

# Analysis of factors related to flood Mitigation in the Welang Watershed, Pasuruan City

Heri Suroso<sup>1</sup>, Loeki Enggar Fitri<sup>2</sup> and Yati Sri Hayati<sup>3</sup>

<sup>1,3</sup>*Master's Programs of Nursing, Faculty of Medicine, Universitas Brawijaya, Malang, Indonesia*

<sup>2</sup>*Department of Parasitology, Faculty of Medicine, Universitas Brawijaya, Malang, Indonesia.*

(Received 13 June, 2020; accepted 17 July, 2020)

## ABSTRACT

Indonesia is a country that has a disaster-prone area; in the year, 2005-2015 it recorded more than 78% hydrometeorology disaster such as a flood occurred including in Pasuruan City. Mitigation of individuals in households is an effort to reduce flood disaster risk. This research aims to analyze factors related to the mitigation of flood disaster in the Welang Watershed, Pasuruan. Design research using analytic observational with Cross-sectional approach. This research samples are 105 head of family located in the disaster-prone area of Welang River Flood, Pasuruan. Data in analysis through correlation test rank Spearman with a significant level ( $\alpha$ ) = 0.05. Correlation rank Test Spearman showed there was a significant correlation between knowledge ( $P = 0.000$ ), self-efficacy ( $P = 0.000$ ), and socioeconomic status (0.000) with flood mitigation. Factors of knowledge, self-efficacy, and socioeconomic status are significantly correlated with community mitigation in the face of the flood disaster, the most correlated factor against flood disaster mitigation is socioeconomic status compared to 2 other factors.

*Key words* : Knowledge, Self-efficacy, Socioeconomic Status, Mitigation, Flood

## Introduction

Natural disasters are the events of earthquakes, floods, storms, drought, forest fires, epidemic diseases, and landslides in a region caused by climate or weather. Flooding is a social-natural disaster due to climate change or weather that requires serious attention (Rehman *et al.*, 2019). In Indonesian, the prevalence of hydrometeorological disaster in 2005 – 2015, recorded more than 78%, including flood (Asdak *et al.*, 2018). The impact of flood disasters is damage to the home, which causes relatively high losses to recover the cost, loss of crop yields, the transmission of disease outbreak, and uncertainty about NASA's Front society and psychological conditions of the victims (Azmeri and Isa, 2018).

Nurses in disaster prevention and mitigation efforts play a role in identifying known risks to disasters. Nurses collaborate with other healthcare professionals to determine the likelihood of significant diseases, work together to develop identified risk-reduction interventions, and to assist in developing surveillance programs on disease outbreaks due to flood disasters (International Council of Nurses, 2009). Nurses in conducting mitigation measures, other than conducting assessments of disease events, should be able to cooperate with the community in doing disaster mitigation either individually or jointly. The community has a significant role in the sustainability and effectiveness of disaster management systems. Efforts to achieve disaster emergency management should include several

stages, such as prevention, emergency response, rehabilitation, and reconstruction. Phases of prevention, preparedness, improving health and psychological status, and rebuilding facilities and infrastructure is an attempt to treat emergency disaster. The effort to mitigate a threat to disasters is to conduct surveillance, mitigation, and preparedness. Improve the community's ability to perform a disaster-prone zone, and building construction by government codes and regulations is a stage of disaster mitigation (Kurniati *et al.*, 2018). People are expected to conduct individual mitigation in households, and it will reduce the risk of flooding, such as minimizing the risk of flooding, the occurrence of victims, transmission of disease outbreaks, loss of building infrastructure, and housing facilities.

Based on BPBD data from Pasuruan City in the year 2019 flooding in the Welang watershed, Pasuruan occurred 6 times in January-April with the highest flood height reached 120 cm, while in 2018 floods occurred 6 times in January and February with a water height of 110-220 cm, there were 2 injured victims. The frequent flood disaster in the Welang watershed, Pasuruan needs effective and efficient handling, so that the community has a significant role and is indispensable in conducting flood mitigation in both individuals in households. Disaster mitigation aims to reduce catastrophic losses. Flood disaster occurs when entering the rainy season and the community in the watershed has a vulnerability to flooding. However, in the region there is no rain, flooding can occur due to the delivery of the plateau, so the impact of flood disaster must be minimized such as injury or even death for the population, damage resulting from economic loss, protection of self and family ineffective in the community in the basin area.

## Method

Research design uses analytic observational with cross-sectional approaches. The research samples are 105 family heads in disaster-prone areas of river flood Welang Rw. 01/Rt. 02-03 Village of Karangketug, Pasuruan City. Sampling based on a purposive sampling method with inclusion and exclusion criteria. The study took place in February – March 2020. Research instruments used questionnaires and determined the correlation between knowledge, self-efficacy, and socioeconomic status of the community in the mitigation of flood disas-

ters. A multivariate analysis based on logistic regression by the Enter method was used to determine the most related factors of flood disaster mitigation.

## Ethical Clearance

This research has been submitted by the Faculty of Health Research Ethics Commission of Universitas Brawijaya, Malang with number 39/EC/KEPK – S2/02/2020.

## Results

### Respondents age Characteristics distribution

The age distribution shows the mean of respondents is 48.9 years, with the youngest age of 29 and the oldest of 69 years old with a data spread of 11.17, which can be observed in Table 1.

### Distribution of socio-demographic characteristics of respondents

Out of 105 respondents were aware of the male gender of 54.3%, and almost half of them (38.1%) were educated at high school. Interestingly. Although most their job (63.8%) were civic affairs, soldiers/police, self-employed or private employees, their revenue mostly (69.5%) under IRD of 1.7 million. Almost all respondents (85.7%) have their own home with nearly half of respondents (48.6%) have a resident of 3-4 people in the house. Although most of the respondents (61%) had a home distance of more than 15 meters from the river flow, all respondents (100%) had experience facing flood more than 1 times. This data can be observed in Table 2.

### Respondents distribution based on knowledge, attitude, self-efficacy and socioeconomic status

Based on 105 respondents obtained, most of the knowledgeable respondents (74.2%) of good knowledge against flood disaster mitigation and 72.4% had an excellent self-efficacy against flood disaster mitigation. Unfortunately, most respondents had less mitigation against the flood disaster of 58.1%. Besides that, more than half of the respondent (56.1%), had functional socioeconomic status against flood disaster mitigation. The data could be observed in Table 3.

The relationship between knowledge, self-efficacy and socioeconomic status of society with disaster mitigation in the Welang watershed, Pasuruan

The results of the analysis of the relationship between knowledge, self-efficacy and socioeconomic status of the community with flood disaster mitigation are known based on statistical test obtained significance value 0.000 (P-Value < 0.05) then H0 rejected, meaning there is the linkage between, knowledge, self-efficacy and socioeconomic status of the community with the mitigation of flood disaster.

The result of the correlation coefficient between knowledge with flood disaster mitigation was obtained (R count) 0.367, meaning the second correlation strength of the variable is weak. Coefficient of correlation between self-efficacy with flood disaster mitigation obtained (R count) 0.481, means the correlation strength of both medium variables, and the correlation coefficient between socioeconomic status

**Table 1.** Characteristics of respondents by age

	N	Minimum	Maximum	Mean	Standard Deviation (SD)
Age	105	29	69	48,19	11,17

**Table 2.** Characteristics of respondents based on social-demographic respondents (n = 105)

No.	Characteristics	Frequency (n)	Percentage (%)
1.	Gender		
	• Male	57	54,3
	• Female	48	45,7
2.	Education		
	• No School	9	8,6
	• Elementary School	34	32,4
	• Junior High School	18	17,1
	• High School	40	38,1
	• College	4	3,8
3.	Job		
	• Civic affairs, soldiers/police, self-employed, private employees.	37	35,2
	• Farmers, farmworkers, factory laborers, freelancers.	67	63,8
	• Not working	1	1,0
4.	Income revenue		
	• <1.700.000	73	69,5
	• 1.700.000-2.800.000	26	24,8
	• >2.800.000	6	5,7
5.	Homeownership		
	• Own property	90	85,7
	• Follow Parents/relatives	13	12,4
	• Contract	2	1,9
6.	Family member		
	• 2 People	14	13,3
	• 3-4 People	51	48,6
	• >4 People	40	38,1
7.	Long time settled		
	• <1 Year	0	0,0
	• > 1 Years	105	100,0
8.	Home distance from the river		
	• < 10 Meters	21	20,0
	• 10-15 Meters	20	19,0
	• >15 Meters	64	61,0
9.	Flood facing experience		
	• Never	0	0,0
	• 1 time	0	0,0
	• > 1 time	105	100,0

with disaster mitigation obtained (R count) 0.633, meaning the correlation strength of both stable variables, it can be known through Table 4.

**A multivariate analysis based on logistic regression**

The results of the logistics regression analysis of this research using the Enter method. The value of R Square shows the importance of 0.637 approaching the cost of 1, meaning 64% of the population in implementing flood disaster mitigation can be explained by factors of knowledge, self-efficacy and socioeconomic status. In comparison, 28% is explained by other factors that are not researched. The value p in each of the variables is a knowledge variable with a value of 0.005, a variable self – efficacy with a value of 0.016, and a variable socioeconomic status with a value of 0.000. All independent variables in the study have a value of < a (0.05); hence there is a link between knowledge, self-efficacy, and socioeconomic status of the community with the mitigation of flood disaster. The excellent relation-

ship strength of the independent variables can be known from the value Exp. (B). The calculated value of Exp. (B) of knowledge, a variable is 8.827, the value of Exp. (B) of variable self-efficacy 15.313 and Value Exp. (B) of the social-economic status variable 18.66. The value of Exp. (B) of the third variable indicates that the socioeconomic status variable has the most reliable relationship strength compared to the knowledge variables, and the self-efficacy that can be seen in Table 5.

**Discussion**

The results of the bivariate analysis showed that the knowledge, self-efficacy, and socioeconomic status of the community had a significant relationship with the mitigation of flood disasters in the Welang watershed, Pasuruan. It is supported by education, occupation, homeownership, the number of family members in one house, extended stay, the distance of home with river flow, and the experience of fac-

**Table 3.** Respondents distribution based on knowledge, attitude, self-efficacy and socioeconomic status (n = 105)

Variable	Objective criteria	Frequency (n)	Percentage (%)
Knowledge	Good Less	7827	74,225,8
Self-efficacy	Good Less	7629	72,427,6
Socioeconomic Status	Good Less	5946	56,143,9
Flood disaster mitigation	Good Less	4461	41,958,1

**Table 4.** The relationship between knowledge, self-efficacy and socioeconomic status of the community with the mitigation of flood disaster mitigation in the Welang watershed, Pasuruan

Variable	Objective criteria	Flood disaster mitigation
Knowledge	Correlation Coefficient (r)	0,367
	Sig. (2-tailed)	0,000
	(p) N	105
Self – Efficacy	Correlation Coefficient (r)	0,481
	Sig. (2-tailed) (p)	0,000
	N	105
Socioeconomic Status	Correlation Coefficient (r)	0,633
	Sig. (2-tailed) (p)	0,000
	N	105

**Table 5.** Results of multivariate analysis of knowledge relationships, self-efficacy and socioeconomic status of society with flood disaster mitigation in the Welang watershed, Pasuruan

Variable	P-Value	Exp. (B)	Nagelkerke R Square
Knowledge	0,005	8,827	0,637
Self – Efficacy	0,016	15,313	
Socio-economic Status	0,000	18,696	

ing the flood of society in a meaningful relation to the behavior of society in applying individual mitigation in households.

Public knowledge of the flood disaster mitigation is mainly good, although it has a weak correlation force. The findings are in line with Yesil *et al.* (2010), Disclosing about public awareness in implementing mitigation measures and preparedness of a disaster is influenced by right knowledge. It is also related to the findings by Dube *et al.* (2015) expressed public understanding of an emergency is very related in implementing structural measures related to disaster risk reduction interventions. Community knowledge related to disaster management affects people's behavior in conducting action efforts to reduce disaster risk. Good public understanding of disaster and disaster management will increase public awareness of disaster risk reduction efforts.

Arsenijevic *et al.* (2017), argues that the factor that affects either the poor person's knowledge is comprised of education, personal experience, and age. The education level is expected to have a high contribution to one's knowledge in the prevention or reduction of disaster risk. Shi *et al.* (2015), stated that education could affect the change of public behavior and concern for climate change resulting in disasters, and increase general knowledge and awareness to prevent or reduce disaster risk. (Lee *et al.*, 2015) suggest that higher community education will make it easier to understand and aware of climate change impacting disasters so that people can participate by making efforts to prevent or reduce individual disaster risk. Thistlethwaite *et al.* (2017), opinion that previous flood experiences can provide community knowledge and change the behavior of people in implementing the way individual flood disaster mitigation.

The findings are in contrast to the study by Botzen *et al.* (2009), who expressed the negative influence of public knowledge on flooding and community willingness to implement the individual flood disaster mitigation by making sand sacks. Moreover, Bubeck *et al.* (2012), States that knowledge of flood disasters is not a significant factor in the behavior of people in implementing individual flood disaster mitigation.

Another factor in the behavior of society in implementing individual mitigation in households is self-efficacy. The results of the study gained self-efficacy respondents were mostly good and had a moderate correlation. It is backed by research

Poussin *et al.* (2014), the relevant attachment between a self-efficacy community and the intention of conducting individual flood disaster mitigation measures, demonstrated by the public's ability to risk perception of disasters in implementing different mitigation measures in households. It is in line with research (Robinson and Botzen, 2019), describes the high self-efficacy has an essential role in taking the individual flood disaster mitigation measures.

Self-efficacy is an individual's confidence in the skills it has to be able to behave or act effectively to get something well expected (Bandura, 1997). Bubeck *et al.* (2013), Expressing self-efficacy can lead to a motivation of high or low protection against disasters, depending on the obstacles or problems that are experienced by one to decide on the protective measures. Self-efficacy is the deciding factor of everyone to maintain social-cognitive behaviors in preparing for disasters (Adams *et al.*, 2019). Babicky and Seebauer (2017), expressed some aspects that have a role in self – efficacy each individual in the management of flood disaster mitigation, namely previous flood experience, risk zone (distance between the house and the river Lips) and social demographic characteristics (education, gender, and income). Household income has a negative relationship with the self – efficacy a person against the risk of the flood disaster because a more prosperous household considers capable or believes that the risk of a lesser flood disaster is experienced than a less affluent household. It is in line with the study Qasim *et al.* (2015), Also reveals about the self-efficacy one to mitigate the disaster mitigation by individuals in households has no significant effect on economic revenues.

Socioeconomic status is one of the supporting factors in implementing disaster mitigation behaviors of individuals in households. The results of the bivariate analysis proved the relevant correlation on the socioeconomic status of population and flood disaster mitigation. The results of the study aligned with the findings of Poussin *et al.* (2014), Disclosing the relevant attachment to the free economy to the conduct of conducting individual flood disaster mitigation measures in the household. It is by the findings (Seyedin *et al.*, 2019). Also reveals the social-economic status of the family one aspect related to the success of disaster risk reduction strategies individually in households. Du•í *et al.* (2017), explaining that the most important aspect of adopting

flood disaster mitigation measures is the economy of the population.

The family's socioeconomic status is a family state of the low level of social and revenue earned. Family economic status can be seen from several factors, namely level of education, income, number of families or dependents in one home and valuables owned (Soepardjo, 2013). (Qasim *et al.*, 2015) Explain the critical factors on the efforts of performing individual flood disaster mitigation measures in the household, and to measure the socioeconomic status of the community is by combining age, income, education, household size, and home ownership.

Multivariate analysis results show socioeconomic status is a factor that is very related to the mitigation of flood disaster in the Welang watershed, Pasuruan, with the excellent relationship strength of the independent variables that can be known from the value *Exp. (B)* 18,696. The results of this study are aligned with Poussin *et al.* (Poussin *et al.*, 2015), Which states that the socioeconomic status of critical factors that play and influence the behavior of one's conduct in conducting disaster mitigation measures relating to environmental hazards. Socioeconomic status can be an option to control from several other factors, such as knowledge and self-efficacy. The functional socioeconomic status will endeavor to immediately seek the right steps to tackle the personal catastrophe to save themselves and the family from the threat of environmental hazards such as flood disaster. Communities with functional socioeconomic status will strive to maximize the risk of disaster reduction risks, both individually in households and groups in communities. Botzen *et al.* (Botzen *et al.*, 2009), Socioeconomic Status can increase the motivation of protection to someone in making decisions personally regarding the creation of flood-resistant homes, such as conducting flood disaster mitigation measures in households. People living in the watershed, when motivated by excellent disaster protection, will make the right decisions on disaster risk reduction behavior by mitigation and disaster preparedness (Uehara, 2017).

This research provides evidence that the theory of conduct Green and Marschel (Green and Marschel, 1999), Can be applied to explain the behavior of the community in conducting disaster mitigation efforts individually in households such as creating water-resistant houses, raising house buildings, elevating the ground floor of the high

potential of water during floods, elevating the electrical system above the high potential of water during floods, installing sand sacks in front and side of the house. However, there are still many people who have not been able to implement individual mitigation in households. Therefore, one of the solving or solving problems related to the lack of disaster mitigation of different communities in homes is to raise public awareness together in the effort to reduce disaster risk by prevention that is maintaining the cleanliness of the environment, doing tree planting, and maintaining the purity of the river so that there is no frequent flooding.

## Conclusion

This research demonstrates a significant relationship between knowledge, self-efficacy, and socioeconomic status of the community with the mitigation of flood disasters in the Welang watershed, Pasuruan. Factors that have the strongest correlation force on the mitigation of flood disasters are socioeconomic status, compared with self-efficacy. Efforts to improve flood disaster mitigation in communities located in the Welang watershed, Pasuruan, are associated with several factors of community behavior formation. These factors are knowledge, self-efficacy, and socioeconomic status based on the perception of society very closely related to the mitigation of the community in the face of a flood disaster in person in the household.

## References

- Adams, R. M., Eisenman, D. P. and Glik, D. 2019. Community Advantage and Individual Self-Efficacy Promote Disaster Preparedness: A Multilevel Model among Persons with Disabilities. *International Journal of Environmental Research and Public Health*. 16(15): 1–18. <https://doi.org/10.3390/ijerph16152779>
- Arsenijević, O., Trivan, D., Podbregar, I. and Šprajc, P. 2017. *Strategic Aspect of Knowledge Management*. 50(2). <https://doi.org/10.1515/orga-2017-0011>
- Asdak, C., Supian, S. and Subiyanto, 2018. Watershed management strategies for flood mitigation: A case study of Jakarta's flooding. *Weather and Climate Extremes*. 21 : 117–122. <https://doi.org/10.1016/j.wace.2018.08.002>
- Azmeri, A. and Isa, A. H. 2018. An analysis of physical vulnerability to flash floods in the small mountainous watershed of Aceh Besar Regency, Aceh province, Indonesia. *Jamba: Journal of Disaster Risk Stud-*

- ies. 10(1) : 1–6. <https://doi.org/10.4102/jamba.v10i1.550>
- Babcicky, P. and Seebauer, S. 2017. The two faces of social capital in private flood mitigation: opposing effects on risk perception, self-efficacy and coping capacity. *Journal of Risk Research*. 20(8) : 1017–1037. <https://doi.org/10.1080/13669877.2016.1147489>
- Bandura, A. 1997. *Self-efficacy: the exercise of control* (Print book). ew York/: W.H. Freeman and Company.
- Botzen, W. J. W., Aerts, J. C. J. H. and Bergh, J. C. J. M. Van Den. 2009. Dependence of flood risk perceptions on socioeconomic and objective risk factors. *Water Resources Research*. 45(10) : 1–15. <https://doi.org/10.1029/2009WR007743>
- Botzen, W. J. W., Aerts, J. C. J. H. and Bergh, J. C. J. M. Van Den. 2009. Willingness of homeowners to mitigate climate risk through insurance. *Ecological Economics*. 68(8–9) : 2265–2277. <https://doi.org/10.1016/j.ecolecon.2009.02.019>
- Botzen, W. J. Wouter, Kunreuther, H., Czajkowski, J. and Moel, H. De. 2019. Adoption of Individual Flood Damage Mitigation Measures in New York City/: An Extension of Protection Motivation Theory. *Risk*, 39(10). <https://doi.org/10.1111/risa.13318>
- Bubeck, P., Botzen, W. J. W., Kreibich, H. and Aerts, J. C. J. H. 2012. Long-term development and effectiveness of private flood mitigation measures/: an analysis for the German part of the river Rhine. *Natural Hazards and Earth System Sciences (NHESS)*. 12(11): 35073518. <https://doi.org/https://doi.org/10.5194/nhess-12-3507-2012>
- Bubeck, P., Botzen, W. J. W., Kreibich, H. and Aerts, J. C. J. H. 2013. Detailed insights into the influence of flood-coping appraisals on mitigation behaviour. *Global Environmental Change*. 23(5) : 1327–1338. <https://doi.org/10.1016/j.gloenvcha.2013.05.009>
- Dube, E., Munsaka, E. and State, M. 2015. The contribution of indigenous knowledge to disaster risk reduction activities in Zimbabwe/: A big call to practitioners The context of the problem in Tsholotsho district. *Journal of Disaster Risk Studies*. 10(1) : 1–8. <https://doi.org/https://doi.org/10.4102%2Fjamba.v10i1.493>
- Du•í, B., Vikhrov, D., Kelman, I., Stojanov, R. and Ju•i•eka, D. 2017. Household measures for river flood risk reduction in the Czech Republic. *Journal of Flood Risk Management*. 10(2) : 253–266. <https://doi.org/10.1111/jfr3.12132>
- Green, L. and Marschel, W. 1999. *Health Promoting Planning an Educational and Environmental Approach* (2nd ed.). company: Mountain view.
- International Council of Nurses. 2009. *ICN Framework of Disaster Nursing Competensis*.
- Kurniati, A., Trsyani, Y. and Theresia, S. I. M. 2018. *Keperawatan Gawat Darurat dan Bencana Sheehy* (1 Indonesi). Singapore: Elsevier Ltd.
- Lee, T. M., Markowitz, E. M., Howe, P. D., Ko, C. and Leiserowitz, A. A. 2015. Predictors of public climate change awareness and risk perception around the world. *Nature Climate Change*. 5(11) : 1014–1020. <https://doi.org/10.1038/NCLIMATE2728>
- Poussin, J. K., Botzen, W. J. W. and Aerts, J. C. J. H. 2014. Factors of influence on flood damage mitigation behaviour by households. *Environmental Science and Policy*. 40 : 1–9. <https://doi.org/10.1016/j.envsci.2014.01.013>
- Poussin, J. K., Wouter Botzen, W. J., and Aerts, J. C. J. H. 2015. Effectiveness of flood damage mitigation measures: Empirical evidence from French flood disasters. *Global Environmental Change*. 31 : 74–84. <https://doi.org/10.1016/j.gloenvcha.2014.12.007>
- Qasim, S., Khan, A. N., Shrestha, R. P. and Qasim, M. 2015. Risk perception of the people in the flood prone Khyber Pukhthunkhwa. *International Journal of Disaster Risk Reduction*. 14 : 373–378. <https://doi.org/10.1016/j.ijdrr.2015.09.001>
- Rehman, J., Sohaib, O., Asif, M. and Pradhan, B. 2019. Applying systems thinking to flood disaster management for a sustainable development. *International Journal of Disaster Risk Reduction*. 1–27. <https://doi.org/10.1016/j.ijdrr.2019.101101>
- Robinson, P. J. and Botzen, W. J. W. 2019. Determinants of Probability Neglect and Risk Attitudes for Disaster Risk/: An Online Experimental Study of Flood. *Risk Analysis*. 39 (11) : 2514–2527. <https://doi.org/10.1111/risa.13361>
- Seyedin, H., Samadipour, E. and Salmani, I. 2019. Intervention strategies for improvement of disasters risk perception: Family-centered approach. *Journal of Education and Health Promotion*. 8(63). [https://doi.org/https://dx.doi.org/10.4103%2Fjehp.jehp\\_200\\_18](https://doi.org/https://dx.doi.org/10.4103%2Fjehp.jehp_200_18)
- Shi, J., Visschers, V. H. M. and Siegrist, M. 2015. Public Perception of Climate Change/: The Importance of Knowledge and Cultural Worldviews. *Risk*. 35(12) : 20183–22201. <https://doi.org/10.1111/risa.12406>
- Soepardjo. 2013. Jurnal Penelitian and Evaluasi Pendidikan. *Jurnal Penelitian Dan Evaluasi Pendidikan*. 17(1) : 108–126. <https://doi.org/https://doi.org/10.21831/pep.v17i1.1364>
- Thistlethwaite, J., Henstra, D., Brown, C. and Scott, D. 2017. How Flood Experience and Risk Perception In fl uences Protective Actions and Behaviours among Canadian Homeowners. *Environmental Management*. 61(2). <https://doi.org/10.1007/s00267-017-0969-2>
- Uehara, M. S. 2017. *Individual Risk Perception and Flood Mitigation/: An Empirical Study of Protective Actions in Australia*. The University of Queensland.
- Yesil, S. T., Dedeoglu, N., Fahrlaender, C. B. and Tanner, M. 2010. Factors Motivating Individuals to Take Precautionary Action for an Expected Earthquake in Istanbul. *Risk Analysis*. 30(8). <https://doi.org/10.1111/j.1539-6924.2010.01424.x>