FLOOD MITIGATION CONSIDERING THE PERCEPTION OF STAKEHOLDERS: CASE STUDY AT SAMARINDA CITY, EAST KALIMANTAN, INDONESIA

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Flood is natural phenomena. For certain rural area, there is a local wisdom that people hadadjusted their live with the flood. On the other side, especially at dense urban area, most of people consider flood as a disaster. Therefore Flood Mitigation Program (FMP) had been conducted to anticipate flood, such as hydraulic structure and flood policy implementation. However in general, FMP was designed without take into account the stake holder perceptions about flood. It caused ineffective and unsustain program due to minimum support from several important stake holder. Since huge samples and interviews are necessary to understand the main perception of the stake holder, Q Method was introduced into this research to understand the stake holder perceptions. And then as well as FMP, flood adaptation will be developed. The advantages of QMethod are subjectivityidentification and small samples. Q Method starts with collecting the flood opinion among the stake holder, and thenarrangesthe statement according to its frequency. The questioners were designed based on frequent statements to quantity the opinion according to relevancy and importance among the statement to the flood. The questioners were distributed again to the stake holder, and then statistical analysis was conducted based on respondents, not based on statements as normal questioner analysis. Samarinda City has long story about FMP. Since flood still occurs, Samarinda City was selected as good case study for these flood new countermeasures. A better effective and sustainable flood programs are expected as outcome of this research.

Introduction

The Flood Mitigation Program (FMP) includes developing and implementing long-term strategies for reducing flood risk, such as planning and constructing capital projects, operating a flood warning system for emergency responders, public education about flood safety, and insurance and flood risks. It asses flood risk and identify technically feasible and cost-effective options to reduce that risk. FMP also were required to describe the planning process and to involve public / stake holders during the planning process, and then provide proper documentation of its formal adoption by the jurisdiction. Risk management decisions that are informed by an address decision maker and stakeholder risk perceptions and behavior are essential for effective risk management policy. Generally, due to minimum support from several important stake holders, the program will become ineffective and unsustain. However, since there is disagreement in the literature over such basic concepts as the definition and measurement of ‘effectiveness’, the common understanding of effectiveness, or different interpretations of this concept among the stake holder would be important information for evaluate the program.

Stake holdersbuild their risk perception and program performance from their own experiences and beliefs (Slovic, 1992). Temporal or institutional factors play a prevailing part in the estimation of the level of perception, depend on psychological, social (Slovic and Peters, 2006), and economical (Grothmann and Reusswig, 2006) of the stake holders. For example, in the case of local authority planners, members of local planning

committees, government officials responsible for housing policy, and insurers, performance will be interpreted in terms of their role within their respective institutions. In the case of house-purchasers, performance will be interpreted in terms of the conduct of their everyday lives. Good stakeholder management is a key component to a healthy project environment, an understanding of tolerance for risk, and other issues that would otherwise delay the program.

Huge samples and interviews are necessary to understand the main perception of the stake holder. Sampling continues until the researcher senses the saturation, the desired end point of data collection. Since saturation is a problematic term (Guest et al. 2006; Mason 2010; Morse 1995; Ryan and Bernard 2006), the decision to stop interviewing is a function of a combination of all or some of the following factorsinterview structure and content, heterogeneity of the group, the number of interviews done already, the complexity of the interviews, the researcher's experience, sampling technique, or resourcing. Glaser and Strauss (1967) intertwined data collection and analysis for one category until saturation, before moving on to collect and analyze data for another category.

Q Method was introduced into this research to understand the stake holder perceptions (Good, 2003). The advantages of Q Method are subjectivity identification and small samples.The application of Q Methodology offers a different, but complementary, approach to examining the effectiveness of FMP, and its findings have potentially important implications for the way both academics and practitioners manage and evaluate the program. Therefore objectives of this research are application of Q Method on FMP evaluation and then consider the flood perception analysis of stake holders for improving the FMP.

Methodology

Samarinda City has long story about FMP. Since flood still occurs, Samarinda City (Fig.2) was selected as good case study for evaluate the effectivity of these flood countermeasures. The data collection starts with the identification of all stake holders at FMP of Samarinda City, and then designs the first questioner for general interviews. The interviews were conducted to collect flood opinionsand statements among the stake holder. The statements were arranged according to its frequency, relevancy and importance for the flood mitigation program (FMP). Based on this list, the second questioner were developed for collect the stake holder perception using Q Method (Fig.1). The questioners were distributed again to several key persons for each stake holder.

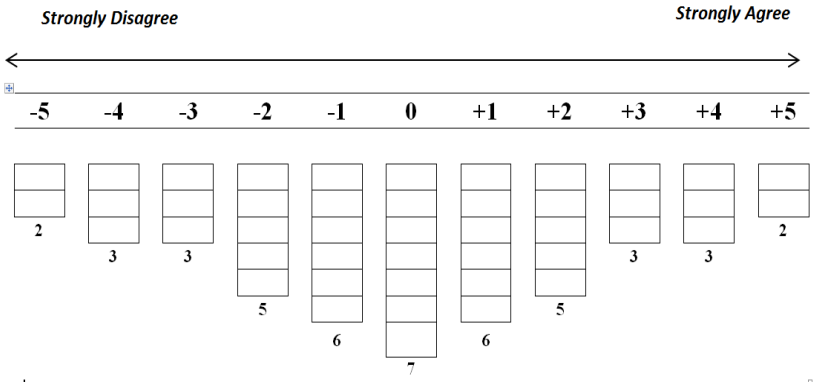

Fig.1: Forced-choice frequency distribution for use with a set of 45 statements

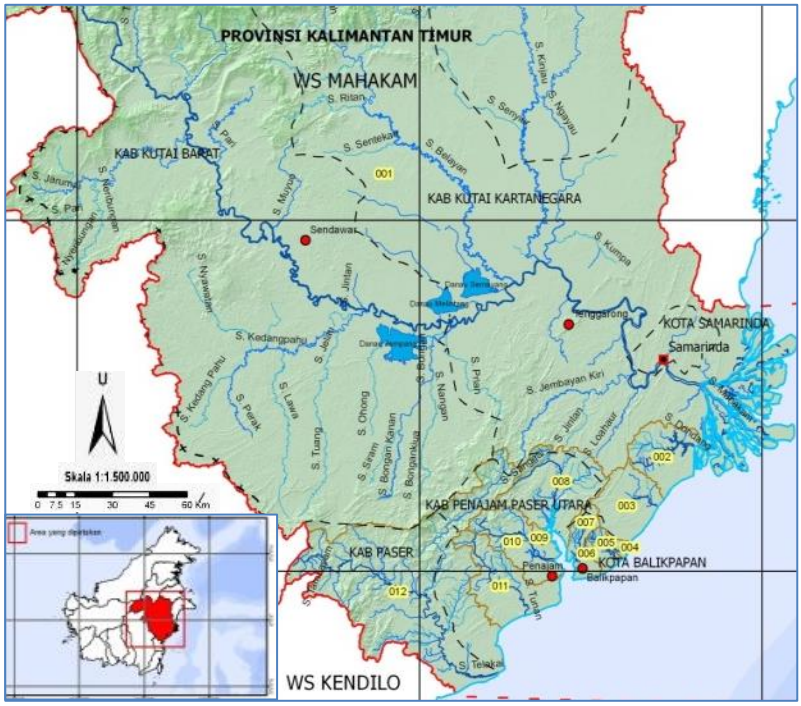

Fig. 2:. Study Location :Samarinda City

Statistical analysis (Q-analysis) was conducted based on respondents, not based on statements as normal questioner analysis. There are four procedures on this stage, such as Q-Sort, Correlation Matrik, and Rotation, and Interpretation. Q-Sort is necessary to understand the respondent perception and statement priority, as a stake holder (Muller &Kals., 2004). Correlation matrix was used to evaluate the subjectivity of each respondent, while rotation was employed to simplify or look for other possibility of the respondent grouping. Last, interpretation was based on factor array of each group to understand the distinguishing and consensus statements.

Result and Discussion

There are 12 stakeholder typesat the study area such as BAPPEDA (Agency for Regional Development), DinasPekerjaanUmum (DPU, Regional Public Works), DPRD (Assembly at provincial level), BadanLingkunganHidup (BLH, The Environmental Agency), Dinas Bina MargadanPengairan (DBMP, Infrastructure and Irrigation Agency), BadanPengelolaan Daerah Aliran Sungai (BPDAS, River Basin Management Agency), DinasCiptaKaryadan Tata Kota (DCKTK, Office of City Planning), BidangPerkotaanSekretariat Kota Samarinda (BPSKS, City Office), DinasKebersihandanPertamanan (DKP, Landscaping Office), BadanPenanggulanganBencana Daerah (BPDP, Regional Disaster Relief Agency), community leaders, and academician.The initial hearing survey collected 181 statements about FMP from these stakeholders, and then the statements were compacted into 45

(Tab.1). Based on these compacted statements, interviews were conducted to 30 key persons of the stakeholders (Tab.2).

Table 1: The Statements (Q-Set)

No	Statements (Q-Set)	No	Statements (Q-Set)
1	Land acquisition is a priority problem.	24	The program planning and implementation has been transparent.
2	The standard land value is debatable	25	Buttom - Up Program is necessary.
3	Inovation is necessary to solve the land problems	26	Systematic programs on technical implementation
4	There is a land conversion in the study area	27	Program policies have been comply with philosophy and social aspect.
5	Lack of recharge area / too much impervious area.	28	Program policies have been in accordance with the legislation
6	Relocation of settlements on the river bank need to be resolved.	29	Low capacity drainage system.
7	Pinalty for illegal land utilization.	30	Lack of secondary data of river boundary.
8	Lack of public participation	31	Environmental community awerness is necessary to increase.
9	Awarnes progam is necessary to be increased.	32	Empowerment of BPBD in the evaluation of the impact of the flood
10	Evaluation program is necessary.	33	The community has understood the rules.
11	There is still different point of view of the program among the stakeholder	34	Environmental awerness activities are necessary to increase.
12	Lack of coordination among the stakeholder.	35	Increased self-reliance of communities
13	Synergy program need to be increased.	36	Lack of synergy program among the stakeholder
14	The implementation of regional planning is not consistent.	37	Public landfills are necessary to increase.
15	No budget problems.	38	Road improvement is improtant.
16	Sustainable and green develepment is necessary.	39	Dam construction was delayed since there are land accuition problems.
17	Inundated area are decreased.	40	Lack of standar design criteria for settelments.
18	The sedimentation is high because the area is dominated by peat soil.	41	Folder is not function properly due to land problems.
19	Erosivity are increased because of illegal mining.	42	Decreament of drainage capacity due to household garbage.
20	Community awerness is necessary	43	Fisheries activity is not problem for flood protection.
21	The management works properly.	44	Community motivation for sustainable environment is necessary to increase.
22	Management of the programs tend to be short-term oriented.	45	Pontianak City FMP is dominated by technical / infrastructure program.
23	Programs from management autority dos not synergy.		

Table 2: Key persons of the stakeholders

Stakeholder	Number	Respondent ID
Community leaders	3	R-1, R-3, and R-4
Academician	4	R-2, R-5, R-22, and R-30
DPRD (Assembly at provincial level)	4	R-6, R-7, R-8, and R-25
BAPPEDA (Agency for Regional Development)	2	R-9, and R-14
Dinas Cipta Karya dan Tata Kota (DCKTK, Office of City Planning)	1	R-10
Dinas Bina Marga dan Pengairan (DBMP, Infrastructure and Irrigation Agency)	2	R-11, and R-12
Bidang Perkotaan Sekretariat Kota Samarinda (BPSKS, City Office)	1	R-13
Badan Lingkungan Hidup (BLH, The Environmental Agency)	6	R-15, R-16, R-17,R-18, R-19, and R-20
Badan Penanggulangan Bencana Daerah (BPBD, Regional Disaster Relief Agency)	1	R-21
Badan Pengelolaan Daerah Aliran Sungai (BPDAS, River Basin Management Agency)	1	R-23
Dinas Kebersihan dan Pertamanan (DKP, Landscaping Office)	1	R-24
Dinas Pekerjaan Umum (DPU, Regional Public Works)	4	R-26, R-27, R-28, and R-29

Correlation matrix shows the subjectivity of each respondent, in term of correlation. Several respondents from the same stakeholder type have high correlation (higher than 0.5). However, centroid factor analysis showed that the rotation was required to obtain confident respondent grouping. After perform a varimax rotation of the factor, four groups of respondent were determined. This analysis also found that R-8 (DPRD) has no significant correlation with all groups, and R-29 (DPU) has significant correlation with 3 groups. Therefore R-8 and R-29 can't be included in Interpretation stage. The factor array was presented on Tab.3, while list of respondent on each group was presented on Tab.4.

Table 3: The factor array for each statement, distinguish and consensus statement

No.	Q-Set	Grup				Distinguishing Statements (P<0.01)				Concensus (P>0.01)
		I	II	III	IV	I	II	III	IV	
1	Land acquisition is a priority problem.	3	4	5	4					4
2	The standard land value is debatable	1	-2	4	3		-2			
3	Inovation is necessary to solve the land problems	5	1	2	2					
4	There is a land conversion in the study area	4	-5	-4	2	4			2	
5	Lack of recharge area / too much impervious area.	2	1	0	5				5	
6	Relocation of settlements on the river bank need to be resolved.	3	0	3	3		0			
7	Pinalty for illegal land utilization.	3	2	-2	5			-2	5	
8	Lack of public participation	4	-1	-1	-1	4				
9	Awarnes progam is necessary to be increased.	0	-1	0	0					0
10	Evaluation program is necessary.	1	3	0	3					2
11	There is still different point of view of the program among the stakeholder	2	-4	-2	0	2	-4			
12	Lack of coordination among the stakeholder.	1	-1	-3	1					
13	Synergy program need to be increased.	2	2	-3	4			-3		
14	The implementation of regional planning is not consistent.	4	0	0	4					
15	No budget problems.	-2	-3	-4	-1				-1	
16	Sustainable and green develepment is necessary.	5	4	-1	2			-1		
17	Inundated area are decreased.	-5	3	-2	-2	-5	3			
18	The sedimentation is high because the area is dominated by peat soil.	-5	0	2	2	-5				
19	Erosivity are increased because of illegal mining.	1	1	1	2					1
20	Community awerness is necessary	2	4	-1	1			-1	1	
21	The management works properly.	-1	-2	-2	-5					
22	Management of the programs tend to be short-term oriented.	0	-2	-4	-2	0				
23	Programs from management autority dos not synergy.	0	-1	-5	-2			-5		
24	The program planning and implementation has been transparent.	1	5	1	-3		5		-3	
25	Buttom - Up Program is necessary.	-1	2	1	-1					
26	Systematic programs on technical implementation	0	-3	-2	-5					
27	Program policies have been comply with philosophy and social aspect.	0	-4	1	-4					
28	Program policies have been in accordance with the legislation	-2	0	-3	-3		0			
29	Low capacity drainage system.	-1	-1	3	0			3		
30	Lack of secondary data of river boundary.	-3	0	1	-1	-3				
31	Environmental community awerness is necessary to increase.	1	5	-1	-1	1	5			
32	Empowerment of BPBD in the evaluation of the impact of the flood	-1	2	2	0					
33	The community has understood the rules.	-4	-2	4	-4			4		
34	Environmental awerness activities are necessary to increase.	-1	-1	5	-1			5		
35	Increased self-reliance of communities	-2	-5	3	-4			3		
36	Lack of synergy program among the stakeholder	-4	-4	2	-3			2		
37	Public landfills are necessary to increase.	-2	-2	0	0					
38	Road improvement is improtant.	-3	1	1	-2					
39	Dam construction was delayed since there are land accuition problems.	-3	0	0	0	-3				
40	Lack of standar design criteria for settelments.	-2	0	4	1	-2		4		
41	Folder is not function properly due to land problems.	0	2	-1	1					
42	Decreament of drainage capacity due to household garbage.	-1	1	2	1	-1				
43	Fisheries activity is not problem for flood protection.	-4	-3	0	-2					
44	Community motivation for sustainable environment is necessary to increase.	2	3	-1	1					
45	Pontianak City FMP is dominated by technical / infrastructure program.	0	1	-5	0			-5		

Table 4:.Respondent for each group.

Stakeholder	Grup			
	I	II	III	IV
Community leaders		R-4	R-1	R-3
Academician	R-30		R-22	R-2, R-5
DPRD (Assembly at provincial level)				R-6, R-7, R-25
BAPPEDA (Agency for Regional Development)	R-14	R-9		
Dinas Cipta Karya dan Tata Kota (DCKTK, Office of City Planning)			R-10	
Dinas Bina Marga dan Pengairan (DBMP, Infrastructure and Irrigation Agency)	R-11, R-12			
Bidang Perkotaan Sekretariat Kota Samarinda (BPSKS, City Office)		R-13		
Badan Lingkungan Hidup (BLH, The Environmental Agency)	R-15, R-16, R-20	R-17, R-19		R-18
Badan Penanggulangan Bencana Daerah (BPBD, Regional Disaster Relief Agency)		R-21		
Badan Pengelolaan Daerah Aliran Sungai (BPDAS, River Basin Management Agency)	R-23			
Dinas Kebersihan dan Pertamanan (DKP, Landscaping Office)	R-24			
Dinas Pekerjaan Umum (DPU, Regional Public Works)	R-25, R-27, R28			

Crib sheet method was employed to interpret the factor arraysince it helps the researcher to deliver genuinely holistic factor interpretations (Brown., 1999; McKeown., 1998; Stephenson., 1983b).According to the distinguish statements (Tab 3), first group that dominated by government officer state inundated areas was increased since land conversion, or lack of public awareness and participation are the main problem on implementing FMP, not the technical aspects. Second group consists of government officer and community leader state that the FMP is effective and transparent since the stakeholder share the same vision. However, the environmental awareness of the community is extremely important to be increased. The third group is look like a conservative group since it consists of academician, community leader, and planning institution. They state that the community play its role on synergic FMP, but not well inform about the program standard. Since the infrastructure project is dominant on FMP, group 3 state that the activity of environmental awareness is necessary to increase. The last group is dominated by legislator and also academician. They state that law enforcement is important to support FMP such as penalty for illegal land utilizationor conversion to impervious area. Since budgets are limited, group 4 also found that FMP planning and implementation transparency should be increased. Despite the different opinion of each group, the entire stakeholders agree that the illegal mining is important problem for effective FMP as well as land acquisition for infrastructure project. FMP multi aspect evaluation is expected to increase the FMP effectiveness.

The decision maker may consider the statement of each group then improve the FMP. Q Method shows most significant statement to be consider, while the usual method show everything, including unrelated insignificant statement. By view side by side the distinguish statement of each group, the decision maker may find other statement / problems, especially on statement that two groups or more have opposite statement. For example at Statement-11, about different flood point of view among the stakeholder, it shows that maybe specific problems exist between these two stakeholders. The same case is also for statement about penalty (Statement-7), inundated area(Statement-17), program planning and transparency (Statement-24), orstandard design criteria of settlement(Statement-40).

Conclusion

- Q method was demonstrated, and found several important consideration on FMP
- A better effective and sustainable flood programs are expected
- Pontianak City's FMPmay require programs related to environmental community awareness and land policy, as stated on consensus.

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References

Brown, S. R. (1999). On the taking of average: Variance and factor analyses compared. Operant Subjectivity, 22, 31-37.

Gery W. Ryan and H. Russell Bernard (2006). Testing an ethnographic decision tree model on a

Glaser, Barney & Strauss, Anselm (1967). The discovery of grounded theory: Strategies for qualitative research. New York: Aldine Publishing Company.

Good, J. M. M. (2003) 'William Stephenson, quantum theory and Q methodology', Operant Subjectivity, 26 (4): 40-56.

Grothmann, T. and Reusswig, F., 2006: People at risk of flooding: Why some residents take precautionary action while others do not. Natural Hazards. 38:101–120

Guest, Greg; Bunce, Arwen& Johnson, Laura (2006). "How many interviews are enough? An experiment with data saturation and variability". Field Methods, 18(1), 59-82.

Mason, Mark (2010). Sample Size and Saturation in PhD Studies Using Qualitative Interviews [63 paragraphs]. Forum Qualitative Sozialforschung / Forum: Qualitative Social Research, 11(3), Art. 8, http://nbn-resolving.de/urn:nbn:de:0114-fqs100387.

McKeown, B. F. (1998). 'Circles: Q methodology and hermeneutical science', Operant Subjectivity, 21 (3/4): 112-38.

Morse, Janice M. (1995). The significance of saturation. Qualitative Health Research, 5(3), 147-149.

Muller, F. H. and Kals, E. (2004). 'Sort technique and Q-methodology: Innovative method for examining attitudes and opinions', Forum: Qualitative Social Research, 5 (2): Article 34.

National sample: recycling beverage cans. Human Organization, Vol. 65, No. 1.

Slovic, P. Perception of Risk Reflections on the Psychometric Paradigm. In Krimsky, S, Golding, D, ed. Social Theories of Risk. Praeger, Westport, 1992, 117–152.

Slovic, P; Peters, E. (December 2006). "Risk Perception and Affect". Current Directions in Psychological Science 15 (6): 322–325. doi:10.1111/j.1467-8721.2006.00461.x

Stephenson, W. (1983). 'Againts interpretation (Part 1& 2)', Operant Subjectivity, 6 (3): 73-103, 109-25.