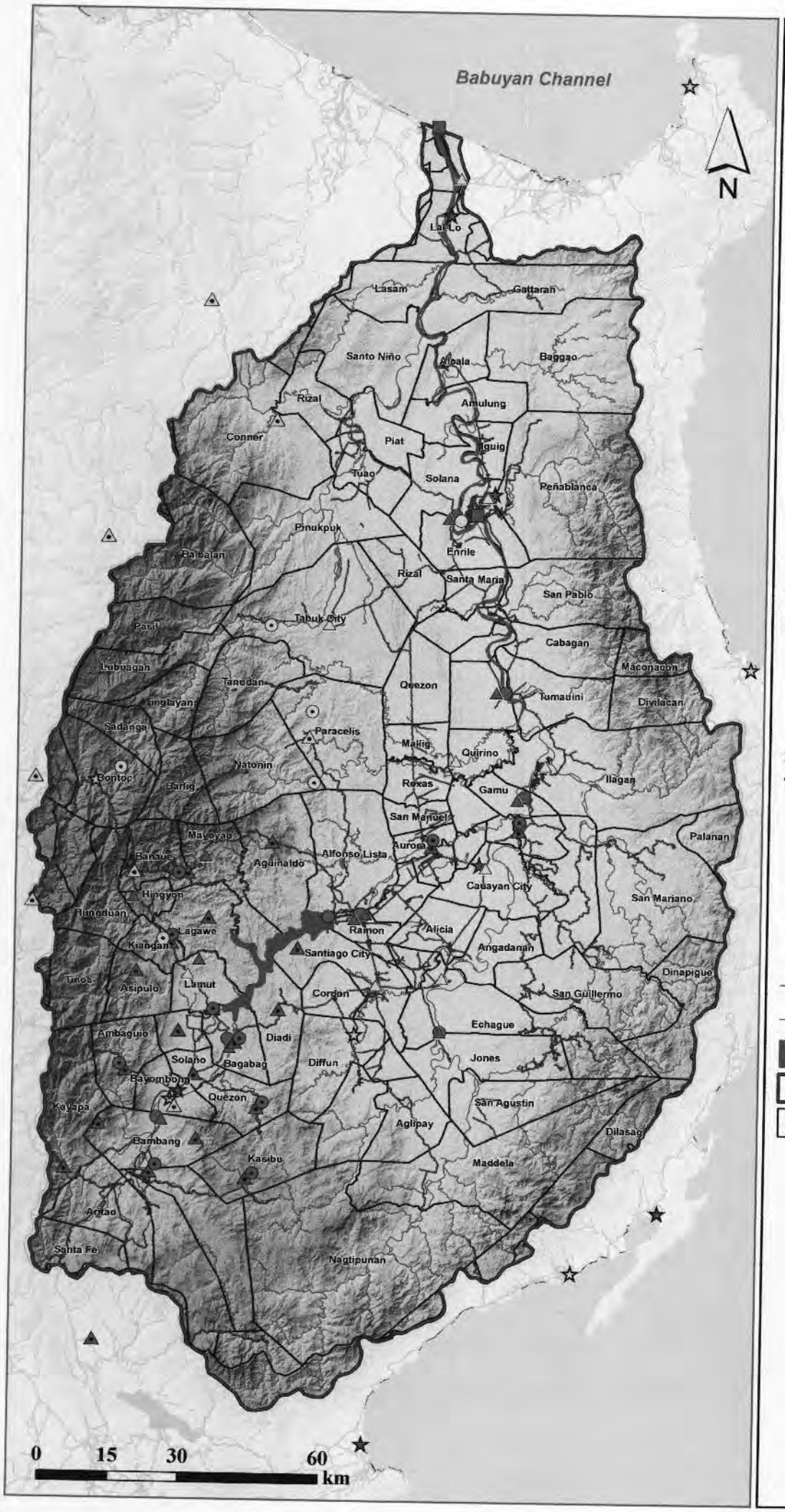
Grouping of the participants and themes to be discussed are tentatively set up for conducting SWOT analysis as follows:

(1) The participants will be divided into three groups (Cagayan A, Cagayan B and Other River Basin Group) and respective groups perform SWOT analysis in parallel.
   - Cagayan A: Hydrological monitoring and analytical tools
   - Cagayan B: Data/information sharing and equipment planning and O & M
   - Other River Basin: Overall issues FFWS related
(2) All three groups will be further divided into two groups to discuss the Internal and External Environments separately (to save time).
(3) Then, three groups paste the cards on the SWOT analysis matrix sheets individually.
(4) Based on the complete SWOT analysis matrix, three groups carry out Cross SWOT analysis and then, formulate future development strategy.
(5) The representatives of the three groups make presentation of their results.

9. Facilitators

Mr. Y.Motoki and Ms. D.Morales will perform as facilitators to support discussions.

MATERIALS FOR DISCUSSIONS



DATA COLLECTION SURVEY
ON SITUATION OF NATIONWIDE
FLOOD FORCASTING AND WARNING
SYSTEM

LOCATION OF RAINFALL & WATER LEVEL STATIONS

CAGAYAN RIVER BASIN

Legend

Rainfall Station (Existing)

Type, Agency

- ARG, PAGASA (FFWS)
- ARG, ASTI (NOAH)
- ARG, NIA
- AWS, PAGASA (KOICA)
- AWS, PAGASA
- AWS, ASTI (NOAH)
- Synoptic, PAGASA

Water Level Station (Existing)

Type, Agency

- WLS, PAGASA (FFWS)
- WLS, ASTI (NOAH)
- WLS, NIA

Station (Plan)

Type, Agency

- ARG, ASTI (NOAH)
- ARG, NIA (NORAD)
- AWS, ASTI (NOAH)
- WLS, ASTI (NOAH)
- WLS, NIA (NORAD)
- Road Network
- River
- Water Body
- Cagayan River Basin
- Municipal Boundary

Current Status of Utilization of Flood Runoff Models

01 Cagayan River Basin, Catchment Area : 27,280 km^2

Availability of Flood Runoff Model: (Available) · Not Available

Description of Model

1. Name of Model : Magat River Basin Flood Forecasting Program (Storage Function Method), developed by "The Project for Strengthening Flood Forecasting and Warning System for Dam Operation", JICA (2012)
   - Target Area : Magat River Basin, Upstream of Magat dam to before junction with Cagayan River (5,113 km2, 19% of whole River Basin)
   - Basin Rainfall : Using 8 telemeter rainfall statons, estimated by Thiessen's polygon method and elevation conversion factor
2. Name of Model : IFAS (Integrated Flood Analysis System), developed by ICHARM
   - Target Area : Whole Cagayan River Basin
   - Basin Rainfall : Using satelllite rainfall data (3B42RT, GSMap, Qmorph, Cmorph, etc.) or ground rainfall stations

Available Data for Development and Modified of Flood Runoff Model

Rainfall

No.	Station Name	Station Type	Data Type	Duration of Record	Location		Elevation (El.m)	Managed Agency	Address
					Latitude	Longitude			
1	Tuguegarao	ARG	Hourly	1982 - Present	17° 36' 56"N	121° 41' 25" E	15.00	PAGASA (FFWS)	Buntun Bridge, Tuguegarao, Cagayan
2	Tumauini	ARG	Hourly	1982 - Present	17° 16' 26"N	121° 47' 56" E	30.00	PAGASA (FFWS)	Poblacion, Tumauini, Isabela
3	Gamu	ARG	Hourly	1982 - Present	17° 04' 18"N	121° 50' 32" E	60.00	PAGASA (FFWS)	Gamu, Isabela
4	Maris Dam	ARG	Hourly	1982 - Present	16° 50' 20"N	121° 30' 50" E	90.00	PAGASA (FFWS)	Oscariz, Ramon, Isabela
5	Pangat	ARG	Hourly	1982 - Present	16° 36' 37"N	121° 40' 50" E	72.00	PAGASA (FFWS)	Pangal, Echague, Isabela
6	ISF - Palanan	AWS	15 min		16° 59' 20"N	122° 23' 48" E	52.00	PAGASA (AWS)	Isabela School of Fisheries, Palanan, Isabela
7	NVSU - Bayonbong	AWS	15 min		16° 29' 19"N	121° 09' 32" E	275.00	PAGASA (AWS)	NVSU Campas, Bayombong, Nueva Vizcaya
8	ISU - Echague	AWS	15 min		16° 56' 10"N	121° 45' 51" E	58.00	PAGASA (AWS)	ISU Campas, Echague, Isabela
9	Lal-lo	AWS	15 min		18° 11' 50"N	121° 39' 53" E	76.00	PAGASA (AWS)	Lal-lo, Aparri, Cagayan
10	Tuguegarao	AWS	15 min		17° 38' 52"N	121° 45' 30" E	73.00	PAGASA (AWS)	Capital Hills, Tuguegarao, Cagayan
11	Banawe	AWS	15 min		16° 55' 52"N	121° 03' 02" E	1,506.00	PAGASA (AWS)	Hiwang Gohang, Banawe, Ifugao
12	RPC - Baler	AWS	15 min		15° 48' 21"N	121° 32' 36" E	12.00	PAGASA (KOICA)	RPC Compound, Bgy.Buhangin, Baler, Aurora
13	Casiguran	AWS	15 min		16° 15' 56"N	122° 07' 44" E	3.00	PAGASA (KOICA)	Bgy.Gulod Casiguran, Aurora
14	Aparri	Synoptic	Daily					PAGASA (Synoptic)	
15	Tuguegarao	Synoptic	Daily					PAGASA (Synoptic)	
16	Magat Damsite	ARG	Hourly	1993 - Present	16° 49' 55"N	121° 30' 14" E	122.86	NIA	Ozcariz, Ramon, Isabela
17	Dumayup	ARG	Hourly	1993 - Present	16° 34' 28"N	121° 16' 22" E	265.20	NIA	Dumayup, Bagabag, Nueva Viscaya
18	Halong	ARG	Hourly	1993 - Present	16° 51' 53"N	121° 03' 32" E	1,266.00	NIA	Mt.Halong, Halong Banaue, Ifugao
19	Santo Domingo	ARG	Hourly	1993 - Present	16° 26' 05"N	121° 07' 01" E	348.50	NIA	Bato Ferry Bridge, Bayombong, Nueva Viscaya
20	Buyoc	ARG	Hourly	1993 - 2009	16° 44' 42"N	121° 11' 37" E	655.00	NIA	Mt Buyoc, Nayon Lamok, Ifugao
21	Dantor	ARG	Hourly	1993 - 2006	16° 56' 46"N	121° 12' 08" E	811.58	NIA	Junction Mapaway, Mayapyap, Ifugao
22	Sta.Ana	AWS	15 min	-	18° 27' 25"N	122° 08' 36" E	13.00	ASTI (NOAH)	Municipal Grounds, Sta.Ana, Cagayan

Current Status of Utilization of Flood Runoff Models

01 Cagayan River Basin, Catchment Area : 27,280 km^2

23	Diffun	AWS	15 min	-	16° 36' 14"N	121° 30' 30" E	135.00	ASTI (NOAH)	Quirino State College, Diffun, Quirino
24	Divilcan	AWS	15 min	-	17° 19' 42"N	122° 17' 46" E	-	ASTI (NOAH)	Divilcan, Isabela
25	Dinalungan	AWS	15 min	-	16° 08' 43"N	121° 57' 23" E	12.00	ASTI (NOAH)	Dinalungan National High School, Dinalungan, Aurora
26	Bontoc	AWS	15 min	-	17° 05' 24"N	120° 58' 39" E	-	ASTI (NOAH)	Government Center, Bontoc, Mt.Province
27	Lamut	ARG	15 min	-	16° 42' 58"N	121° 10' 18" E	-	ASTI (NOAH)	Ifugao State University, Nayon, Lamut, Ifugao
28	Bulanao	ARG	15 min	-	17° 24' 02"N	121° 26' 19" E	-	ASTI (NOAH)	Agromet Site of Kalinga Apayao State College (KASC), Bulanao, Kalinga
29	Carig Sur	ARG	15 min	-	17° 39' 07"N	121° 45' 14" E	-	ASTI (NOAH)	DOST RO2 Cmpd., Tuguegarao City
30	Echague	ARG	15 min	-	16° 43' 00"N	121° 41' 00" E	-	ASTI (NOAH)	CVARRD Complex ISU-Echague Compound Echague, Isabera
31	Santiago	ARG	15 min	-	16° 42' 00"N	121° 33' 00" E	-	ASTI (NOAH)	LGU Compaund, Santiago City, Isabela
32	Cauayan	ARG	15 min	-	16° 56' 00"N	121° 46' 00" E	-	ASTI (NOAH)	LGU Compaund, San Pablo, Cauayan City
33	Iligan	ARG	15 min	-	17° 08' 00"N	121° 53' 00" E	-	ASTI (NOAH)	LGU Compaund, Iligan, Isabela
34	Maddela	ARG	15 min	-	17° 08' 24"N	121° 42' 04" E	-	ASTI (NOAH)	Maddela Institute of Technology, Maddela Quirino
35	Dupax del Norte	ARG	15 min	-	16° 20' 00"N	121° 06' 00" E	-	ASTI (NOAH)	Bgy.Holywood (Private), Depax Del Norte, Nueva
36	Camalaniugan	ARG	15 min	-	18° 16' 05"N	121° 40' 59" E	-	ASTI (NOAH)	Camalaniugan, Cagayan
37	Asipulo	ARG	Hourly	Plan	16° 43' 14"N	121° 04' 10" E	994.00	NIA (NORAD)	
38	Bambang 1	ARG	Hourly	Plan	16° 25' 15"N	121° 00' 06" E	1,181.00	NIA (NORAD)	
39	Bambang 2	ARG	Hourly	Plan	16° 23' 43"N	121° 11' 47" E	530.00	NIA (NORAD)	
40	Bunhian	ARG	Hourly	Plan	16° 58' 33"N	121° 20' 07" E	984.00	NIA (NORAD)	
41	Dantor	ARG	Hourly	Plan	16° 00' 00"N	121° 00' 00" E	418.00	NIA (NORAD)	
42	Diadi	ARG	Hourly	Plan	16° 38' 57"N	121° 21' 19" E	236.00	NIA (NORAD)	
43	Lagawe 2	ARG	Hourly	Plan	16° 49' 37"N	121° 12' 38" E	587.00	NIA (NORAD)	
44	Pingkian	ARG	Hourly	Plan	16° 20' 01"N	120° 56' 07" E	598.00	NIA (NORAD)	
45	Santiago	ARG	Hourly	Plan	16° 46' 14"N	121° 23' 27" E	258.00	NIA (NORAD)	
46	Solano	ARG	Hourly	Plan	16° 31' 13"N	121° 11' 20" E	257.00	NIA (NORAD)	
47	Villaverde	ARG	Hourly	Plan	16° 36' 16"N	121° 09' 22" E	287.00	NIA (NORAD)	
48	Ambaguio Bridge	ARG	Hourly	Plan	16° 31' 37"N	121° 03' 08" E	540.00	NIA (NORAD)	
49	Aurora Bridge	ARG	Hourly	Plan	16° 58' 23"N	121° 39' 26" E	50.00	NIA (NORAD)	
50	Baretbet Bridge	ARG	Hourly	Plan	16° 34' 59"N	121° 16' 11" E	258.00	NIA (NORAD)	
51	Lagawe 1	ARG	Hourly	Plan	16° 46' 59"N	121° 08' 04" E	431.00	NIA (NORAD)	
52	Lamo Bridge	ARG	Hourly	Plan	16° 20' 12"N	121° 06' 31" E	397.00	NIA (NORAD)	
53	Lamut Bridge	ARG	Hourly	Plan	16° 38' 52"N	121° 13' 28" E	259.00	NIA (NORAD)	
54	Mayoyao	ARG	Hourly	Plan	16° 54' 51"N	121° 10' 02" E	595.00	NIA (NORAD)	
55	Naguilian Bridge	ARG	Hourly	Plan	17° 00' 22"N	121° 49' 57" E	33.00	NIA (NORAD)	
56	Runruno	ARG	Hourly	Plan	16° 28' 02"N	121° 19' 39" E	377.00	NIA (NORAD)	
57	Tubo Bridge	ARG	Hourly	Plan	16° 19' 11"N	121° 17' 48" E	762.00	NIA (NORAD)	

Current Status of Utilization of Flood Runoff Models

01 Cagayan River Basin, Catchment Area : 27,280 km^2

58	Kabugao	ARG	15 min	Plan	18° 01' 26"N	121° 10' 59" E	-	ASTI (NOAH)	Kabugao, Apayao
59	Conner	ARG	15 min	Plan	17° 47' 42"N	121° 19' 19" E	-	ASTI (NOAH)	Conner, Apayao
60	Paracelis	ARG	15 min	Plan	17° 10' 52"N	121° 24' 14" E	-	ASTI (NOAH)	Paracelis, Mt.Province
61	Mt.Data	ARG	15 min	Plan	16° 51' 14"N	120° 51' 25" E	-	ASTI (NOAH)	Mt.Data, Mt.Province
62	Banaue	ARG	15 min	Plan	16° 54' 50"N	121° 03' 36" E	-	ASTI (NOAH)	Banaue, Ifugao
63	Besao	ARG	15 min	Plan	17° 05' 42"N	120° 51' 25" E	-	ASTI (NOAH)	Besao, Mt.Province
64	Malibcong	ARG	15 min	Plan	17° 33' 47"N	120° 59' 24" E	-	ASTI (NOAH)	Malibcong, Abra
65	Masoc	AWS	15 min	Plan	16° 28' 18"N	121° 08' 33" E	-	ASTI (NOAH)	Masoc, Bayombong, Nueva Vizcaya, Cagayan Valley Campus
66	Masoc	ARG	15 min	Plan	16° 28' 18"N	121° 08' 33" E	-	ASTI (NOAH)	Masoc, Bayombong, Nueva Vizcaya, Cagayan Valley Campus
67									
68									

Water Level

No.	Station Name	Data Type	Duration of Record	Location		Catchment Area (km^2)	Managed Agency	Address
				Latitude	Longitude			
1	Tuguegarao	Hourly	1982 - Present	17° 36' 56"N	121° 41' 25" E		PAGASA (FFWS)	Buntun Bridge, Tuguegarao, Cagayan
2	Tumauini	Hourly	1982 - Present	17° 16' 26"N	121° 47' 56" E		PAGASA (FFWS)	Poblacion, Tumauini, Isabela
3	Gamu	Hourly	1982 - Present	17° 04' 18"N	121° 50' 32" E		PAGASA (FFWS)	Gamu, Isabela
4	Maris Dam	Hourly	1982 - Present	16° 50' 20"N	121° 30' 50" E		PAGASA (FFWS)	Oscariz, Ramon, Isabela
5	Pangat	Hourly	1982 - Present	16° 36' 37"N	121° 40' 50" E		PAGASA (FFWS)	Pangal, Echague, Isabela
6	Baretbet	Hourly	2008 - Present	16° 35' 00"N	121° 15' 00" E		NIA	Bagabag, Nueva Vizcaya
7	Santo Domingo	Hourly	1999 - Present	16° 26' 05"N	121° 07' 01" E		NIA	Bato Ferry Bridge, Bayombong, Nueva Viscaya
8	Ibulao	Hourly	2008 - Present				NIA	Ibulao Bridge, Lagawe, Ifugao
9	Magat Dam	Daily	1983 - Present	16° 50' 00"N	121° 27' 02" E	4,143	NIA	Ozcariz, Ramon, Isabela
10	Maris Dam	Daily	1983 - Present	16° 50' 20"N	121° 30' 50" E	4,161	NIA	Ozcariz, Ramon, Isabela
11	Buntun Bridge	10 min	-	17° 36' 50"N	121° 41' 26" E		ASTI (NOAH)	Buntun Bridge, Bgy.Buntun, Tuguegarao
12	Ambaguio Bridge	Hourly	Plan	16° 31' 37"N	121° 03' 08" E		NIA (NORAD)	
13	Aurora Bridge	Hourly	Plan	16° 58' 23"N	121° 39' 26" E		NIA (NORAD)	
14	Baretbet Bridge	Hourly	Plan	16° 34' 59"N	121° 16' 11" E		NIA (NORAD)	
15	Lagawe 1	Hourly	Plan	16° 46' 59"N	121° 08' 04" E		NIA (NORAD)	
16	Lamo Bridge	Hourly	Plan	16° 20' 12"N	121° 06' 31" E		NIA (NORAD)	
17	Lamut Bridge	Hourly	Plan	16° 38' 52"N	121° 13' 28" E		NIA (NORAD)	
18	Mayoyao	Hourly	Plan	16° 54' 51"N	121° 10' 02" E		NIA (NORAD)	
19	Naguilian Bridge	Hourly	Plan	17° 00' 22"N	121° 49' 57" E		NIA (NORAD)	
20	Runruno	Hourly	Plan	16° 28' 02"N	121° 19' 39" E		NIA (NORAD)	
21	Tubo Bridge	Hourly	Plan	16° 19' 11"N	121° 17' 48" E		NIA (NORAD)	

Current Status of Utilization of Flood Runoff Models

01 Cagayan River Basin, Catchment Area : 27,280 km^2

22	Aluling Bridge	10 min	Plan	-	-		ASTI (NOAH)	Aluling Bridge, Mt.Province
23	Chico Karayan Bridge	10 min	Plan	17° 05' 32"N	121° 24' 56" E		ASTI (NOAH)	Chico Karayan Bridge, Paracelis, Mt.Province
24	Canao Bridge	10 min	Plan	17° 23' 45"N	121° 19' 17" E		ASTI (NOAH)	Canao Bridge, Tabuk, Kalinga
25	Masablang Bridge	10 min	Plan	17° 06' 50"N	121° 01' 38" E		ASTI (NOAH)	Masablang Bridge, Paracelis, Mt.Province
26	Ibulao Bridge	10 min	Plan	16° 47' 02"N	121° 07' 16" E		ASTI (NOAH)	Ibulao Bridge, Kiangan, Ifugao
27								
28								
29								

Discharge Measurement

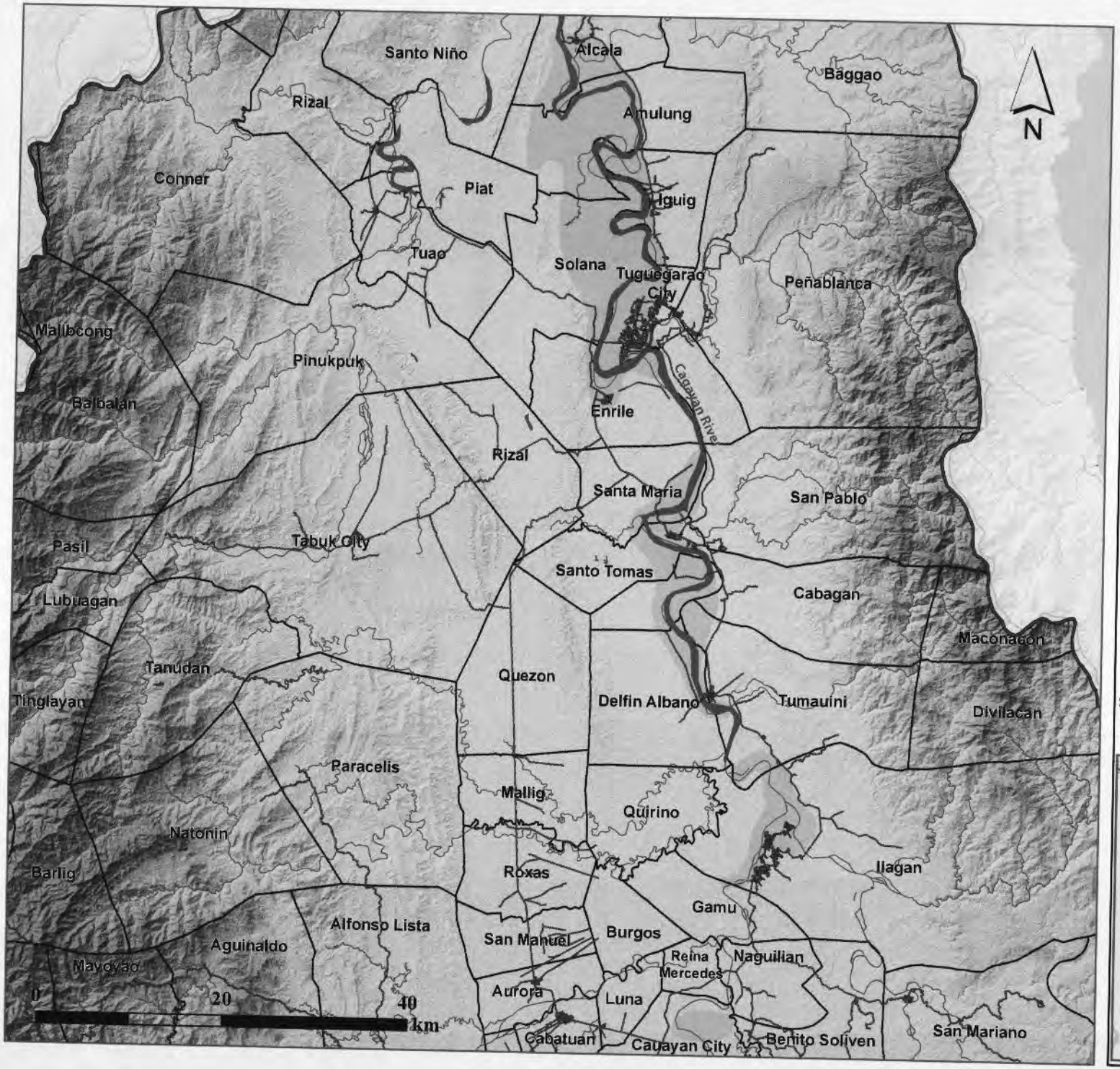
No.	Station Name	Duration of Record	Location		Nos of Record	Managed Agency
			Latitude	Longitude		
1	Gamu	2001 - 2009	17° 04' 18"N	121° 50' 32" E	64	DPWH
2						
3						
4						
5						

River Cross Section Data

No.	Distance of Survey	Survey Year	Nos of Data	Managed Agency
1	Magat River (Maris Dam - Confluence with Cagayan River), 47.5 km	2010	47	NIA
2				
3				
4				

Note: ▭ GS integrated in Flood Forecasting Model

14



DATA COLLECTION SURVEY
ON SITUATION OF NATIONWIDE
FLOOD FORCASTING AND WARNING SYSTEM

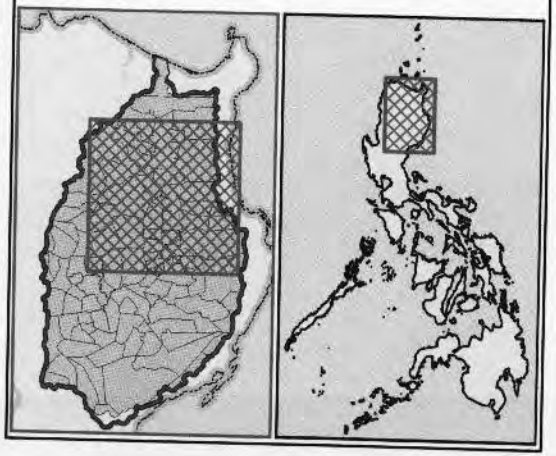
LOCATION OF FLOOD POTENTIAL AREA

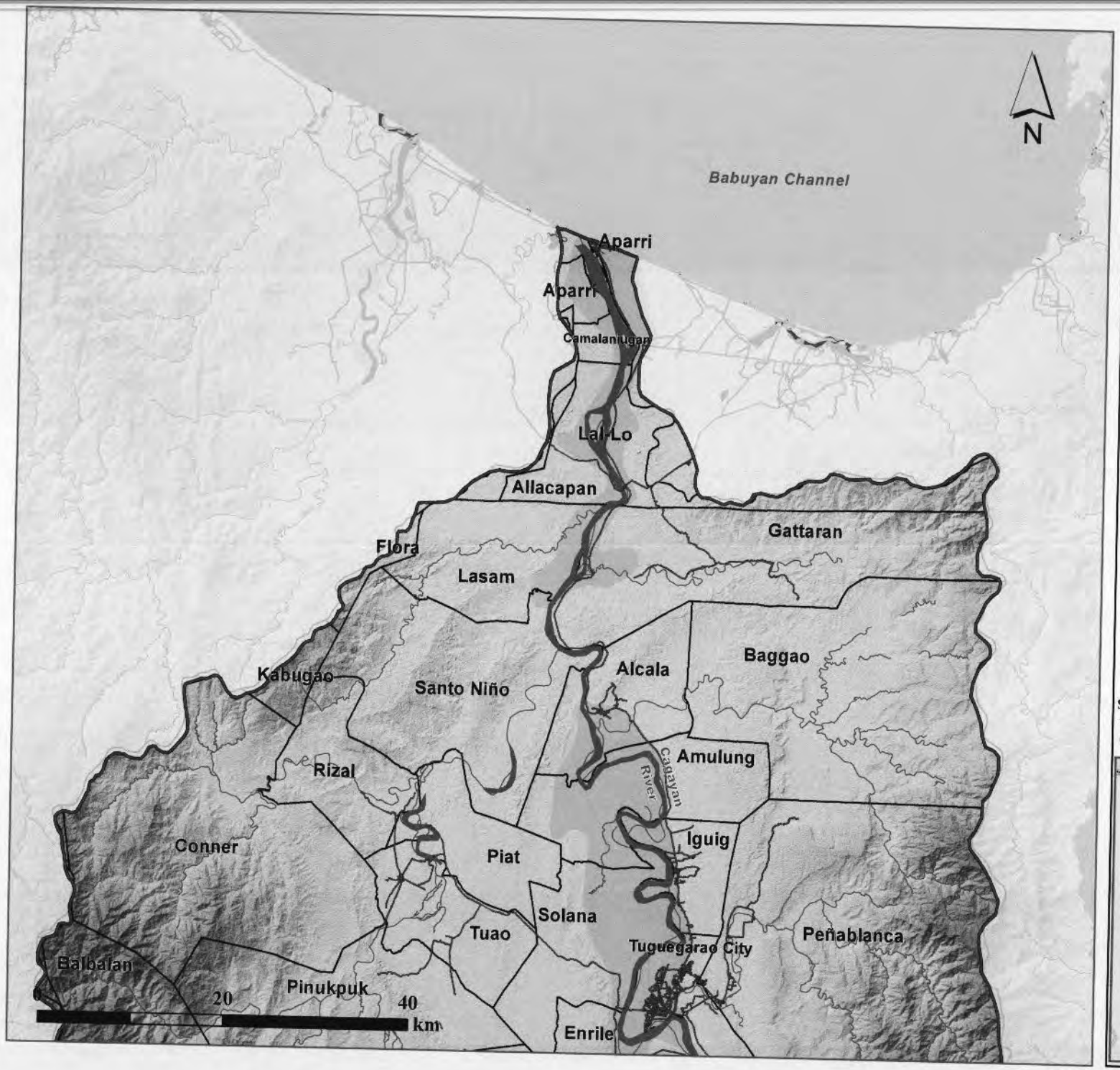
CAGAYAN RIVER BASIN
(Upstream Area)

Legend

- Road Network
- River
- Flood Potential Area
- Water Body
- Cagayan River Basin
- Municipal Boundary

Source: The study on the nationwide flood risk assessment and the flood mitigation plan for the selected areas in the Republic of the Philippines





DATA COLLECTION SURVEY
ON SITUATION OF NATIONWIDE
FLOOD FORCASTING AND WARNING SYSTEM

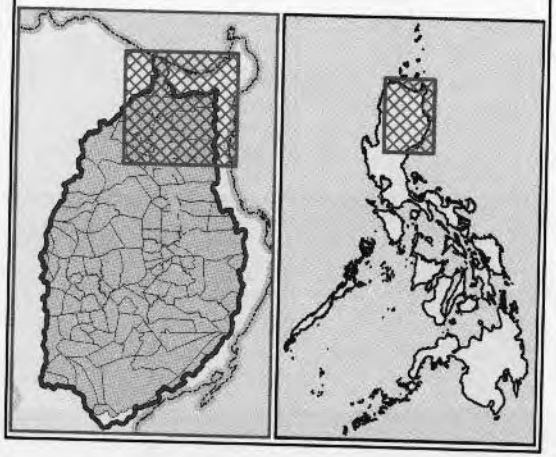
LOCATION OF FLOOD POTENTIAL AREA

CAGAYAN RIVER BASIN
(Downstream Area)

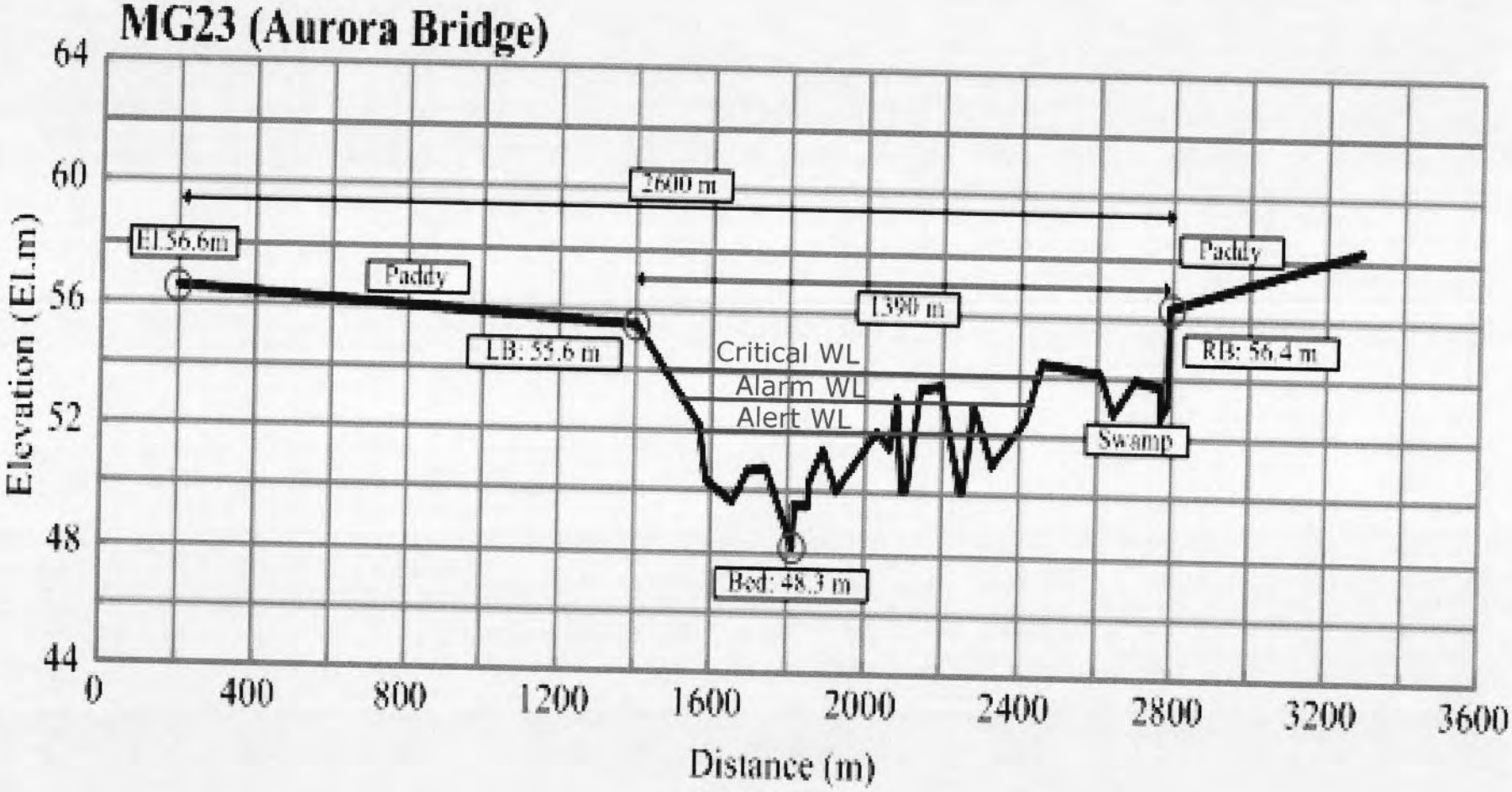
Legend

- Road Network
- River
- Flood Potential Area
- Water Body
- Cagayan River Basin
- Municipal Boundary

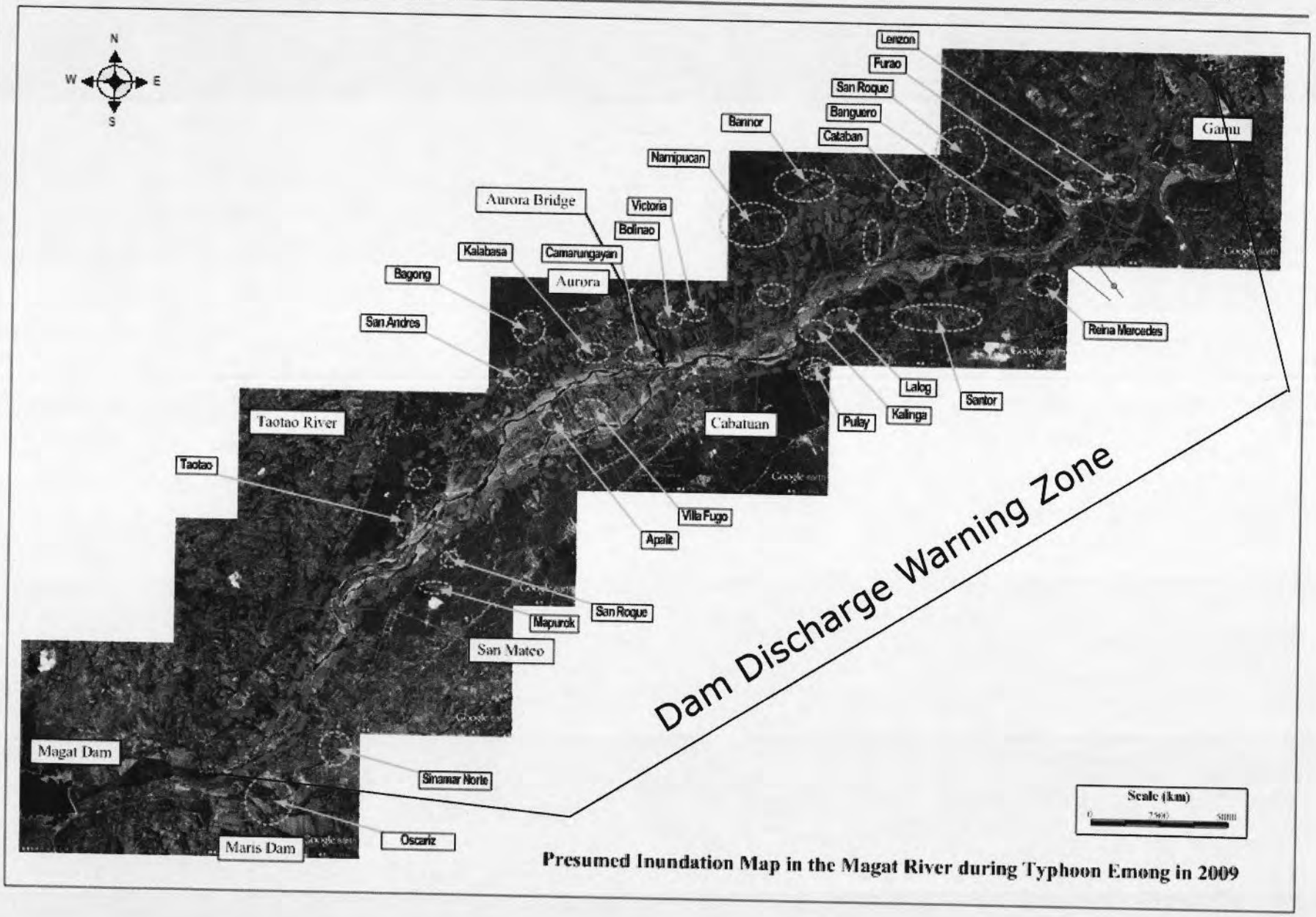
Source: The study on the nationwide flood risk assessment and the flood mitigation plan for the selected areas in the Republic of the Philippines



Flood Warning WLs on River Cross Section at Aurora Bridge



Provisional Inundation Map



Presumed Inundation Map in the Magat River during Typhoon Emong in 2009

(Sample of River Basin Flood Bulletin)

REPUBLIC OF THE PHILIPPINES
Department of Science and Technology
Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)
Tuguegarao PAGASA Complex, Tuguegarao City

FLOOD BULLETIN NO.2
CAGAYAN RIVER BASIN
ISSUED AT 4:00 PM TODAY, 4 NOVEMBER 2009
(VALID UNTIL THE NEXT ISSUANCE AT 5:00 AM TOMORROW)

AVERAGE BASIN RAINFALL (mm):

PAST 48 HOURS ENDING AT 2:00 PM TODAY = 112 MM
FORECAST FOR THE NEXT 24 HOURS = 50 MM

EXPECTED HYDROLOGICAL RESPONSE:

1. GRADUAL RISE OF UPPER MAIN CAGAYAN RIVER AND ITS TRIBUTARIES GANANO RIVER AND DIADI RIVER.

   FLOODING HAS OCCURED AND EXPECTED TO PERSIST WITHIN THE NEXT 12 HOURS IN THE LOW LYING AREAS OF SANTIAGO CITY, ECHAGUE, ANGADANAN, ALICIA AND CAUAYAN.

2. GRADUAL RISE OF MIDDLE MAIN CAGAYAN RIVER AND ITS TRIBUTARIES MAGAT RIVER, PINACANAUAN RIVERS OF ILAGAN, TUMAUINI AND SAN PABLO.

   FLOODING HAS OCCURRED AND EXPECTED TO PERSIST WITHIN THE NEXT 12 HOURS IN THE LOW LYING AREAS OF REINA MERCEDES, NAGUILIAN, GAMU, ILAGAN, TUMAUINI, DELFIN ALBANO, STO TOMAS CABAGAN, STA MARIA, AND SAN PABLO.

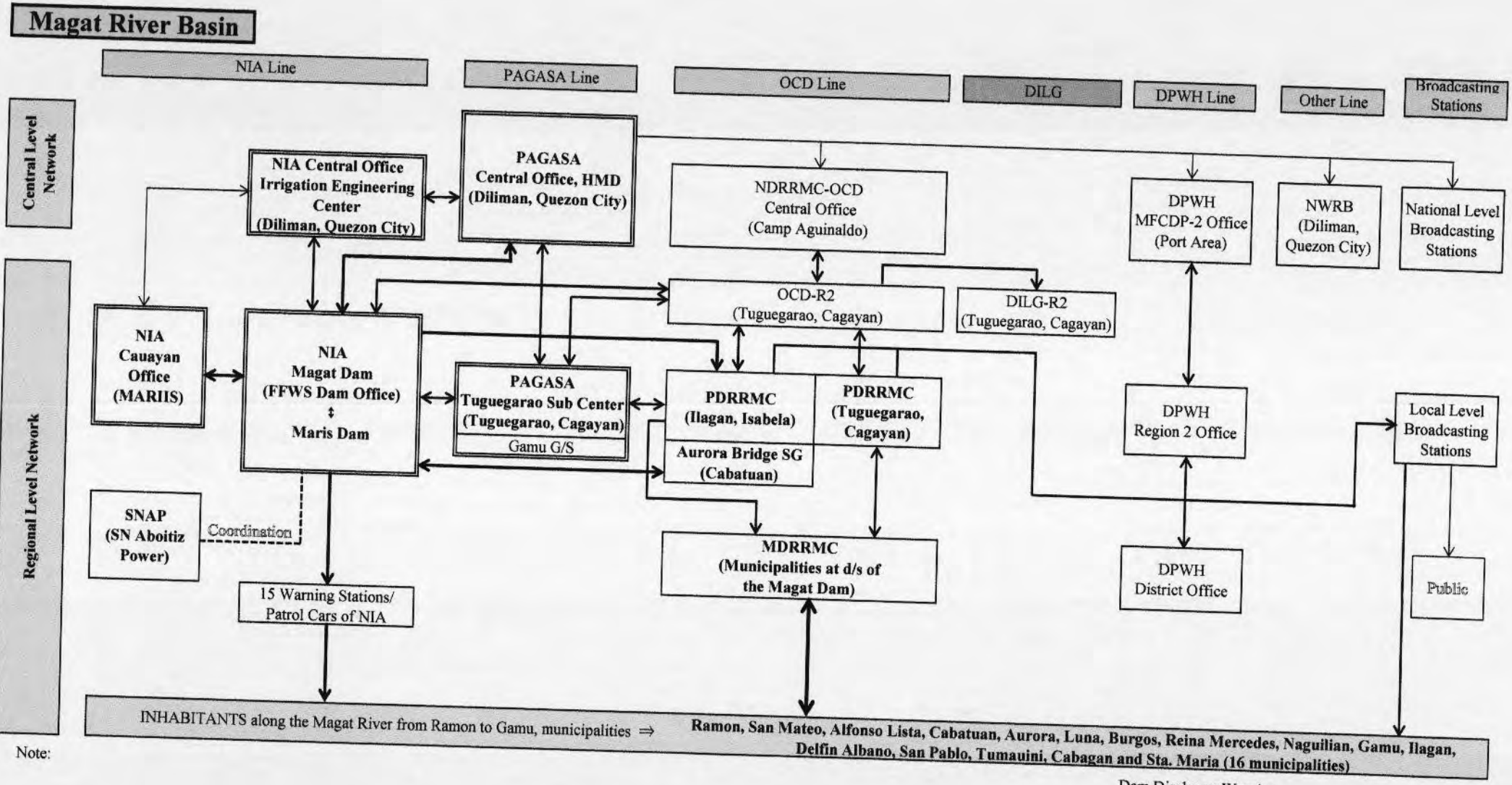
3. GRADUAL RISE OF LOWER MAIN CAGAYAN RIVER AND ITS TRIBUTARIES PINACANAUAN RIVER OF TUGUEGARAO, PARED RIVER, CHICO RIVER, DUMMUN RIVER AND ZINUNDUNGAN RIVER.

   FLOODING IS EXPECTED TO OCCUR WITHIN THE NEXT 12 HOURS IN THE LOW LYING AREAS OF ENRILE, TUGUEGARAO CITY, SOLANA, IGUIG, AMULUNG, ALCALA, GATTARAN, LASAM, BAGGAO, LALLO, CAMALANUIGAN AND APARRI.

THE RESIDENTS IN THE LOW LYING AREAS AND THE DISASTER COORDINATING COUNCILS CONCERNED ARE ADVISED TO TAKE APPROPRIATE ACTION.

PREPARED BY:
LLB/ ACP/AEB

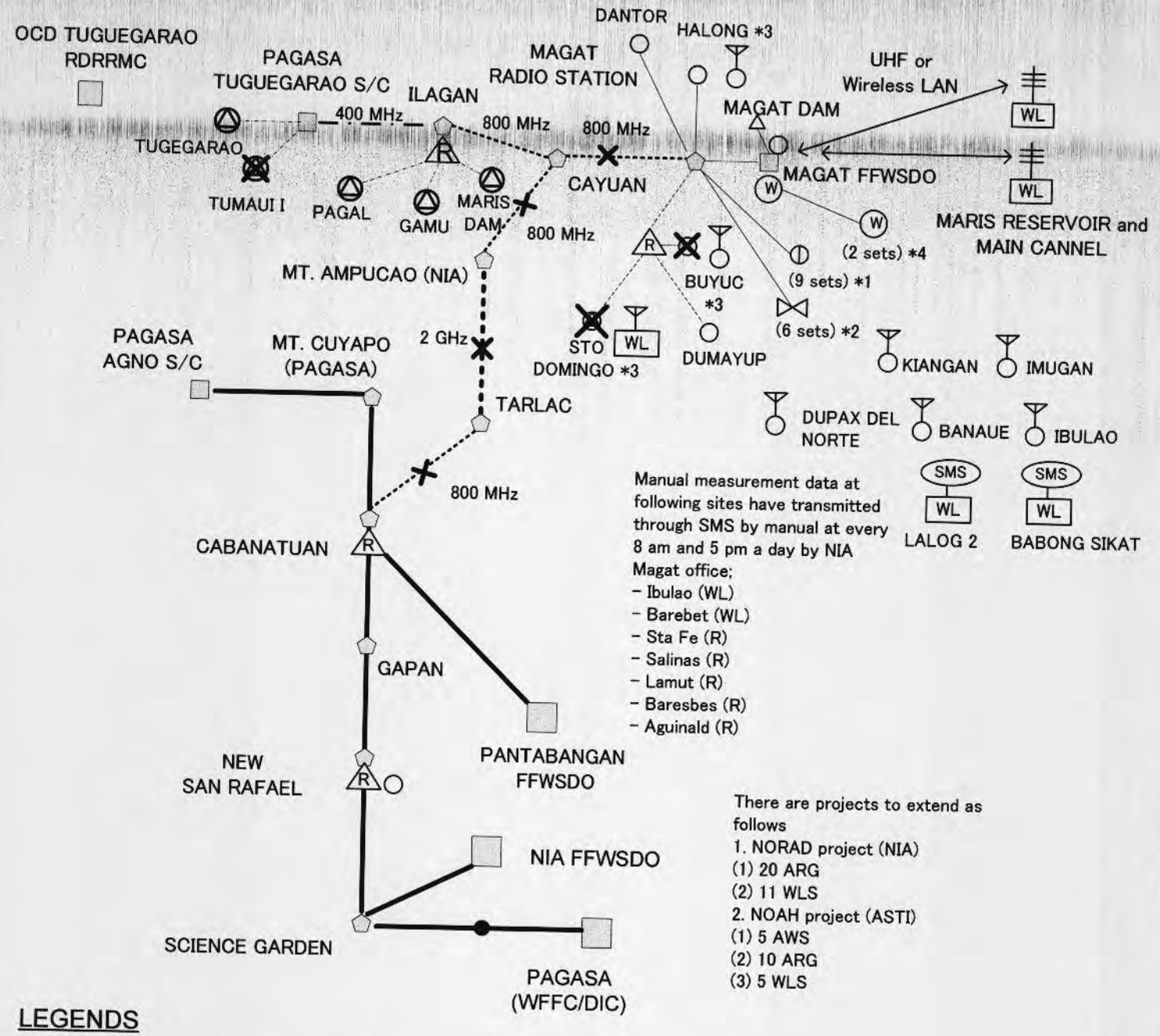
NOTED BY:
SUSAN R. ESPINUEVA, Ph.D.
OIC, HMD



Note:

Dam Discharge Warning:
Warning 1 - Before commencement of discharge
Warning 2 - After commencement of discharge
Warning 3 - Rapid increase of discharge

Dam Discharge Warning Information Network in Magat River Basin
(Proposed by the Project, November 2012)



LEGENDS

- 2/5/7 GHz Microwave Link
- 400/800 MHz UHF Link
- Optic Fiber Link
- 150 MHz VHF Link
- 2/5/7 GHz Microwave Repeater Station
- 150 MHz Repeater Station
- Rain-gauge Station
- Water Level Station
- Rain-gauge Station/Water Level Station
- Warning Station (Speaker & Radio Telephone)
- Warning Station (Speaker)
- Warning Station (Local Made)
- Satellite Rain-gauge Station
- WL Satellite Water level-gauge Station

NOTES

- Not Working

*1: Three stations out of 9 stations were nonoperational.

*2: One station out of 6 stations was nonoperational.

*3: NIA MAGAT office has installed new satellite telemetry equipment at following stations in 2010:
- Sto Domingo, Buyoc, Halong and Kiangan.

*4: NIA MAGAT office has installed new warning equipment at following sites in 2010
- Magat office, San Mateo and Banauero remote stations.

Telecommunication Network in Cagayan River Basin as of April 2013

2/

Table 14.1 Recommendation on Enhancement of FFWSDO/FFWS (1/3)

No.	Category	Key Issues	Responsible Agency	Target River Basin	Key Suggestions	Priority *
1	Overall FFWSDO/FFWS concerned					
1-1	Flood Operation Rules	Current Flood Operation Rules of the target dams were prepared in 1980's and need to be updated in terms of hydrological setting and conditions at d/s riparian	NIA, NPC, PAGASA	Agno, Pampanga and Magat/ Cagayan	Comprehensive review and updating of the current flood operation rules is required for all dams taking account of flood recordsw in recent years and disaster risk reduction at downstream riparian areas, etc.	A
1-2	Integration of forecasted rainfall into FFWSDO	Without hourly rainfall data incoming few hours in the target river basins, effective use of the Flood Models would not be realized.	PAGASA, (NIA, NPC)	Agno, Pampanga and Magat/ Cagayan	Aiming at enhancement of flood waning operation by PAGASA in the target river basins, it is expected that the Flood Models would be appropriately utilized for assessment of flood discharge and corresponded water levels. By means of H-Q rating curves and flood warning water levels, more specific information can be issued by PAGASA. To enable it, incoming rainfall in the target areas should be examined and assessed in collaboration with Weather Forecasting Section during flood operation period.	A
1-3	Enhancement of inter-agencies collaboration on FFWS/FFWSDO	Expansion of FFWS is now envisaged to other river basins by PAGASA.	PAGASA	Other river basins	Through the implementation of this Project, the information network and collaboration among LGU, PAGASA Sub-centers and JOMC has been strengthened. Their roles has been clarified and their importance has been further stressed in FFWS/FFWSDO. This collaboration should be institutionalized and applied for PAGASA's endeavor on strengthening of FFWS in other river basins in cooperation with LGUs and DPWH.	B
1-4	Integration of other observatories into present FFWSDO/ FFWS	Available data will not effectively utilized for flood forecasting.	PAGASA	Agno, Pampanga and Magat/ Cagayan	It is recommended that new monitoring equipment (ex: new rainfall gauging stations in the Magat River basin planned by NORAD) should be integrated for improvement of accuracy in flood forecasting in the river basin concerned.	B
2	Meteorology and Hydrology/ Flood Forecasting Tools					
2-1	Installation of additional rainfall gauging stations	Reliability of basin mean rainfall is in weak.	NPC	Agno	By current monitoring network, rainfall at high elevation in the mountain range cannot be observed in the Upper Agno River basin. Additional observatories should be installed at higher location at upstream of San Roque Dam in order to assess more accurate inflow into the reservoirs of the three dams.	A
2-2	Installation of additional rainfall gauging stations	Reliability of basin mean rainfall is in weak.	NIA	Magat	Additional rainfall gauging stations should be installed at upstream of Magat Dam in particular at higher elevation and at downstream basin of the dam site as well. At downstream of the dam site only rainfall gauging stations of PAGASA are available. If possibility of rearrangement of locations is still remained in the plan of NORAD, installation at higher elevation is	B
2-3	Installation of additional water level gauging stations	Calibration of flood runoff model is insufficient.	PAGASA	Agno	Available water level records during flood events are very few or data is not properly arranged without check. Improvement system for data quality check and proper arrangement are prerequisite.	A

Table 14.1 Recommendation on Enhancement of FFWSDO/FFWS (2/3)

2-4	Installation of additional water level gauging stations	Calibration of flood runoff model is insufficient.	PAGASA	Pantabangan	It is recommended to install automatic water level gauge at Rizal, since even without no outflow from Pantabangan Dam, inundation will occur at Upper Pampanga River basin.	A
2-5	Installation of additional water level	Calibration of flood runoff model is insufficient.	NIA	Magat	It is recommended that additional water level gauging stations should be installed in the Magat River basin (ex. the Matuno, Alimit, and Lamu, etc.).	B
2-6	Elaboration of Flood Runoff Models	Area coverage of the current model is insufficient.	NIA	Upper Pampanga	Downstream boundary of the current flood runoff model (Dam Inflow and Dam Downstream Forecasting Model) in the Upper Pampanga River basin needs to be extended from Palayan City to San Isidro to cover the full stretches of dam discharge warning zone of Pantabangan Dam.	A
2-7	Elaboration of Inundation Analysis Model in Pampanga	Accuracy of river cross sections needs to be elaborated.	PAGASA, NIA	Pampanga	Accuracy of the elevation system of river cross sections surveyed by PAGASA needs to be elaborated by connecting reliable bench marks along the Pampanga River.	B
3	Organization and System for Flood Forecasting and Warning Operations					
3-1	Sustainability of proper dam operation	Awareness on tasks for FFWSDO in NPC will be threatened due to decrease of FFWS staff along with privatization of power sector in the country.	NPC, SPRC, SNAP	Ambuklao/ Binga /San Roque Dams and Angat Dam	In orderto ensure for FFWSDO to be carried out in collaboration of NPC and private corporations, exchanging the agreements on the tasks related to FFWSDO should be considered. The agreement should clarify how the tasks related to FFWSDO are delineated, and rainfall and water level data are shared between them, etc.	A
3-2	Updating of flood warning water levels on the current computer	Discrepancies of flood warning levels in the current computer system need to be	PAGASA	Agno, Pampanga	The flood warning water levels in the Agno and Pampanga River basins showing on the computer system (installed by the Grant-aid Project under JICA) shall be updated in accordance with recommendations by the current	A
3-3	Strengthening of River Bain Sub-centers of PAGASA	Increasing roles and expectations of PAGASA Sub-centers	PAGASA	Agno, Pampanga, Cagayan	In order to cope with increasing roles of staff and facilities at existing three Sub-centers (in the Agno, Pampanga and Cagayan), those shall be further strengthened.	A
3-4	Continuation of IEC activities	To secure better understanding on FFWSDO from local governments concerned is one crucial	PAGASA, NIA, NPC	Agno, Pampanga and Magat/ Cagayan	IEC activities should be continued by each agency to increase the level of awareness of local people in the target river basins.	A
4	Equipment for FFWSDO/FFWS and O & M					
4-1	Rehabilitation/ replacement of spillway gate control facilities	Precise spillway gate opening/closing is difficult.	NIA, NPC	All dams (except San Roque Dam)	Gate control devices shall be improved/ renewed for more reliable spillway gate operation in the level of "cm" with enabling remote control from FFWS Dam Office (or power house).	A
4-2	Rehabilitation of existing telemetry system at upstream of dam sites	Deterioration of the existing telemetry equipment	NIA, NPC	All dams	The existing telemetry system at upstream of dam sites shall be rehabilitated aiming at more accurate estimation of inflow discharge into the reservoirs.	A
4-3	Rehabilitation of existing warning system	Deterioration of the existing warning equipment	NIA and NPC	All dams	The existing warning system shall be rehabilitated for proper operation of dam discharge warning.	A

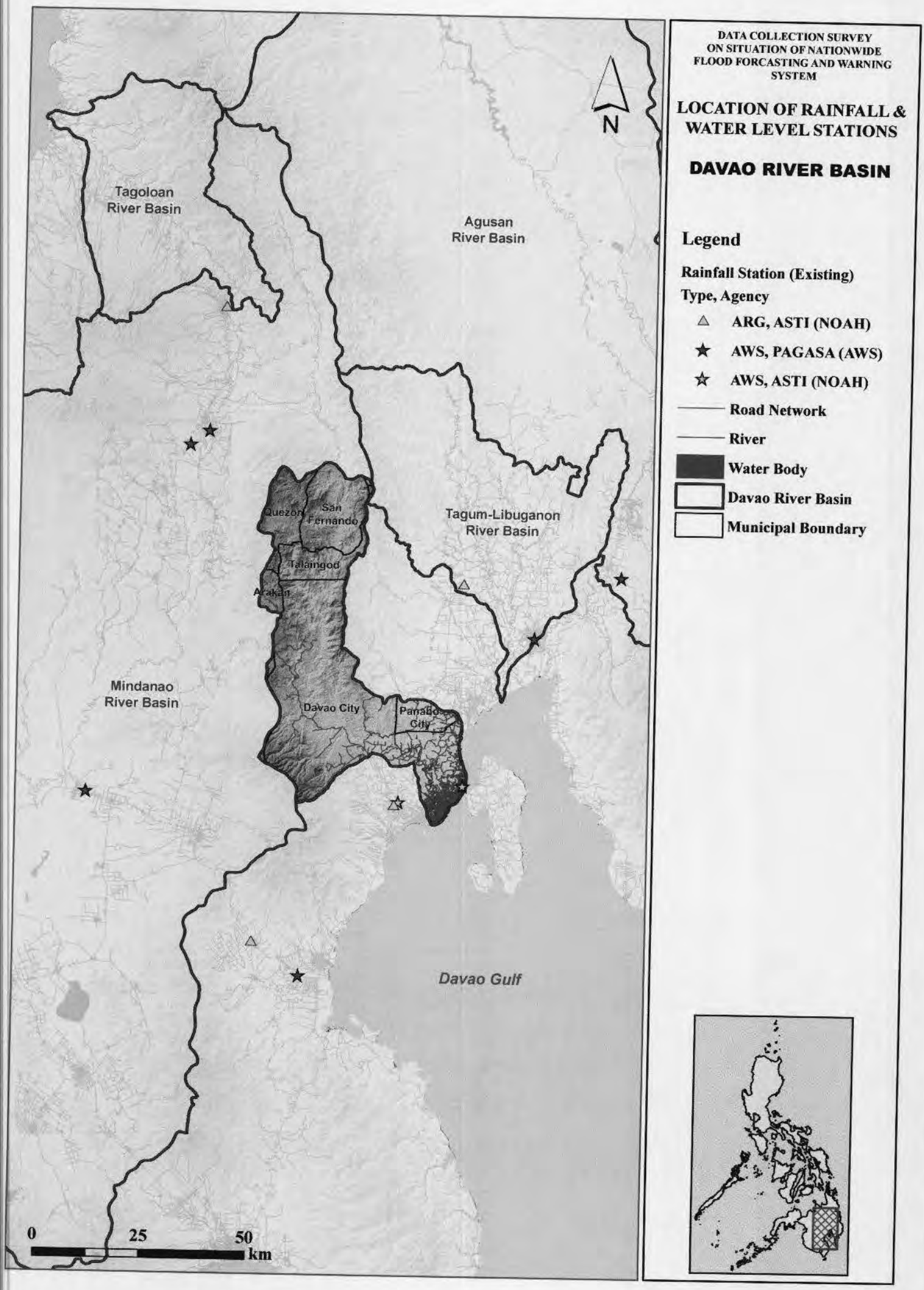
Table 14.1 Recommendation on Enhancement of FFWSDO/FFWS (3/3)

4-4	Telecommunication system for comprehensive dam operation of the Agno River basin	There is no reliable telecommunication and dam control/operation information system among Ambuklao, Binga and San Roque Dams.	NPC, SRPC and SNAP	Agno River basin	Dam control/operation information (gate status and outflows data etc) of Ambuklao, Binga and San Roque Dams shall be shared through more reliable telecommunication system.	A
4-5	Telecommunication system for comprehensive dam operation of the Angat River basin	There is no reliable telecommunication and dam control/operation information among Angat, Ipo and Bustos Dams.	NIA, NPC and PAGASA	Angat River basin	Dam control/operation information (gate status and outflows data etc) of Angat, Ipo and Bustos dams shall be shared through more reliable telecommunication system.	A
4-6	Procurement of spare parts of old FFWSDO (Category B and C**)	Deterioration of the existing equipment	JOMC	Agno, Pampanga and Magat/ Cagayan	Procurement of spare parts of old FFWSDO which are categorized as "B" and "C".	A
4-7	Utilization of digital TV	Text message though the existing cellphone system has limitation for FFWS	PAGASA, OCD, DPWH, NWRB, etc	-	It is recommended that all government agencies related to FFWS activities share the disaster situation in real time with visual information and to transmit it quickly and simultaneously.	B
4-8	Backbone telecommunication system for central government agencies	Sharing the data of FFWS and flood information is not appropriately conducted.	PAGASA, OCD, DPWH, NWRB, PDRRMCs,	-	It is recommended to establish the reliable telecommunication network providing for alternative route and backup system for proper operation of FFWS.	B
4-9	Procurement of spare parts of FFWS managed by PAGASA (Category B and C)	Spare parts shall be stored for proper operation of the FFWS.	PAGASA	Agno, Pampanga and Magat/ Cagayan	Procurement of spare parts of FFWS managed by PAGASA which are categorized as "B" and "C".	B
5	Capacity Development of Human Resources					
5-1	Fundamental knowledge on meteorology and hydrology	Lack of technical knowledge and skills to pursue the tasks on FFWSDO/FFWS	PAGASA (main), NIA, NPC and other related	-	In order to consolidate appropriate understanding on monsoon weather and flood mechanism, technical workshop and lectures shall be periodically conducted inter agencies with participatory approach by the initiative of PAGASA.	B
5-2	Employment of young staff	Technical knowledge transfer between different generations will be in O & M section.	PAGASA	-	It is recommended that PAGASA will employ young staff for Equipment O & M works continuously.	B
5-3	Employment of geodetic engineer	Needs of topographic survey works will increase in the agency.	PAGASA	-	In order to meet increase of topographic survey works and discharge measurements in PAGASA, it is recommended that a geodetic engineer/ expert should be employed as a permanent staff in Equipment O & M section.	B

Remarks: *, Priority A, Actions to be conducted in the mid-term (YR2013 - YR2016)
B, Actions to be conducted in the long-term (YR2013 - YR2020)

Source: Consultant Team

"Project Completion Report Vol.1 Main Report. Nov. 2011"


DATA COLLECTION SURVEY
ON SITUATION OF NATIONWIDE
FLOOD FORCASTING AND WARNING
SYSTEM
LOCATION OF RAINFALL &
WATER LEVEL STATIONS
DAVAO RIVER BASIN
Legend
Rainfall Station (Existing)
Type, Agency
ARG, ASTI (NOAH)
AWS, PAGASA (AWS)
AWS, ASTI (NOAH)
Road Network
River
Water Body
Davao River Basin
Municipal Boundary
N
Tagoloan
River Basin
Agusan
River Basin
Tagum-Libuganon
River Basin
Mindanao
River Basin
Quezon
San
Fernando
Talaingod
Arakan
Davao City
Panabo
City
Davao Gulf
0
25
50
km

Current Status of Utilization of Flood Runoff Models

15 Davao River Basin, Catchment Area : 1,623 km^2

Availability of Flood Runoff Model	Available	·	(Not Available)

Description of Model

1. Name of Model :
   Target Area :
   Basin Rainfall :

Available Data for Development and Modified of Flood Runoff Model

Rainfall

No.	Station Name	Station Type	Data Type	Duration of Record	Location		Elevation (El.m)	Managed Agency	Address
					Latitude	Longitude			
1	Panabo	ARG	15 min	-	07° 33' 42"N	125° 39' 12" E	-	ASTI (NOAH)	Panabo, Davao del Norte
2	Malaybalay	ARG	15 min	-	08° 09' 07"N	125° 07' 57" E	-	ASTI (NOAH)	PAGASA Malaybalay Station, Capitol Compound, Malaybalay City, Bukindnon
3	Davao City	AWS	15 min	-	07° 07' 40"N	125° 39' 18" E	-	ASTI (NOAH)	PAGASA Office, Davao City
4	Bansalan	ARG	15 min	-	06° 47' 18"N	125° 12' 17" E	-	ASTI (NOAH)	Bansalan, Davao del Sur
5	Nabunturan	AWS	15 min	-	07° 34' 40"N	125° 59' 34" E	82.00	PAGASA (AWS)	Nabunturan, Compostela Valley
6	USEP - Tagum	AWS	15 min	-	07° 26' 46"N	125° 48' 23" E	22.00	PAGASA (AWS)	USEP Campus Tagum, Davao del Norte
7	Valencia	AWS	15 min	-	07° 53' 12"N	125° 06' 01" E	315.00	PAGASA (AWS)	Valencia, Bukidnon
8	CMSU - Musuan	AWS	15 min	-	07° 51' 24"N	125° 03' 35" E	301.00	PAGASA (AWS)	CMSU Campus, Musuan, Bukidnon
9	Kabacan	AWS	15 min	-	07° 06' 34"N	124° 50' 50" E	245.00	PAGASA (AWS)	Kabacan, North Cotabato
10	Digos	AWS	15 min	-	06° 42' 53"N	125° 18' 23" E	50.00	PAGASA (AWS)	Digos, Davao Del Sur
11	Sto.Nino	AWS	15 min	-	07° 05' 08"N	125° 30' 29" E	-	ASTI (NOAH)	Sto.Nino, Tugbok District, Davao City
12	Sto.Nino	ARG	15 min	-			-	ASTI (NOAH)	Sto.Nino, Tugbok District, Davao City
13									

Water Level

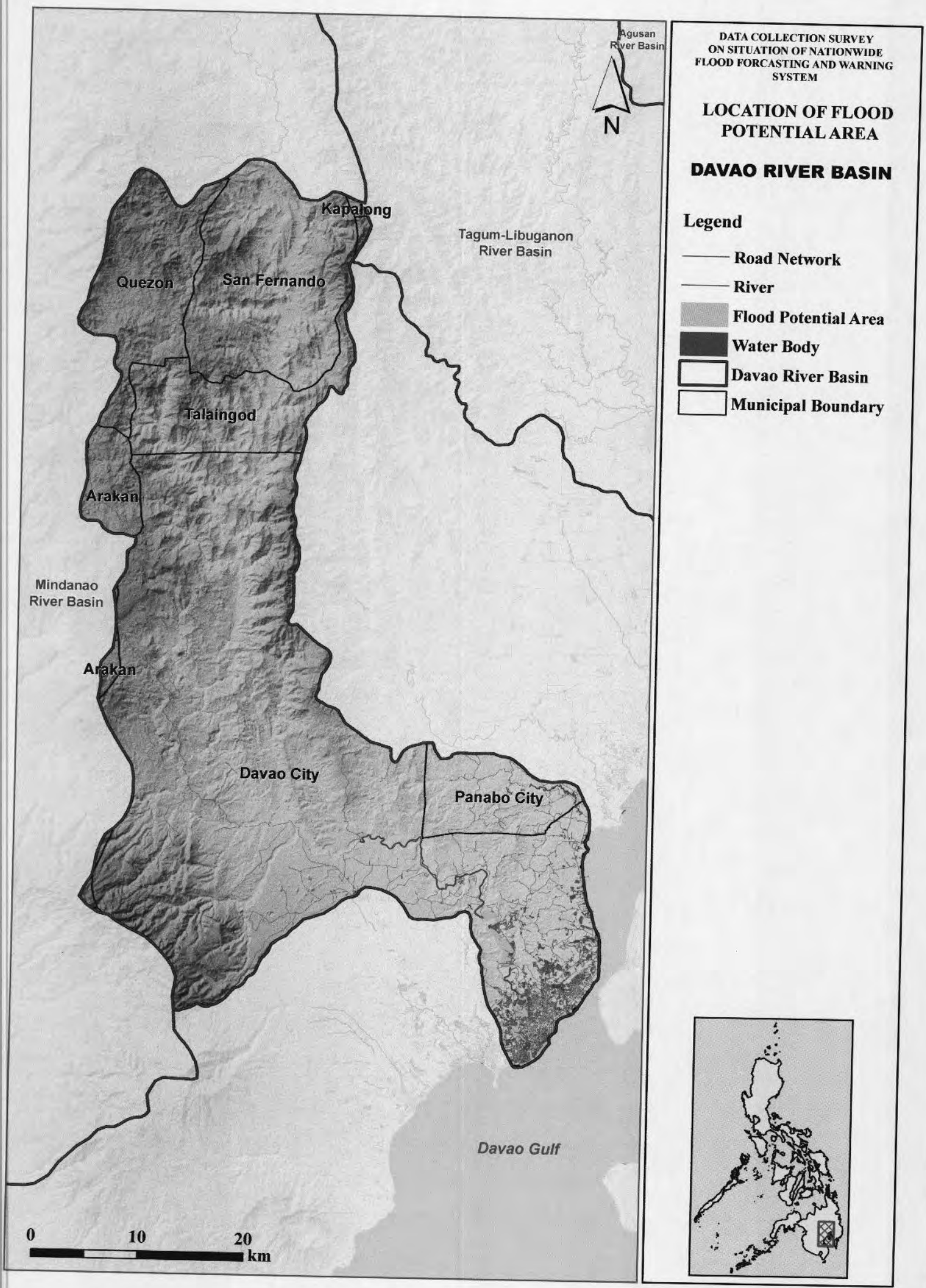
No.	Station Name	Data Type	Duration of Record	Location		Catchment Area (km^2)	Managed Agency	Address
				Latitude	Longitude			
1								
2								

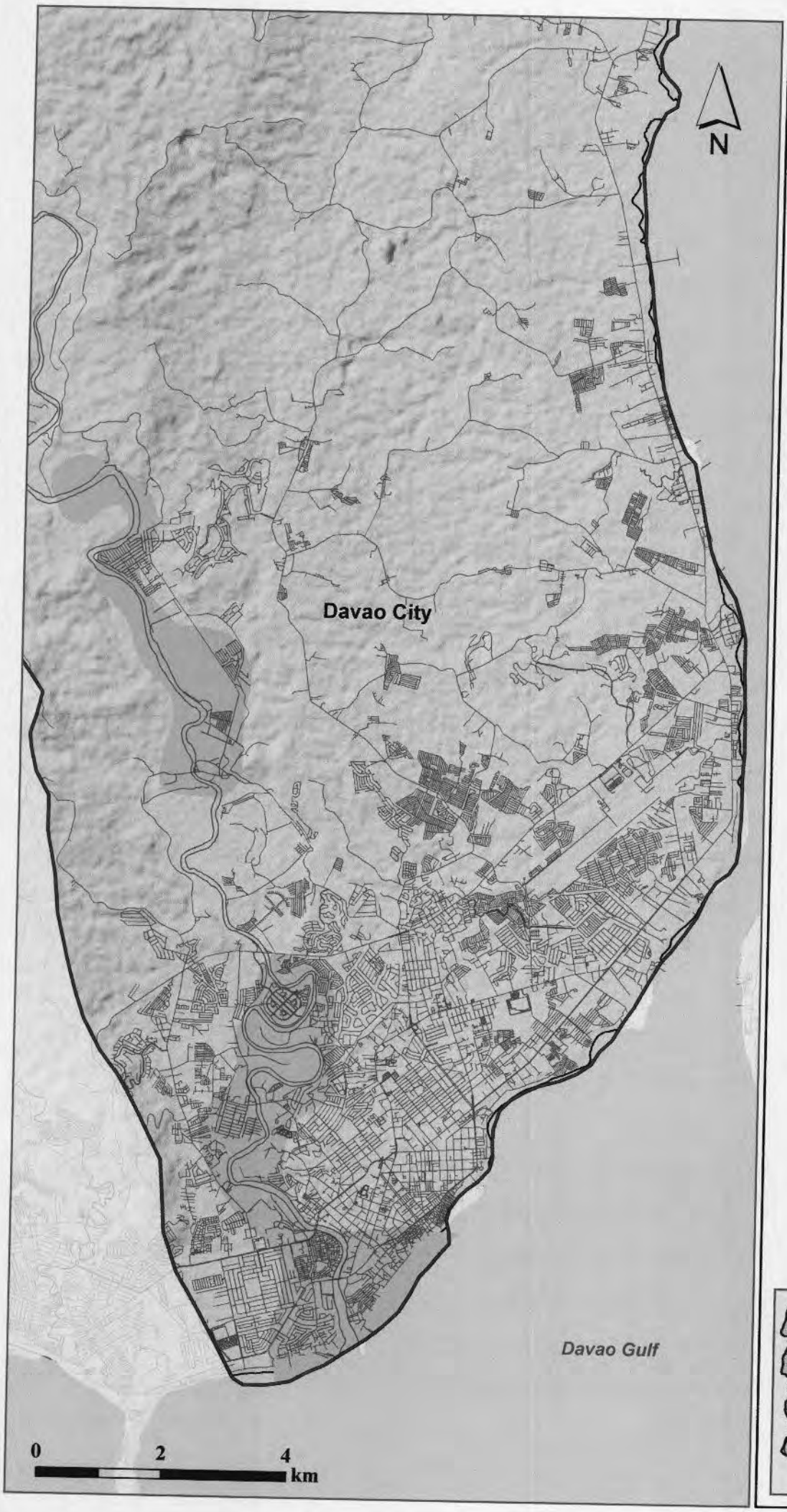
Discharge Measurement

No.	Station Name	Duration of Record	Location		Nos of Record	Managed Agency
			Latitude	Longitude		
1						
2						

River Cross Section Data

No.	Distance of Survey	Survey Year	Nos of Data	Managed Agency
1				
2				


Agusan River Basin
N
Kapalong
Tagum-Libuganon River Basin
Quezon
San Fernando
Talaingod
Arakan
Mindanao River Basin
Arakan
Davao City
Panabo City
Davao Gulf
0
10
20
km
DATA COLLECTION SURVEY ON SITUATION OF NATIONWIDE FLOOD FORCASTING AND WARNING SYSTEM
LOCATION OF FLOOD POTENTIAL AREA
DAVAO RIVER BASIN
Legend
Road Network
River
Flood Potential Area
Water Body
Davao River Basin
Municipal Boundary



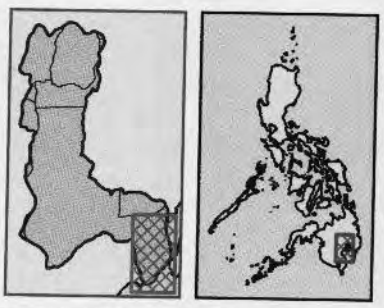
DATA COLLECTION SURVEY
ON SITUATION OF NATIONWIDE
FLOOD FORCASTING AND WARNING
SYSTEM

LOCATION OF FLOOD POTENTIAL AREA

DAVAO RIVER BASIN
(Downstream Area)

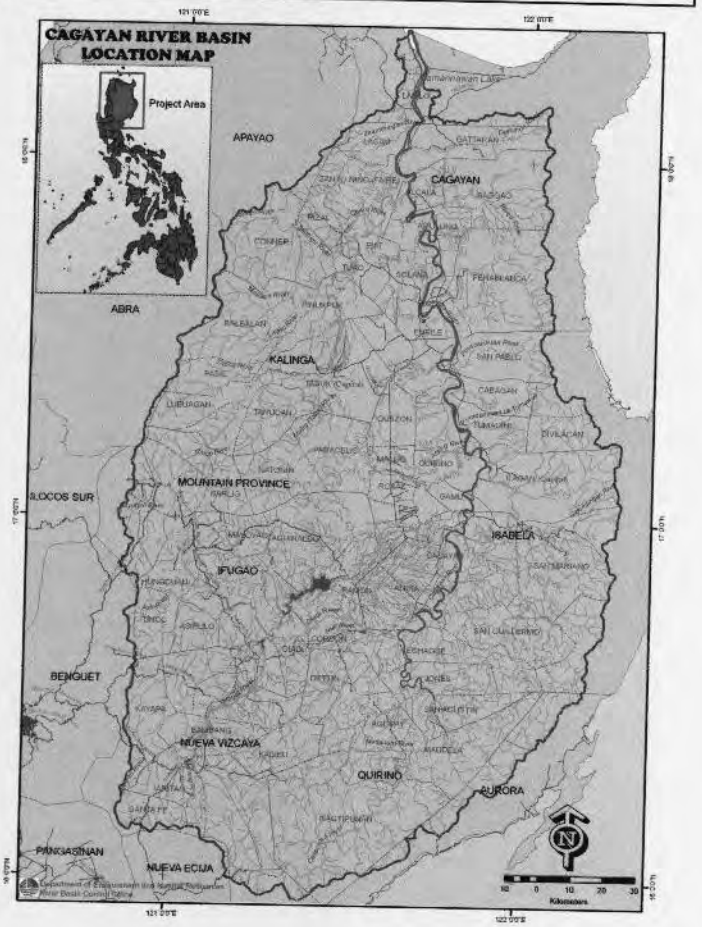
Legend

- Road Network
- River
- Flood Potential Area
- Water Body
- Davao River Basin
- Municipal Boundary

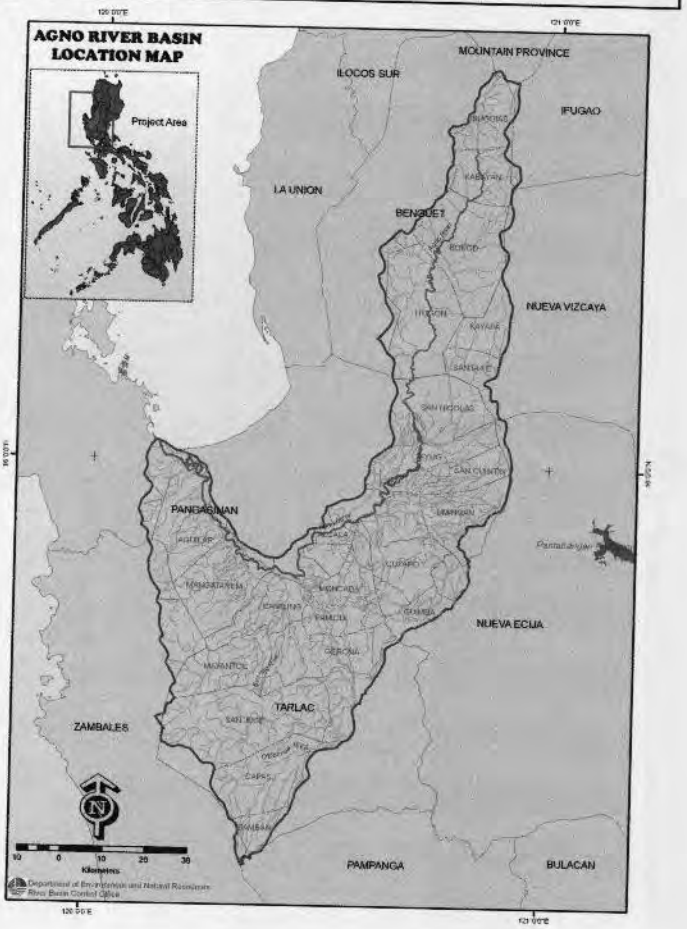


27A

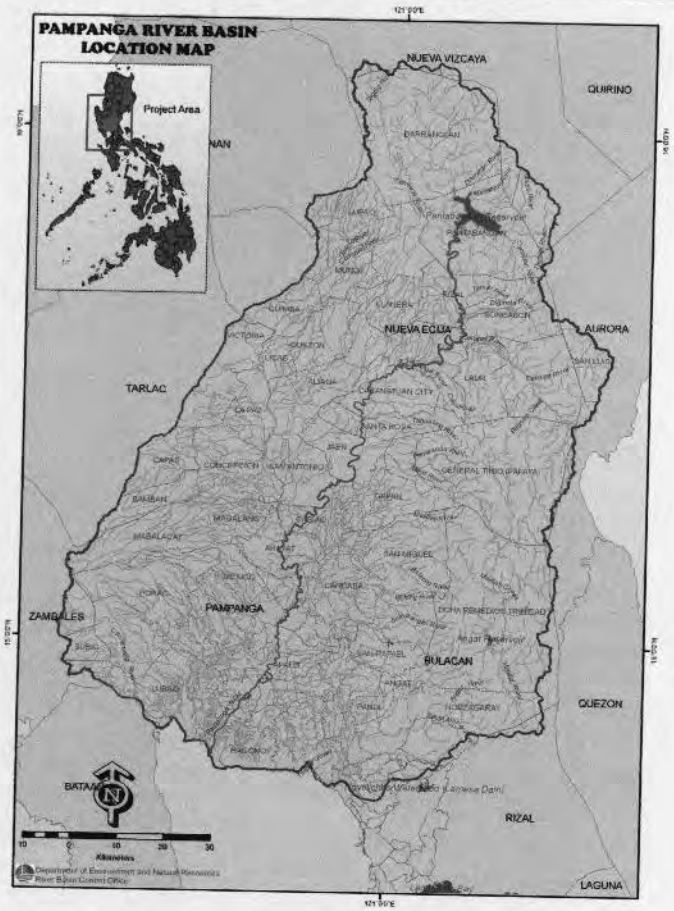
01 Cagayan River Basin



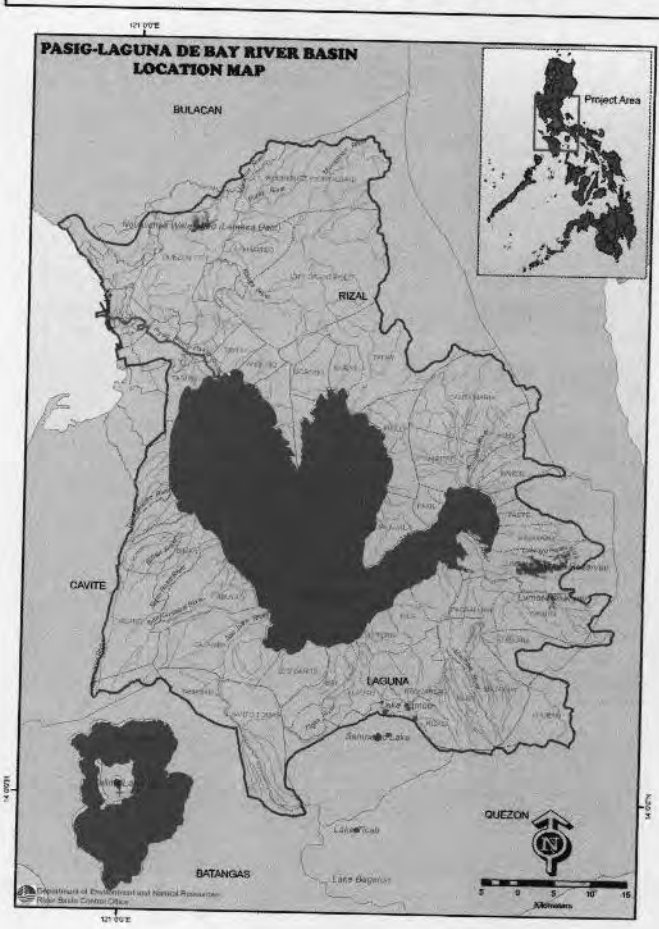
02 Agno River Basin



03 Pampanga River Basin



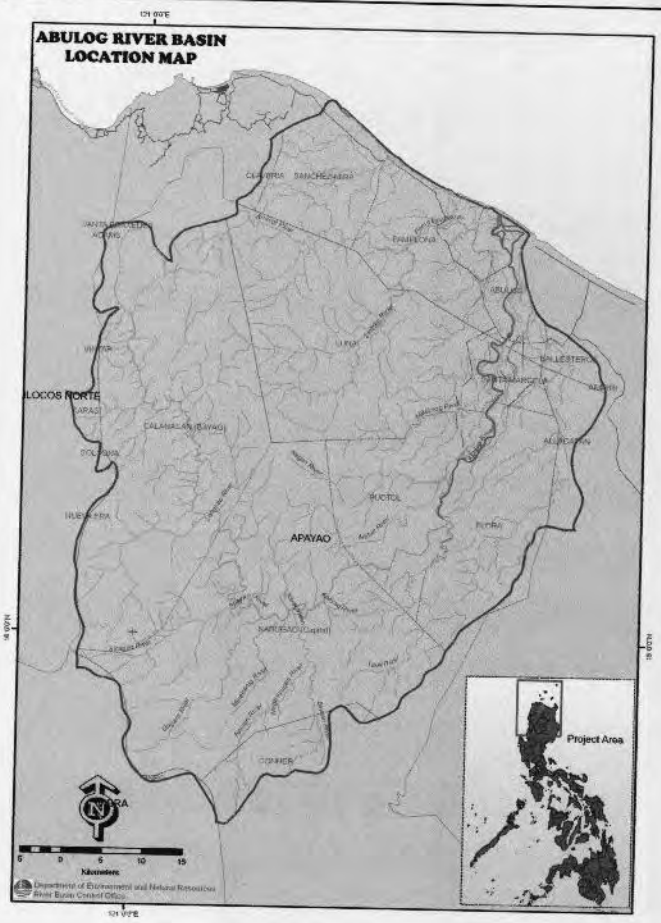
04 Pasig-Laguna River Basin



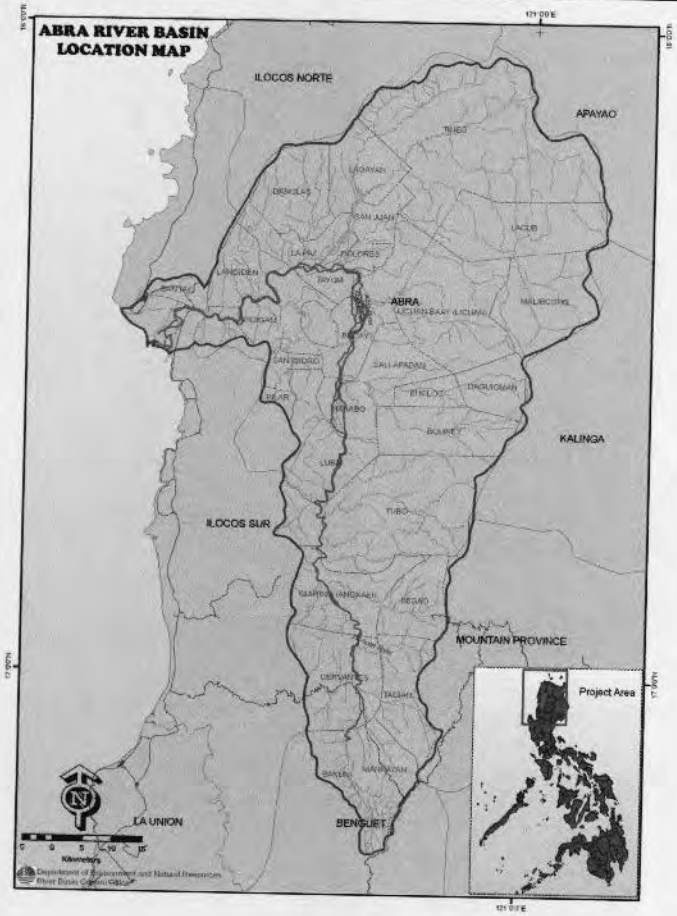
28

05 Bicol River Basin

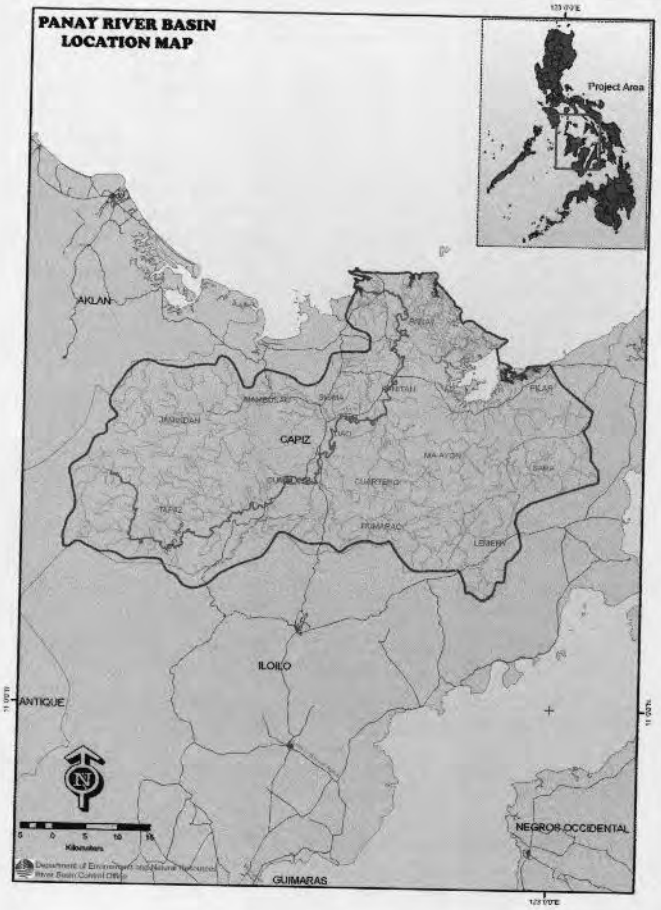
06 Abulog River Basin



07 Abra River Basin



08 Panay River Basin



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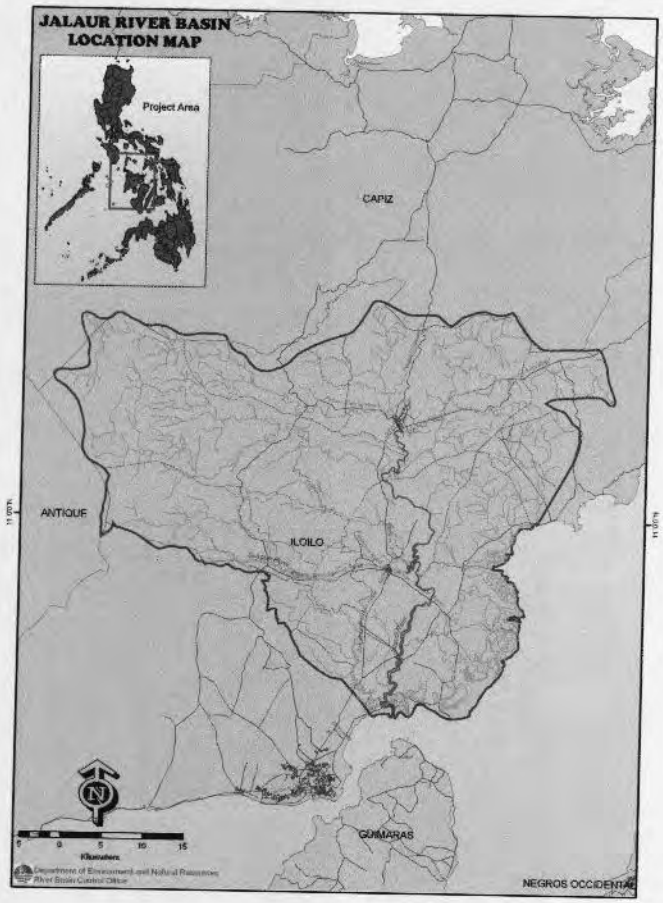
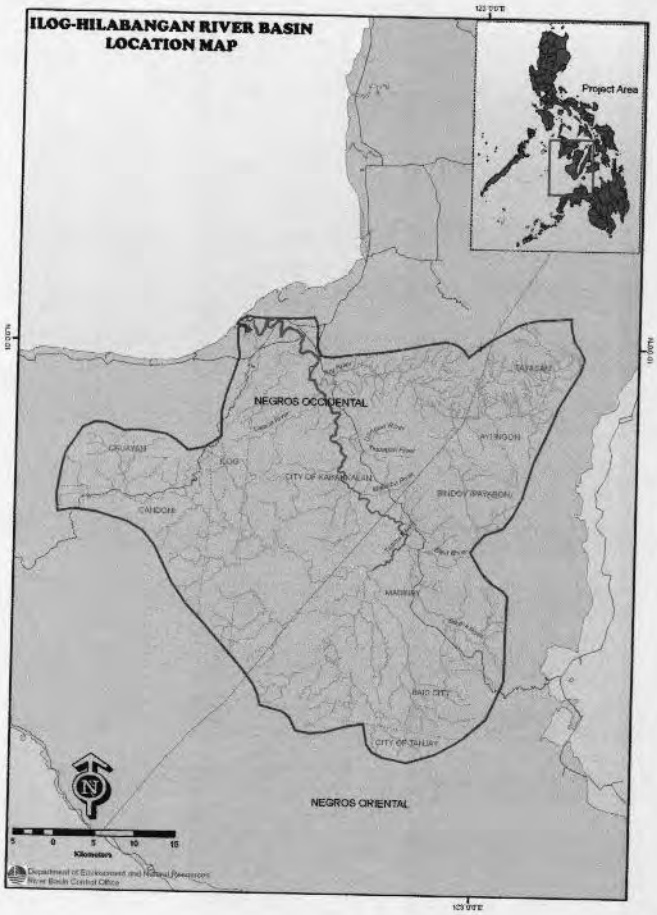
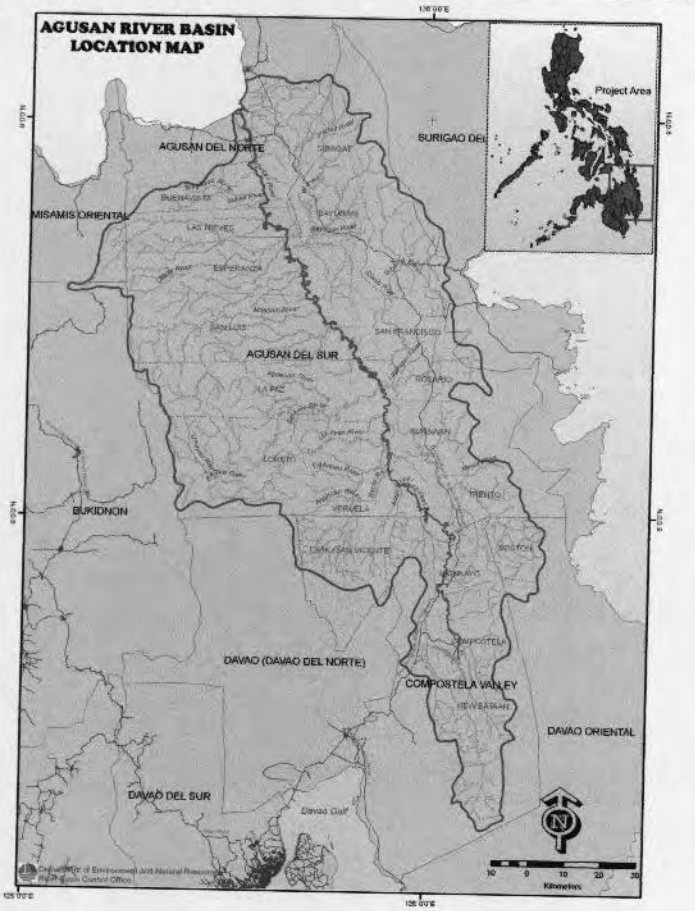
09 Jalaur River Basin



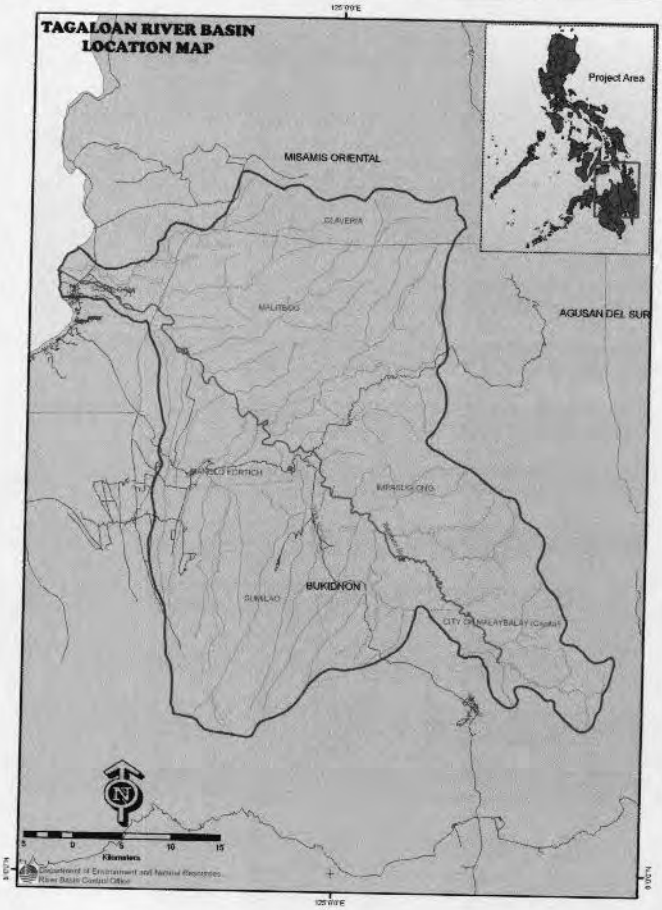
10 Ilog-Hilabangan River Basin



11 Agusan River Basin

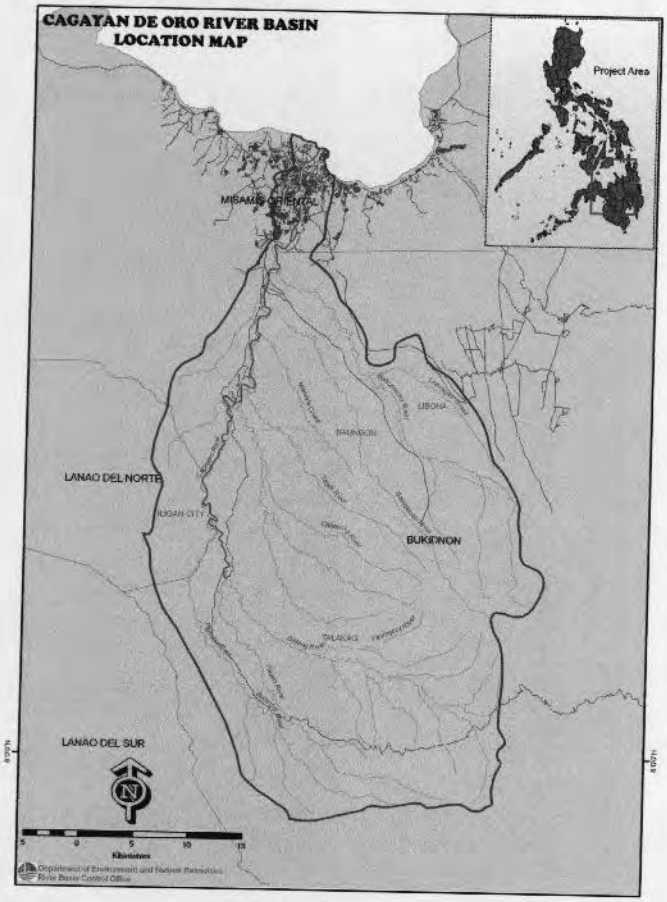


12 Tagoloan River Basin

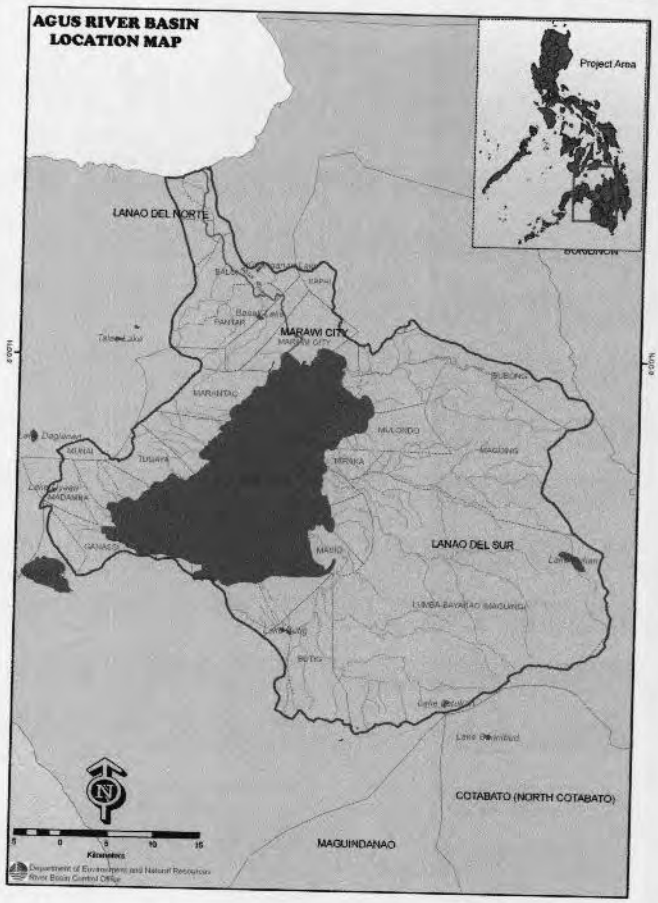


30

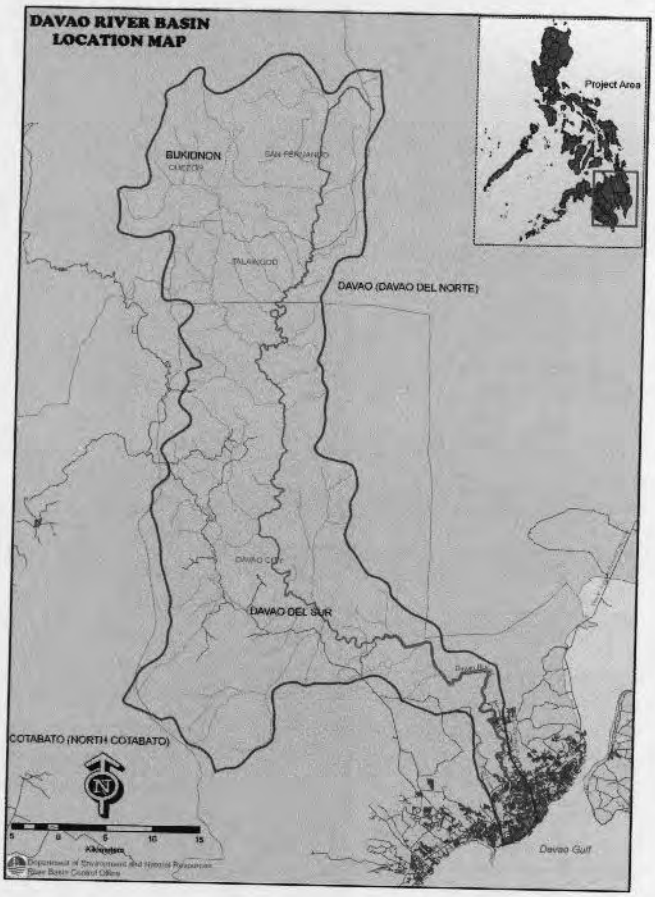
13 Cagayan De Oro River Basin



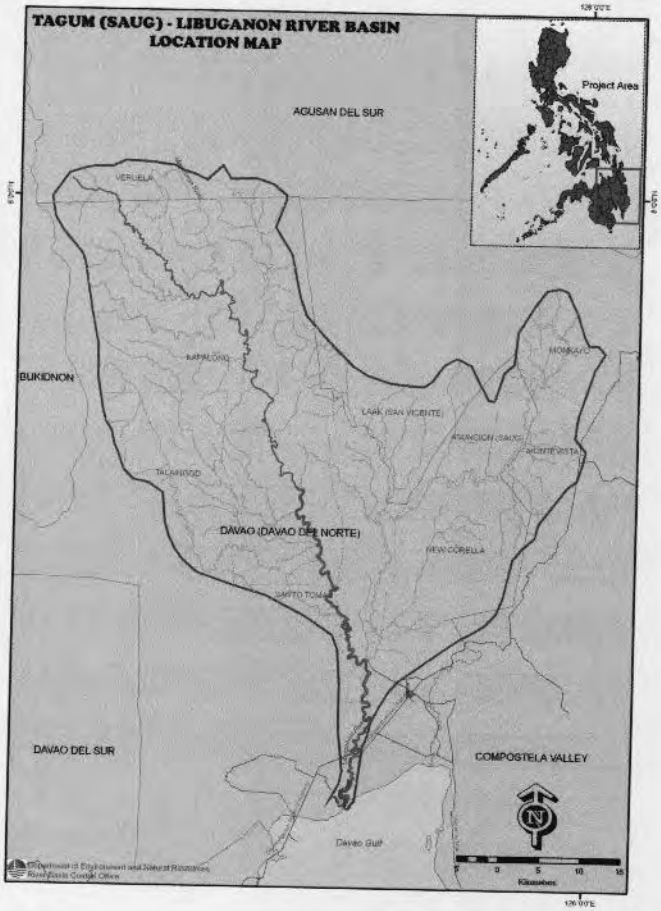
14 Agus-Lake Lanao River Basin



15 Davao River Basin

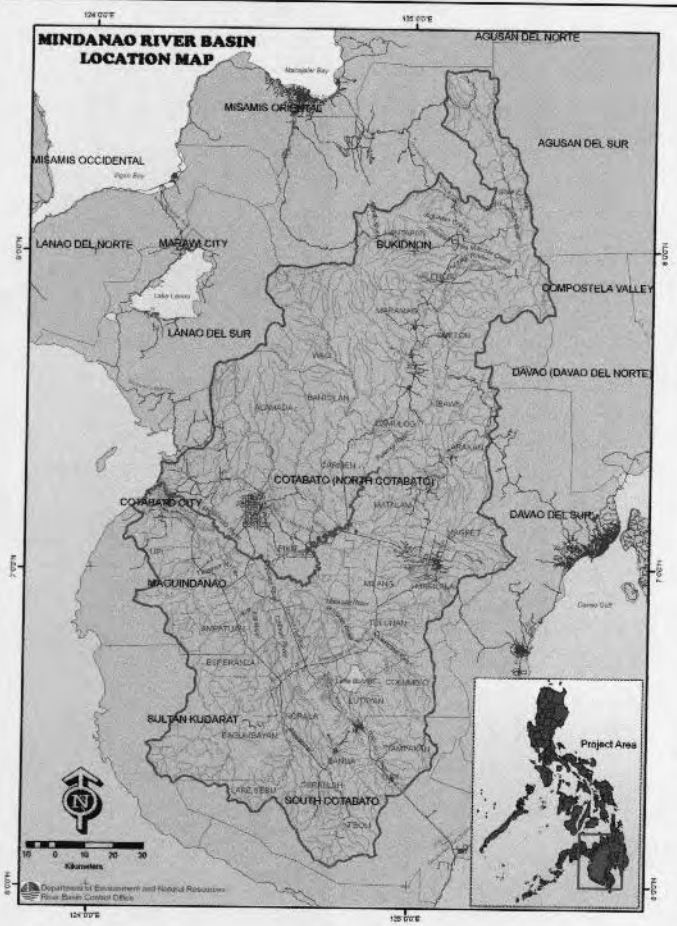


16 Tagum-Libuganon River Basin

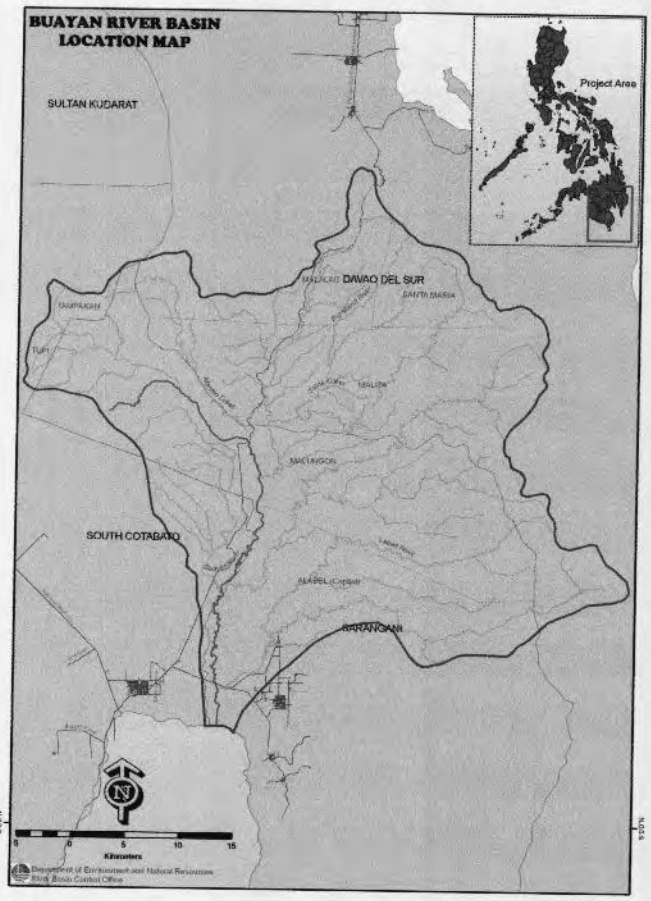


31

17 Mindanao River Basin



18 Buayan-Malungon River Basin



19 Mandulog River Basin

Japan International Cooperation Agency

Data Collection Survey on Situation of Nationwide Flood Forecasting and Warning System (FFWS) in the Philippines

Tuguegarao Seminar Workshop: List of Participants by Group

Group 1: Cagayan A (C-A) Hydrological Monitoring and Analysis Tools

Name		Agency	Designation
1.	Dr. Urduja A. Tejada	DOST Region 2	Director
2.	Dr. Susan R. Espinueva	HMD, PAGASA	Chief
3.	Dir. Melvin N. Navarro	DPWH Region 2	Director
4.	Mr. Mariano C. Dancel	NIA-MARIIS	Operations Manager
5.	Ms. Norma M. Talosig	OCD Region 2	Director
6.	Mr. Leo L. Buñag	PAGASA-CRBFFWC	AWSC/CMO
7.	Ms. Nivagine C. Nievares	HMD, PAGASA	Weather Specialist I
8.	Mr. Antonio C. Pagalilauan	PAGASA-CRBFFWC	Weather Specialist II
9.	Mr. Wilfredo C. Gloria	NIA-MARIIS, Magat Dam	Division Manager A
10.	Mr. Ryan Valentin	NIA-MARIIS, Magat Dam	Hydrologist
11.	Mr. Noriel Marc L. Dela Cruz	Amulung MDRRMO	Administrative Aide III
12.	Ms. Rosanna G. Ibarra	Enrile MDRRMO	Project Development Officer
13.	Mr. Sebastian Manuel	San Pablo MDRRMO (Isabela)	Officer-In-Charge
14.	Atty. Segundo Urata	Tuguegarao City DRRMO	Executive Officer

Group 2: Cagayan B (C-B) Equipment and Information Sharing

Name		Agency	Designation
1.	Mr. Florentino Baniqued	NIA-MARIIS	Department Manager
2.	Mr. Sancho A. Mabborang	DOST Region 2	Asst. Reg. Dir. for Field Operations
3.	Mr. Benjamin L. Nicdao II	DOST Region 2	Science Research Specialist I
4.	Eng'r. John Aldrin A. Umoquit	DPWH Region 2	Engineer II
5.	Mr. Phillip Labugen	OCD Region 2	Civil Defense Officer II
6.	Ms. Rosalie C. Pagulayan	HMD, PAGASA	Weather Specialist II
7.	Mr. Berlin V. Mercado	HMD, PAGASA	Sr. Weather Specialist
8.	Ms. Amor C. Benitez	PAGASA-CRBFFWC	Weather Specialist II
9.	Mr. Saturnino T. Tenedor	NIA-MARIIS, Magat Dam	Chief of FFWSDO
10.	Mr. Ben Roger Lucas	NIA-MARIIS	Telecom Engineer
11.	Ms. Edna Junio	Cagayan PDRRMO	Executive Officer
12.	Mr. Fernando B. Cadangan	Enrile MDRRMO	Administrative Aide IV/IT Designate
13.	Mr. Joisen P. Callo	Tuguegarao City DRRMO	Community Affairs Assistant

14.	Mr. Reynaldo C. Floria	Alcala MDRRMO	Municipal Planning and Development Coordinator
15.	Mr. Edmond Guzman	Isabela PDRRMO	Executive Officer

Group 3: Other River Basins

Name		**Agency**	**Designation**
1.	Ms. Fredolina D. Baldonado	NL-PRSD	Officer-In-Charge
2.	Mr. Hilario G. Esperanza	PAGASA-ARBFFWC	Weather Specialist I/OIC
3.	Ms. Ophelia Eduardene M. Parallag	Public Information Office	Officer-In-Charge
4.	Ms. Rhonalyn Vergara	HMD, PAGASA	Weather Specialist I

Other Participants

	Name	**Designation**	**Agency**
1.	Mr. Akio Yonezawa	Second Secretary	Embassy of Japan
2.	Mr. Sachiko Takeda	Deputy Representative	JICA Phil. Office
3.	Mr. Hayato Nakamura	Project Formulation Advisor	JICA Phil. Office
4.	Mr. Kessy Reyes	Program Officer	JICA Phil. Office
5.	Mr. Akihisa Okuda	River Management Expert	DPWH
6.	Mr. Takaaki Kusakabe	Disaster Management Expert	OCD-NDRRMO
	Name	**Group**	**Designation**
1.	Mr. Yoshihiro Motoki	JICA Study Team	Team Leader
2.	Mr. Morihiro Wasa	JICA Study Team	Team Member
3.	Mr.Yasushi Azuma	JICA Study Team	Team Member
4.	Mr. Yoshiyuki Shinji	JICA Study Team	Team Member
5.	Mr. Ahmad Al-Hanbali	JICA Study Team	Team Member
6.	Ms. Daisy Morales	JICA Study Team	Team Member
7.	Mr. Karl R. Pangan	JICA Study Team	Team Member
8.	Mr. Jerel V. Celadiña	JICA Study Team	Team Member

SEMINAR for the Data Collection Survey on
Situation of Nationwide Flood Forecasting and Warning System
in the Republic of the Philippines
11 April 2013 * 9:00 AM
Holiday Plaza Hotel, Tuguegarao, CAGAYAN

	Name	Agency/Municipality	Designation	Contact Number(s)	Signature
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4	Fidelina D. Baldonado	NL PRSD	AWSC	9275343	
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12	TAKAAKI KUSAKABE	JICA - OCD		09295317868	
13	Akihisa OKUDA	JICA - DPWH	DPWH		
14	Akio Yonezawa	Embassy of Japan		09189097513	
15	Hayato NAKAMURA	JICA Phil's	PFA	02 8897214	

Attendance Sheet_ Seminar p.1

SEMINAR for the Data Collection Survey on
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11 April 2013 * 9:00 AM
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	Name	Agency/Municipality	Designation	Contact Number(s)	Signature
16	Kessy Reyes	JICA	Program Officer		[signature]
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Attendance Sheet_ Seminar p.2

A-2-38

SEMINAR for the Data Collection Survey on
Situation of Nationwide Flood Forecasting and Warning System
in the Republic of the Philippines
11 April 2013 * 9:00 AM
Holiday Plaza Hotel, Tuguegarao, CAGAYAN

	Name	Agency/Municipality	Designation	Contact Number(s)	Signature
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33	EMERSON LESTE	〃			
34	Manbiro WASA	JICA Study Team	Hydrologist		
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40					
41					
42	Y. AZUMA	JICA Study Team	Equipment planning		
43	Y. SHINJI	JICA Survey Team	Telecom Engr.		
44	SACHIKO TAKEDA	JICA PP	Senior Rep		
45					

+ 6 Divisions

Appendix A-3

Output of the Preliminary Meeting on Interim Report

Japan International Cooperation Agency

Department of Science and Technology
Philippine Atmospheric, Geophysical and
Astronomical Services Administration (PAGASA)

DATA COLLECTION SURVEY
ON
SITUATION OF NATIONWIDE FLOOD FORECASTING AND WARNING SYSTEM

Preliminary Meeting on Interim Report

April 26, 2013
Amihan Conference Room, 2nd FL., PAGASA,
Diliman, Quezon City, Metro Manila

Nippon Koei Co., Ltd.

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Issues of Discussions

- Findings and results of evaluation of the Project NOAH
- Needs assessment on enhancement of exiting FFWS/FFWSDO
  - Cagayan & Pasig-Marikina River Basins
- Examples of development of FFWS in Japan
- Needs assessment on new development of FFWS in the major river basins
  - Agusan River basin (Mindanao)

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Project NOAH
(Nationwide Operational Assessment of Hazards)

- Distribution of Hydrometeorological Devices in hard-hit areas in the Philippines (**Hydromet**): 600 automated rain gauges and 400 water level monitoring station by December 2013

- Disaster Risk Exposure Assessment for Mitigation – Light Detection and Ranging (**DREAM-LIDAR**) Project: accurate flood inundation and hazard maps by December 2013

- Enhancing Geohazards Mapping through LIDAR: identifying areas prone to landslides by December 2014

- Coastal Hazards and Storm Surge Assessment and Mitigation (CHASSAM): wave surge, wave refraction, and coastal circulation models by December 2014

Project NOAH
(Nationwide Operational Assessment of Hazards)

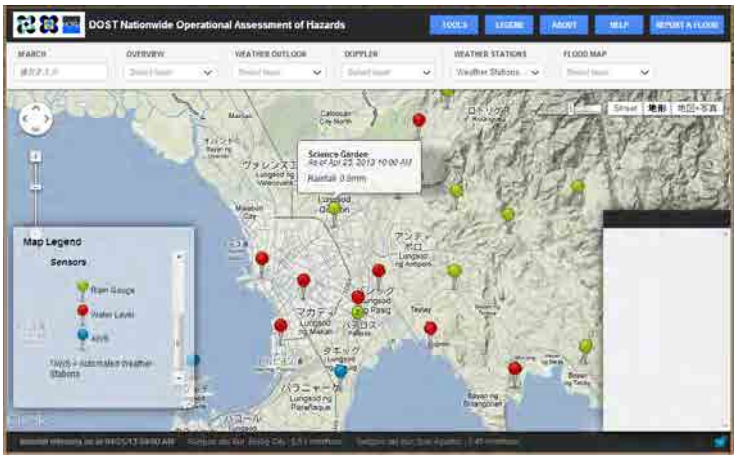
- Flood Information Network (**FloodNET**) Project: flood early warning systems by December 2013

- Local Development of Doppler Radar Systems (LaDDeRS): developing local capacity to design, fabricate, and operate sub-systems of Doppler radars

- Landslide Sensors Development Project: early monitoring and warning system f or landslides

- Weather Hazard Information Project (**WHIP**): television, web portal, IEC

Advantages on NOAH Monitoring Stations



Data source: Project NOAH web site

✓ It shows a significant progress in the flood monitoring capacity especially in basins where there are a few available gauges. A total of 1,000 rainfall or water level gauges is installed within the short period of two years.

Disadvantages on NOAH Monitoring Stations

- Basic concept is missing on how to utilize observed data and for what purpose. The priority is given on the installing of gauges.
- There is duplication of gauges among several projects such as those provided by foreign donors or Project NOAH since there is no appropriate cooperation and coordination among projects. Duplication of gauges may cause confusion in the operation of flood forecasting and warnings (Duplication can be a redundant system in another word. In this meaning, it is an advantage.).
- The rainfall and water level gauges are only installed in readily-accessible locations, considering the short Project period. The water level gauges were set on bridges. There is no basic concept of system design considering hydrological aspects. The locations of gauges should be carefully selected considering hydrological characteristics and historical flood damages. The deficiency of basic concepts may influence the progress of the Project (Originally it is difficult to establish appropriate basic concepts within a short period of time.).

Advantage and Disadvantages on Data Management of NOAH

✓ Through the web site of Project NOAH, citizens can easily access and can monitor rainfall and water level data in real time. The locations and observed values of gauges are shown in the web site.

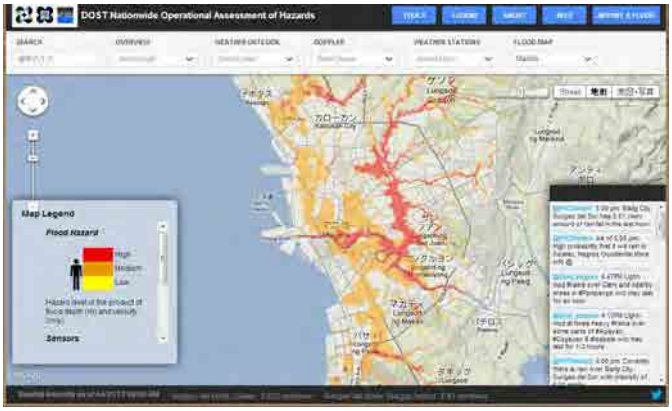
✓ Database system for monitoring and analyzed data (rainfall and water level monitoring stations, weather stations, rainfall radars, satellite images, weather forecasting, inundation maps) was established.

➢ There is no quality control activity, such as checking of data acquisition rate or checking the accuracy of sensors.

➢ Reliability of observed data should be examined to be utilized for flood forecasting and warning.

[Legend]
✓ Advantages
➢ Disadvantages

Advantage and Disadvantages on NOAH Flood Analysis



Data source: Project NOAH web site

✓ Free software, such as HEC-HMS and HEC-RAS for flood runoff modeling, is used in the Project. This decreases the amount of initial investment for the system.

➢ The reliability of models are not shown. It is probable that further calibration of models are required.

[Legend]
✓ Advantages
➢ Disadvantages

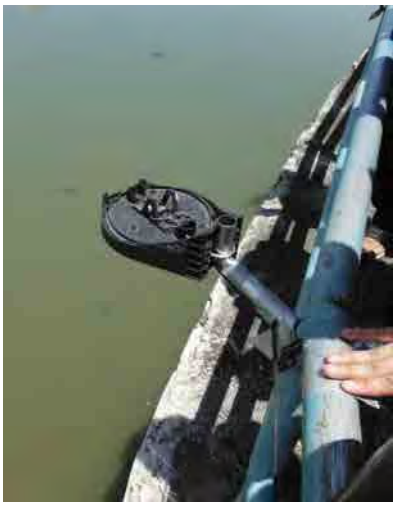
Advantages on NOAH Equipments

✓ Ultrasonic type water level sensors which do not require costly civil works were used.

✓ Though the sensors that were used were manufactured by foreign countries, several parts were made in the Philippines. Therefore, there is possibility for the development of technologies in the Philippines as well as an accumulation of technical experiences among NOAH staff.

✓ The observed data is automatically sent by SMS or satellite communication. The controller selects SMS as first step. If SMS does not work, then satellite communication is used.

Disadvantages on NOAH Equipments



➢ There are some risks in sustainability of the system due to durability of equipments or insufficient maintenance. How those gauges actually work during flood events should be carefully monitored.

➢ In the situation of functional data logger and dysfunctional, NOAH system observes as “0 mm of rainfall” instead of “the error”.

➢ Possibility of vandalism is high due to no fence.

➢ The spec of equipments are not shown.

➢ Observed data of water level sensors installed on bridges will be affected by the vibration of bridges.

Advantages and Disadvantages on Operation and Maintenance of NOAH Equipments

✓ According to one of the staff of Project NOHA, equipments of NOAH will be maintained by LGUs.

➢ According to one of the staff of Project NOAH, all products including the 1,000 gauges will be transferred to PAGASA. Currently, the possibility and feasibility of transfer of equipment from Project NOAH to PAGASA are under question among PAGASA staff. This is mainly due to the limited human resources as well as the low reliability of the equipments when compared to PAGASA's existing stations. However, Project NOAH is implemented by order of the President of the Philippines so it is probable that the transfer is inevitable. The current capability of maintenance of equipments in PAGASA is limited. If there are no appropriate actions to strengthen capacity, most of NOAH gauges will just deteriorate.

[Legend]
✓ Advantages
➢ Disadvantages

11

Advantages of Human Resources in Project NOAH

✓ The average age of Project staff is young, so this might raise the future level of engineering in the Philippines.

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Preparation for the Transfer of NOAH System to PAGASA

- It is revealed that **hydrological aspects** were not considered in the selection of locations of monitoring stations in Project NOAH. The transfer of the system to PAGASA should be examined carefully. Operational FFWS stations and NOAH stations **cannot be simply integrated**.

- Important NOAH stations in hydrological aspect **can become FFWS stations with replacement of equipments** considering reliability and durability of the system. Other equipments should be classified as **secondary stations**. To avoid confusions on the transfer of the System, **the basic concept** of the transfer should be discussed among related agencies and the agreement should be documented. Also, PAGASA should prepare **the strategy for effective utilization** of the NOAH System for the achievement of sustainable operation and maintenance.

Needs assessment on enhancement of exiting FFWS/FFWSDO

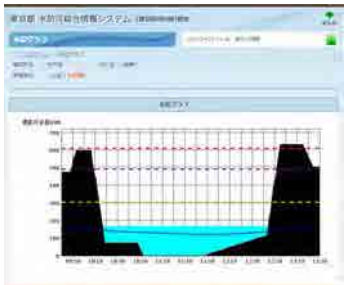
Cagayan & Pasig-Marikina River Basins

FFWS without Dam

- PAGASA, DPWH and MMDA developed FFWS in five major river basins, namely; the **Pampanga**, **Agno**, **Bicol**, **Cagayan** and **Pasig-Marikina** River basins, mainly with Japanese assistances.
- **Existing FFWS** except for the Bicol River basin are mostly **related to dam operation**, including planned dam.
- Remaining 13 out of 18 major basins and small basins such as Mandulog River basin are **without dam**.
- FFWS **with dam scheme** may have different components in flood forecasting and warning, as compared to FFWS **without dam scheme**.
- Effective and efficient FFWS without dam should be figured out.
- FFWS for small rivers in Japan can be used as one base **example**.

FFWS for Small Rivers in Japan

River Monitoring System

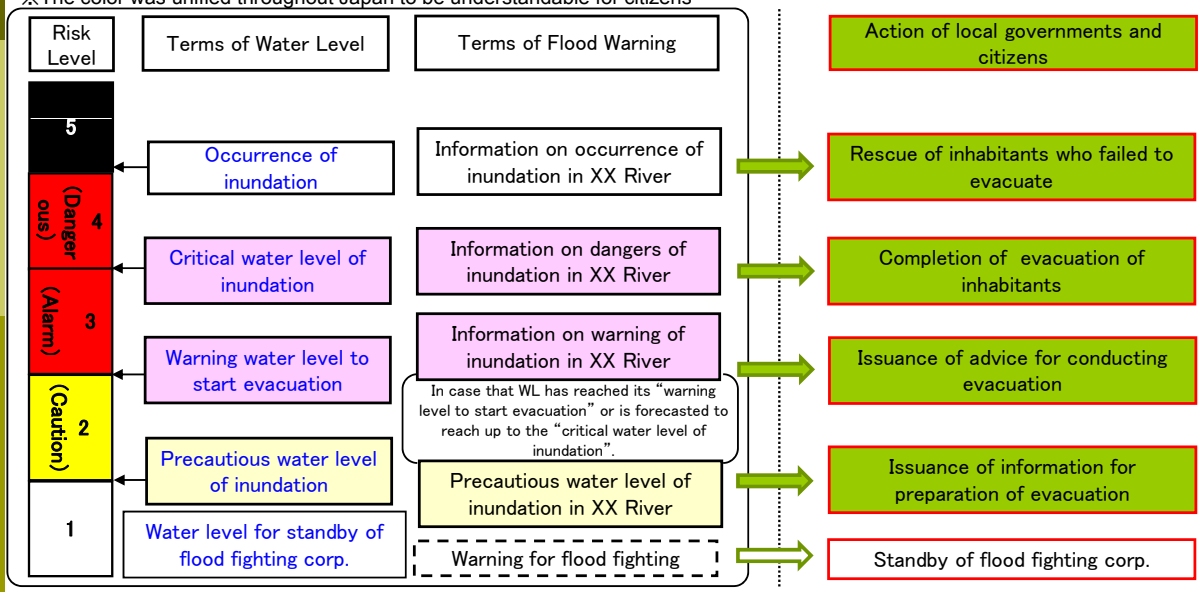


Source: Tokyo, Japan

Flood Warning Levels

Flood Warning Levels: flood warning levels are defined to consider the degree of flood seriousness and evacuation timing.
Terms of Flood Warnings: terms for flood warnings are defined to let the citizens identify appropriate actions.

※The color was unified throughout Japan to be understandable for citizens



Menus for FFWS

	Level 1	Level 2
Equipments	☐ Automatic water level gauge at control point ☐ Telemeter system between gauges and river management agencies ☐ Communication system between river management agencies and local governments	☐ Additional automatic water level and rain gauges
Hydrological Forecasting	☐ No forecasting	☐ Forecasting (water level correlation or flood runoff model)
Utilization of Historical Data	☐ Only uses channel flow capacity ☐ After the accumulation of data, flood frequency is considered.	
Flow Capacity	☐ At water level gauging station	☐ Up/downstream portions are considered.
Evacuation Lead Time	☐ Not considered	☐ Considered

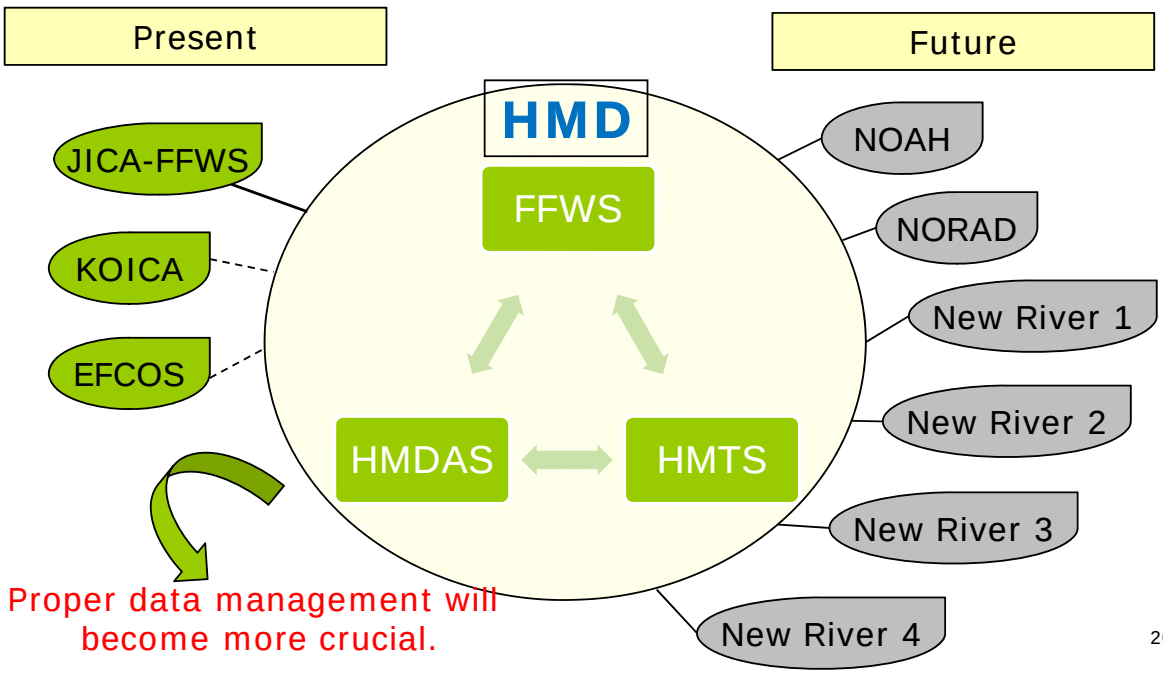
Minimum level before 2005

Minimum level after 2005

Needs assessment on new development of FFWS in the major river basins

Agusan River basin (Mindanao)

Anticipated Situation of Future HMD



Direction of Actions to be Undertaken

- Characteristic Features of new development of FFWS
  - Simple configuration (menu of equipment) compared with FFWDO
  - Less stakeholders (only PAGASA and LGUs)
  - Starting from minimum level (Level 1) and development in step by step
  - If determined certain methodology, speedy development will be possible.

Key technical issues/lessons which are applicable for new river basins (without dam) will be identified with PAGASA HMD in the course of discussions on Interim Report.

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Data Collection Survey
on Situation of Nationwide Flood Forecasting and Warning System
in the Republic of the Philippines

Minutes of Meeting
on
Preliminary Meeting on Interim Report

1. Date/Time : April 26, 2013 (Friday), 09:00 – 11:30 A.M.
2. Venue : Amihan Conference Room, 2nd FL, Main Office Bldg., PAGASA Science Garden Complex, BIR Road Diliman, Quezon City
3. Agenda : Discuss Draft Interim Report with PAGASA Team
4. Participants : 34 persons (Ref: Attachment A)
5. Materials Distributed : Copy of the Power Point Presentations
6. Highlights :

6.1 Issues for Discussion
(1) Findings and results of evaluation of the Project NOAH
(2) Needs assessment on enhancement of existing FFWS/FFWSDO (Cagayan and Pasig-Marikina River Basins)
(3) Examples of development of FFWS in Japan
(4) Needs assessment on new development of FFWS in the major river basins (Agusan River Basin in Mindanao)

6.2 Introduction (Ms. Nancy Lance of PAGASA served as the Meeting's Emcee.)
(1) Welcome Remarks: Eng'r Catarino Davis, Acting Deputy Administrator, PAGASA
(2) Message: Mr. Hayato Nakamura, Project Formulation Advisor, JICA Philippine Office

6.3 Presentation by Study Team (Refer to Attachment B)
(5) Mr. Yoshihiro Motoki, Team Leader/Organization/Flood Warning of the JICA Study Team
(6) Mr. Morihiro Wasa, Meteorological and Hydrological Observation/Flood Runoff Model B

6.4 Open Forum

In the Open Forum, some key issues were discussed and shared the cognitions as summarized below:

(1) Instructions by JICA Philippine Office

1) Needs Assessment

With regard to the needs assessment, not only comments but also achievements have to be clarified. There is a need to clarify what has been achieved in each project. Regarding the implementation of NOAH, the use of the word "advantage" is all right, but the word "disadvantage" should be replaced by "challenge."

2) Clarification with evidences

Issues cannot be settled by estimated preliminary data. There is a need to clarify the issues from evidence based on information and data. These are needed to provide project data explanation on the situation and capabilities regarding the 13 river basins.

(2) PAGASA's information on current activities for FFWS

PAGASA is currently integrating efforts in FFWS. In March, a flood drill was held and there was a revision in the levels of warnings. Before the integration, there was only one (1) level of warning, just

the response. Adopted now in the Metro Manila areas are the three (3) standard levels of flood warning. GET: Level 1: Awareness Level; SET: Level 2: Preparedness Level; GO: Level 3: Response Level which the LGUs accepted. There will be another drill in next month by a request of LGUs so the communities and local chief executives can understand fully these warnings. These are already integrated in their DRRM Contingency Plans. It will be a multi-stakeholders' flood drill. In terms of standards, there is a need to have backup on the standards in FFWS, one of the issues in NOAH and other foreign funded projects. Standard technical manuals both for river basins and for dams are needed as well as standards for implementation and/or design of FFWS for major rivers and principal river basins. For smaller river basins, there is now a promotion of community-based flood warning system. This can be implemented at the level of the local government.

(3) Important issues for rainfall observation

Regarding the overlapping of JICA, NOAH and other donors, it is recommended that attention be given especially for rainfall. Rainfall is highly variable in space and time. It is very necessary that the observation network should be properly designed. What resolution of the data is to be achieved? Putting up the sensors is easy, but the usefulness of data points should be considered as well as sustainability of the system. Questions are: how do we sustain and maintain them?; what is the optimum design that would be useful and beneficial for PAGASA? These issues need to be considered.

(4) Future reformation of FFWS in PAGASA

PAGASA wishes to announce that all FFWS data will be inputted or integrated into the NOAH Project. This will address integration among JICA (EFCOS), KOIKA and NOAH Pasig-Marikina. Design of the FFWS, just like in Japan, for small river basins, should be recommended. In accordance with the DRR Management Law, the LGU will be in charge of evacuation with the DILG seeing to it that these will trickle down to smallest local government unit. The DOST is charged with disaster prevention and mitigation while the DILG is in charge of disaster preparedness. The only problem will still be, can the LGU operate with or without the PAGASA Unit Office? The management of small river basins will now rest with the City or the Municipality. This should be a matter to be looked into, whether, among others, they would be capable of hiring hydro meteorologists (technical capability).

(5) Elaboration and submission of Interim Report (Draft)

This meeting is a preliminary discussion on the Interim Report. All comments from the JICA Philippines and Head Office need to be complied with. The draft version will be then prepared before May 2, 2013. Further discussion with HMD will be continued. Official submission to the JICA Philippine Office will be on May 12, 2013. If the draft is then considered acceptable, a copy could be forwarded or delivered to PAGASA subsequently.

The outcome of this Report and data will be shared with PAGASA. The final version will be compiled by May 10, 2013. As of the tentative schedule, it has been already mentioned with the Team that since Japan side will be having a spring holiday season, the Team will submit the compiled version on May 2, if possible, so that this can be shared immediately. But some other concerns should be further discussed with HMD.

(6) Official disclosure of Interim Report (Final)

The Final Report will be stored in the JICA Library. It can also be checked on the website of JICA. The Interim Report is an internal document and data will be input into the Final Report. Preliminary information should be shared internally between JICA and PAGASA so that they can be discussed how carefully to present data in the Report. With this, the Final Report can be shared with ASTI and Project NOAH.

(7) Description on the Project NOAH

There are some really critical issues raised here although the Team was able to talk with members of NOAH. The Study Team have seen for themselves the installation they have, but then this will solicit some issues from NOAH. It is recognized that there are some sensitive descriptions and issues included regarding the operation of the NOAH. There still is a need to further carefully check together with the HMD to confirm up to what level can be disclosed.

(8) Calibration of rainfall data of Doppler radars

By means of support of the suppliers, some of the staff are able to maintain sensor calibration. As for data calibration, the PAGASA is also thankful to some donors, like JICA, of equipment. The technology that we will learn from data calibration with new gadgets, like Doppler radars, can be applied to other US radars. It is a big challenge for PAGASA as well as data coming from the different satellites. This is also another aspect that needs PAGASA's consideration so that users can be supported with quality data. Regarding radar, the outcome will be shared with the Team for the finalization of the Report in September. Another JICA TCP will be started at that time.

(9) Needs Assessment in the current study

The Study and the meeting serve a good opportunity for PAGASA to see what the Agency really needs and what its areas of improvement consist of. An assessment from outsiders really shows what are actually needed by PAGASA. It is good for the Organization to see itself from an outsider's view. Appreciation is expressed by PAGASA for the assessment conducted.

(10) Involvement of water security issue studied by Tokyo University (Dr.Koike)

The recent research of Tokyo Univ. on water security in Metro Manila shows a good initiative and it is worth looking forward to for dam operations. There is a need to find the connection of their study with the FFWS. In terms of other arrangements such as in managing Marikina, the associated issues we can be included. The possibility will be further discussed.

REPUBLIC OF THE PHILIPPINES
Department of Science and Technology
Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)
PAGASA Science Garden, Agham Road, Diliman, Quezon City 1100

Meeting: **INTERIM REPORT**
For the Project "Data Collection Survey on Situation of Nationwide Flood Forecasting and Warning System

Date and Time: **April 26, 2013; 9:00 -11:00am**

Venue : **AMIHAN Conference Room,**
Science Garden, Agham Road
Diliman, Quezon City

NAME	AGENCY	DESIGNATION	SIGNATURE
1. Dr. Vicente B.Malano	PAGASA	OIC-Administrator's Office	
2. Dr. Flaviana Hilario	PAGASA	Acting-Deputy Administrator for RnD	
3. Engr. Catalino Davias	PAGASA	Acting-Deputy Administrator for A and ES	✓
4. Dr .Susan Espinueva	PAGASA	Chief, HMD	
5. Mr. Robert Sawi	PAGASA	Chief, WD	
6. Ms. Lilibeth Gonzales	PAGASA	Chief, FMD	
7. Dr. Esperanza Cayanan	PAGASA	OIC-NCR-PRSD	
8. Ms. Fredolina Baldonado	PAGASA	OIC-NL-PRSD	
9. Mr. Mario Dungca	PAGASA	AWSC-HMD	
10. Ms.Margaret Bautista	PAGASA	AWSC-HMD	
11. Mr.Hilton Hernando	PAGASA	CMO-PRBFFWC	
12. Mr. Roy Badilla	PAGASA	AWSC-HMD	
13. Ms. Nancy Lance	PAGASA	AWSC-HMD	
14. Mr. H. Nakamura	JICA-PHILS.	Project Formulation Advisor	
15. Mr. Y. Motoki	JICA STUDY TEAM	Team Leader	
16. Mr. M. Wasa	JICA STUDY TEAM	MET and Hydro expert	
17. Mr. Y. Azuma	JICA STUDY TEAM	O and M Expert	
18. Mr. Y. Shinji	JICA STUDY TEAM	Forecasting and warning Expert	
19. Mr. A. Al-Hanbali	JICA STUDY TEAM	GIS Inundation Expert	

REPUBLIC OF THE PHILIPPINES
Department of Science and Technology
Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)
PAGASA Science Garden, Agham Road, Diliman, Quezon City 1100

Meeting: **INTERIM REPORT**
For the Project "Data Collection Survey on Situation of Nationwide Flood Forecasting and Warning System

Date and Time: **April 26, 2013; 9:00 -11:00am**

Venue : **AMIHAN Conference Room, Science Garden, Agham Road Diliman, Quezon City**

NAME	AGENCY	DESIGNATION	SIGNATURE
1. DAISY N. MORALES	JICA STUDY TEAM	Organization & System	[signature]
2. KARL PANGAN	JICA STUDY TEAM	HYDROLOGY	[signature]
3. JEREL JOHN CELADIÑA	JICA Study Team	Equipment Planning / O&M	[signature]
4. FRANCISCO B. BALMAZAR JR.	JICA STUDY TEAM	GIS / INUNDATION	[signature]
5. Akihisa OKURA	JICA-DPWH	DPWH	[signature]
6. Hayato NAKAMURA	JICA Phils	PFA	[signature]
7. YOSHIYUKI UENO	JICA Phils	Representative	[signature]
8. Hayato Nakamura	JICA Phils.	PC	[signature]
9. Takaaki KUSAKABE	JICA-OCD		[signature]
10. JONATHAN PAZ	JICA STUDY TEAM	TELECOM	[signature]
11. NESTOR B. NIMES			[signature]
12. PAJARILLO, MA. TERESA	PMO - HMD	Project Secretariat	[signature]
13. RCPAGULAYAN	PAGASA-DOST	WS 2	[signature]
14. ELENA U. TAN	-do-	OA, Chief of Staff	[signature]
15. SYLVIA DAVIS	-do-	Chief Admin	[signature]
16. [illegible]	-do-	Chief Training	[signature]
17. [illegible]	HMD	WSII	[signature]
18. Pirelino dela Cruz	HMD-Equipment	WOII	[signature]
19. PERCY N. Sibling	JICA STUDY TEAM	Admin.	[signature]
20.			

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Postal Address: P.O. Box 3278 Manila Tel No. (63-2) 929-4865 (w/Fax) & 434-9040

Appendix A-4

Output of the Final Meeting

Data Collection Survey
on
Situation of Nationwide Flood Forecasting and Warning System

Handout for Discussions on Final Report

September 13, 2013

Venue: Amihan Conference Room, 2nd Floor
PAGASA Central Office
Diliman, Quezon City

Japan International Cooperation Agency

Department of Science and Technology
Philippine Atmospheric, Geophysical
and Astronomical Services Administration
Republic of the Philippines

Nippon Koei Co., Ltd.

JAPAN INTERNATIONAL COOPERATION AGENCY

Data Collection Survey
on
Situation of Nationwide Flood Forecasting and Warning System

Discussions on Final Report

AGENDA

Venue: Amihan Conference Room, 2nd FL., Main Office in Science Garden, PAGASA
Agham Road, Diliman, Quezon City
Date : September 13, 2013 Friday

			Time
(1)	Registration		13:00 – 13:10
(2)	Opening Ceremony		13: 10– 13:20
	Welcome Remarks	**Dr. Vicente B. MALANO** OIC - Administrator, PAGASA	
	Message	**Mr. Hayato NAKAMURA** Project Formulation Officer, JICA Philippine Office	
(3)	Presentation of Final Report (Draft Version)		13:20 – 14:20

- **Mr. Yoshihiro MOTOKI,** Team Leader/Organization/ Flood Warning
- **Mr. Morihiro WASA,** Meteorological and Hydrological Observation/Flood Runoff Model B
- **Mr. Yoshiyuki SHINJI,** Forecasting and Warning System
- **Mr. Ahmed Al-Hanbali,** GIS/ Inundation Analysis

JICA Study Team

	~~ *Coffee Break & Open Forum* ~~~~~~~~~~		14:20 – 14:50
(5)	Closing Remarks	**Dr. Susan R. ESPINUEVA** Chief, Hydrometeorological Division, PAGASA	14:50 – 15:00

(Adjourn at 15:00)

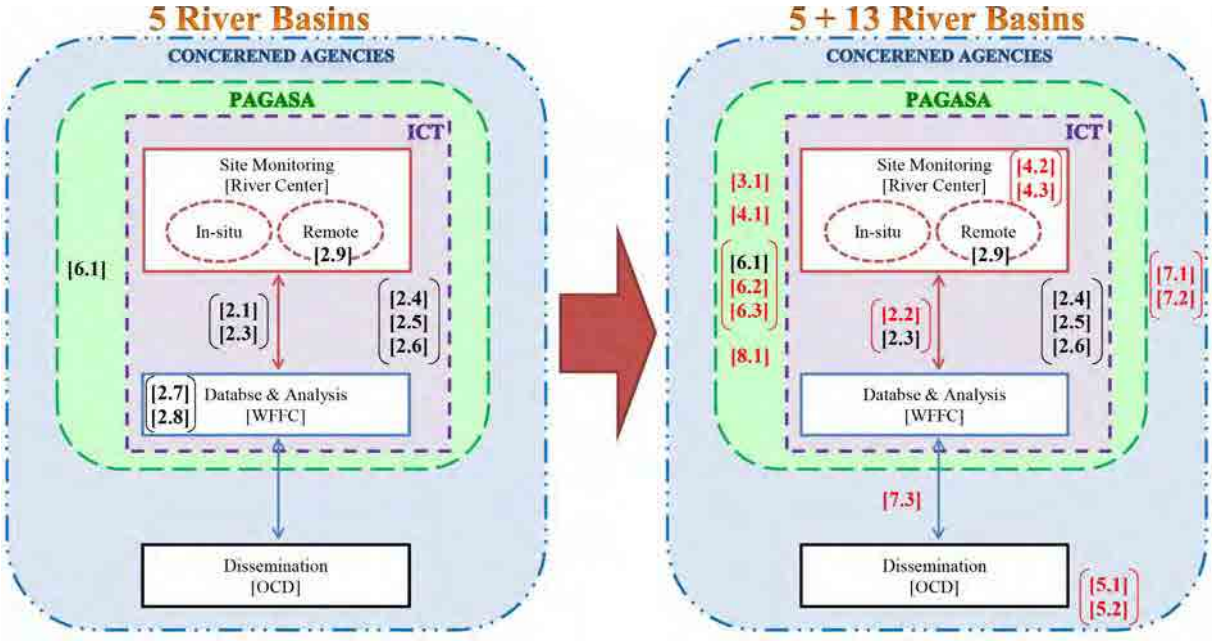
Contact: Project Office in PAGASA Tel:02-928-2754 or 02-929-4065

<< IDENTIFIED ISSUES AND RECOMMENDATIONS >>

Issues	Reccomendations
Chapter 6 6.1 Meteorological and Hydrological Monitoring (1) Setting Target for Installation of Rainfall and Water Level Stations (2) Additional Rainfall and Water Level Gauging Station by Project NOAH (3) Duplication of Rainfall and Water Level Stations (4) Reliability of Monitoring Data (5) Classification of Stations (6) Sharing of Tide Level 6.2 Data Management (1) Automation of Data Management (2) Integration of Observed Data (3) Strategy of Quality Control of Archived Data 6.3 Survey Works (1) Coordination among Related Agencies (2) Archive of River Cross Section Data (3) Connection of Water Level Monitoring and River Cross Sections (4) Quality of Survey Works (5) Update of River Cross Section Data (6) Target Stations for Discharge Measurements and Work Demarcations 6.4 Flood Forecasting Models (1) Expansion of FFWS Target Basins and Stepwise Approach of Model Development (2) Coverage Area of Existing Flood Runoff Models (3) Further Calibration of Existing Flood Runoff Models 6.5 Inundation Analysis (1) Coordination among Related Agencies (2) Stepwise Approaches for Establishment of Inundation Forecasting Model (3) Detail Elevation and River Cross Section Data (4) Trainings on Remote Sensing Technologies 6.6 Post Flood Survey (1) Improvement of Operation Manual of FFWS (2) Sharing Good Examples (3) Collaboration with LGUs (4) Further Implementation of Post Flood Surveys	Chapter 12 12.1 Framework of Recommendations toward the Expansion of PAGASA FFWS Target Areas (1) Integration of the existing in-situ monitoring systems and combination with remote monitoring systems (2) Modification of the Existing Systems (3) Establishment of the New Systems (4) Rules for the operation of FFWS considering communications with related agencies (5) Organization reinforcement of PAGASA and related agencies 12.2 Combination of Remote and In-situ Monitoring System 12.2.1 Strengthening of the Communication Link between WFFC and River [2.1] Communication Link for the Bicol and Cagayan River Basin [2.2] Communication Link for the River Basins without FFWS [2.3] Further Improvement of Communication Link for Monitoring System 12.2.2 Integrate the IT Network of Weather Division and Hydrometeorology Division [2.4] Integration of PAGASA Networks [2.5] PAGASA ICT Security Policy [2.6] Further Improvement of PAGASA ICT 12.2.3 Development of PAGASA Database [2.7] Integrate the Monitoring Data in the Hydrometeorology Division [2.8] Standardize the Data Format 12.2.4 Remote Monitoring for the Mindanao or Agusan River Basins [2.9] Application of GSMaP and IFAS 12.3 Modification of the Existing Systems [3.1] Modification of the Existing Systems 12.4 Stage-wise Approach for the Development and Standardization of Equipment Interface [4.1] Stage-wise Development of FFWS in Target River Basins [4.2] Proper Selection of Water Level Sensor Type [4.3] Standardization of Telemetry Equipment 12.5 Setting-up Warning Standards in New River Basins [5.1] Setting of Localized Warning Standards [5.2] Development of the Operation Manuals of New River Basins 12.6 Institutional Strengthening of PAGASA HMD [6.1] Capacity Development of Staff of HMD and Concerned Agencies [6.2] Capacity Development of Staff of New River Flood Forecasting and Warning Centers (RFFWCs) [6.3] Organizational Reform of HMD 12.7 Strengthening of Coordination Systems [7.1] Authorization and Activation of JOMC [7.2] Strengthening of Linkage between RFFWCs and LDRRMCs [7.3] Improvement of the Dedicated Communication Link between PAGASA/HMD and OCD-NDRRMC 12.8 Development of In-situ Monitoring Systems in the 13 Major River Basins [8.1] Roadmap of Development of the Systems in the 13 Major River Basins
Chapter 7 7.1 Issuance of Flood Information/Warning (1) River basins with existing FFWS (Cagayan, Agno, Bicol and Pampanga) - Updation of warnig WL (FFWS) - Refreciton of updated warning WL on the monitoring system (FFWSDO) (2) Pasig-Marikina River Basin - Methodology to determine waring WL (3) New river basins - Determination of warning WL 7.2 Coordination System among Concerned Agencies (1) River basins with existing FFWS (Cagayan, Agno and Pampanga) (2) Bicol River basin - Strengthening river center (3) Pasig-Marikina River basin - Demarcation between HMD and NCR (4) New river basins - Strengthening JOMC - Coordinaiton of PAGASA and OCD - Coordinaiton of river center and LGU	
Chapter 8 8.1 Existing Communication System and Equipment for Meteorological/Hydrological Monitoring System (1) KOICA-II - Low durability of equipments (2) NOAH Project - Vandalism - Rusting (3) Telemetry stations in the existing FFWSDO - Rehabilitation (4) Existing backbone telecommunication network - Rehabilitation (5) Utilization of the existing FFWS - Data sharing and archiving - Capability to modify the system 8.2 Operation and Maintenance of Existing Equipment - Shortage of staff for O and M of ASTI equipments - Shortage of capacity on O and M on data server and other computer systems 8.3 Transmission and Dissemination of Monitored Data 8.4 Communications System (1) Inadequate Means of Communications Networks among municipal and barangay members in remote regions and provinces (2) Unreliable Communications at MDRRMC (3) Dedicated Communications Network between PAGASA/HMD and OCD- (4) Communications dependent on Telecom Carriers and Providers (5) One way Communications 8.5 Currently Used Information Communication Technology (ICT)	

Issues to be solved by OCD
Source: Study Team

Framework of Recommendations toward the Expansion of PAGASA FFWS Target Areas



[2.1]	Communication Link for the Bicol and Cagayan River Basin
[2.2]	Communication Link for the River Basins without FFWS
[2.3]	Further Improvement of Communication Link for Monitoring System
[2.4]	Integration of PAGASA Networks
[2.5]	PAGASA ICT Security Policy
[2.6]	Further Improvement of PAGASA ICT
[2.7]	Integrate the Monitoring Data in the Hydrometeorology Division
[2.8]	Standardize the Data Format
[2.9]	Application of GSMaP and IFAS
[3.1]	Modification of the Existing Systems
[4.1]	Stage-wise Development of FFWS in Target River Basins
[4.2]	Proper Selection of Water Level Sensor Type
[4.3]	Standardization of Telemetry Equipment
[5.1]	Setting of Localized Warning Standards
[5.2]	Development of the Operation Manuals of New River Basins
[6.1]	Capacity Development of Staff of HMD and Concerned Agencies
[6.2]	Capacity Development of Staff of New River Flood Forecasting and Warning Centers (RFFWCs)
[6.3]	Organizational Reform of HMD
[7.1]	Authorization and Activation of JOMC
[7.2]	Strengthening of Linkage between RFFWCs and LDRRMCs
[7.3]	Improvement of the Dedicated Communication Link between PAGASA/HMD and OCD-NDRRMC
[8.1]	Roadmap of Development of the Systems in the 13 Major River Basins

Japan International Cooperation Agency

Department of Science and Technology
Philippine Atmospheric, Geophysical and
Astronomical Services Administration (PAGASA)

DATA COLLECTION SURVEY
ON
SITUATION OF NATIONWIDE FLOOD FORECASTING AND WARNING SYSTEM

Discussion on Final Report

September 13 , 2013
Amihan Conference Room, 2nd FL., PAGASA,
Diliman, Quezon City, Metro Manila

Nippon Koei Co., Ltd.

Issues of Discussions

- Outline of the Study Results and Schedule
- Identified Issues in Various Aspects and Fields
- Recommendations

Study Objective and Target Area

- Objective
  - To identify the crucial issues in target river basins
  - To clarify future development needs on FFWS for capacity development
- Target Areas (**Total 19 river basins**)
  1. **Five river basins** being equipped with FFWS
     - Luzon Island: Agno, Bicol, Cagayan, Pasig-Marikina and Pampanga
  2. **13 river basins** being not equipped with FFWS
     - Luzon Island : Abra and Abulug
     - Visayas : Panay, Jalaul, Ilog-Hilabangan
     - Mindanao Island : Agusan, Agus-Lake Lanao, Buayan-Malungon, Cagayan De Oro, Mindanao, Davao, Tagoloan, Tagum-Libuganon
  3. **One river basin** where has been hit by recent devastated flood
     - Mindanao Island : Mandulog (Iligan City)

Location of Study Area

Location Map


5 River Basins with Existing FFWS


19 Target River Basins

Study Schedule (Actual)

Item	YR2013								
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	1	2			3			4	5
Key Events	Commencement of the Study	Kick-off Meeting (3/12)	Workshop at Tuguegarao (4/11)		Interim Report Submission (6/20)			Discussion on Final Report (Darft Version) (9/13)	Submission of Final Report
Major Works Completed		Data collection & interviews with concerned agencies		Preparation of Interim Report	Follow-up survey			Follow-up survey & preparation of Final Report	

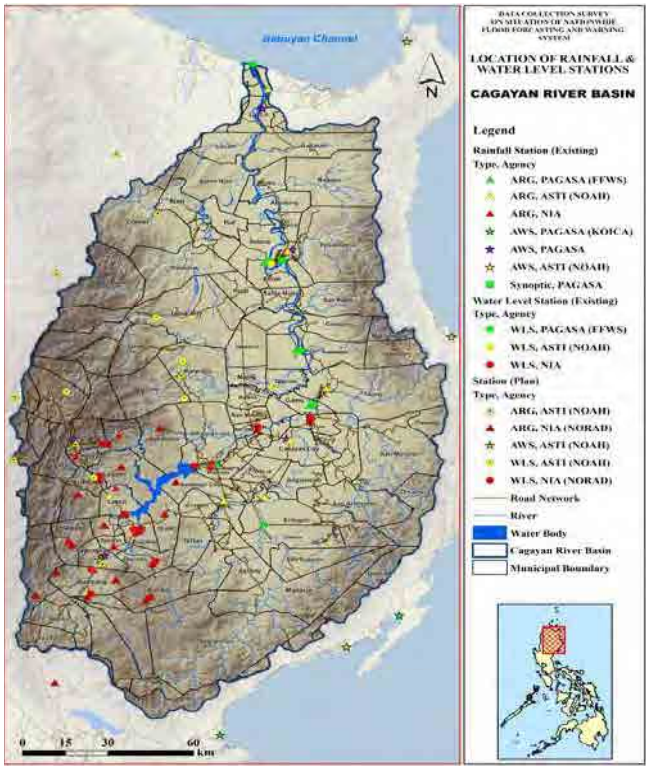
Note: 1: 1st Home Work 2: 1st Field Work
5: 2nd Home Wrok 3: 2nd Field Work
4: 3rd Field Work

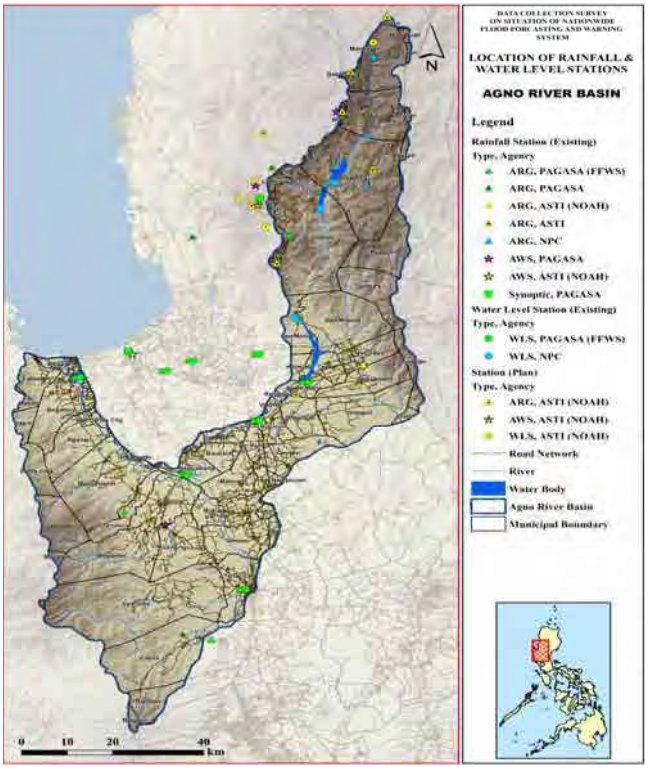
Source: Study Team

Outline of Study Results (Contents of Final Report)

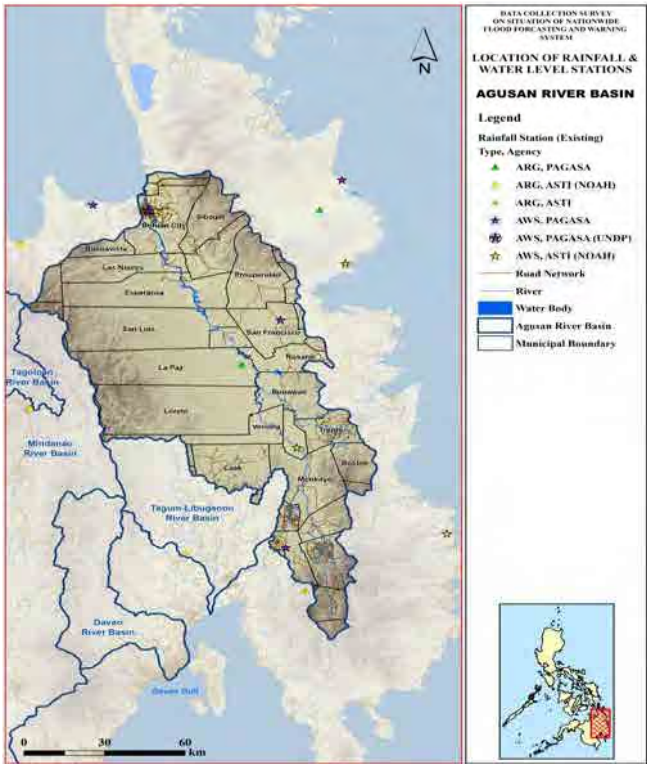
- Chap 1 Outline of the Survey
- Chap 2 Schedule of Survey Works
- Chap 3 Situation of the Target River Basins
- Chap 4 Relevant Government Policy, Laws, Regulations and Development Plans
- Chap 5 Country Development Policy and Aid Program of the Government of Japan
- Chap 6 Current Status and Issues to be Solved on Monitoring, Data Management and Analysis
- Chap 7 Current Status and Issues to be Solved on Flood Information and Coordination System
- Chap 8 Current Status and Issues to be Solved on Communication System and Equipment
- Chap 9 On-Going Projects under PAGASA HMD and Project NOAH
- Chap 10 Preliminary Study on Candidates of Japanese Technologies
- Chap 11 Preliminary Study on Stage-wise Development in Target River Basins
- Chap 12 Recommendations

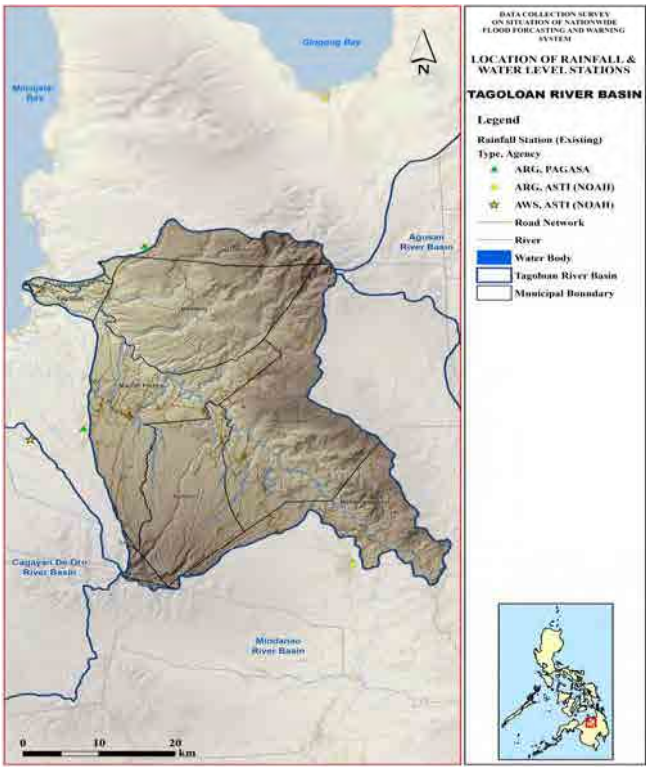
Location of Rainfall and Water Level Stations (1/2)



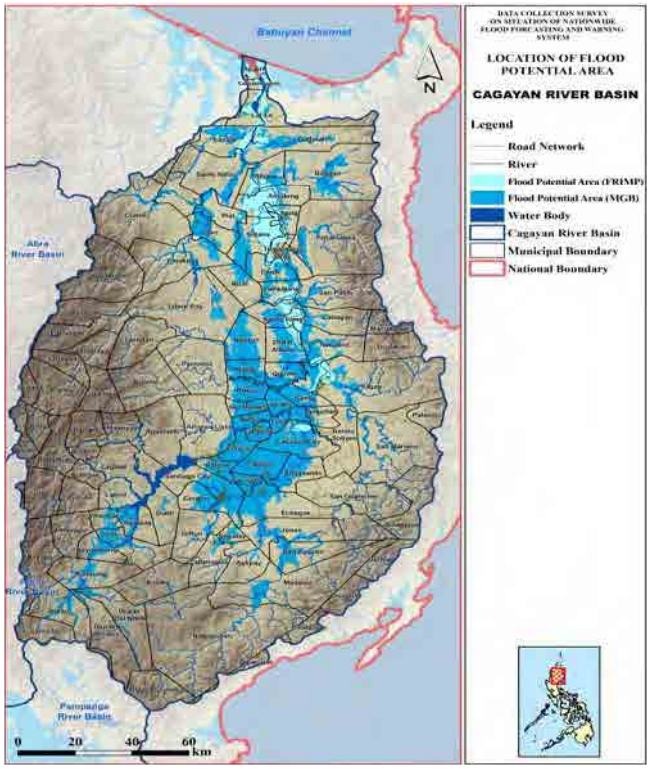


Location of Rainfall and Water Level Stations (2/2)

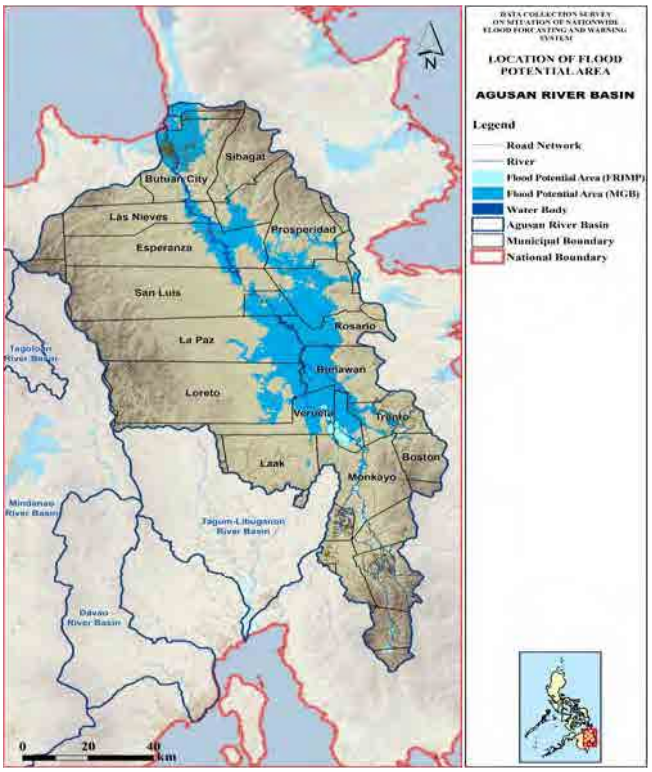




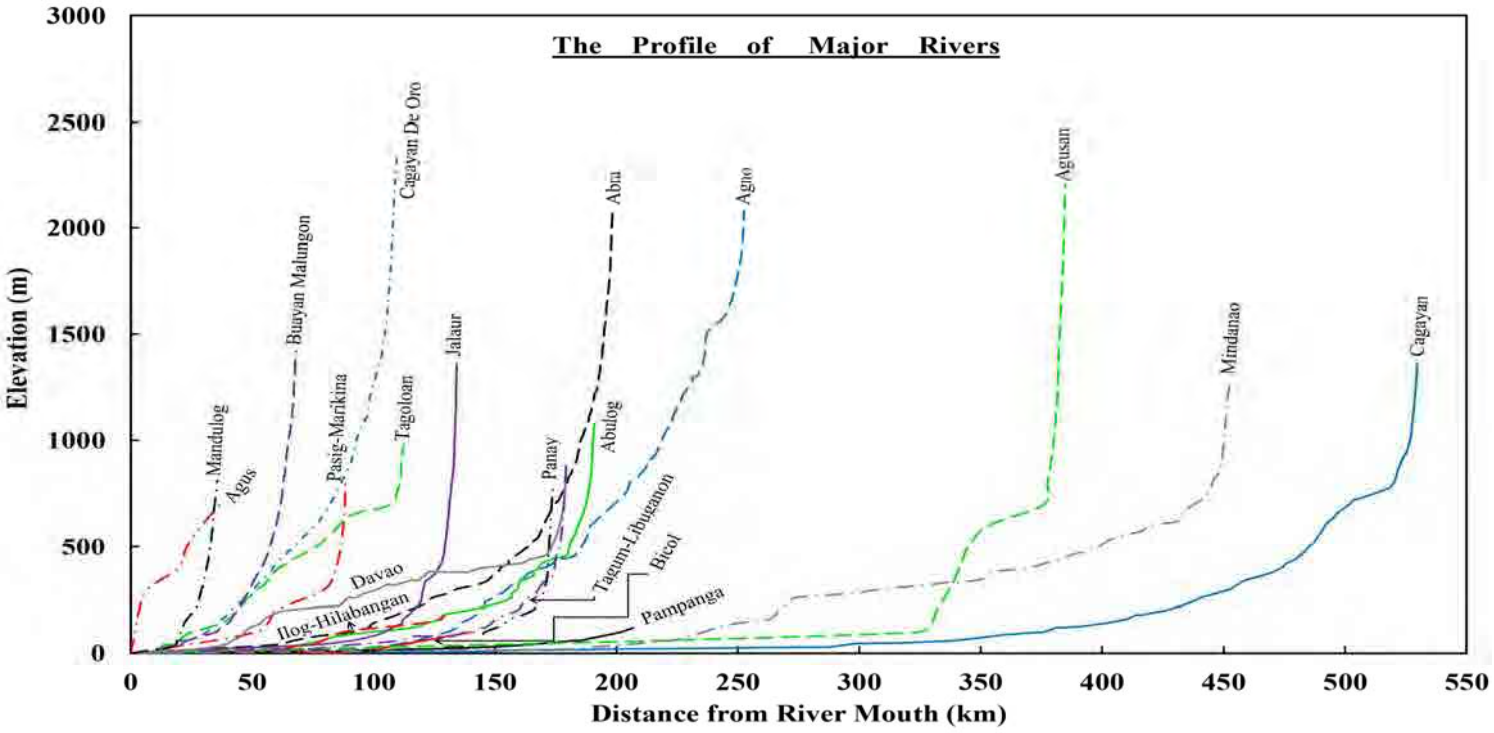
Flood Potential Area (1/2)



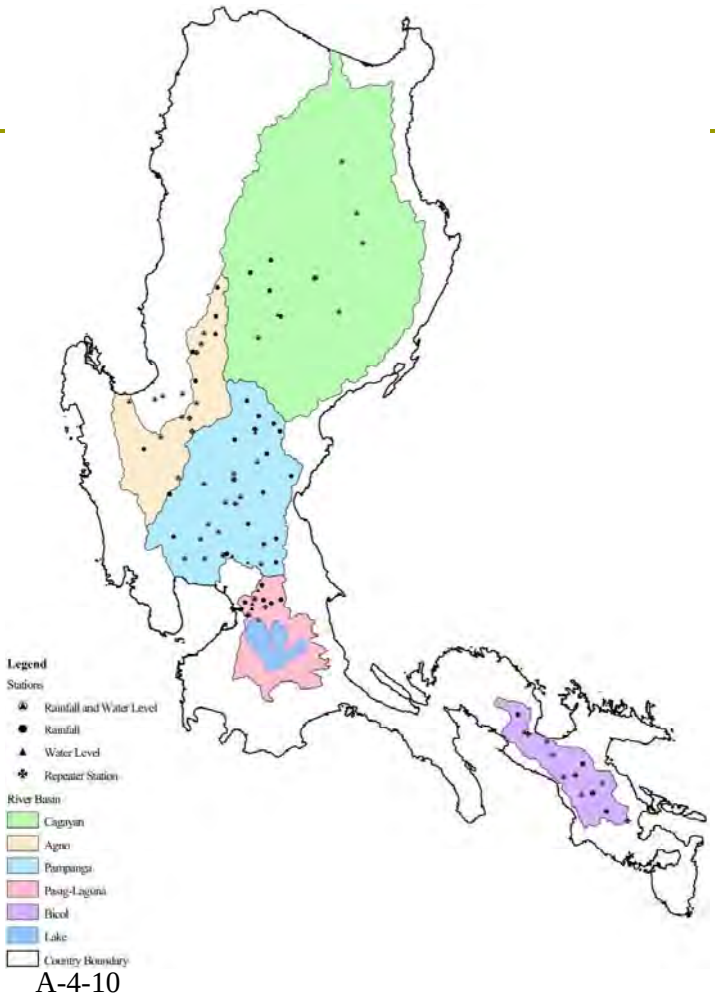
Flood Potential Area (2/2)



The Profiles of Major Rivers



Existing FFWS Stations in 5 Major River Basins



Issues to be Solved on Monitoring, Data Management and Analysis

- Meteorological and Hydrological Monitoring
- Data Management
- Survey Works
- Flood Forecasting Models
- Inundation Analysis
- Post Flood Survey

13

Issues to be Solved on Flood Information and Coordination System

- Issuance of Flood Information/ Warning
- Coordination System among Concerned Agencies

14

Issues to be Solved on Communication System and Equipment

- Existing Communication System and Equipment for Meteorological/ Hydrological monitoring System
- Operation and Maintenance of Existing Equipment
- Transmission and Dissemination of Monitored Data
- Communication System
- Currently Used Information Communication Technology (ICT)

15

Basic Concept of Stage-wise Development of FFWS

Image of Stage-wise Development of FFWS for Needs Assessment

Conceivable Component		
Construction of river centers	Establishment of telemetering system between gauging stations and river center	Further enhancement of function of river center for FFWS
Topographic survey at water level gauging station	River cross section and longitudinal profile survey, discharge measurement	Application of LIDAR and ADCP technologies
Installation of one rain gauge & one water level gauge	Increase of gauging stations (rainfall & water level)	Further increase of gauging stations (rainfall & water level)
Setting of warning levels (WL & rainfall)	Forecasting by water level correlations of gauging stations	Preparation of flood runoff model & inundation analysis model
Securing communication link with LGUs concerned	**Establishment of data transferring system from river centers to PAGASA WFFC**	CCTV and other remote flood watching system by ICT technologies
1973 ~ 1986	**1987 ~ 2003**	**2004 ~ 2013 ~**
Pampanga, Cagayan, Agno, Bicol	Pampanga, Cagayan, Agno, Pasig-Marikina	Partially in Pampanga, Cagayan and Agno* (*: Flood runoff models cover the areas for dam discharge warning.)

Source: Study Team

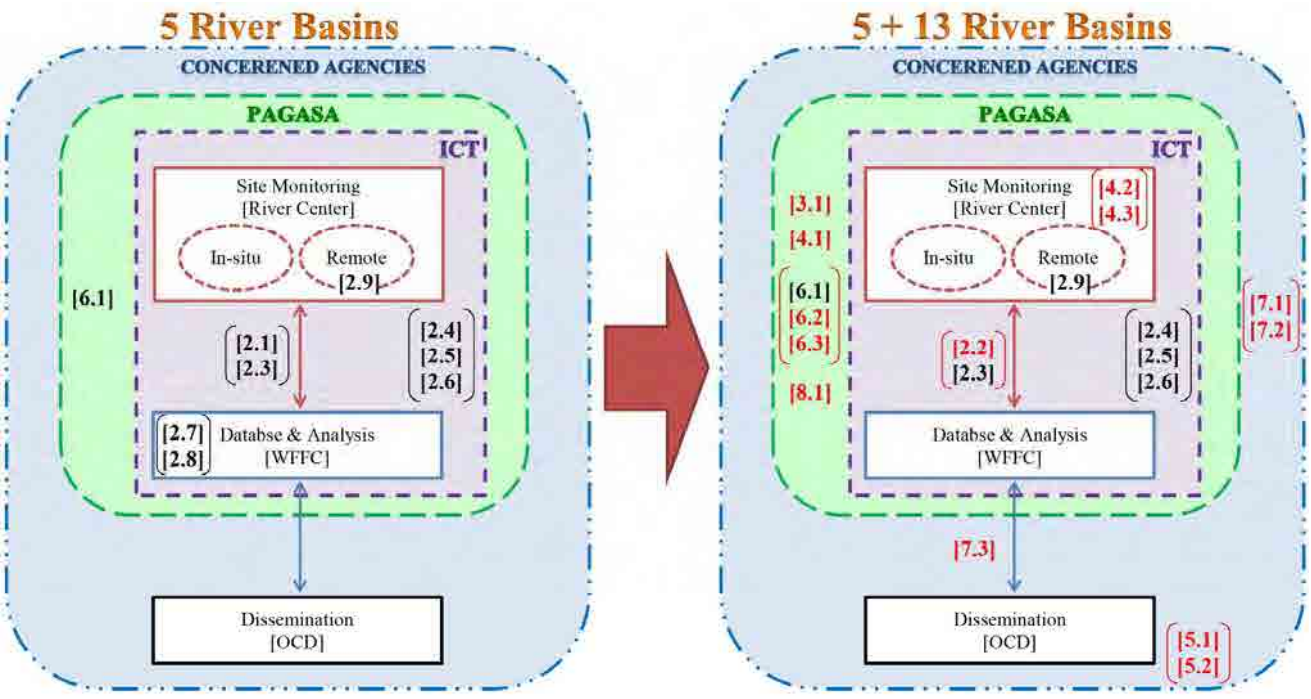
16

Basic Recognition to form Recommendation

- Integration of the existing in-situ monitoring systems and remote monitoring systems
- Modification of the existing systems
- Establishment of the new systems
- Organizational strengthening of PAGASA
- Rules for operation of FFWS with effective ICT

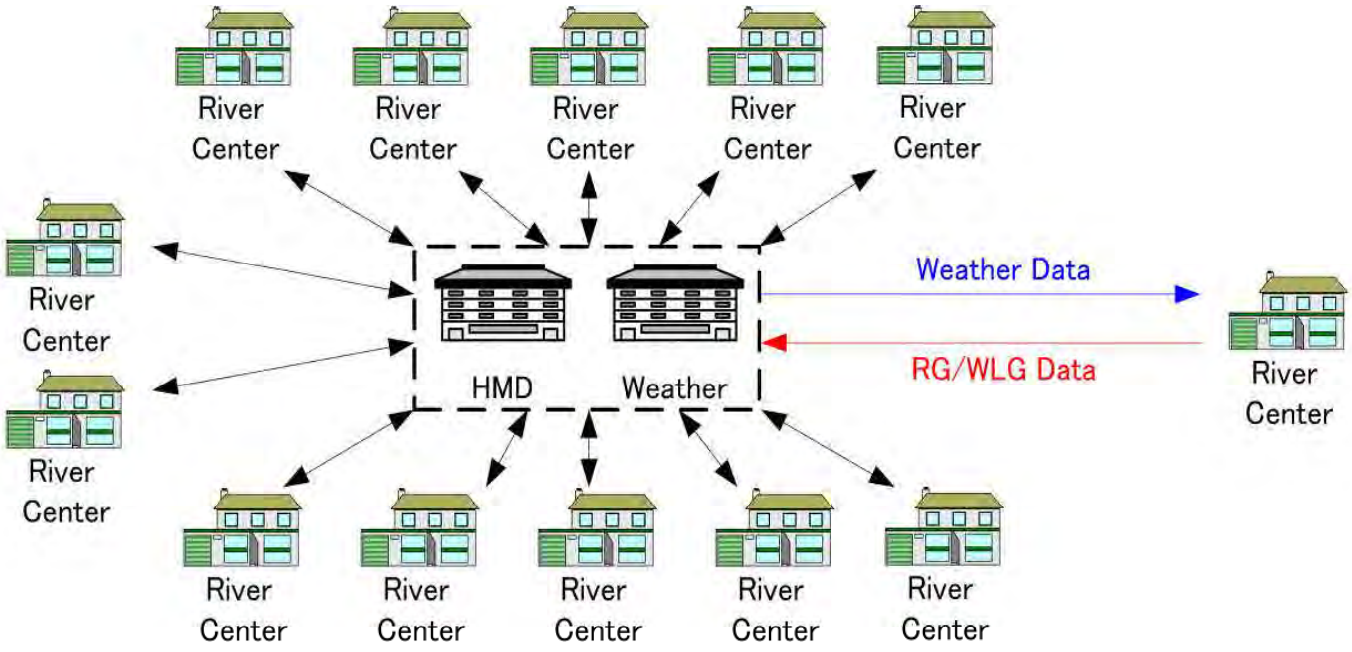
Recommendations (1/4)

1. Framework of recommendations toward the expansion of PAGASA FFWS Target Areas



Recommendations (2/4)

Schematic Image of Centralization and Localization



Recommendations (3/4)

2. Combination of Remote and In-situ Monitoring Systems

[2.1] Communication Link for the Bicol and Cagayan River Basins
[2.2] Communication Link for the River Basins without FFWS
[2.3] Further Improvement of Communication Link for Monitoring System
[2.4] Integration of PAGASA Networks
[2.5] PAGASA ICT Security Policy
[2.6] Further Improvement of PAGASA ICT
[2.7] Integrate the Monitoring Data in the Hydrmeteorological Division
[2.8] Standardize the Data Format
[2.9] Application of GSMaP and IFAS

3. Modification of Existing Systems

[3.1] Modification of Existing Systems

4. Stage-wise Approach for the Development and Standardization of Equipment Interface

[4.1] Stage-wise Development of FFWS in Target River Basins
[4.2] Proper Selection of Water Level Sensor Type
[4.3] Standardization of Telemetry Equipment

Recommendations (4/4)

5. Setting-up Warning Standards of New River Basins

[5.1] Setting of Localized Warning Standards

[5.2] Development of the Operation Manuals of New River Basins

6. Institutional Strengthening of PAGASA HMD

[6.1] Capacity Development of HMD Staff and Concerned Agencies

[6.2] Capacity Development of Staff of New River Flood Forecasting and Warning Centers (RFFWCs)

[6.3] Organizational Reform of HMD

7. Strengthening of Coordination Systems

[7.1] Authorization and Activation of JOMC

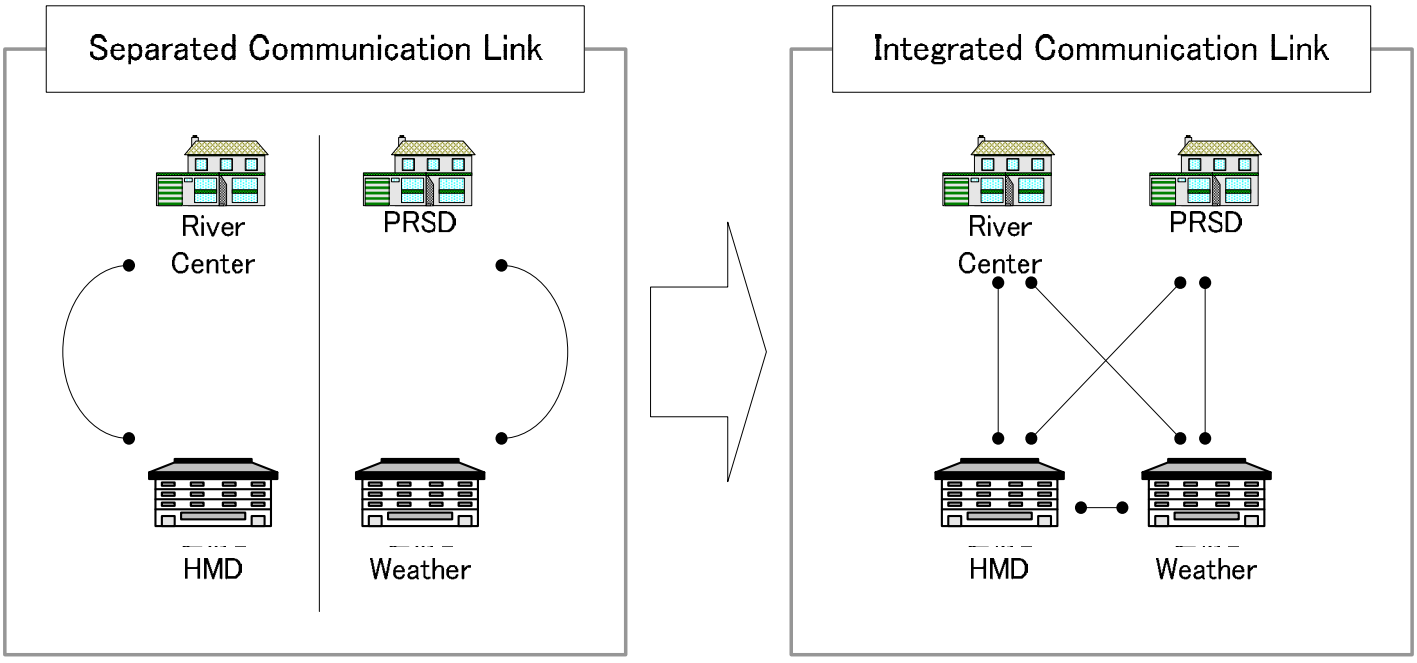
[7.2] Strengthening of Linkage between RFFWCs and LDRRMCs

[7.3] Improvement of the Dedicated Communication Link between PAGASA/ HMD and OCD-NDRRMC

8. Development of In-situ Monitoring Systems in the 13 Major River Basins

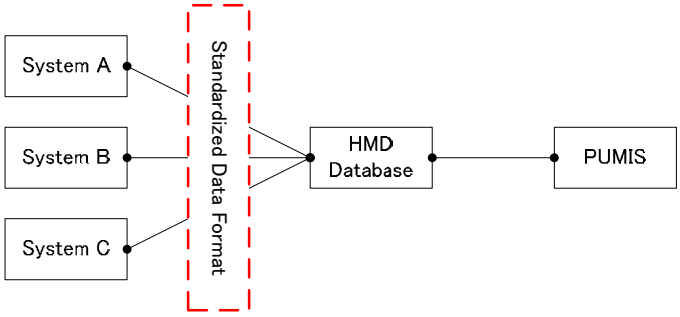
[8.1] Roadmap of Development of the Systems in the 13 River Basins

Integration of IT Network

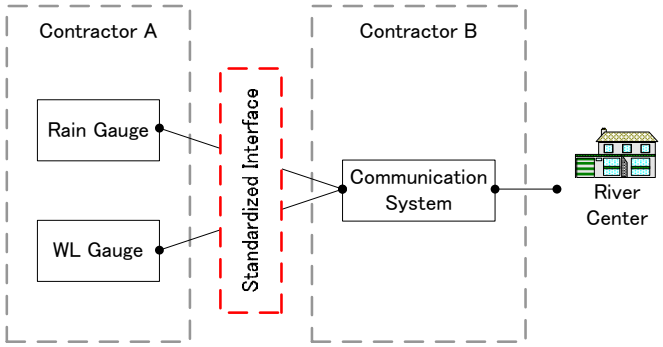


Standardization of Data Format and Telemeter Equipment

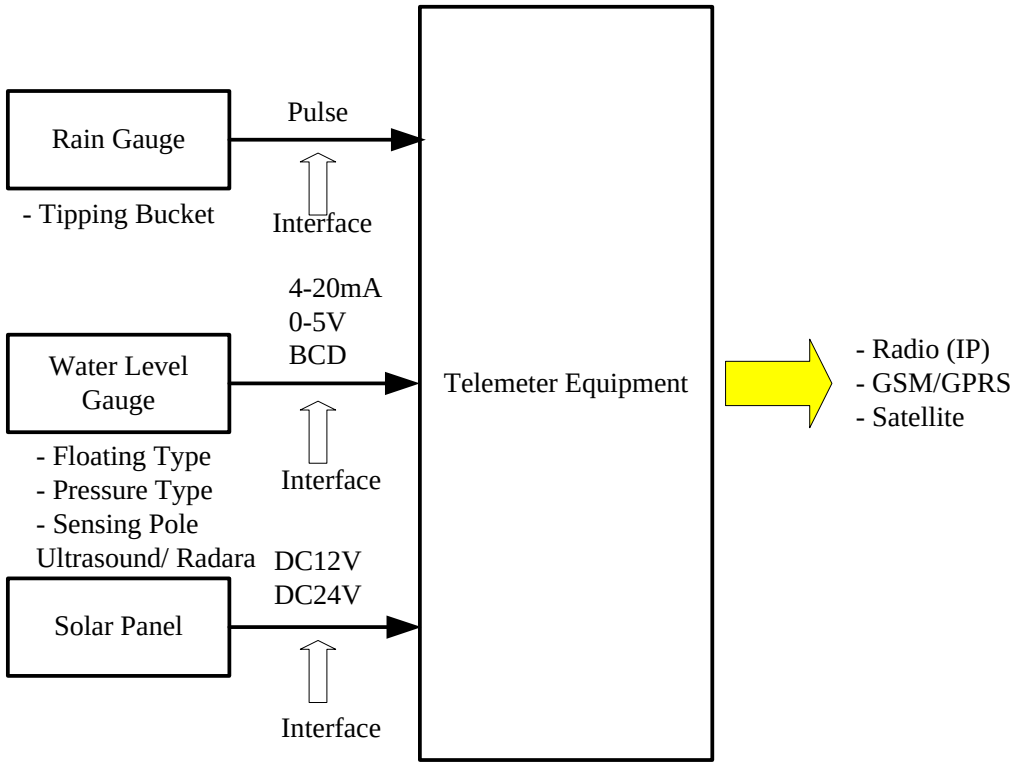
Standardization of Data Format of PAGASA Database



Standardization of Interface for Telemeter Equipment



Design Concept of Standardization of Equipment (Tentative)

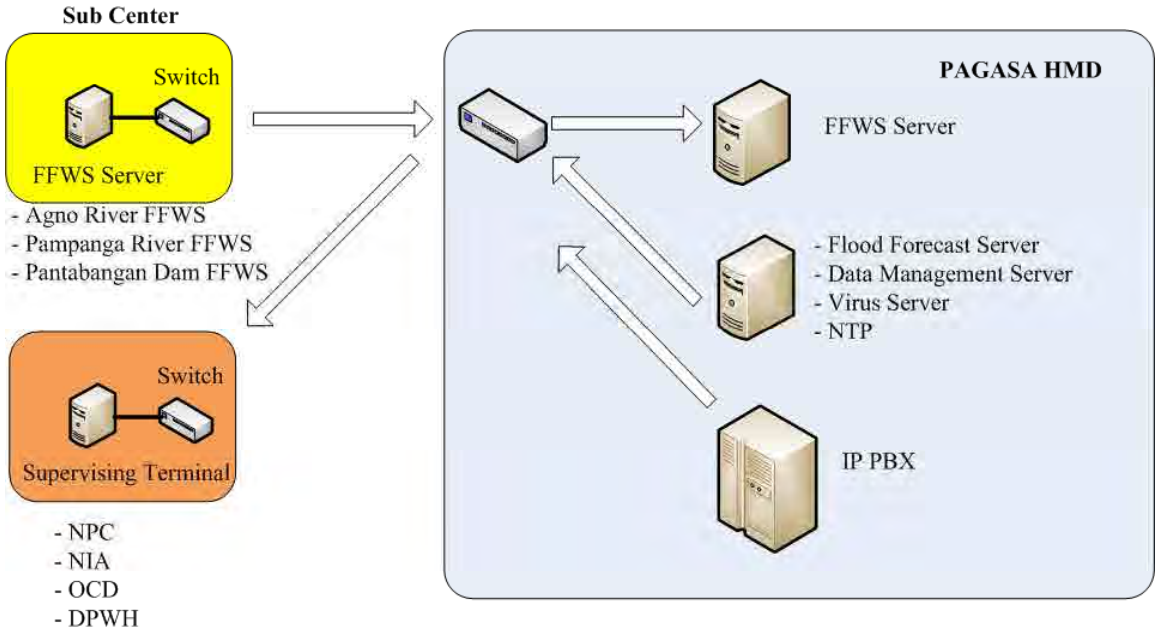


What is ICT?

- ICT is an acronym which stands for Information and Communication Technology
- ICT is constantly evolving and difficult to keep up with the changes that happen so fast.
- ICT refers to technologies that provide access to information through telecommunications.
- ICT focuses on primarily on communication technologies such as Internet, IP network, Network Security, Data Storage, Cloud Computing, Virtual Server, Virtual Private Network, and much more, all included in the configuration of ICT.

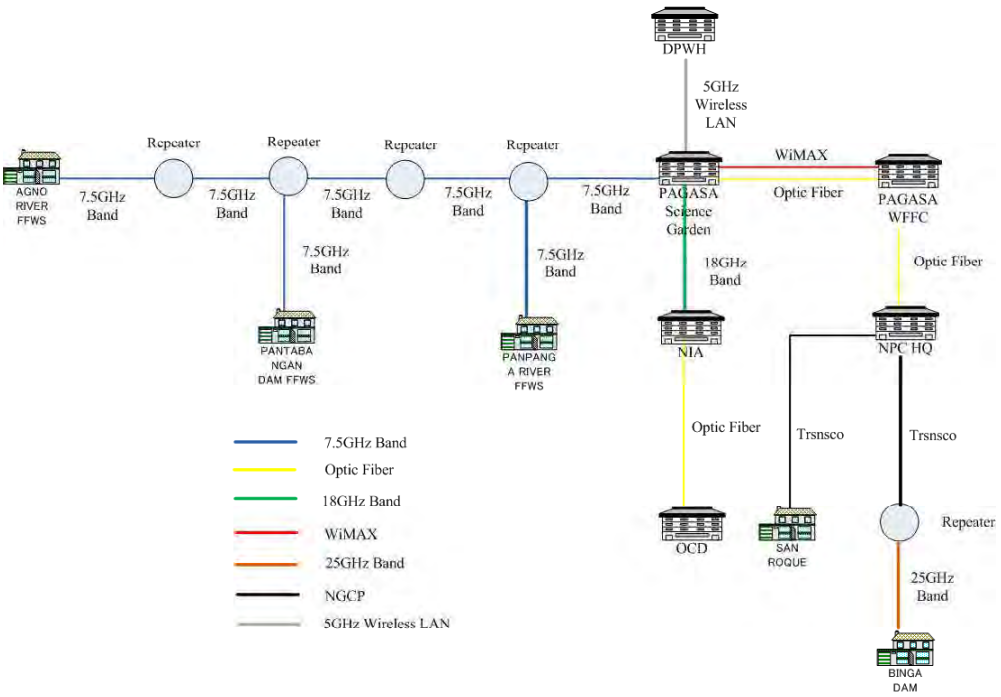
Current Status (PAGASA FFWS Computer Network)

- The rainfall and water level data collected at Sub Centers are transported to PAGASA HMD thru PAGASA FFWS Computer Network.



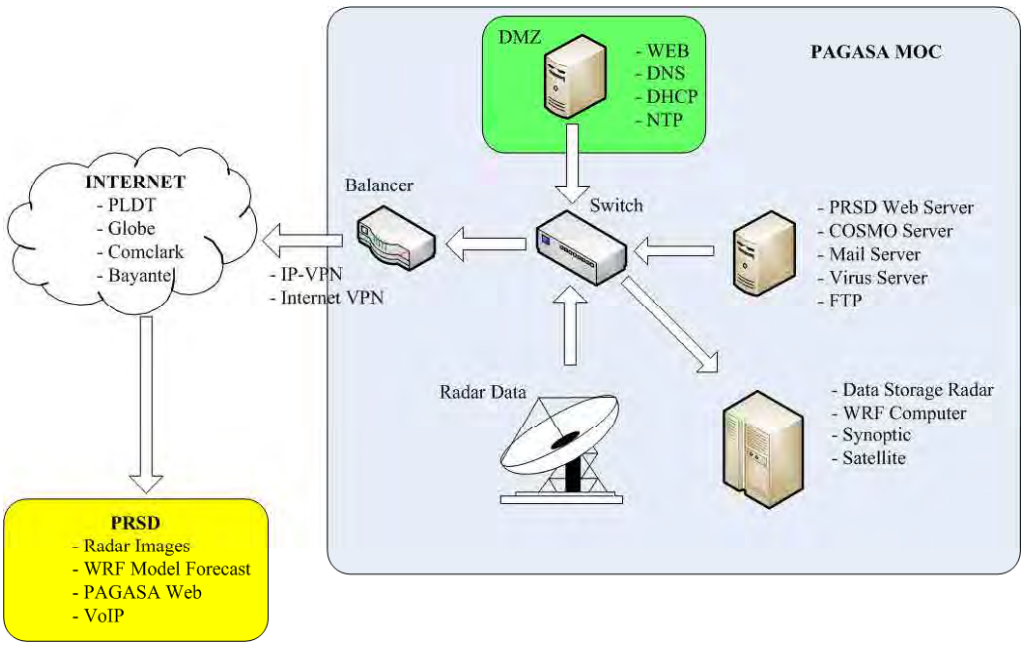
Current Status (PAGASA FFWS Computer Network)

- Sub centers are linked thru microwave, optic fibers and other P-P radios.

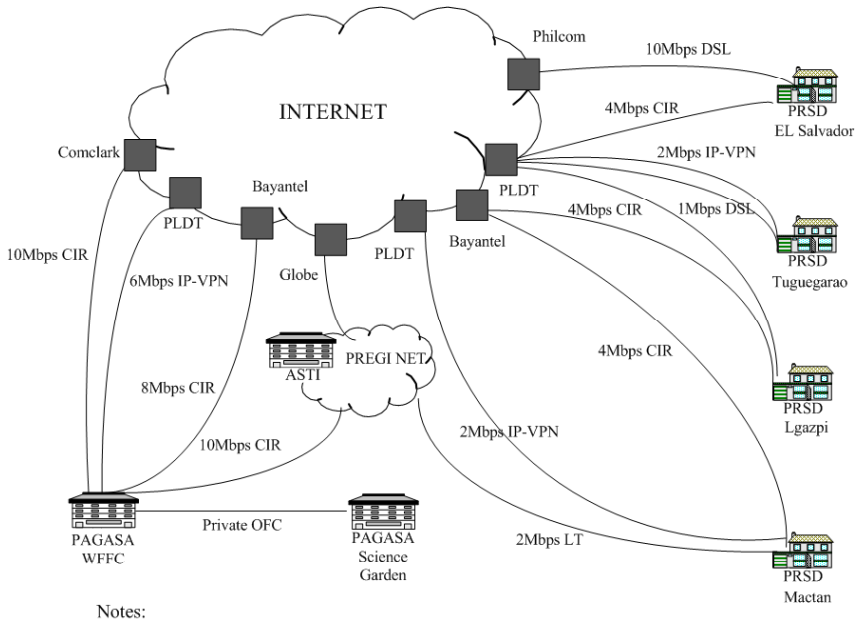


Current Status (PAGASA ICT Computer Network)

- PGASA ICT network has Internet connections with four ISP's and PRSD can download and upload weather data in real time directly from FTP server located in PAGASA MOC.



Current Status (PAGASA ICT Computer Network)



Notes:

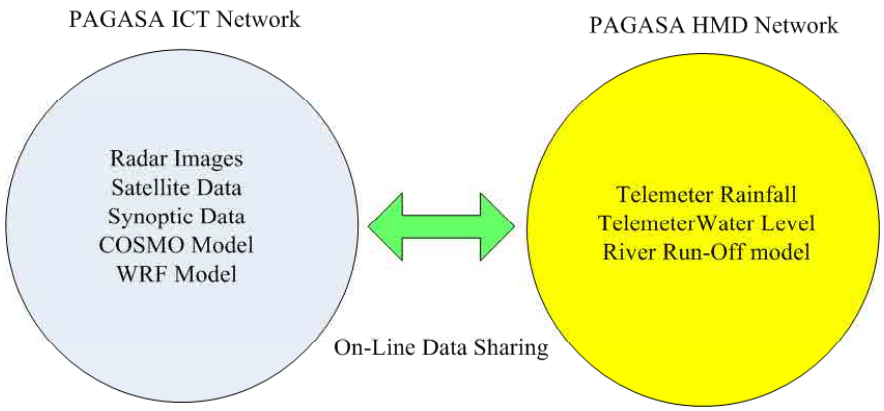
CIR	Committed Information Rate
PREGEI NET	Philippines Research Education Information Network
LT	Local Transport
DSL	Digital Subscriber Line
IP-VPN	Internet Protocol-Virtual Private Network
OFC	Optic Fiber Cable

IP-VPN and Internet VPN are used for connections with remote PRSD's. Internet service providers are PLDT, Globe, Comclark and Bayantel. The Circuit data speed from 2Mbps to 10Mbps depends on the type of services that ISP can offer.

Future Plan (PAGASA ICT Computer Network)

Recommendation:

PAGASA FFWS network to be integrated into the PAGASA ICT network.



Advantages

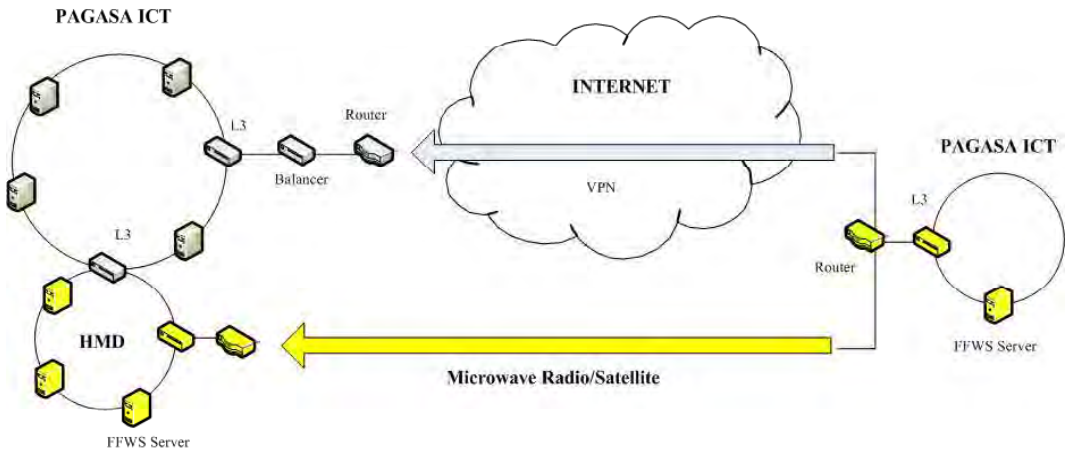
✓On-line and real-time data sharing

✓Establishment of weather database in future process

✓Remote FFWS connection with FFWS in PAGASA MOC via PAGASA ICT networking.

Future Plan (PAGASA ICT Computer Network)

✓Rainfall and water level data obtained in the local PRSD to be transported to the PAGASA MOC through the ICT networks as shown below.



Future Plan (PAGASA ICT Computer Network)

■ Other recommendations regarding enhancement of PAGASA ICT

- Skilled ICT engineers and technicians are urgently needed for a full implementation of PAGASA ICT's scope.
- New ICT organizational structure must be discussed to cope with development of PAGASA ICT.
- PAGASA ICT security policy should be established to protect its own network from external computer threats.
- Core network equipment , such as load balancer routers/switches should operate in redundancy.
- Unified Threat Management should be introduced to protect the system from external computer threats.
- Power supply system should be upgraded for more reliable back-up power source.

DISCUSSION on FINAL REPORT
for
Data Collection Survey on Situation of Nationwide Flood Forecasting and Warning system
13 September 2013 * 1:00 PM
Amihan Conference Room, PAGASA Science Garden
Agham Road, Diliman, Quezon City

	Name	Agency	Designation	Contact Number(s)	Signature
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2	Hayato NAKAMURA	JICA Philippines	PTA		
3	DAISY N MORALES				
4	Arlene Ferrer	PKII			
5	MARIO DUNGCA	PAGASA	AWSC		
6	~~ROY X. BADILLA~~	~~PAGASA~~	~~AWSC~~		
7	ALEX PALADA	NPC	DM		
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DISCUSSION on FINAL REPORT
for
Data Collection Survey on Situation of Nationwide
Flood Forecasting and Warning system
13 September 2013 * 1:00 PM
Amihan Conference Room, PAGASA Science Garden
Agham Road, Diliman, Quezon City

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Data Collection Survey
on Situation of Nationwide Flood Forecasting and Warning System
in the Republic of the Philippines

Minutes of Meeting
on
Discussion on Final Report

1. Date/Time : September 13, 2013 (Friday), 13:00 – 16:30 P.M.
2. Venue : Amihan Conference Room, 2nd FL, Main Office Bldg., PAGASA Science Garden Complex, BIR Road Diliman, Quezon City
3. Agenda : Discuss Draft Final Report with PAGASA Team and Other Partner Agencies
4. Participants : 23 persons (Ref: Attachment A)
5. Materials Distributed : Copy of the Power Point Presentations
6. Highlights :

6.1 Issues for Discussion
(1) Outline of the Study results and schedule
(2) Identified issues in various aspects and fields
(3) Recommendations

6.2 Introduction (Dr. Susan R. Espinueva, Chief, Hydrometeorological Division, PAGASA. served as the Meeting's Emcee.)
(1) Welcome Remarks: Dr. Vicente B. Malano, OIC-Administrator, PAGASA
(2) Message: Mr. Hayato Nakamura, Project Formulation Advisor, JICA Philippine Office

6.3 Presentation by Study Team (Refer to Attachment B)
(1) Mr. Yoshihiro Motoki, Team Leader/Organization/Flood Warning of the JICA Study Team
(2) Mr. Morihiro Wasa, Meteorological and Hydrological Observation/Flood Runoff Model B
(3) Mr. Yoshiyuki Shinji, Forecasting and Warning System
(4) Mr. Ahmed Al-hanbali, GIS/Inundation Analysis

6.4 Open Forum

In the Open Forum, some key issues were discussed and shared as presented below:

Questions/Comments/Recommendations	Response
Malano: It is recommended that Flood Forecasting Warning Centers be located/built within the premises of LGUs or within the provincial capitols to ensure coordination between FF Warning Centers and DRRMO provincial offices.	**Motoki:** Coordination is important to have a more convenient and close communication with river centers, especially in the initial stage.

Palada: Has it been considered to transfer to PAGASA the control of FFWS of five river basins with dams (except Bicol) which are currently operated by different agencies? It has been observed that these are operating separately, so these FFWS could be integrated in one unit in PAGASA. Control of spillways should be transferred to PAGASA.	**Malano:** Amenable to the suggestion but that the corresponding salary of those presently controlling the dam operations should also be transferred to PAGASA. Dam operations should be coordinated with LGU.
	Nakamura: There are already manuals regarding dam operations for compliance.
	Espinueva: For the information of JICA, Pantabangan Dam has referred to the protocol to LGU. LGU, NIA, and Pantabangan have recommendations and PAGASA still has to coordinate with Pantabangan Management. Dam operation should be coordinated with the local government unit before being implemented.
	Malano: It will be more appropriate if there is coordination between LGUs and dam operators.
Barba: With reference to recommendation no. 8 which states that only 13 major river basins will be developed, which river basin will not be developed,? What is the recommendation regarding the 19th river basin?	**Espinueva:** The 13 river basin centers are under PAGASA.
	Malano: Clarification: There are 18 major river basins, while the one river basin, Mandulog, is not considered as major river basin.
	Motoki: In addition to the 18 major river basins, five of which were already developed and 13 are yet to be developed; there is one small river basin (Mandulog), which will be developed after these 13 priority river basins have been developed.
	Espinueva: There are other projects (donors like UNDP/AusAID) which are working on Mandulog. Mandulog river basin will be integrated in Agus-Lake Lanao.
Mercado: Clarification, if there is any recommendation after the completion of data collection. If JICA is going to proposed any project for the river basins, what is the priority river basin for the next case of the Study?	**Nakamura:** The Study covers only the data collection at this stage. For projects in the future, the focus would be on knowledge transfer and not necessarily on equipment.
	Espinueva: PAGASA already submitted PCP. The centers for Tagum-Libuganon, Mindanao are under bidding, to be awarded before the end of the year.

	Mercado: Mindanao is a priority. There is a proposal to consolidate Mindanao river basin master plans.
Nakamura: For the Mindanao/Agusan River basin, the Government of the Philippines and Japan will determine the priorities. Based on the Interim Report of the Study, it is suggested that large river basins such as Mindanao/Agusan will have satellites. A needs assessment has to be conducted.	**Motoki:** If there is remote sensing data, there would be more accuracy in forecasting work. Such opportunities should not be avoided.
Badilla: With reference to the diagram shown in slide no. 22, there is no link between the river center and PRSA. Can we connect river centers to PRSD since many river centers are not located at PRSD? On Integration of IT network, River Centers and PRSD are not linked.	**Wasa:** River center data should be sent to HMD.
	Nakamura: Link between HMD and PRSD is needed. HMD to control quality.
	Malano: PAGASA devolves it services to its regional centers. Hence, it is highly recommended that river centers be connected to PRSDs, to have ready access from the river center to the PRSD.
	Espinueva: Administratively, river centers are under PAGASA. HMD will help FF Warning Centers in terms of technical matters.
	Motoki: The mandate of HMD covers the river centers. There is a need to conduct a review and update.
	Espinueva: The HMD will be handling directly the new river basins; same thing with the river centers.
Palada: When will the system be available? Especially the implementation of the ICT system?	**Nakamura:** This is just the data collection survey stage.
Dungca: The ICT organization of PAGASA sees that the presentation jibes with our thinking. All data from different donors/agencies will be included and integrated in the PAGASA unified management system.	**Wasa:** Integration of data is very important in HMD. There is a need to develop a data format for integration (candidate format: XML style/format). However, XML style is a just a general idea and still needs detailed discussion in the determination of data and dissemination.

	Motoki: There is a need to discuss and decide many things regarding this matter. The team extends its support and encouragement in this endeavor.
Kusakabe: Based on the experience in Japan, maintenance of the equipment is very important, since these equipment are vulnerable. In Japan, the ICT in every office has two to three teams handling the maintenance and related needs of equipments.	**Malano:** Not all equipment/ stations are maintained by PAGASA. There are outside contractors to maintain these equipment and Automatic Weather Stations.
MWSS representatives: Have you considered other agencies' projects (installation of devices is done by different agencies in different river basins)? Is there any consideration on other agencies for data collection?	**Wasa:** Systems of other agencies have been checked. All are separated and there is no standard data format for integration. There is a need for integration, but there is no standard data format.
	Motoki: Surveyed and visited several stations of NOAH.
	Nakamura: PAGASA is the most responsible agency on the FFWS, so others need to discuss with PAGASA.
	Espinueva: Standardization of monitoring facility is very important. But is seen as a gap or issue. Another is data policy management. NEDA should come up with policies that will mandate agencies to notify/ ask permission from PAGASA before putting up any equipment/ devices. In this way, integration and interoperability will not be a problem