

D. Field Survey and Selection of River Basins by the First Screening

Table of Contents

	Page
1 PREPARATION OF FIELD SURVEY	D- 1
1.1 Composition of Teams for Field Survey.....	D- 1
1.2 Schedule for Field Survey	D- 1
1.3 Main Survey Items for Field Survey	D- 1
1.3.1 River Characteristics	D- 2
1.3.2 Flood Types	D- 2
1.3.3 Flood Damages.....	D- 2
1.3.4 Existing and Planned Countermeasures	D- 2
1.3.5 Land Acquisition for Structural Measures.....	D- 2
1.3.6 Existing and Planned Water-use Facilities	D- 2
1.3.7 Related Plan.....	D- 2
1.4 Survey Procedure	D- 2
1.4.1 Preparation for the Survey.....	D- 3
1.4.2 Workshop.....	D- 3
1.4.3 Field Reconnaissance	D- 3
1.4.4 Data Collection.....	D- 3
2 COMPILATION OF FIELD SURVEY RESULTS	D- 3
2.1 Discussion with Regional Offices	D- 3
2.1.1 Comments on Major River Basins Excluded	D- 5
2.1.2 Comments on Other Dangerous River Basins.....	D- 4
2.2 Major Findings of Field Survey	D- 4
2.2.1 Findings on Flood Types	D- 5
2.2.2 Frequency of Floods.....	D- 7
2.2.3 Contents of Flood Inundation Conditions	D- 7
2.2.4 Present Countermeasures against Floods	D- 9
2.2.5 Planned Countermeasures against Floods	D-10
3 REVIEW OF THE FIRST SCREENING	D-11
3.1 Preliminary Selection of 100 River Basins through the First Screening.....	D-11
3.2 Replacement of River Basins for those by Preliminary Selection.....	D-12
3.2.1 Exclusion of Two River Basins	D-12
3.2.2 Inclusion of Six River Basins with regard to Major River Basin Treatment (Guideline 1).....	D-13
3.2.3 Inclusion of 16 River Basins Newly Identified as Dangerous River Basins	D-13
3.3 Selection of 120 River Basins through the First Screening.....	D-13

3.3.1 Viewpoint of First Screening Guideline	D-13
3.3.2 Category of River Basins	D-14
3.3.3 Regional Distribution	D-14
3.3.4 Size of River Basins	D-14

List of Tables

Table

Table D.3.1	List of Newly Included Dangerous River Basins	D-13
Table D.3.2	Types of River Basin	D-14
Table D.3.3	River Basin Classification	D-14

List of Figures

Figure

Figure D.2.1	Dominant Flood Types	D- 5
Figure D.2.2	Classification of Plural Flood Types	D- 5
Figure D.2.3	Number of Plural Flood Types	D- 5
Figure D.2.4	Composition of Flood Types	D- 6
Figure D.2.5	Classification of Flood Types	D- 6
Figure D.2.6	Flood Frequency	D- 7
Figure D.2.7	Flood Casualty	D- 7
Figure D.2.8	Flood Duration	D- 8
Figure D.2.9	Flood Depth	D- 8
Figure D.2.10	Flood Area	D- 8
Figure D.2.11	Present Countermeasures	D- 9
Figure D.2.12	Present Funds	D- 9
Figure D.2.13	Present Structural Measures	D- 9
Figure D.2.14	Present Non-structural Measures	D-10
Figure D.2.15	Planned Countermeasures	D-10
Figure D.2.16	Planned Funds	D-10
Figure D.2.17	Planned Structural Measures	D- 11
Figure D.2.18	Planned Non-structural Measures	D- 11

List of Tabs.

Tab.

Tab. D-1-1	Field Survey Schedule of Team-1 and 2.....	D-T-1
Tab. D-2-1	List of River Basins Proposed by Regional Offices	D-T-1
Tab. D-2-2	List of Dangerous River Basins Proposed by Regional Offices	D-T-1
Tab. D-2-3	Classification of Selected River Basin	D-T-2
Tab. D-2-4	Flood Casualty based on Questionnaire	D-T-3
Tab. D-2-5	Field Survey Result	D-T-4
Tab. D-3-1	Selected 120 River Basins (Result of 1st Screening)	D-T-7
Tab. D-3-2	Regional Distribution	D-T-7
Tab. D-3-3	Size of River Basins	D-T-7

List of Fig.

Fig.

Fig. D-3-1	Location of 120 River Basins	D-F-1
------------	------------------------------------	-------

D. FIELD SURVEY AND SELECTION OF RIVER BASINS BY THE FIRST SCREENING

1 PREPARATION OF FIELD SURVEY

The field survey was conducted in the 100 river basins preliminary selected in the First Screening. The objectives of the field survey are to confirm the adequacy of the 100 river basins, to collect the data and information for the further screening, and to modify the 100 river basins if necessary.

The composition of the field survey teams, field survey schedule, main survey items, and survey procedure are described below.

1.1 Composition of Teams for Field Survey

The total number of the members of the field survey teams was 13, comprised of: two (2) personnel from the Study Team; four (4) personnel from the DPWH; and seven (7) personnel from the local consultant. The local consultant was employed under the supervision of the Study Team for safety reasons and due to the limited study time schedule.

Nine (9) teams conducted the field survey, as follows:

Team-1 and 2 (two teams) : one (1) member from the Study Team and two (2) members from the DPWH for each team; and

Team-A to G (seven teams) : one (1) member from the local consultant for each team.

Team-1 and 2 conducted the 13 workshops at the Regional Offices of the DPWH and the field survey for 33 river basins. In addition to this, the DPWH counterpart personnel conducted three (3) workshops at Region IX, XII and ARMM. Team-A to G conducted the field survey for the remaining 67 river basins.

1.2 Schedule for Field Survey

Team-1 and 2 conducted the field survey from the middle of January to end of February 2007, and the first week of May 2007. In addition to these, the DPWH counterpart conducted the survey at Region IX, XII and ARMM in the latter half of March 2007. On the other hand, Team-A to G conducted the field survey in February 2007. The survey schedule of Team-1 and 2 is shown in Tab. D-1-1.

1.3 Main Survey Items for Field Survey

The main survey items of the field survey were: (1) river characteristics; (2) flood types; (3) flood damages; (4) existing and planned countermeasures; (5) land acquisition for structural measures; (6) existing and planned water-use facilities; and (7) related plan. The contents of these items were, as follows:

1.3.1 River Characteristics

This identified the characteristics of the river, i.e., torrential stream or meandering stream, river with bed above ground or excavated river, riverbed degradation or riverbed aggradation, and years of flood occurrence, etc.

1.3.2 Flood Types

This identified the types of floods, i.e., flash floods, overflow, inland flooding, bank erosion, or other.

1.3.3 Flood Damages

Data on the largest flood damages in the last 20 years were collected, i.e., year/month of flood occurrence, flood depth, flood duration, flood area, damaged land use, flood casualties, numbers of affected people and houses, and damage amounts, etc.

1.3.4 Existing and Planned Countermeasures

Data on the existing and planned countermeasures were collected, i.e., purpose of flood control (safety of human life, reduction of economic damages, improvement of living conditions, others), contents of non-structural measures, contents of structural measures, and financing source for structural measures, etc.

1.3.5 Land Acquisition for Structural Measures

Data on the land acquisition conditions were collected, i.e., land category of area for structural measures (private, government, other), and present land use of area for structural measures (forest, grass land, agricultural, residential, industrial, commercial, other).

1.3.6 Existing and Planned Water-use Facilities

This identified the types of existing and planned water-use facilities, i.e., intake, dam and reservoir, pump station, diversion channel or other.

1.3.7 Related Plan

This identified the kinds of related plan, i.e., land development plan, urban plan, flood control plan, water use plan, city/municipal land use plan and other.

1.4 Survey Procedure

The procedure of the field survey consisted of: (1) preparation for the survey; (2) workshop; (3) field reconnaissance; and (4) data collection. The contents of these items were, as follows:

1.4.1 Preparation for the Survey

Each team prepared necessary materials for the field survey. These materials included:

- Topographic maps covering each river basin (scale 1:50,000 and/or 1: 250,000);
- Questionnaire containing the major survey items mentioned above; and
- Workshop materials including the results of the First Screening and others.

1.4.2 Workshop

Team-1 and 2 conducted the workshop at each DPWH Regional Office to explain and discuss the progress and results of the First Screening. In this workshop, relating data/information (e.g., flood damage records, existing countermeasures, etc.) was confirmed and collected.

1.4.3 Field Reconnaissance

The teams conducted the field reconnaissance in company with the DPWH personnel from Regional or District Offices, and/or LGU personnel. Through the field reconnaissance, flood damage area was surveyed to collect data/information on flood damages, flood depth, and flood duration, etc.

1.4.4 Data Collection

The data/information confirmed in the workshop were collected from the concerned offices and through the field reconnaissance.

2 COMPILATION OF FIELD SURVEY RESULTS

This section includes: (1) discussion with Regional Offices; and (2) major findings of the field survey, as follows:

2.1 Discussion with Regional Offices

Team-1 and 2 conducted the workshops at 13 Regional Offices of the DPWH. On the other hand, the DPWH counterpart personnel conducted the workshops at Region IX, XII and ARMM.

In these workshops, the results of the First Screening (selection of 100 river basins together with the nomination of river basins for each Regional Office) were explained, and the selected 100 river basins were agreed in principle.

On the other hand, there were comments on: (1) major river basins excluded from the 100 river basins; and (2) nomination of other dangerous river basins. Details of these comments are explained below.

2.1.1 Comments on Major River Basins Excluded

Some major river basins, such as Pampanga, Agno, Pasig-Marikina-Laguna de Bay and Agusan, were excluded from the selected 100 river basins since flood control projects have already been implemented or scheduled. For these river basins, the following discussions were made:

- The regional office requested to incorporate some river basins (shown in Tab.D-2-1), which are tributaries or main streams of these river basins, but not included in the objective areas for the implementation of a flood control projects; and
- The team-1 and 2 answered the ranking of such river basins will be confirmed and decided.

Through the confirmation of high ranks of these river basins (within the top 100 ranking), 6 river basins were added to the 100 river basins. The details are shown in Tab.D-2-1.

2.1.2 Comments on Other Dangerous River Basins

The Regional Offices have own flood damage data/information, and the following discussions were made:

- The regional offices proposed that the river basins shown in Tab.D-2-2 should be included among the dangerous river basins; and
- For this comment, the team-1 and 2 requested the Regional Offices to provide additional data to show the flood damages of the above river basins, and the teams will make the decision based on such data.

Through the confirmation of the flood damage, 16 river basins were added to the 100 river basins. The details are shown in Tab.D-2-2.

2.2 Major Findings of Field Survey

The major findings of the field survey are emphasized, as follows (see Tab.D-2-5, for the detailed results of the field survey):

1. Findings on flood types;
2. Frequency of floods;
3. Contents of flood inundation conditions;
4. Present countermeasures against floods; and
5. Planned countermeasures against floods.

The details of these findings are described below.

2.2.1 Findings on Flood Types

Regarding flood types, the findings are on: (1) dominant flood types; (2) plural flood types; (3) composition of flood types; and (4) classification of flood types. The details of these findings are, as follows:

(1) Dominant Flood Types

The flood types are classified into the flash floods, overflow, inland flooding, bank erosion and other. Based on this classification, the flood types for each river basin are summarized, as follows:

As shown in Figure D.2.1, the most dominant flood type is overflow, followed by bank erosion, flash flood and inland flooding in this order. Especially, over flow has been detected in most of the river basins. As for the other types, those by lahar and tidal influence are notable.

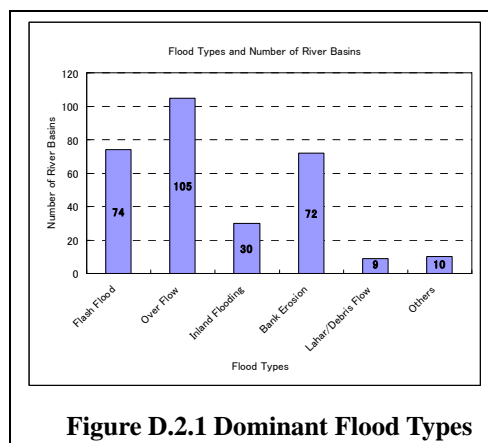


Figure D.2.1 Dominant Flood Types

(2) Plural Flood Types

The most river basins have the plural flood types (96/120). As shown in Figures D.2.2 and D.2.3, some river basins have one flood type, while other river basins have more than two types. Among these, 45 river basins out of 120 (38 %) have two types. In 6 river basins, most of flood types (5 types) are observed.

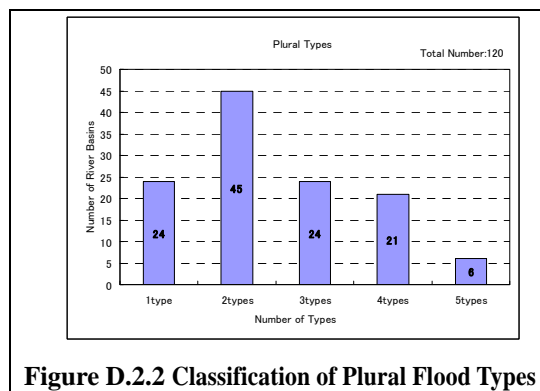


Figure D.2.2 Classification of Plural Flood Types

(3) Composition of Flood Types

The composition of plural types is shown in Figure D.2.4 (in this figure, the following abbreviations are used, F: flash flood, O: over flow, I: inland flooding, B: bank erosion, L: lahar/debris flow, Ot: others). Among these, the case of two types is dominant, and three and four types follow. In the case of two types, the dominant plural flood types are “Overflow and Bank Erosion”. Even in the case of more than two plural types, combination of “Overflow and Bank Erosion” is prominent.

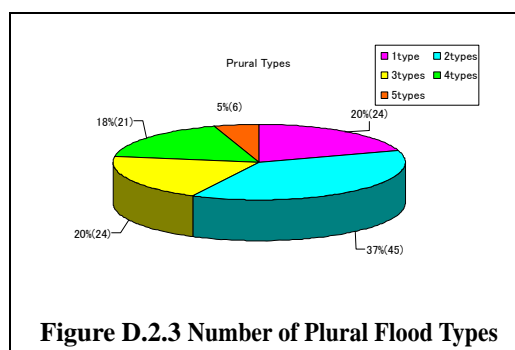


Figure D.2.3 Number of Plural Flood Types

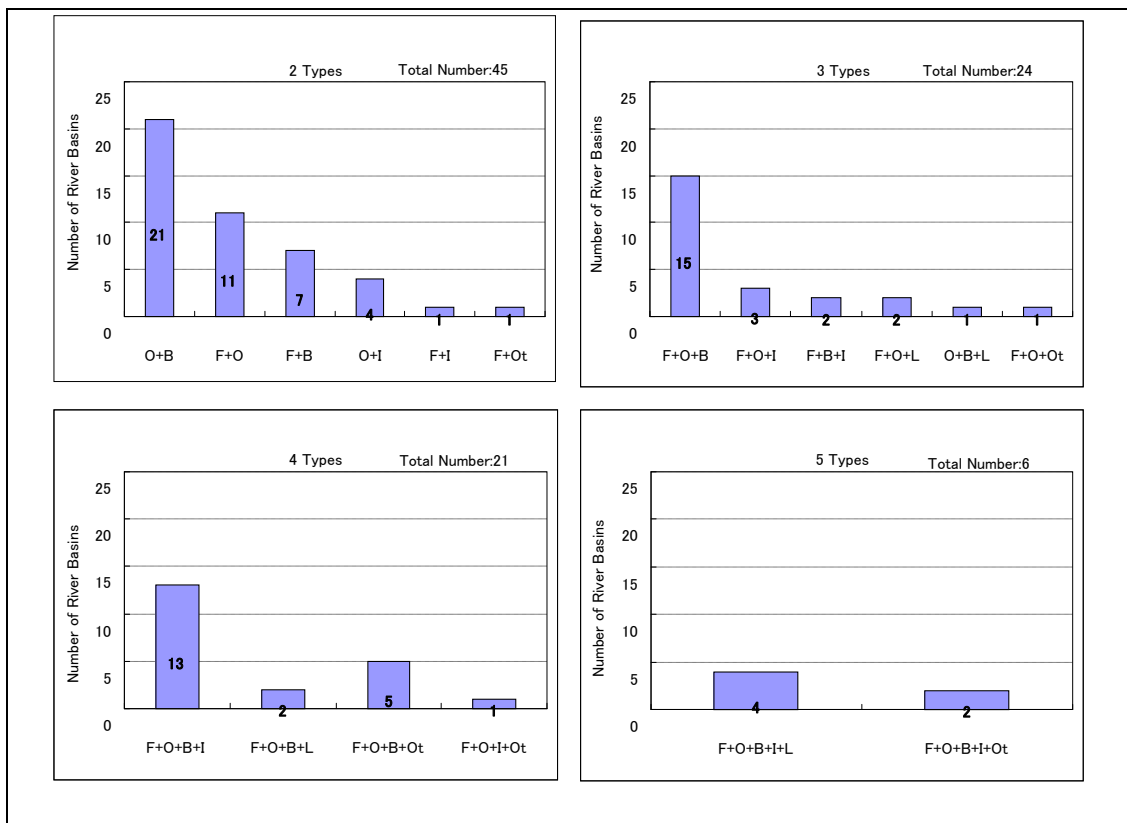


Figure D.2.4 Composition of Flood Types

(4) Classification of Flood Types

As shown in Tab.D-2-3 and Figure D.2.5, most of river basins have plural types. Among these, over flow type in combination with bank erosion and/or flash flood is dominant (F+O+B). Then, inland flooding in addition to the above combination is remarkable (F+O+B+I). Further, lahar/debris flow type is specified (F+O+B+I+L).

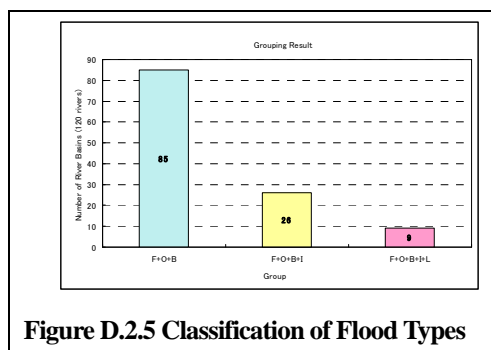


Figure D.2.5 Classification of Flood Types

2.2.2 Frequency of Floods

The findings here are regarding: (1) frequency of floods; and (2) flood casualty, as follows:

(1) Frequency of Floods

Figure D.2.6 shows that 41 river basins have experienced floods every year. This case cannot be identified from the statistical data applied to the First Screening. On the other hand, 22 river basins have experienced flood once in 10 years, and 38 river basins have less than three times in 10 years.

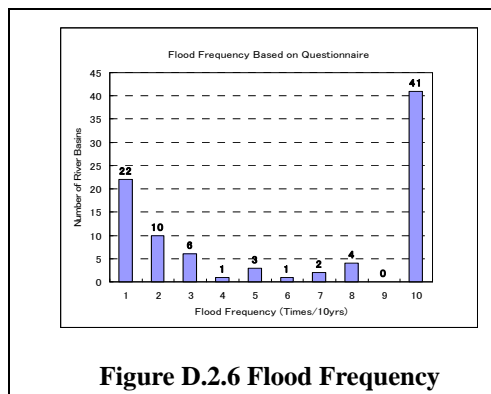


Figure D.2.6 Flood Frequency

(2) Flood Casualty

Tab.D-2-4 and Figure D.2.7 show the flood casualties base on the questionnaire survey. The largest casualty was 806 peoples (dead 222, injured 215, missing 369) occurred at the Yawa/Basud /Quirangay River Basin, Region V, in 2006. The cause of this casualty was lahar from Mayon volcano. Other significant casualties were 700 people by flashfloods at the Daguitan-Marabong River Basin, and 436 people by overflows at the Agos River Basin.

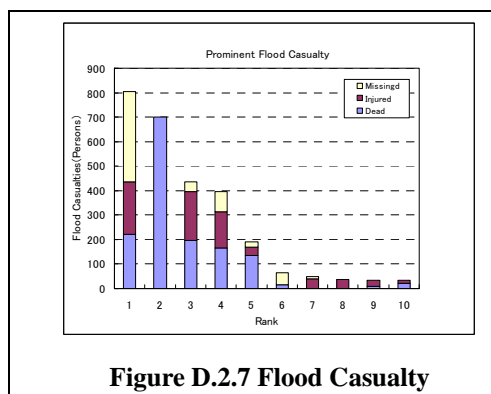


Figure D.2.7 Flood Casualty

2.2.3 Contents of Flood Inundation Conditions

In order to identify the flood inundation conditions: 1) flood duration; 2) flood depth; and 3) flood area were surveyed. The details of the conditions are, as follows:

(1) Flood Duration

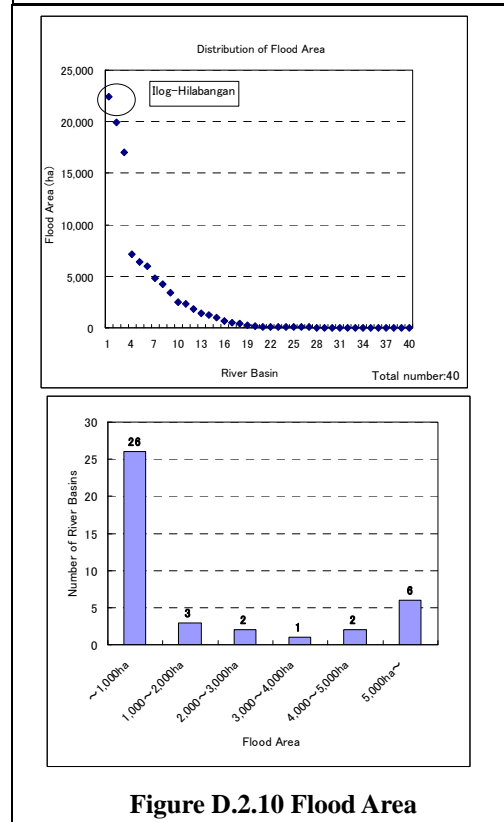
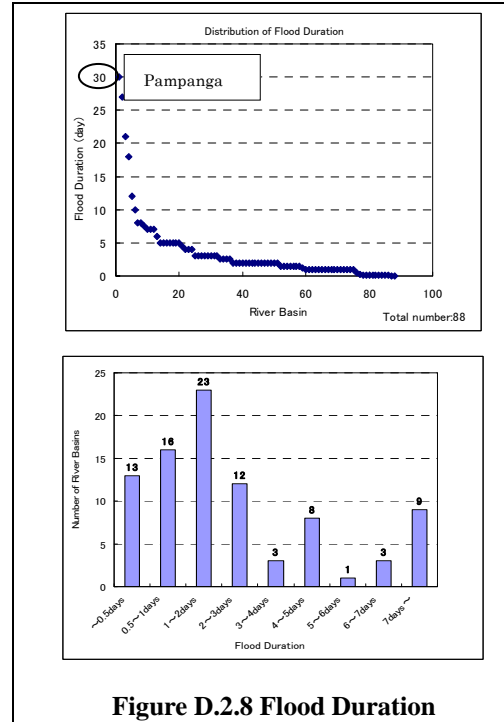
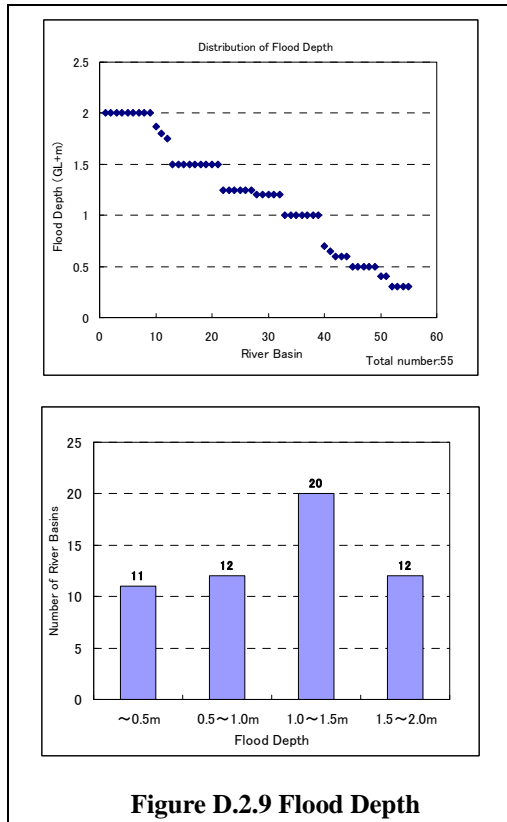
Figure D.2.8 shows the distribution of the flood duration. As shown in the figure, most of the river basins have experienced inundation of one to two days. The inundation duration in 9 among the 88 river basins is more than one week. The longest inundation duration was 30 days in the Pampanga River Basin.

(2) Flood Depth

Figure D.2.9 shows the distribution of the flood depth. As shown in the figure, the observed flood depths are in the range of 0 to 2 m. The dominant case is between 1.0 to 1.5 m.

(3) Flood Area

The collected data on this item is limited and not well arrange, hence, the survey results may not be so accurate. Figure D.2.10 shows the distribution of flood area. As far as the figure is concerned, the flood area in most cases is less than 1,000 ha, and the maximum flood area of more than 20,000 ha was detected in the Ilog-Hilabangan River Basin.



2.2.4 Present Countermeasures against Floods

The survey results of the present countermeasures are summarized as: (1) general present conditions; (2) present structural measures; and (3) present non-structural measures. The details are described below.

(1) General Present Conditions

Figures D.2.11 and D.2.12 show the general conditions of the present countermeasures against floods.

As shown in the figure, 106 river basins out of 120 river basins (88%) have some countermeasures, and 80 river basins have both structural and non-structural measures. On the other hand, 14 river basins have no countermeasures.

As the financing sources for these measures, the main sources are the central or local governments, and only 46 river basins have received international fund. As the comments from the local offices, the allocated budget is not enough to cope with the flood problems, and it is expected to increase.

(2) Present Structural Measures

Figure D.2.13 shows the contents of the present structural measures. From the figure, the following conditions are identified:

- The most dominant structural measures are river improvement which covers 75 % of the total river basins.
- In some river basins, dam and/or flood way have been provided.
- Retarding pond is very few in number of river basins.

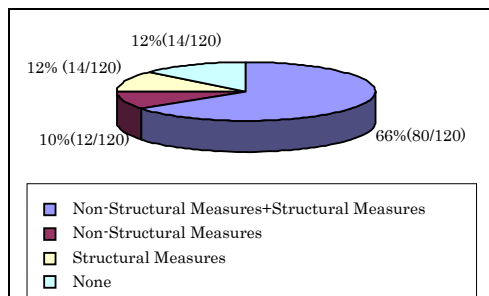


Figure D.2.11 Present Countermeasures

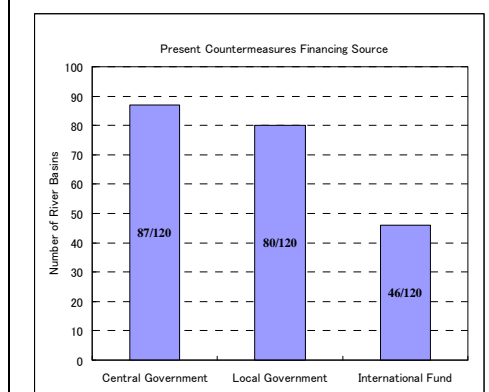


Figure D.2.12 Present Funds

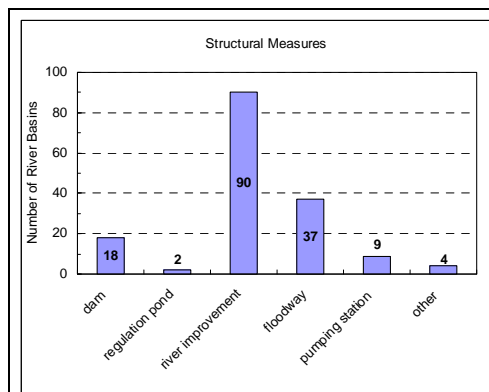
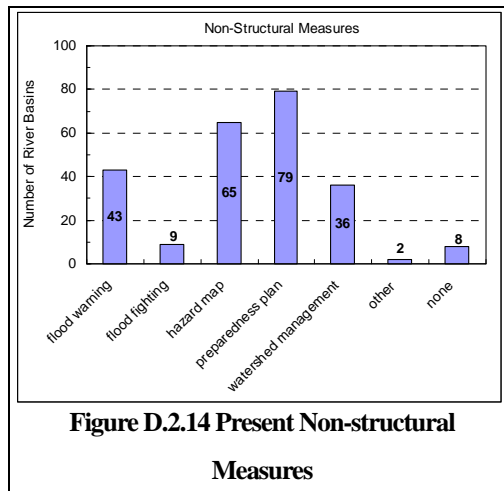


Figure D.2.13 Present Structural Measures

(3) Present Non-structural Measures

The contents of the present non-structural measures are shown in Figure D.2.14. From the figure, the following conditions are identified:

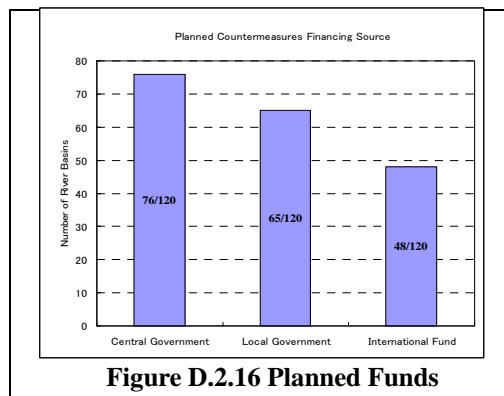
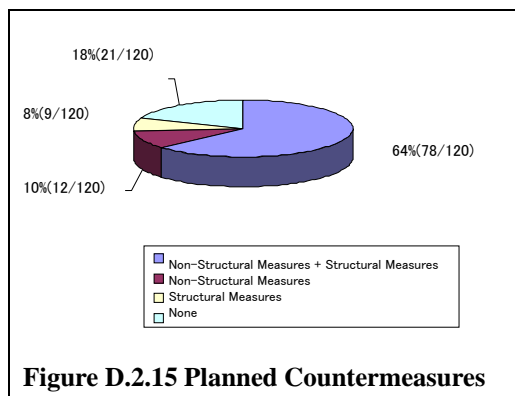
- In most of the river basins (120 river basins in total), preparedness plan including hazard map have been prepared.
- In 43 river basins, flood warning systems have been arranged, and in 36 river basins, watershed managements have been practiced.



2.2.5 Planned Countermeasures against Floods

The survey results of the planned countermeasures are summarized in the same manner as the present measures.

(1) General Planned Conditions



Figures D.2.15 and D.2.16 show the general conditions of the planned countermeasures against floods.

As shown in the figure, 99 river basins among 120 river basins (82%) have some plans to provide countermeasures. Especially, 78 river basins have plans to provide structural and non-structural measures. The river basins having present measures have also plans to strengthen or expand the present measures.

Regarding to the financing sources for the planned measures, the main sources are central or local governments, and only 48 river basins have plans to receive international fund.

(2) Planned Structural Measures

Figure D.2.17 shows the contents of the present structural measures. From the figure, the following conditions are identified:

- It is planned to introduce or develop river channel improvements in most of river basins (88 river basins); and
- Some river basins have plans to introduce dam, flood way and/or regulation pond.

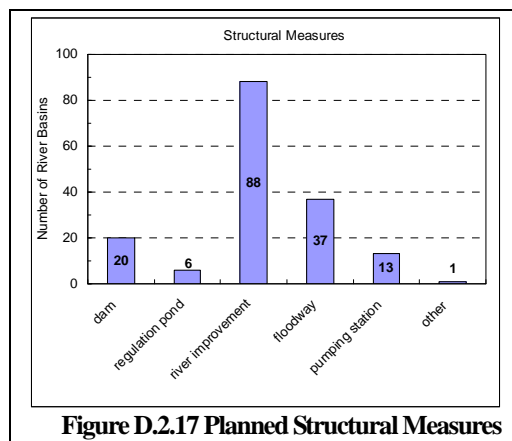


Figure D.2.17 Planned Structural Measures

(3) Planned Non-structural Measures

The contents of the planned non-structural measures are shown in Figure D.2.18. From the figure, the following conditions are identified:

- Most of the river basins (124 river basins in total) have plans to introduce hazard map and/or preparedness; and
- Likewise, 49 river basins and 39 river basins have plans to introduce flood warning system and/or watershed management.

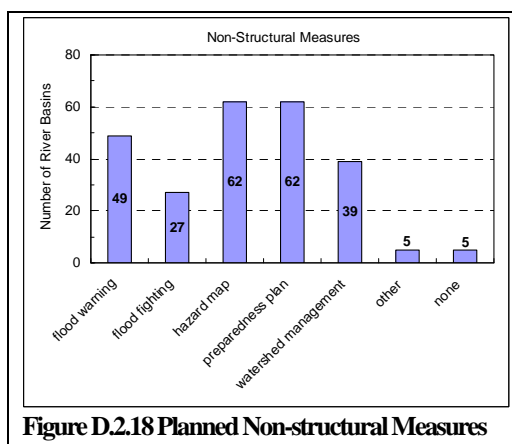


Figure D.2.18 Planned Non-structural Measures

3 REVIEW OF THE FIRST SCREENING

Through the First Screening, 100 river basins are preliminarily selected. For these 100 river basins, the field survey is conducted for the verification. Based on the field survey, two river basins are judged to have less flood damage potential, and these are excluded from the 100 river basins. On the other hand, based on the discussions with the DPWH Regional Offices, the six (6) river basins regarding major river basins and 16 river basins regarding dangerous river basins are added to the 100 river basins.

As the results, a total 120 river basins ($100 - 2 + 6 + 16$) are identified as the objective river basins for the Second Screening. Tab.D-3-1 and Fig.D-3-1 show the list and location of these 120 river basins. The contents of the review are described below.

3.1 Preliminary Selection of 100 River Basins through the First Screening

The 100 river basins are preliminarily selected through the First Screening, and are classified into five (5) categories from the viewpoint of the guideline. The number of river basins for each category is, as follows:

- Major River Basins : 14
- Dangerous River Basins : 20
- Allocated River Basins for Each Region : 47
- Allocated Principal River Basins : 15
- Allocated Other River Basins : 4

In this selection, 14 major river basins are selected out of 18 major river basins, excluding the Pampanga, Agno, Pasig-Marikina-Laguna Bay and Agusan River Basins, since the flood control projects have already been implemented or scheduled to be implemented. On the other hand, 69 principal and 17 other river basins are selected.

3.2 Replacement of River Basins for those by Preliminary Selection

To confirm the adequacy of the preliminary selection of 100 river basins, field survey for the 100 river basins has been conducted. Finally, through the field survey and discussions with the DPWH regional offices, it was clarified that the following replacements among the 100 river basins were necessary:

3.2.1 Exclusion of Two River Basins

It was identified that two (2) river basins (Lubayat and Darga) have less flood damage and are not required to be provided with high priority flood control projects. The situations of these basins are explained below:

(1) Lubayat River Basin

Almost all of the Lubayat River Basin locates in Real Municipality, Quezon Province. In the First Screening, the flood casualty (S7) and flood damages (S8) of the basin were estimated based on the values of Real Municipality. However, based on the field survey, it was confirmed that there were no flood casualties and damages in the past 10 years.

This situation can be explained that the flood casualties and damages occurred in Real Municipality, but the flood area was not located in the Lubayat River Basin. However, based on the estimation method, the flood casualties and damages were distributed to the Lubayat River Basin.

(2) Daraga River Basin

The Daraga River Basin, of which location was identified from the 1/250,000 scale map, was not the actual Daraga River Basin itself. This was confirmed during the field survey using 1/50,000 scale map. Its name was the Kapantaran River Basin, and this river basin had no flood problems. On the other hand, the original Daraga River Basin is included in the Legazpi City Basin, which is one of the selected 100 river basins.

3.2.2 Inclusion of Six River Basins with regard to Major River Basin Treatment (Guideline 1)

Some river basins, such as Pampanga, Agno, Pasig-Marikina-Lagna de Bay and Agusan, are excluded, since flood control projects of these river basins have been implemented or scheduled the implementation soon. However, even in such river basins, there are areas of upstream or tributaries which are not included in the objective areas for the implementation.

The following river basins were designated as the dangerous river basins, which are upstreams or tributaries of major river basins but out of the objective areas for the above mentioned implementation. As the results, these were identified to have the necessity of inclusion judging from the severe flood damage conditions:

- Upstream of Pampanga and tributaries
- Upstream of Agno and tributaries
- Upper Marikina
- East Mangahan
- San Juan (tributaries of Pasig)
- Upper Agusan

3.2.3 Inclusion of 16 River Basins Newly Identified as Dangerous River Basins

The river basins shown in the following table are newly included in the list of dangerous river basins in accordance with the information and request from the respective Regional Offices:

Table D.3.1 List of Newly Included Dangerous River Basins

Classification	Region	Name of River Basin	Number of River Basins
Principal River	VI	Cairawan, Sibalom, Dalanas, Tibiao, Sipalay, Jaro-Aganan	6
	VII	Managa, Guinabasan	2
	VIII	Dale, Cadac-an	2
	X	Balatukan	1
	XI	Lipadas, Talomo, Tuganay	3
Other River	III	Meycauayan	1
	VIII	Bantayan	1
Total			16

3.3 Selection of 120 River Basins through the First Screening

As the results of the First Screening, total 120 river basins have been selected as the objective river basins for the Second Screening (refer to Tab.D-3-1 and Fig.D-3-1). The composition of these 120 river basins is, as follows:

3.3.1 Viewpoint of First Screening Guideline

As the results of the replacement, the number of dangerous river basins increased by 21, while the number of allocated ones for each region decreased by one, as shown in the table below.

Table D.3.2 Types of River Basin

River Basins	Preliminary 100 River Basins	By This Replacement	Selected 120 River Basins
Major River Basin	14	No change	14
Dangerous River Basin	20	+21	41
Allocated River Basins for Each Region	47	-1	46
Allocated Principal River Basins	15	No change	15
Allocated Other River Basins	4	No change	4
Total	100		120

3.3.2 Category of River Basins

As the results of the replacement, the number of principal and other river basins increased by 19 and 1, respectively (refer to Table D.3.3).

Table D.3.3 River Basin Classification

Category of River Basins	Preliminary 100 River Basins	By This Review	Selected 120 River Basins
Major River Basin	14	No change	14
Principal River Basin	69	+19	88
Other River Basin	17	+1	18
Total	100		120

3.3.3 Regional Distribution

Through this review, all regions (including NCR) are allocated with river basins. The largest number allocated is 13 for Regions IV-A and VI. On the other hand, the smallest is two (2) for CAR and NCR. New regional distribution is shown in Tab.D-3-2.

3.3.4 Size of River Basins

The distribution of the basin sizes is shown in Tab.D-3-3. The largest and the second largest river basin numbers of basin size classes are 52 (43%) for 100-500 km² and 27 (23%) for 500-1,000 km², respectively. The average size is around 1,120km².

Tab. D-1-1 Field Survey Schedule of Team-1 and 2

Week	Team-1		Team-2	
	Region	Period	Region	Period
1st Week	IV-A (3)	17 - 18 January	IV-A (3)	17-18 January
2nd Week	VIII (3)	24 - 27 January	III (3)	24 - 26 January
3rd Week	VII (3)	30 January - 2 February	I (3)	31 January - 3 February
4th Week	VI (3)	6 - 9 February	II (3)	7 - 10 February
5th Week	XI (3)	13 - 16 February	IV-B (3)	14 - 17 February
6th Week	X (3)	20 - 23 February	V (3)	21 - 24 February
7th Week	XIII (0)	2 - 6 May	CAR (0)	2 - 3 May
Total Survey Quantity: 13 Regions and 33 River Basins				

Note: Number in parenthesis is the numbers of river basins surveyed.

Tab.D-2-1 List of River Basins Proposed by Regional Offices

Major River Basin	Tributaries/ Mainstream	Ranking	Conclusion	Remarks
Pampanga	Third	-	Exclude	Locates in Guagua river basin
	Mainstream (include Rio Chico)	17	Include	
Agno	Toboy	-	Exclude	Locates in Patalan river basin
	Mainstream (include Ambayawan, Banila Viray de Palo)	17	Include	
Pasig-Marikina-Laguna de Bay	Upper Marikina	21	Include	
	East Mangahan	44	Include	
	San Juan	91	Include	
Agusan	Upper Agusan	21	Include	

Tab.D-2-2 List of Dangerous River Basins Proposed by Regional Offices

Region	Name of River Basins	Ranking	Data*		Conclusion
			Casualty	Damage	
III	Meycauayan	21	1	35 MP	Include
IV-B	San Rafael	485	--	--	Exclude
VI	Cairawan	485	10	55 MP	Include
	Sibalom	125	17	60 MP	Include
	Dalanas	957	15	240 MP	Include
	Tibiao	957	15	110 MP	Include
	Sipalay	236	5	57 MP	Include
	Jaro-Aganan**	125	12	297 MP	Include
VII	Managa	349	31	275 MP	Include
	Sta. Ana	91	--	--	Exclude
	Guinabasan	607	35	6.25 MP	Include
VIII	Bantayan	349	20	2.25 MP	Include
	Dale	236	10	8 MP	Include
	Cadac-an	170	13	7.5 MP	Include
X	Balatukan	831	5	298 MP	Include
XI	Lipadas	607	2	88 MP	Include
	Talomo	607	30	155 MP	Include
	Tuganay	1058	--	14 MP	Include
XII	Allah	485	--	--	Exclude
	Banga	485	--	--	Exclude
	Bulloc	236	--	--	Exclude
	Small Margus	831	--	--	Exclude
	Buluan	236	--	--	Exclude
	Libungan II	485	--	--	Exclude

Note) *: Source: Questionnaire except for Jaro-Aganan.

**): The data are quoted from the "Study on the Flood Control for Rivers in the Selected Urban Centers, 1995" in the form of the total amount (1982 to 1992).

--: No data

Tab.D-2-3 Classification of Selected River Basin

Group	Type	Region	River Name	Flood Types							Scale					
				Flash Flood	Over Flow	Inland Flooding	Bank Erosion	Landslides/ Debrisflow	Other	Category	Basin Area (sq.D)					
F+O+B	F+O+B		I SINOCALAN/MARCOS OY(DAGUPAN)	X	X		X			X(high tide)	P	1,023				
			I PATALAN/GAYANGA/ANGALACAN	X	X		X			X(crooked/silted)	P	456				
			I BAINCOLUGUN/MARINE PANOSINAN	X	X		X			X(crooked/silted)	P	378				
			I BUAYA	X	X		X				P	246				
			I AGNO(include AMRAYAWAN, BANILA)	X	X		X				P(D)	5,722				
			II NANGALISAN/BAGGAO-PAREDO(AGAYAN)	X	X		X				M	27,743				
			III PAMPANGA(include RIO CHICO)	X	X		X			X(breaching)	P(D)	8,122				
			IV-B MARIANDO/BIUSWANGA	X	X		X				P	469				
			IV-B BAROC	X	X		X				P	162				
			V KABULUGAN/VELASCO/BATO LAKE/IBDOL	X	X		X			X(confluence)	M	2,999				
			VI ILOG-HILABANGAN	X	X		X				M	2,080				
			VI PANAY/MAMBUSAO	X	X		X				M	2,311				
			VI SIPALAY	X	X		X				P(D)	336				
			VIII PADAC, AN	X	X		X				P(D)	362				
			X CAGAYAN DE ORO	X	X		X				M	1,265				
			XI HUIO	X	X		X				P	642				
			XI MAO O	X	X		X				O	30				
			XI LIPADAS	X	X		X				P(D)	163				
			XI UPPER AGUSAN	X	X		X				P(D)	1,745				
			XIII TAGO	X	X		X				P	1,370				
			II PAMPLONA	X			X				P	699				
			IV DONSOL/MANILATO	X			X				P(D)	413				
			V LADO	X			X				P	931				
			VI AKLAN	X			X				P	1,010				
			IX TUMAGA	X			X				P(D)	255				
	XI TALOMO	X			X				P(D)	279						
	ARMM MATABER	X			X				P	197						
	F+B			I ABRA		X		X			M	4,851				
				I AMBUJAYAN		X		X			P(D)	1,307				
				I BACARRA-VINTAR		X		X			P	627				
				IV-A KALIWA		X		X			P	468				
				IV-B MAG-ASAWANG, TURIG		X		X			P(D)	448				
				IV-B BONGABONG		X		X			P	574				
				IV-B PULA		X		X			P	245				
				IV-B ALAGMALAYLAY-BAGO		X		X			P	506				
				VI HEMOYAN		X		X			P	462				
				VI JARO-AGANAN		X		X			P(D)	464				
				VII OMBADOGBALAMBAN		X		X			P	237				
				VIII CATARMAN		X		X			P(D)	632				
				VIII DUNGOAN(PAGBANGANAN)		X		X			P	176				
				VIII PANGSANGA-AN		X		X			P	511				
				IX MABANGI		X		X			P	1,308				
				X TACLOAN		X		X			M	1,762				
				X MABANDING		X		X			P	634				
				X IPONAN		X		X			P	412				
				XI PADADA MAINIT		X		X			P	1,216				
				XIII BOSTON		X		X			O	43				
				ARMM MATALING		X		X			P	420				
				F+O			I SILAG-SANTA MARIA	X	X				X(high tide)	P	310	
							I ALAMBING/TAGCOING	X	X					P	241	
							IV-A MILIS	X	X					P(D)	112	
							VI BACOLOD	X	X					O	187	
	VII SARANG, DAKO	X	X								P	168				
	VII MANANGA	X	X								P(D)	86				
	VII GUNABASAN	X	X								M(L)	131				
	VIII DASILITAN-MARARON	X	X								P	292				
	VIII BANTAYAN	X	X								O(D)	69				
	XI DAVAO	X	X								M	1,992				
	XII SILWAY-POPONG-SINALAI(POLOMOLO)	X	X								O	577				
	XII SIGUEL	X	X								P	358				
	O						I BARAKU		X					P	192	
							II BANIRBOLUK(AL-LOI)		X					O	511	
							II OLIVERIA(CABO LUNGAN)		X					P	270	
							III NATUN		X					P	828	
							III MEYCALAYAN		X					O(D)	249	
							NOR UPPER MARIKINA		X					P(D)	515	
							NOR SAN JUAN		X					P(D)	90	
							IV-B AMNAY		X					P(D)	495	
							IV-B BALETE		X					P	132	
							IV-B POLA		X					P	140	
							V BART-BASUD		X					P	277	
							VI JALAU		X					M	1,534	
							VIII DALI		X					P(D)	169	
				X MANDULOG		X					P	780				
				XI BUAYAN-MALUNGUN		X					M	1,321				
				XIII IRAN		X					P	808				
				XIII SURIGAO		X					P(D)	170				
				XIII LAKE MAINIT-TUBAY		X					P	473				
				ARMM AGUS/DUAYAN		X					M	1,898				
				ARMM NETUAN		X					P	265				
				E			IV-A IYAM/LUCENA	X					X(flood by spillway)	P(D)	158	
							IV-A LALAVINAN(REAL-2)	X						O	46	
							IV-B CAGURAY	X						P	361	
							V RAGAY	X						P	176	
							X DALATUKAN	X						P(D)	221	
	F+O+B+H						I ARINGAY	X	X	X	X		X(high tide)	P	421	
							II PALANAN-PINACANAUAN	X	X	X	X			P	755	
							III MALUPA-DIANAGUANG	X	X	X	X			X(confluence)	P	690
							IV-A UMIRAY	X	X	X	X				P	628
							IV-A TIGNONAN	X	X	X	X				P	87
				IV-A KINANUMAN(REAL-1)	X	X	X	X				O	10			
				IV-A GENERAL NAKAR-2-(b)	X	X	X	X				P	17			
				VI CATARMAN	X	X	X	X				P(D)	71			
				VI SIDALOM	X	X	X	X				P(D)	650			
				VI DALANAS	X	X	X	X				P(D)	184			
				VI TIRIAGO	X	X	X	X				P(D)	72			
				VII SIPOONG-STACATALINA/GAMITAN	X	X	X	X				P	320			
				XII MINDANAO	X	X	X	X				M	20,873			
				CAR ABILLEG	X	X	X	X				M	2,766			
				CAR BALAMB	X	X	X	X				P	510			
III ANGAT				X	X	X	X				X(high tide)	P	917			
IV-A DOMACAN/TAMRAK(TAYARAS)				X	X	X					O(D)	45				
IV-A GENERAL NAKAR-2-(a)				X	X	X					O	37				
VII CERBU/MANDAWA				X	X	X					O(D)	241				
F+B+H						II BALIA	X	X	X	X			P	118		
						IX SIBUGUEY	X	X	X	X			P	954		
						IV DISACAN-MANUKANJOSE(DALMAN PONDIT)	X							O	274	
						IV-A CALIMPANG(KALIMPONG)	X	X	X					P(D)	445	
						IV-A EAST MANGAHAN	X	X	X					P(D)	84	
						XI TAGUM-LIBUGANON	X	X	X					M	2,434	
	XI TUGANAY	X	X			X					P(D)	747				
	III SANTA RITA/KALAKLAN/OLONGAPO CITY	X	X			X	X			X(lahar/debris flow)	O(D)	102				
	V YAWA/BASUD/GURANGAY/LEGAZPI CITY	X	X			X	X			X(lahar/debris flow)	O(D)	126				
	X GUBALE-B	X	X			X	X			X(lahar/debris flow)	P	182				
F+O+L			III BINAGSAGAN(CATARMAN-13)	X	X	X	X			O(D)	25					
			III BILAO	X	X	X	X			X(lahar/debris flow)	P(D)	664				
			VI BAGO	X	X	X	X			X(lahar/debris flow)	P	968				
			III GUAGUA	X	X					X(lahar/debris flow)	O(D)	1,605				
			III SANTO TOMAS-GABOR	X	X					X(lahar/debris flow)	P(D)	334				
			O+B+L	IV-A AGOS	X	X		X			X(lahar/debris flow)	P(D)	483			

M : Major River Basin, P : Principal River Basin, O : Other River Basin, (D) : Dangerous River Basin

Tab.D-2-4 Flood Casualty based on Questionnaire

Rank	River Name	Region	Year	Flood Casualty	Total	Flood Reason
1	Yawa/Basud/Quirangay	V	2006	Dead 222, Injured 201, Missing 369	806	Lava from Mayon Volcano
2	Daguitan-Marabong	VIII	1992	Dead 700	700	Over Flow
3	Agos	IV-A	2004	Dead 197, Injured 198, Missing 41	436	Debris Flow
4	Dinaggasan	X	2001	Dead 166, Injured 146, Missing 84	396	Pile up log Destroyed
5	Caguray	IV-B	1988	Dead 135, Injured 35, Missing 20	190	
6	Disakan-Manukan	IX	2001	Dead 15, Missing 50	65	
7	Guagua	III	2002	Injured 40, Missing 8	48	
8	Ilog-Hilabangan	VI	1990	Dead 1, Injured 36	37	
9	Guinabasan	VII	2005	Dead 10, Injured 25	35	
10	Baua	II	1989	Dead 20, Injured 15	35	

Tab.D-2-5 Field Survey Result (1/3)

No.	Region	River Name	Category	Basin Area (km ²)	Flood Causes					Flood Frequency		Flood Information				Flood Casualty	
					Flash Flood	Over flow	Intend Flooding	Bank Erosion	Other	Times of Flood During Last 20 Years	Average Flood Times	Largest Flood Year	Flood Depth	Flood Area	Flood Duration	Flood Casualties	Number of Affected People and Houses
1	I	ABRA	M	4,951		X		X		5	every 5 to 10 years during heavy rain	---	---	---	---	---	---
2	I	AMBURAYAN	PD	1,307		X		X		No answer	---	---	---	---	---	---	---
3	I	SINOCALAN/MAROSUY(DAGUPAN)	P	1,023		X		X		Every time during heavy rain	1-2times/year	June 1998	5-6ft	55ha	2-3days	Dead2/Injured3	600household
4	I	PATALAN/CAYANGA/ANGALACAN	P	656		X		X	X(closed/silted)	5	1-2times/year	typhoon Gading Sep 1998	GL-1m	3,022ha	1-2days	Dead1/Injured2	houseC10P1048/3,075Persons
5	I	ARINGAY	P	421		X		X	X(high tide)	6	2-3times/year	typhoon Gading Sep 1998	0.3-1m	3,400ha	1-3days	Dead2	houseC11SP305/2,949Persons
6	I	BARARO	P	192		X		X		Every time during heavy rain	1-2times/year	typhoon Fera July 2001	7m	---	---	Injured25	houseC26P218/8,600Persons
7	I	BACARRA-VINTAR	P	627		X		X		Every time during heavy rain	1-2times/year	---	---	---	---	---	---
8	I	BAINGCUGUIN/MABINE PANGSINAN	P	378		X		X	X(closed/silted)	No answer	1time/year	typhoon Gading Sep 1998	---	110ha	1day	Dead1	houseC10P55/1,349Persons
9	I	SILAG-SANTA MARIA	P	310		X		X		Every time during heavy rain	1time/year	typhoon Gading Sep 1998	---	100ha	1day	---	houseC86P168/1,833Persons
10	I	BUAYA	P	246		X		X		2	---	---	---	---	---	---	---
11	I	ALAMINOS/TAGOONG	P	221		X		X		No answer	every typhoon	---	---	---	---	---	---
12	II	NANGALAN/BAGGAO-PARED(CAGAYAN)	M	27,743		X		X		No answer	2-3times/year	typhoon Gading Sep 1998	6m from original water surface	Bray Paniki	3days	---	houseC9P123/2,192Persons
13	II	PAMPLONA	P	698		X		X		No answer	---	---	---	---	---	---	---
14	II	PALANAN-PINAGANAUAN	P	755		X		X	X	4	1time/year	1997	5m	17,000ha	3days	Dead18/Injured5/Missing2	houseC208P8,500/10,800persons
15	II	BANUBOUR/LAL-LOI	O	811		X		X		2	1-2times/year	2005/2004	2-3m	---	1-2days	---	---
16	II	CLAYERRA/CABICUNGAN	P	279		X		X		No answer	1time/year	June 2004	river bank+1m	380ha	2days	---	houseP180/1,895persons
17	II	BAUA	P	118		X		X	X	No answer	---	---	0.5m	---	---	---	---
18	III	GUAGUA	OD	1,605		X		X	X(lahar siltation)	2	1time/year	1989	2m	500ha	2days	Dead20/Injured15	houseC12
19	III	SANTA RITA KALAKLAN(OLONGAPO CITY)	OD	102		X		X	X(lahar siltation)	10	1time/year	Aug 1997	1.6m	9ha	1day	---	---
20	III	SANTO TOMAS-GABOR	PD	334		X		X	X(lahar siltation)	10	1time/year	Aug 1997	1.8m	13ha	1day	---	---
21	III	BUCAO	PD	664		X		X	X(lahar siltation)	No answer	1time/year	July 2006	1.2m	1,250ha	4days	Injured14	houseC2580P883/16,430persons
22	III	ANGAT	P	817		X		X	X(high tide/dam release)	1	---	Aug 27 2004	1.2m	633ha	---	Dead1	houseC7454/36,375persons
23	III	MALIPA-DIAN(AGUANG)	P	666		X		X	X(confluence of the river)	2	---	Sep Nov./1995,1994	1-4m	---	1day	Dead10	1,000persons
24	III	WAYUM	P	239		X		X		4	---	---	---	---	---	---	---
25	IV-A	AGOS	PD	483		X		X	X(debris flow)	No answer	1time/year	Nov 29 2004	5m	---	---	Injured30	houseC11P74/800persons
26	IV-A	MUS	PD	112		X		X		No answer	1time/year	heavy rain	1-1.5m	---	1day	---	---
27	IV-A	CALIMPANG/KAPUMPONG	PD	446		X		X		No answer	---	---	---	---	---	---	---
28	IV-A	TYAM/LUCENA	PD	158		X		X	X(flood by spillway)	No answer	1-2times/year	Nov 1995	3m from top of spillway	---	---	---	houseP1/8persons
29	IV-A	DOMACAN/TAMBAK(TAYABAS)	OD	45		X		X		No answer	---	Nov 1995	2m from top of slab	---	---	Dead1	houseC148P71/68persons
30	IV-A	UMIRAY	P	628		X		X	X	2	1-2times/year	2005/2004	2-3m	---	1-2days	---	---
31	IV-A	KALWA	P	468		X		X		No answer	---	---	---	---	---	---	---
32	IV-A	LURAYAT	P	80		X		X		No answer	---	---	---	---	---	---	---
33	IV-A	TIGNOAN	P	87		X		X	X	No answer	---	---	---	---	---	---	---
34	IV-A	LALAVINAN(REAL-2)	O	46		X		X		No answer	1-3times/year	2005/2004	1-3m	---	1day	---	---
35	IV-A	KINAMJAN(REAL-1)	O	10		X		X	X	2	1-3times/year	2005/2004	1-2m	---	2day	---	---
36	IV-A	GENERAL NAKAR-2(b)	O	17		X		X	X	2	1-3times/year	2005/2004	1-2m	---	1day	---	---
37	IV-A	GENERAL NAKAR-2(a)	O	37		X		X	X	2	1-3times/year	2005/2004	1-2m	---	1day	---	---
38	IV-B	AMNAY	PD	495		X		X		Every time during heavy rain	1time/year	---	1-1.5m	---	4hrs	---	---
39	IV-B	MAG-ASAWANG TUBIG	PD	443		X		X		2	---	2005/2004	2-5m	Catapan area	3weeks	---	---
40	IV-B	GAGURAY	P	361		X		X		2	2-3times/year	Dec 1989	2-5m(GL+1.0m)	6,000ha	1day	Dead135/Injured35/Missing20	houseC85/500persons
41	IV-B	BALETE	P	132		X		X		1	1-3times/year	Nov 1995	1-1.5m	---	---	---	---
42	IV-B	BONGABONG	P	574		X		X		2	1-3times/year	during typhoon and heavy rain	5m(GL+1.2m)	---	2-3days	Dead1/Injured5	houseC2101P955/34,380persons
43	IV-B	PULAZ(MALAYLAY-BACD)	P	245		X		X		Every time during heavy rain	---	---	0.6m	---	4days	---	---
44	IV-B	MAGBANDONG(BUSWANGA)	P	509		X		X		Every time during heavy rain	---	---	0.5m	---	3days	---	---
45	IV-B	BAROC	P	162		X		X		No answer	2times/year	---	---	---	4days	---	---
46	IV-B	POLA	P	140		X		X		5	3times/year	July 2001	1.2m	2,344ha	3days	Dead3/Injured9/Missing2	houseC156P365/2,608persons
47	IV-B	POLA	P	140		X		X		5	3times/year	July 2001	0.4m	---	1-2days	---	---
48	V	KABILUGAN/VELASCO/BATO LAKE(BICOL)	M	2,999		X		X		Every time during heavy rain	every year	Nov 1995	water level is invert of bridge girder	---	---	---	houseC656P1473/30,622persons
49	V	YAWA/BASUD/QUIRANGAY(LEGAZPI CITY)	OD	126		X		X	X(confluence of the river)	3	1time/year	typhoon Reming Nov.30.2006	8.5m	1,800ha	0.5day	Dead117/Missing162	houseC80P60/300persons
50	V	DONSOL/MANLATO	PD	413		X		X	X(lahar siltation)	2	2times/year	typhoon Reming Nov.30.2006	3-5m	6-8ha	1day	Dead105/Injured215/Missing207	housesC854P833/79,089persons
51	V	KAPANTARAN(DARAGA)	OD	47		X		X		No answer	1-2times/year	---	15m from concrete wall	---	1day	---	---
52	V	LABO	P	931		X		X		No answer	1-2times/year	---	3m from river bed	---	1day	---	---
53	V	DAET-BASUD	P	277		X		X		Every time during heavy rain	1time/year	---	---	---	---	---	houseC14/70persons
54	V	QUINALE-B	P	182		X		X	X(lahar siltation)	2-3times/year	Nov 1986	2m	268,691ha	5-7days	Dead3	---	
55	V	RAGAY	P	176		X		X		No answer	---	---	---	---	---	---	---
56	VI	BIG-HILABANGAN	M	2,090		X		X		Every time during heavy rain	16	during heavy rain	8m	22,400ha	5days	Dead1/Injured36	housesC908/78,380persons
57	VI	JALAJUR	M	1,534		X		X		14	5times/year	Nov 1996	7m	---	---	---	---
58	VI	PANAY/MAMBUSAO	M	2,311		X		X		Every time during heavy rain	2times/year	rainy season	1-1.5m	---	4-5days	---	---
59	VI	BAGO	P	868		X		X		Every time during heavy rain	1-2times/year	rainy season	1-1.5m	---	5days	---	---
60	VI	AKLAN	P	1,010		X		X	X(mud flow)	8times/year	Nov 1991	0.6m	0.3m from street level	---	several hours	Dead5	---
61	VI	BADLOD	O	187		X		X		Every time during heavy rain	1-2times/year	---	1-1.5m	---	1day	---	---
62	VI	HMOGAN	P	452		X		X		Every time during heavy rain	1-2times/year	---	1-1.5m	---	2-3days	---	---
63	VII	CEBU/MANDAWA	OD	241		X		X		Every time during heavy rain	4times/year	August 28 2006	3-4m	---	3-4hrs	Dead6	---
64	VII	COMBADO(BALAMBAN)	P	237		X		X		4	15times/year	Nov 1992	4m	0.22ha	0.5day	---	3,500persons
65	VII	SAPANG DAKO	P	169		X		X		2	1times/year	Nov 1992	5m	2	1day	---	---
66	VII	POPOONG/STA CATALINA/CAWITAN	P	320		X		X		2	more 2 times/year	June 19-20 2004	1.5m	30ha	2days	Dead8/Injured9/Missing1	houseC93P87/2,000Persons
67	VIII	CATARMAN	PD	632		X		X		No answer	5times/year	Dec 2006	1-1.5m	---	1-1.5days	---	80Persons
68	VIII	DUNGGARAN(PAGBANGANAN)	P	176		X		X		13	5times/year	Dec 1972	1	10ha	2days	---	houseC250/10,000persons
69	VIII	DAGUITAN-MARABONG	P	292		X		X		1	1times/year	Nov 1992	---	---	3days	Dead700	houseP450/4,000persons
70	VIII	PAGSANGA-AN	P	511		X		X		Every time during heavy rain	4times/year	June-Nov	---	---	2-3days	---	---
71	IX	TUMAGA	PD	255		X		X		No answer	1time/year	---	---	---	1day	---	---
72	IX	IBACAN-MANUKAN(JOSE DALMAN PONOTI)	O	274		X		X		Every time during heavy rain	1-2times/year	Aug 11-12 2001	---	191ha	3days	Dead15/Missing50	houseP129/55persons
73	IX	SIBUYAY	P	994		X		X		No answer	1-3times/year	1999	---	---	7days	---	house11,000
74	IX	MAPANGI	P	1,306		X		X		Every time during heavy rain	1-3times/year	---	---	---	---	---	---
75	X	TAGOLOAN	M	1,782		X		X		No answer	0.25time/year	1989	2m	---	3days	---	---
76	X	GAGAYAN DE ORD	M	1,365		X		X		Every time during heavy rain	1-2times/year	---	3m	---	1-2hours	---	---
77	X	DINAGGASAN(CATARMAN-1S)	OD	25		X		X	X(debris flow)	1	---	June 5 2001	0.7m	Entire Campung island	1day	Dead166/Injured146/Missing84	---
78	X	MARANDING	P	634		X		X		No answer	1time/year	Dec 1999	1.5-2m	---	3days	---	---
79	X	IPONAN	P	412		X		X		4	1time/year	Dec 1999	1.2m	---	2days	---	---
80	X	MANDUOG	P	780		X		X		Every time during heavy rain	1-2times/year	---	1.2m	---	2days	---	---
81	XI	BUAYAN-MAI LUNGAN	M	1,321		X		X		No answer	---	---	---	---	2-5hrs	---	---
82	XI	DAVAO	M	1,992		X		X</									

Tab.D-3-1 Selected 120 River Basins (Result of 1st Screening)

No.	River Name	Region	Basin Area (km2)	Category	1st Screening Result		No.	River Name	Region	Basin Area (km2)	Category	1st Screening Result	
					Score	Rank						Score	Rank
1	ABRA	I	4,951	M	52	7	61	SIBUGUEY	IX	994	P	29	349
2	AMBIRAYAN	I	1,307	P(D)	55	3	62	MAPANGI	IX	1,306	P	28	485
3	SINOCALAN/MAROSYOY(DAGUPAN)	I	1,023	P	53	6	63	TAGOLOAN	X	1,762	M	30	236
4	PATALAN/CAYANGA/ANGALACAN	I	656	P	51	10	64	CAGAYAN DE ORO	X	1,365	M	29	349
5	ARINGAY	I	421	P	51	10	65	DINANGGASAN(CATARMAN-1S)	X	25	O(D)	52	7
6	BARARO	I	192	P	37	59	66	MARANDING	X	634	P	28	485
7	BACARRA-VINTAR	I	627	P	36	69	67	PONAN	X	412	P	27	607
8	BALINGCUGUIN/MABINI PANGSINAN	I	378	P	36	69	68	MANDULOG	X	780	P	26	721
9	SITAG-SANTA MARIA	I	310	P	35	81	69	BUAYAN-MALUNGUN	XI	1,400	M	31	170
10	BUAYA	I	246	P	33	101	70	DAVAO	XI	1,992	M	29	349
11	ALAMINOS/TAGOONG	I	221	P	32	125	71	TAGUM-LIBUGANON	XI	2,434	M	32	125
12	NANGALISAN/BAGGAO-PAREDI(CAGAYAN)	II	27,743	M	53	6	72	PADADA MAINIT	XI	1,216	P	30	236
13	PAMPLONA	II	698	P	37	59	73	HIO	XI	642	P	30	236
14	PALANAN-PINACANAUAN	II	755	P	36	69	74	MACO	XI	30	O	30	236
15	BANURBOI/R(LAL-LOI)	II	511	O	36	69	75	MINDANAO	XII	20,673	M	35	81
16	CL AVERIA/CABICUNGAN	II	270	P	33	101	76	IRAN	XII	808	P	40	36
17	BAUA	II	118	P	33	101	77	SITAWAY-POPONG-SINAUAL(POLOMOLOK)	XII	577	O	29	349
18	GUAGUA	III	1,605	O(D)	36	2	78	SIGUEL	XII	358	P	27	607
19	SANTA RITA/KALAKLAN(OLONGAPO CITY)	III	102	O(D)	32	125	79	SURIGAO	XIII	170	P(D)	30	236
20	SANTO TOMAS-GABOR	III	334	P(D)	31	170	80	TAGO	XIII	1,370	P	34	91
21	BUCAO	III	664	P(D)	31	170	81	LAKE MAINIT-TUBAY	XIII	473	P	32	125
22	ANGAT	III	917	P	51	10	82	BOSTON	XIII	43	O	32	125
23	MALUPA-DIAN(AGUANG)	III	666	P	36	69	83	AMNAY	IV-B	495	P(D)	30	236
24	NAYUM	III	229	P	31	170	84	MAG-ASAWANG TUBIG	IV-B	443	P(D)	28	485
25	AGOS	IV-A	483	P(D)	37	59	85	CAGURAY	IV-B	361	P	45	25
26	MIUS	IV-A	112	P(D)	35	81	86	BALETE	IV-B	132	P	40	36
27	CALLUMPANG/KAPUMPONG	IV-A	446	P(D)	31	170	87	BONGABONG	IV-B	574	P	39	44
28	IYAM/LUCENA	IV-A	158	P(D)	30	236	88	PULA	IV-B	245	P	35	81
29	DOMACAN/TAMBAK(TAYABAS)	IV-A	45	O(D)	29	349	89	ALAG(MALAYLAY-BACO)	IV-B	505	P	33	101
30	UMIRAY	IV-A	628	P	46	21	90	MAGBANDO/BUSWANGA	IV-B	466	P	33	101
31	KALIWA	IV-A	468	P	44	26	91	BAROC	IV-B	162	P	33	101
32	TIGNOAN	IV-A	87	P	37	59	92	POLA	IV-B	140	P	33	101
33	LALAVINAN(REAL-2)	IV-A	46	O	40	36	93	AGUS-BUAYAN	ARMM	1,898	M	31	170
34	KINANLIMAN(REAL-1)	IV-A	10	O	40	36	94	MATALING	ARMM	420	P	29	349
35	GENERAL NAKAR-2-(b)	IV-A	17	O	39	44	95	NITUAN	ARMM	365	P	28	485
36	GENERAL NAKAR-2-(a)	IV-A	37	O	38	52	96	MATABER	ARMM	197	P	26	721
37	KABILUGAN/VELASCO/BATO LAKE(BICOL)	V	2,999	M	57	1	97	ABULUG	CAR	2,766	M	52	7
38	YAWA/BASUD/QUIRANGAY(LEGAZIPI CITY)	V	126	O(D)	36	69	98	BAUIANG	CAR	510	P	49	15
39	DONSOL/MANLATO	V	413	P(D)	35	81	99	UPSTREAM of AGNO(include AMBAYAWAN, BANILA)	I	5722	P(D)	47	17
40	LABO	V	931	P	37	59	100	UPSTREAM of PAMPANGA(include RIO CHICO)	III	8122	P(D)	47	17
41	DAET-BASUD	V	277	P	35	81	101	MEYCAUYAN	III	154	O(D)	46	21
42	QUINALE-B	V	182	P	33	101	102	UPPER MARIKINA	NCR	515	P(D)	46	21
43	RAGAY	V	176	P	33	101	103	EAST MANGAHAN	IV-A	84	P(D)	39	44
44	LOG-HILABANGAN	VI	2,162	M	41	33	104	SAN JUAN	NCR	90	P(D)	34	91
45	JALAU	VI	1,534	M	37	59	105	JARO-AGANAN	VI	464	P(D)	32	125
46	PANAY/MAMBUSAO	VI	2,311	M	38	52	106	CAIRAWAN	VI	71	P(D)	28	485
47	BAGO	VI	868	P	40	36	107	SIBALOM	VI	690	P(D)	32	125
48	AKLAN	VI	1,010	P	39	44	108	DALANAS	VI	184	P(D)	24	957
49	MANDALAGAN(BACOLOD CITY)	VI	187	O	35	81	109	TIBIAO	VI	72	P(D)	24	957
50	HMOCAN	VI	462	P	36	69	110	SIPALAY	VI	336	P(D)	30	236
51	CEBU/MANDAWE	VII	241	O(D)	31	170	111	MANANGA	VII	86	P(D)	29	349
52	COMBADO/BALAMBAN	VII	237	P	31	170	112	GUINABASAN	VII	131	P(D)	27	607
53	SAPANG DAKO	VII	169	P	31	170	113	BANTAYAN	VIII	89	O(D)	29	349
54	SIPOCONG/STA.CATALINA/CAWITAN	VII	320	P	27	607	114	DALE	VIII	169	P(D)	30	236
55	CATARMAN	VIII	632	P(D)	31	170	115	CADAC-AN	VIII	523	P(D)	30	236
56	DUNGCAAN/PAGBANGANAN	VIII	176	P	43	28	116	BALATUKAN	X	221	P(D)	25	831
57	DAGUITAN-MARABONG	VIII	292	P	36	69	117	TUGANAY	XI	747	P(D)	25	831
58	PAGSANGA-AN	VIII	511	P	34	91	118	LIPADAS	XI	163	P(D)	27	607
59	LUMAGA	IX	255	P(D)	22	1121	119	RAMO	XI	279	P(D)	27	607
60	DISACAN/MANUKAN(JOSE DALMAN PONOTI)	IX	274	O	30	236	120	UPPER AGUSAN	XI	1745	P(D)	46	21

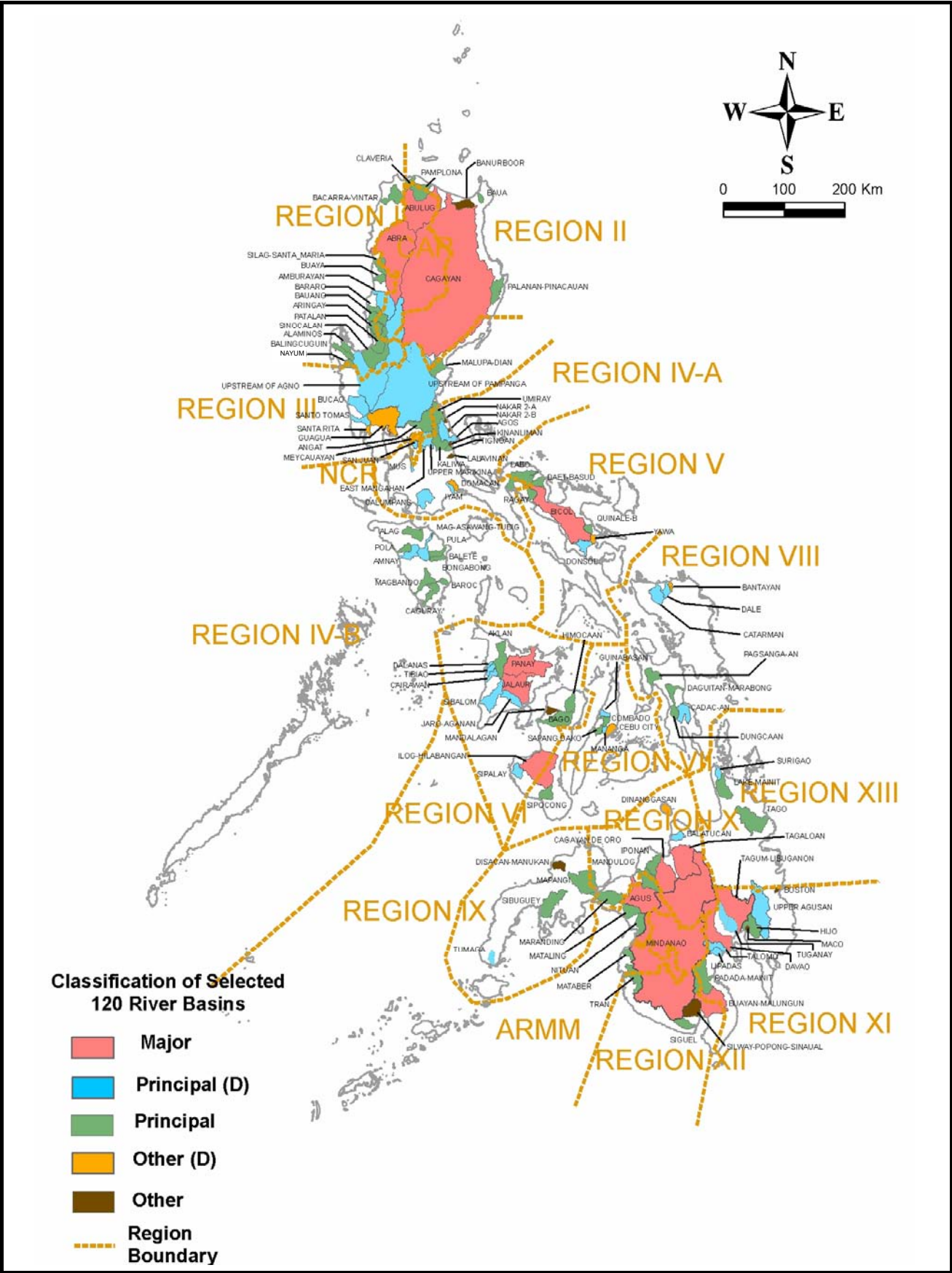
M - Major River Basin, P - Principal River Basin, O - Other River Basin, (D) - Dangerous River Basin

Tab.D-3-2 Regional Distribution

Regional Distribution	Preliminary 100 River Basins	By This Review	Selected 120 River Basins
Region I	11	+1	12
Region II	6	No change	6
Region III	7	+2	9
Region IV-A	13	No change	13
Region IV-B	10	No change	10
Region V	8	-1	7
Region VI	7	+6	13
Region VII	4	+2	6
Region VIII	4	+3	7
Region IX	4	No change	4
Region X	6	+1	7
Region XI	6	+4	10
Region XIII	4	No change	4
Region XIII	4	No change	4
Region CAR	2	No change	2
Region ARMM	4	No change	4
Region NCR	0	+2	2

Tab.D-3-3 Size of River Basins

Size of River Basins	Selected 120 River Basins
- 100 km2	17 (14%)
100 – 500 km2	52 (43%)
500 – 1,000 km2	27 (23%)
1,000 – 5,000 km2	20 (17%)
5,000 – 10,000 km2	2 (2%)
20,000 – 30,000 km2	2 (2%)
Average	1,116



THE STUDY ON THE NATIONWIDE FLOOD RISK ASSESSMENT AND THE FLOOD MITIGATION PLAN FOR THE SELECTED AREAS IN THE REPUBLIC OF THE PHILIPPINES

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig.D-3-1

Location of 120 River Basins

E. Grouping and Selection of Model River Basins

Table of Contents

	Page
1 GENERAL	E- 1
2 GROUPING	E - 1
3 SELECTION OF MODEL RIVER BASINS	E - 3

List of Table

Table

Table E.3.1 Model River Basins.....	E - 3
-------------------------------------	-------

List of Figures

Figure

Figure E.1.1 Grouping and Selection of Model River Basins	E - 1
Figure E.2.1 Classified 120 River Basins in Terms of 3 Flood Damage Types	E - 2
Figure E.2.2 Classified 120 River Basins in Terms of 6 Flood Damage Types	E - 3

List of Tabs.

Tab.

Tab. E-2-1 Group Classification by Plural Flood Types.....	E-T-1
Tab. E-2-2 Selected Model River Basins	E-T-1

List of Fig.

Fig.

Fig. E-3-1 Location of Model River Basins	E-F-1
---	-------

E. GROUPING AND SELECTION OF MODEL RIVER BASINS

1 GENERAL

120 river basins are selected through the First Screening, and these 120 river basins are narrow down to 56 river basins through the Second Screening, as described in Supporting Report C.

In this Supporting Report, these selected river basins are classified into several groups considering the combinations of plural flood damage types. Following to these groups, one (1) model river basin is selected from each group, as shown in the following diagram:

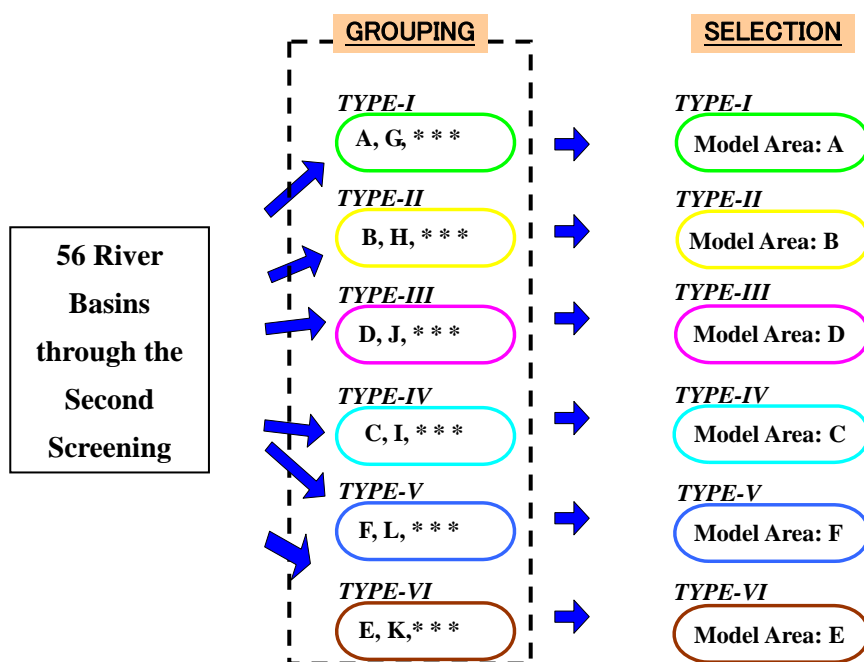


Figure E.1.1 Grouping and Selection of Model River Basins

2 GROUPING

In principle, grouping is conducted on the basis of the flood damage types. However, as identified in the field survey results (refer to Supporting Report D), most of the river basins suffer from not only one flood damage type but also combination of plural flood damage type, such as debris flow and flash flood in the upstream, bank erosion and overflow in the middle and downstream, and inland flooding in the downstream. Finally, these combinations of plural flood damage types can be classified into the following three groups:

- Group (1) **Combination of flash flood type (F), overflow type (O) and/or bank erosion (B):**
F+O+B type for 85 river basins (some of these river basins have only one or two flood damage types);
- Group (2) **Inland flood type (I) in addition to combination under the above item (1):**
F+O+B+I type for 26 river basins; and
- Group (3) **Lahar type including debris flow (L) in addition to the combination in the above item (2):** F+O+B+I+L type for 9 river basins.

Among these combinations, first combination (Group (1): F+O+B type) is dominant with 85 river basins, and the second combination (Group (2): F+O+B+I) includes 26 river basins, as shown in Figure E.2.1.

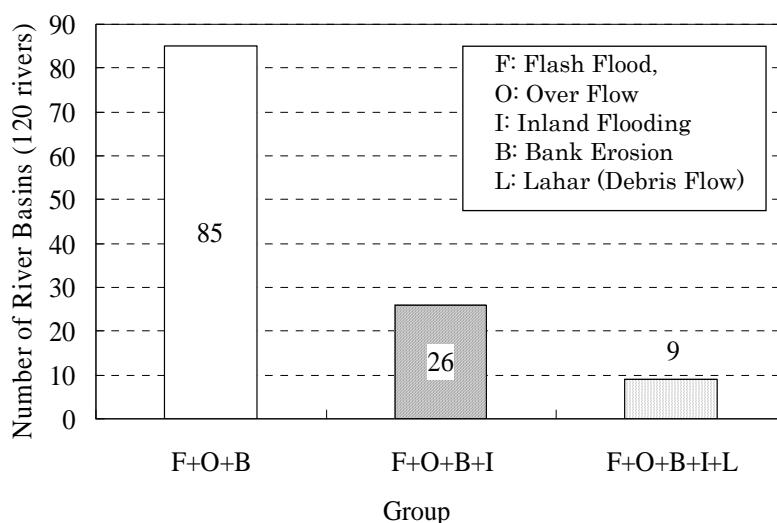


Figure E.2.1 Classified 120 River Basins in Terms of 3 Flood Damage Types

Considering the number of each combination, these first and second combinations are further classified into three (3) and two (2) combinations, respectively. Finally, six (6) groups are formulated in total, as shown in Figure E.2.2 and Tab. E-2-1.

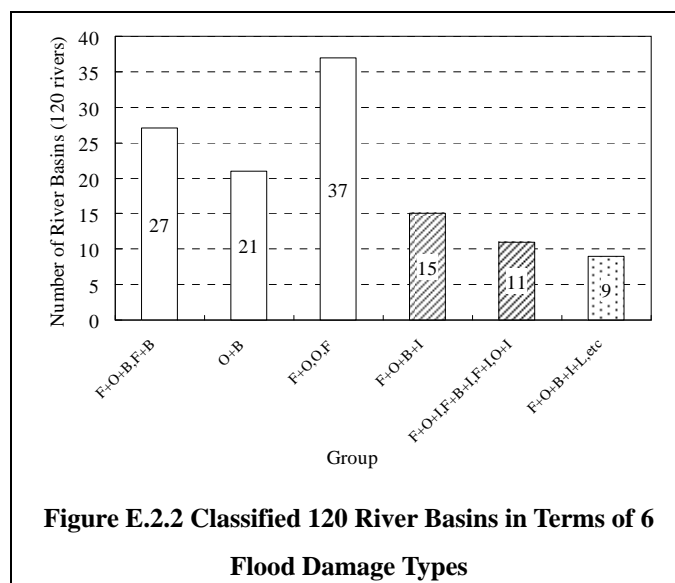


Figure E.2.2 Classified 120 River Basins in Terms of 6 Flood Damage Types

Following to the above grouping, the selected 56 river basins are classified into the 6 groups, as shown in Tab. E-2-2.

3 SELECTION OF MODEL RIVER BASINS

Based on the Tab. E-2-2, one (1) model river basin is selected from the respective six (6) groups under the following principle:

- Two (2) model river basins are selected from each region (Luzon, Visayas and Mindanao);
- In principle high priority is given to a higher-ranking river basin; and
- Also, high priority is given to a river basin with enough data and information.

As a result, the following river basins are selected as the model river basins (refer to Table E.3.1):

Table E.3.1 Model River Basins

Group	Name of River Basin	Region	Catchment Area (km ²)	Ranking
F+O+B, F+B Type	Ilog-Hilabangan	VI,VII (Visayas)	2,162	30
O+B Type	Dungcaan	VIII (Visayas)	176	47
F+O, O, F Type	Meycauayan	III,NCR (Luzon)	201	7
F+O+B+I, F+I Type	Kinanliman	IV-A (Luzon)	10	25
F+O+I, F+I+B, F+I Type	Tuganay	XI (Mindanao)	747	32
F+O+B+I+L Type	Dinanggasan	X (Mindanao)	29	16

The locations of the six (6) model river basins are shown in Fig. E-3-1.

Tab. E-2-1 Group Classification by Plural Flood Types

Group	No.	Type	Number
Group (1) F+O+B	1	F+O+B	27
		F+B	
	2	O+B	21
		F+O	
		O	
3	F	37	
	F		
Sub-Total			85
Group (2) F+O+B+I	4	F+O+B+I	15
		F+O+I	
	5	F+B+I	11
		F+I	
		O+I	
Sub-Total			26
Group (3) F+O+B+I+L	6	F+O+B+I+L	9
		F+O+B+L	
		F+O+L	
		O+B+L	
Sub-Total			9
Total			120

Tab. E-2-2 Selected Model River Basins

Group No.	Grouping	Luzon			Visayas			Mindanao			Total Number
		Rank	Region	River name	Rank	Region	River name	Rank	Region	River name	
1	F+O+B/F+B	5	I,CAR	PATALAN/CAYANGA/ANGALACAN	15	VI	AKLAN	12	IX	TUMAGA	17
		13	III	UPSTREAM of PAMPANGA(include RIO CHICO)	29	VI	PANAY/MAMBUSAO(Major River Basin)	19	XI	LIPADAS	
		14	II,CAR	CAGAYAN(Major River Basin)	30	VI,VII	ILOG-HILABANGAN(Major River Basin)	27	XI	UPPER AGUSAN	
		21	I	UPSTREAM of AGNO(include AMBAYAWAN,BANILA)				31	XI	TALOMO	
		23	I,CAR	SINOCALAN/MAROSOY(DAGUPAN)				68	X	CAGAYAN DE ORO(Major River Basin)	
		24	V	BICOL(Major River Basin)				72	XIII	TAGO	
		28	V	DONSOL/MANLATO							
61	II,CAR	PAMPLONA									
2	O+B	36	I,CAR	AMBURAYAN	47	VIII	DUNGAAN(PAGBANGANAN)	18	X	IPONAN	6
		39	I,CAR	ABRA(Major River Basin)				44	X	TAGOLOAN(Major River Basin)	
3	F+O/O/F							108	ARMM	MATALING	15
		1	NCR,IV-A	UPPER MARIKINA	9	VI	MANDALAGAN(BACOLOD CITY)	17	XI	DAVAO(Major River Basin)	
		3	NCR	SAN JUAN	22	VII	GUINABASAN	45	ARMM,X	AGUS/BUAYAN(Major River Basin)	
		7	III,NCR	MEYCAUAYAN	42	VI	JALAU(Major River Basin)	46	XII	SILWAY-POPONG-SINAUAL(POLOMOLOK)	
		11	IV-A	IMUS	67	VIII	DAGUITAN-MARABONG	74	XI,XII	BUAYAN-MALUNGUN(Major River Basin)	
		37	IV-B	BALETE				75	XIII	LAKE MAINIT-TUBAY	
4	F+O+B+I	50	IV-B	CAGURAY							6
		20	III	MALUPA-DIAN(DAGUPAN)				10	XI,ARMM	MINDANAO(Major River Basin)	
		25	IV-A	KINANLIMAN(REAL-1)							
		26	CAR,II	ABULUG(Major River Basin)							
41	I,CAR	ARINGAY									
43	CAR,I	BAUANG									
5	F+O+I/F+B+I/F+I/O+I	2	IV-ANCR	EAST MANGAHAN	4	VII	CEBU/MANDAWA	32	XI	TUGANAY	6
		40	III	ANGAT				38	XI	TAGUM-LIBUGANON(Major River Basin)	
6	F+O+B+I+L/F+O+B+L F+O+L/O+B+L							104	IX	SIBUGUEY	6
		6	V	YAWA/BASUD/QUIRANGAY(LEGAZPI CITY)	35	VI	BAGO	16	X	DINANGGASAN(CATARMAN-1S)	
		8	III	SANTA RITA/KALAKLAN(OLONGAPO CITY)							
		33	IV-A	AGOS							
34	III	GUAGUA									
Total Number		27			10			19			56

Note: Shaded row shows the selected model river basins

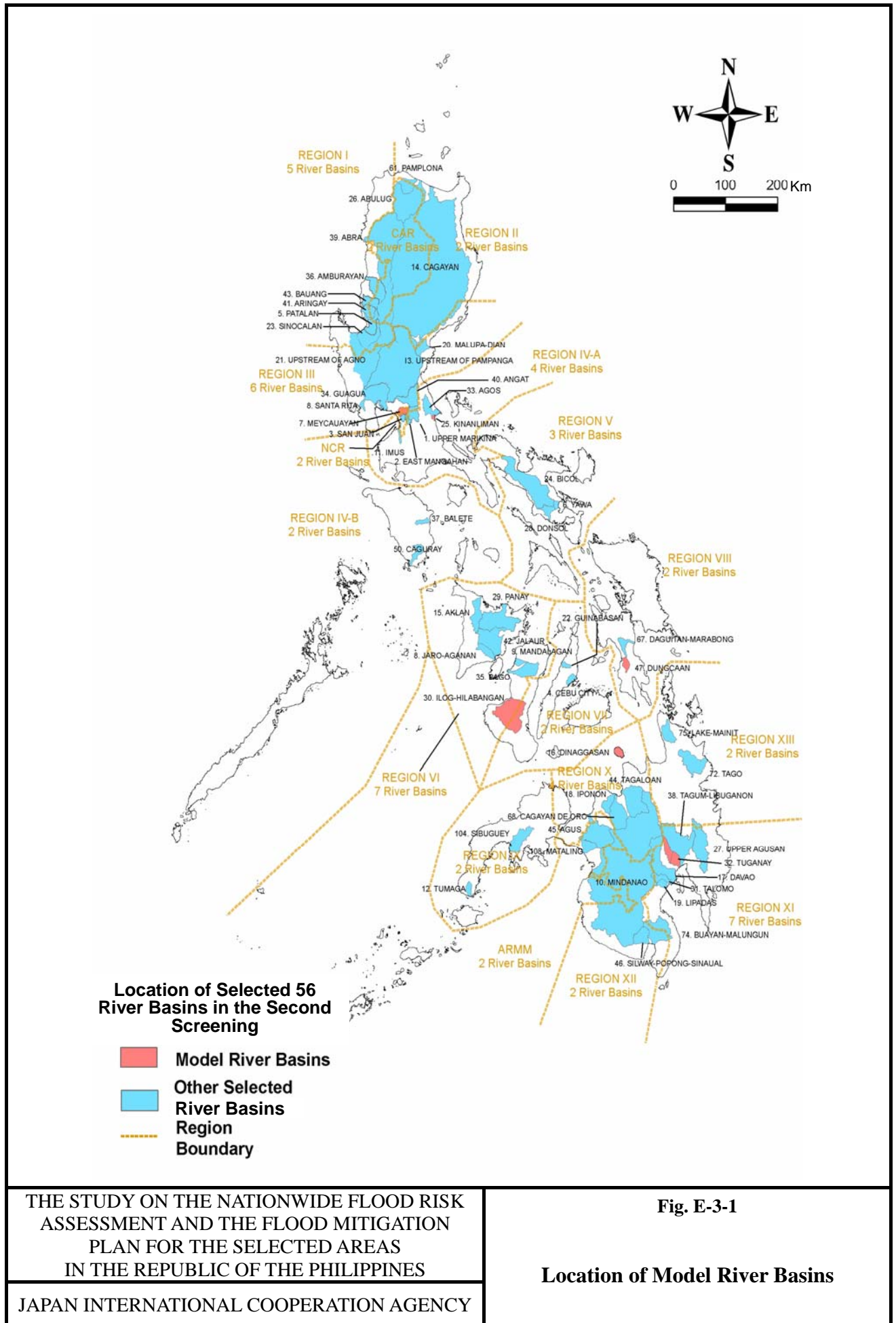


Fig. E-3-1

Location of Model River Basins