

PAIRWISE ASSESSMENT ON THE INTERRELATIONSHIPS OF FLOOD RISK MANAGEMENT BARRIERS IN METRO MANILA, PHILIPPINES

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1. INTRODUCTION

Metro Manila (MM), the capital region of the Philippines, is considered as the most at risk to climate impacts among the mega cities in the world, largely due to its exposure to tropical cyclones and flooding. The normal high incidence of typhoons brings in heavy rains when it coincides the southwest monsoon occurrence in the months of June to September. In fact, there are about 3 to 4 incidences of significant flooding that besets MM annually caused by typhoons, monsoon rains and even torrential rains

One of the worst flooding in MM was on 2009 when the Typhoon Ondoy (international name: Ketsana) devastated the region. Typhoon Ondoy incurred losses and damages estimated to be more than one billion dollars with fatalities of 747 and flood depths of 7 meters submerging even the high-class residential areas. This onslaught resulted, for the first time, to the formulation of the Integrated Flood Risk Management (FRM) plan for MM. In an ideal setting, the masterplan can be executed flawlessly, but in the complex Philippine setting, eliminating flood problems is almost impossible. In order to successfully execute and implement the integrated FRM plan, certain barriers that may act as hindrance needs to be identified first to devise appropriate resolution to them.

Barriers are defined as obstacles that can be overcome with concerted effort, creative management, change of thinking, prioritization, and related shift of resources, land uses, institutions, etc. Overcoming barriers does not ultimately lead to success in the implementation and outcomes but understanding the how barriers and constraints on a temporal dimension can be beneficial for a sustainable and flood resilient urban city in the Philippines.

This study aims to identify the FRM barriers in MM from a collection of data sources and literature. These barriers are categorized typologically with respect to major aspects related to them. Then, experts and practitioners in flood management determine barrier interrelationship through a pairwise assessment.

2. FLOOD RISK MANAGEMENT BARRIERS

Despite very limited collection of research related to flooding and very strict access to scientific records in

Table 1. FRM Barriers in MM

Aspects	Barriers
Governance A ₁	B ₁₁ Lack of sole organizing body ^{3),4),5)}
	B ₁₂ Lack of communication among agencies and to the community ^{7),3)}
	B ₁₃ Lack of prioritization ^{3),4)}
	B ₁₄ Lack of flood control infrastructure ^{1), 2), 5)}
Social A ₂	B ₂₁ Excessive encroachment ^{4), 7)}
	B ₂₂ Poor solid waste management ⁴⁾
	B ₂₃ Poor urban planning ⁴⁾
Scientific Resources A ₃	B ₃₁ Lack of technological capabilities ^{1), 2), 7)}
	B ₃₂ Lack of data and access ^{1), 2), 3)}
	B ₃₃ Lack of experts ^{3), 5), 7)}
	B ₃₄ Lack of funding and data processing systems ^{1), 2)}
	B ₃₅ Modernization of flood control structures ^{2), 3)}

MM, barriers to FRM are identified in a holistic manner by the authors capturing various facets of problems on FRM in MM. Table 1 shows the summary of the barriers identified from a collection of data sources and literature.

The barriers in flood risk management in MM are identified to belong to three major aspects: governance (A₁), social (A₂) and scientific resources (A₃). There are 12 barriers identified wherein 4, 3 and 5 are related to the governance, social and scientific resources aspects, respectively.

3. PAIRWISE ASSESSMENT OF FRM BARRIERS

Five experts and practitioners in the flood management practice in the Philippines are identified and consulted to for the pairwise assessment of the FRM barriers to determine its interrelationships. This study used a contextual relationship of the FRM barriers based on “influencing factors” type of relation. This type of relation means that one variable influences another variable. Four symbols denotes the pairwise relationship between barrier *i* and barrier *j*:

- a) Symbol “+” denotes that barrier *i* influences barrier *j*
- b) Symbol “-” denotes barrier *i* is influenced barrier *j*
- c) Symbol “±” means that barrier *i* and barrier *j*

Keywords: barriers, flood risk management, pairwise assessment, Metro Manila, Philippines

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Table 2. Pairwise assessment of the experts and practitioners on the FRM barriers.

Aspect	A1			A2			A3							
	Barriers			j										
	B11	B12	B13	B14	B21	B22	B23	B31	B32	B33	B34	B35		
A1	i	B11	+++ +-	+++ ++	+++ +0	+00 00	++0 00	++0 00	+++ 00	+++ ++	+++ +0	+++ +±	+++ +±	
		B12	---	+++ +±	++0 00	+++ +0	++0 0±	+++ 0±	+00 0±	+0 ±±	-00 00	-00 00	+00 00	
		B13	---	---	+++ -±	-00 0±	000 ±±	+0 0±	+++ -±	++- 0±	++- 0±	+++ ±±	+++ ±±	
		B14	---	-0 00	---	+00 0±	+00 00	++- 00	+++ ±±	+++ ±±	+++ ±±	+0± ±±	+++ ++	
A2	i	B21	-00 00	---	+00 0±	-00 0±	+++ ±±	++- ±±	000 00	000 00	000 00	000 00	000 0±	
		B22	-0 00	-0 0±	000 ±±	-00 00	---	-±	-0 0±	-00 00	000 00	-00 00	000 0±	
		B23	-0 00	---	+0 0±	-+ 00	++ ±±	++0 0±	---	-0 00	-0 0±	---	000 ±±	000 0±
A3	i	B31	---	-00 0±	---	---	000 00	+00 00	+00 00	---	+++ ±±	++- --	+±± ±±	+++ 0±
		B32	---	+0 ±±	-+ 0±	---	000 00	000 00	+00 0±	---	---	++- --	+-- -±	+00 0±
		B33	---	+00 00	-+ 0±	-0 ±±	000 00	+00 00	+++ 00	++ ++	++- ++	---	++- 00	+00 0±
		B34	---	+00 ±±	---	-0± ±±	000 00	000 00	000 ±±	-±± ±±	++- ±±	-+ 00	---	+00 ±±
		B35	---	-00 00	---	---	000 0±	000 0±	000 0±	---	-00 0±	-0 0±	-00 ±±	---

influence each other

- d) Symbol “0” means that barrier i and barrier j are independent of each other.

Table 2 presents the summary of the pairwise assessment of the experts and researchers. The table shows that the lack of sole organizing body, B11, have the strongest influence to all other barriers especially to those in the governance, A1, and scientific resources, A3, aspect. This is an indicative that establishment or at least assigning a lead agency in FRM that supports planning, implementation, operations and maintenance has to be carried out. Meanwhile, B11 have less influence to barriers in the social aspect, A2, although some experts perceived that B11 influences barriers A2 on some degree.

Generally, the findings show that barriers in A1 aspect are strong influencers to all other barriers to FRM especially to barriers in A3 aspect. Barriers in A2 on the other hand do not strongly influence all other barriers indicating that barriers in this aspect are highly dependent on others and overcoming them would depend to the barriers in A1.

4. CONCLUSION

This study was able to identify three aspects that encompasses the FRM barriers in MM namely, governance, social and scientific resources aspects. Twelve barriers were identified in this study wherein 4,

3 and 5 are related to governance, social and scientific resources aspects, respectively. The interrelationships among these barriers shows that the most influential barrier is lack of sole organizing body. Generally, barriers in the governance aspect strongly influence other barriers within this aspect and in the scientific resources aspect.

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