The Role of Sense of Coherence and Social Capital on Perceived Risk: The Salutogenic Model Approach on Flood Survivors in Indonesia

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Abstract. The study of flood risk perception has been received growing attention in multi-disciplinary research and practice. Indonesia’s government approach on managing the impact of flood is highly dependence on structural engineering solutions. Few empirical attempts have systematically established to understand whether positive psychological capacity strategy helps flood survivors to overcome the negative impact of flood. This study aims to investigate the effectiveness of salutogenic and social capital models on flood risk perception. A national survey was used to collect the data of flood survivors across Indonesia. A battery comprising socio-demographic information, measures of salutogenic variable (sense of coherence), social capital (sense of community and social trust), and individual risk perception on flood was administered to the Indonesian adult (N = 194). This study findings showed that the overall model successfully predicted the perceived risk dimensions. However, different routes of correlation across variables were identified. Discussion and future recommendation are presented with regard to the study finding.

Keywords: Disaster preparedness, Flooding, Indonesia, Salutogenic, Social capital

1. Introduction

Natural disaster affects large number of people across the world. The World Health Organization (WHO) data shows a dramatic increase in the number of natural disasters in the past five decades. Scientific reports have evidences confirming that the increases of trend are mostly related to human activities. The high number of urbanizations causes excessive population growth (Cohen, 2006). As a result, sprawling cities and excessive consumption of fossil fuels increased in agricultural production leading to massive deforestation and mining activity (Satterthwaite, 2009). Without these environmental protections, there is a higher threat of flooding once the rainy season comes.

Indonesia listed as the third most vulnerable country to flooding in Asia, just below China and India, and ranked seventh in the world in terms of number of people affected by the surge (Indonesian Weather Bureau, 2016). Indonesia is a massive archipelago, a home of 268 million people who lived in across 17,000 islands. It is located at the equator with a tropical climate that often encounter with natural disasters. Wet season in Indonesia spans around October to April every year, causing heavy rainfall comes in the intense tropical downpours across the region. Indonesian Weather Bureau (2016) indicated 30% of natural disaster occurred in Indonesia is flooding. People lived in big cities (e.g. Jakarta, Surabaya, Bandung, Semarang, Medan) are faced with recurring severe flooding every year due to high density, massive construction and poor drainage system.

On early January 2020, the overnight heavy downpours caused riverbanks across Jakarta overload with floodwaters, inundating thousands of houses and buildings, submerged hospitals, local markets, airport and bus terminals, including the presidential palace complex. It forced the local authorities to cut the electricity and telecommunication lines as the waters reached as high as two meters in numerous commercial and residential areas. At least 53 people die, and more than 400,000 people were evacuated...
from their homes. Estimated financial loss due to the floods have reached around 5.2 trillion rupiah. Flood was also hit numerous cities in Java, Sumatera, and Kalimantan regions, swept thousands of buildings, farms, and rice fields, destroying people’s livelihood and transportation systems. Death toll raised and millions of people in total had affected by this incident.

In response to this recurring problem, the government develops a national flood mitigation initiative (Murniningtyas, 2011). There are two strategies used in the flood prevention plan; the structural and non-structural approaches. The structural approach emphasised in technical mitigation using conventional engineering approaches (e.g. builds large scale embankments, dam, diversion canals and river normalization). While the non-structural approach focused on developing regulations for land use management and flood early warning system. Both of these strategies were criticized for put too much emphasis on technical-oriented indicators that might not sufficient to prevent losses from recurring hazards. The structural strategy may also not offer full protection against flood due to unpredictable rainfall pattern, which often creates a false sense of protection among population at risk and lead them to take less precautionary steps to adjust with the upcoming floods. The government report itself acknowledge that the initiative has placed small attention to people and community participations might do to deal with the risk (Murniningtyas, 2011). Therefore, it is important to consider alternative, non-structural measure of disaster impact from the point of view of the survivors.

Scholars have identified that understanding the individual perception of risk is an important step to design better disaster mitigation plan (Wachinger, Renn, Begg, & Kuhlicke, 2013). Perception of risk refers to individual efforts to collect, select, and interpret cues of uncertain impact of the disaster (Renn, 1989). These cues may refer to individual subjective experiences about the incident (Vanneuville & Kellens, 2011), whether they are direct (e.g. witnessing flood) or indirect experiences such as acquiring information from news or others. Morgan, Fischhoff, Bostrom, and Atman (2002) suggest that perceived risk is a form of cognitive schema that people use to evaluate the potential hazards. Xu et al. (2019) explained that risk perception consists of four dimensions; 1) Possibility, 2) Worry, 3) Controllability, and 4) Resilience. Probability refers to the likelihood of whether a disaster will happen again in the future. Worry measures the emotional state when a disaster occurs. While controllability denotes to the degree of individual capacity to control their negative belief about the disaster that occurred, and Resilience represents people's perceptions about the impact of a disaster, whether it will have a positive or negative impact on them. This mental model is developed from the social learning process, personality attributes, and prior success coping with previous stressor that constantly maintained through social influence mechanism (media & peer influences). Gainey, Alper, and Chappell (2011) suggest that perception of risk is determined by a combination of personal and community level characteristic.

Personal exposure to risk during the flood could be understood using the salutogenic model of health and stressor by Antonovsky (1988). This model denotes to people way of thinking that focus on a desire for positive and optimal experiences built upon sense of coherence (Mittelmark et al., 2017). Antonovsky (1988) defines Sense of coherence (SOC) as a combination between optimism and sense of control. It is used to evaluate the ability to handle stressor based on the available psychological and social resources (George, 1996; Mittelmark et al., 2017). People with high SOC have better chance to seek meaning in life experiences and are more likely to appraise stressor as a nonthreatening stimulus than persons with lower SOC. According to Mittelmark et al. (2017) SOC encourages people to think that; 1) the risk they receive, whether they are from internal or external sources, can be predicted and controlled; 2) they have resources that available for them to use to manage the risk; and 3) the risk as a challenge and worthy for time investment and involvement.

The link between sense of coherence on perceived risk could be also explained through Protection Motivation Theory (PMT) by Rogers (1985). The PMT posits that individual perception of risk is developed from a fear-drive model which indicated that fear motivate people to do a trial and error act to reduce the adverse impact of risk. If the risk mitigation plan is oriented to managing the fear, then people are likely to build their protective plan based upon negative emotional state, which in turn may lead to maladaptive psychological responses, such as denial or anger. In the contrary, if the mitigation
A few studies in Indonesia have been conducted to investigate the impact of flood towards a higher risk of mental health problems. Previous findings indicated that flood may induced traumatic stress disorder (Taufiq, Susanty, Titi, & Nurlina, 2014). Bradford et al. (2012) suggest that it is important to understand the way people developed their perception of risk and what factors underlying it. This study hypothesised that salutogenic and social capital variables would predict perceived risk among flood survivors in Indonesia. This model offers a brand-new psychological and non-structural approaches to enhance the quality of flood risk mitigation in Indonesia. In practical context, this study finding would be expected to serve as an alternative source of information for the stake holders (government, environmental researcher, health practitioners) to improve the effectiveness of flood management delivery.

2. Method
2.1 Sample
The sample were recruited from across Indonesia using an online survey. A total of 194 participants who have experienced flooding were voluntary participated in this study. Participants personal information (e.g. name, address, phone) were not provided to ensure the confidentiality. The participants were also asked for their consent prior to the survey. The following table 1 describes sample characteristic of this study.
Table 1. Respondents characteristics

| Characteristic          | Distribution N (%) |
|-------------------------|--------------------|
| Gender                  |                    |
| Female                  | 123 (64 %)         |
| Male                    | 71 (36 %)          |
| Age group               |                    |
| Young adult (18-28 years-old) | 122 (71%)      |
| Middle adult (29 - 40 years-old) | 41 (27%)       |
| Late adult (41- 65 years-old)  | 31 (2%)           |
| Highest education       |                    |
| Junior high school      | 4 (2%)             |
| Senior high school      | 70 (36%)           |
| Undergraduate           | 85 (44%)           |
| Post-graduate           | 32 (17%)           |
| Not answer              | 3 (1%)             |

2.2 Measures

2.2.1 Demographic information. Participants completed a demographic survey asking about their age, gender, highest education background, and place of living. A question asking whether they have experienced flooding in the previous year was asked to ensure participant meet with the inclusion criteria.

2.2.2 Perceived Risk. Perceived risk of flood was measured by the modified risk perception scale (Xu et al., 2019). The scale consists of 13 items asking participant’s perception of risk of flood. The scale comprises four sub-scales measuring each dimensions of risk; possibility (item 1 to item 6), worry (item 7 to item 9), controllability (item 10 & item 11) and resilience (item 12 & Item 13). The participants used a 5-point Likert scale (1 = strongly not agree to 5 = strongly agree) to indicate the degree of perception of risk. The original scale was translated into Indonesians. The scale has been reported to have an acceptable internal consistency (Cronbach’s alpha = .73) (Xu et al., 2019). Analysis of reliability based on the present study indicate the Cronbach’s alpha of the scale to be .76, and its dimensions were .75, .85, .57, and .66 respectively indicating moderate to high reliability level (Hinton, McMurray, & Brownlow, 2014).

2.2.3. Sense of coherence. The Sense of coherence was measured using the 13 item version of SOC Scale, comprising three main dimensions; comprehensibility, manageability, and meaningfulness (Antonovsky, 1979). A semantic scale of 1 to 7 points (1 = never have the feeling to 7 = always have the feeling) was used to indicate respondent’s feeling about the questions/statements. A total SOC score was obtained by summed all the score answers ranging from 13 to 91. A higher score indicates participant’s higher sense of coherence. The scale has been initially tested across cultures and available in 49 different languages. The Indonesian version of the scale was developed by the author using translation and back-translation protocol (Brislin, 1970). The authors using Cronbach’s alpha to examine scale validity and further checking the scale factorial validity using the Exploratory Factor Analysis (EFA). Both analysis results indicated that item # 7 (“Doing the things, you do every day is: a source of deep pleasure and satisfaction—a source of pain and boredom”) was troublesome due to poor item fit, and therefore the authors decide to exclude this item. As a result, the 12 item of Indonesian version of SOC scale would be best used in the study (Cronbach’s alpha = .906) rather than the original 13 item version. Similar issue was also found in others studies with different combination of items to exclude in the SOC scale. For example, Drageset and Haugan (2016) reported that the item # 2 was problematic due to error covariance in their model. While another study by Lerdal, Fagermoen,
Bonsaksen, Gay, and Kottorp (2014) indicated that item # 1 has failed to demonstrate acceptable goodness of fit using the Rasch model.

2.2.4 Sense of community. The sense of community (SOCM) was measured using the Brief Sense of Community Scale (BSCS) developed by Peterson, Speer, and McMillan (2008). This scale consists of 8 items using a 5-point Likert-type response ranging from 1 = strongly disagree to 5 = strongly agree. Respondent was asked to respond a question about their community/neighbourhood (e.g. “I can get what I need in this neighbourhood”). The scale has satisfactory psychometric properties in the original version (Cronbach’s alpha = .92) (Peterson et al., 2008) as well as in a different language (e.g. German) (CFI = .994; TLI = .988; RMSEA = .042) (Wombacher, Tagg, Bürgi, & MacBryde, 2010). Reliability analysis based on the present study indicated the Cronbach’s alpha for the Indonesian version of the scale to be .85 indicating satisfactory internal consistency.

2.2.5 Trust. Social trust was measured using General Trust Scale (GTS) developed by Jovanović (2016). The GTS comprises two different trust orientations: the interpersonal trust and institutional trust. All items were rated on an 11-point Likert scale, ranging from 0 (not trust at all) to 10 (trust completely). This scale has been translated and adapted into the Indonesian language and cultural context. Reliability analysis based on this study showing adequate psychometric properties of the scale (Cronbach’s α = .88).

2.3 Analysis

Total scores in the scales were used to examine how Sense of coherence, Sense of community, and Trust associated with each dimensions of Perceived risk. The authors using an open-source statistical software program JASP (JASP Team, 2020) to conduct multi regression analyses on the four separate dimensions of perceived risk (Possibility, Worry, Controllability, and Resilience). A set of dummy variables of gender (1 = male, 0 = female), senior high school (1 = yes, 0 = no), graduate (1 = yes, 0 = no), post-graduate (1 = yes, 0 = no), middle adult (1 = yes, 0 = no), and late adulthood (1 = yes, 0 = no) were prepared to test whether different demographic factors have an impact on perceived risk dimensions. Junior high school category and young adulthood category was used as an anchor for education and age group variables. Only independent variables with $P < 0.05$ in the univariate analyses were put into multivariate models and likelihood ratio using $P < 0.10$ and $P < 0.15$ as entry and removal criteria.

3. Result

3.1 Descriptive analysis

There were no missing values in the data. All scales were checked for validity and reliability by using the Cronbach alpha coefficient. Data were also subjected to standard statistical assumption checks, including normality, linearity, and homogeneity. The inter-correlations among all variables were tested using the Bivariate Pearson correlation which are provided in the Table 2. The correlation analysis revealed there were no significant correlations between demographic factors (gender, education background, and late adulthood) and perceived risk dimensions, except for the middle adulthood group that negatively associated with the worry. As seen in the Table 2, the predictor variables (sense of coherence, sense of community, and trust) were indicating mild to low correlation to independent variables (possibility, worry, controllability, and resilience).
Table 2. Descriptive and Bivariate Pearson correlation matrix

| Variables            | $M$  | $SD$ | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     |
|----------------------|------|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Gender               | .483 |      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      |
| SMA                  | .481 | -1.92*| -     | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      |
| D3S1                 | .497 | .062 | -.663*| -      | -      | -      | -      | -      | -      | -      | -      | -      | -      |
| S2S3                 | .165 | .124 | -.334*| .392*  | -      | -      | -      | -      | -      | -      | -      | -      | -      |
| Middle adult         | .409 | .052 | -.336*| .179*  | .212*  | -      | -      | -      | -      | -      | -      | -      | -      |
| Late adult           | .367 | .194*| -.269*| .102*  | -.299*| -.226*| -      | -      | -      | -      | -      | -      | -      |
| Sense of coherence   | 45.397 | 15.326 | -.086 | .274*  | -.151* | -.299*| -.184*| -.089 | -      | -      | -      | -      | -      |
| Sense of community   | 29.392 | 6.059 | -.012 | -.056 | .012   | -.013 | .073   | .081  | .012   | -      | -      | -      | -      |
| Interpersonal trust  | 6.727 | 1.749 | -.144*| -.110 | -.046  | .062  | .038   | .189  | .092   | .452*  | -      | -      | -      |
| Institutional trust  | 14.747 | 5.003 | .182* | .055  | -.132 | -.033 | -.070 | .270* | .118   | .386*  | .516*  | -      | -      |
| Possibility          | 12.284 | 4.323 | -.067 | -.030 | .027   | -.074 | -.039 | .012  | .455*  | -.014 | .160*  | .016  | -      |
| Worry                | 9.541 | 3.501 | -.005 | .073  | -.059 | -.134 | -.209*| .140  | .485*  | -.128 | .284*  | .342* | .563*  |
| Controllability      | 6.902 | 1.884 | -.064 | -.058 | .018   | .094  | .054   | .023  | .065   | .350*  | .243*  | .319* | .061  |
| Resilience           | 7.129 | 1.934 | .016  | .005  | -.091 | .078  | .005   | .066  | .045   | .367*  | .228*  | .222* | -.222* |
3.2 Multi regression analysis
The proposed model of this study is based on the earlier literature indicating the perceived risk as a multi-dimensional construct (Xu et al, 2019). Hence, the perceived risk variable was treated as four separate sub-scales (possibility, worry, controllability, and resilience) and therefore were analysed through four separate multi-regression analyses (Table 3).

Table 3. Multiple regression analyses of perceived risk dimensions

|                      | Possibility | Worry | Controllability | Resilience |
|----------------------|-------------|-------|-----------------|------------|
|                      | B          | β     | B              | β          | B         | β       |
| Constant             | 18.684     | .0000 | 17.973          | .0000      | 3.023     | .0000   |
| Self-coherence       | -.127      | -.450* | -.102          | -.446*     | .005      | .039    |
| Sense of community   | .044       | .002  | .012           | .021       | .082      | .264**  |
| Interpersonal Trust  | -.518      | -.210* | -.269          | -.134      | .016      | .015    |
| Institutional Trust  | .104       | .121  | -.160          | -.229*     | .077      | .205    |
| R²                   | .237       | .330  | .164           | .144       |           |
| Adjusted R²          | .221       | .316  | .146           | .126       |           |

** P = < .001; * P = < .01

In the first analysis, a multiple regression was performed to predict the Possibility based on Sense of coherence, Sense of community, Interpersonal trust, and Institutional trust. The overall model of independence variables was explained 23% of the variance and significantly predicted the Possibility of risk (F (4,189) = 213.986, p < .001). The analysis results show that Sense of Coherence (B = -.127, p = < .001) and Interpersonal trust (B = -.518, p = .008) did negatively significantly predict the Possibility, however, Sense of community (B = .044, p = .394) and Institutional trust (B = .104, p = .113) failed to significantly predict the Possibility.

Second analysis was determined to predict Worry based on Sense of coherence, Sense of community, Interpersonal trust, and Institutional trust. All four variables added significantly to the prediction (F (4,190) = 238.175, p < .001) and was explained 33 % of the variance of Worry. The analysis results show that Sense of Coherence (B = -.102, p = < .001) and Institutional trust (B = -.160, p = .002) did negatively significantly predict the Worry. In the contrary, Sense of community (B = .012, p = .757) and Interpersonal trust (B = -.269, p = .069) failed to significantly predict Worry.

The third analysis results showing that Sense of coherence, Sense of community, Interpersonal trust, and Institutional trust explained 14% of the variance and significantly associated with the Controllability (F (4,180) = 9.266, p < .001). However, only Sense of community (B = .082, p = < .001) that significantly predicts the Controllability, while Sense of coherence (B = .005, p = .558), Interpersonal trust (B = .016, p = .859), and Institutional trust (B = .077, p = .011) did not significantly predicted the Controllability.

Final multiple regression analysis was carried out to test between Sense of coherence, Sense of community, Interpersonal trust, and Intrapersonal trust to the Resilience. The analysis indicated the overall model explained the variance of resilience by 12% and significantly predicted it (F (4,189) = 7.980, p < .001). The model shows only Sense of community (B = .102, p = < .001) that significantly predicted the Resilience, while Sense of Coherence (B = .004, p = .633), Interpersonal trust (B = .048, p = .605) and Institutional trust (B = .028, p = .365) did not significantly predict the Resilience.
4. Discussion
Indonesia has experienced frequent and recurrent flooding every year. However, limited studies were found in the literature on the question whether the salutogenic and social capital factors are associated with the perceived risk. The present study aims to investigate the roles of Sense of coherence, Sense of community and Trust on Flood perceived risk among Indonesians. The current findings indicated that the hypothesis was supported as the overall independence model (Sense of coherence, Sense of community, and Interpersonal and Institutional Trust) significantly associated with all perceived risk dimensions. Nevertheless, the findings also indicate that different patterns of relationships emerge between these independent variables to each dimension of perceived risk.

The findings suggest that only sense of coherence and interpersonal trust that significantly predict the possibility of risk. This means that when people are optimistic and at the same time trusting one another, they will likely to believe that the risk of current flooding will not affect them in the future. We found that higher sense of coherence indicates that people appraisal of risk as more predictable and controllable. Such appraisal might lead to effective coping strategy to handle the negative symptoms of risk, such as feelings of worry. While people’s trust towards the social institutions (government, law, and media) would help them to dispose positive emotional response to the risk compare to those who have less trust. Our multiple regression model also indicates that sense of community plays a significant role as a factor influencing both the controllability of risk and resilience.

Further, it seems that a community to some extent helps people to manage risk by providing conducive and supportive environment. Our finding parallel to Noviekayati et al., (2019) study indicating people’s sense of community facilitates people positive response to risk and further prevent the mental health issue. Positive social relations with the community often promote attachment and satisfaction with the residential neighbourhood, which may facilitate one’s sense of well-being. Further, this condition is not only enhancing one’s happiness, but it also positively associated with social connectedness which in turns also increased one’s sense of social support among one another, which extremely beneficial in the times of disaster (Yanuarti, 2006; Gumelar, Akbar, Suryaratri, Erchanis, & Wahyuni, 2020). Although the effect sizes of these social capital variables vary across all dimensions of risk, this study suggesting that sense of community and trust played important roles in determining the perception of risk. Particularly for those lived in an area vulnerable to flood (e.g. Jakarta), both factors are important to help them tackle the adverse impact of the disaster (Babcicky & Seebauer, 2017).

Improving sense of coherence and social capital variables has been recognized as an effective prevention strategy against the risk and mental health issues. A sense of coherence may be improved through an intervention involving mental health experts. Therefore, this relevant intervention should be included in the risk mitigation plan. While creating strong community in Indonesia should be more feasible given its strong collectivistic culture value.
5. Limitation and future direction
We identify a number of limitations for further refinement in the possible future study. Firstly, the participants sample size was considerably low. Such sample size might affect the prediction power of the analysis and might not fully represent the situation in other regions. Therefore, larger and more diverse sample from across Indonesia is warranted for further study. Next to that, this current study was employed a cross-sectional analysis, which could not provide explanation on the nature of causality across variables. Advance analysis using experimental or longitudinal approaches may provide comprehensive perspective about the complex relationship among variables.

6. Conclusion
This study aimed to examine the salutogenic and social capital model of the perceived flood risk. First, we found that both salutogenic and social capital aspects are important to understand how people manage their perceived risk of flood. Second, while the overall model was reported significantly associated to the perceived risk, different patterns emerged on the association variance between the salutogenic and social capital variables to each perceived risk dimensions. High level of sense of coherence was identified as key factors that contribute to lower perception of risk and low anxiety level. While the sense of community seems to be especially important to enhance people’s sense of control and resilience in the aftermath of the flood. Finally, the results of this current study may assist policy makers, health practitioners, and community leaders in developing intervention and delivering flood mitigation plan based on the needs of flood survivors.

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