

Post-liquefaction Handling of Community Housing in Central Sulawesi

Andi Pasinringi¹

¹Faculty of Social and Political Sciences, Tadulako University, Palu-Indonesia

¹andipasinringiuntad@gmail.com

Article History: Received: 10 January 2021; Revised: 12 February 2021; Accepted: 27 March 2021; Published online: 20 April 2021

Abstract: The three major disasters on 28 September 2018 that occurred in Central Sulawesi gave the local government the opportunity to prove how to better rebuild post-disaster settlements and shelters. The researcher tries to see whether knowledge of post-disaster reconstruction can be applied according to the policies that have been decided. The approach taken starts with local government regulations supported by local documents as a literature review. Qualitative data were collected through observation, document analysis, and interviews with the Regional Disaster Management Agency and affected community leaders. The government's efforts to relocate affected communities to permanent and temporary housing are still ongoing, even after two years of the disaster. Data collection and socialization have been carried out, but the central budget is inadequate, so that the fulfillment of new developments is carried out at certain points.

Keywords: disaster, liquefaction, post-disaster shelter

1. Introduction

According to the Global Disaster Assessment survey, natural disasters have hit both developed and developing countries, causing enormous ecological, social, fiscal and physical damage (Varo et al., 2019). The consequences of natural disasters, such as earthquakes, tsunamis or liquefaction, will be even more serious in the future, as districts will be larger and more populated (K. Jones et al., 2021). The meeting of the three major plates of the world, namely the Indo-Australian, Eurasian and Pacific plates makes Indonesia a country that has the potential for large natural disasters. Especially in earthquakes, when the plates are in an active state, then a collision occurs (Riady Ibnu Khaldun et al., 2019). Earthquake is an event that shakes or shakes the earth due to the sudden movement / shift of the rock layers on the earth's crust due to the movement of tectonic plates (Atmojo & Muhandis, 2019). In some cases, one of the most common causes of seismic disturbance is ground liquefaction due to earthquakes (Yuan et al., 2020). This process causes the building to collapse suddenly, thus contributing to a significant risk of earthquakes (Dilek et al., 2021). Liquefaction is a phenomenon often seen as ejection of sand at ground level (K. G. Jones et al., 2021). Liquefaction is a common process in which soil loses its shear strength and behaves like a liquid in a short period of time. If liquefaction occurs in an area with a lot of human socio-economic activities, it can cause serious natural disasters. Significant deformation or disturbance to the ground caused by liquefaction can compromise the above ground structures in the plot for example, buildings and roads (Chen et al., 2019). This phenomenon causes land subsidence and the slope of the building (Liang et al., 2020).

Preventing and reducing liquefaction damage is considered an important issue in anti-seismic measures. Not only to support rescue operations after a disaster, but also to transport goods to disaster-affected emergency areas as well as early recovery of the supply chain (Ohsumi et al., 2019). Mitigation is the key or ultimate goal for all disaster activities that occur. Even in times of low seismicism, government and private agencies involved in emergency response must regard public safety and preparedness as priorities which must be justified on a regular basis (Vasiliki et al., 2020). To date, safeguards for damage prevention and risk control have been generally recognized, as demonstrated by government laws and regulations around the world (Gao et al., 2020). This concept is especially helpful when governments or public bodies seek to justify major improvements in urban infrastructure and disaster preparedness (K. Jones et al., 2019). However, the clarification of the disaster management concept seems unclear compared to other traditional disciplines (Ho et al., 2019). The preamble to the 1945 Constitution, mandates that the Republic of Indonesia is obliged to protect the entire Indonesian nation and all Indonesian bloodshed. In this case, protection for life and livelihood, including protection against disasters in the context of realizing public welfare based on Pancasila, has been stated in Law Number 24 of 2007 concerning Disaster Management (Sukino et al., 2019). Determination of disaster status is an important process because it will have an impact on the budgeting system for disaster management activities as well as sources of disaster management funds, in this case whether sourced from the regency / city / provincial Revenue and Expenditure Budget (APBD) or the State Revenue and Expenditure Budget (APBN). and have implications for the mobilization of existing resources (Rifaldi, 2020).

The earthquake, tsunami, and liquefaction that hit Palu City, Donggala Regency, and Sigi Regency on September 28, 2018 left deep sorrow for the victims. A 7.4-magnitude earthquake destroyed residential areas. Casualties and material losses are inevitable (Daswati et al., 2019). This event triggered a tsunami and liquefaction that caused more than 2,000 casualties (Bao et al., 2019). The number of refugees in Central Sulawesi is estimated at 133,631 people spread across 122 points with details of 46,167 people in Palu City, 41,256 people in Sigi District, 45,737 people in Donggala District and 471 people in Parigi Moutong (Samad et al., 2020). Geologically, Sigi, Donggala and Palu is a trajectory of Sesar Palu Koro that stretches along the north south with a length of 500 km in total where half of it is on land ranging from Palu Bay to the north of Bone Bay. With the confluence of the three main tectonic plates above, this region is prone to natural disasters caused by the movement of the plates so as to encourage the movement of the Palu Koro Shear Fault. This is the cause of the earthquake with a magnitude of 7.4 M that devastated the coastal area of Palu Bay on September 28, 2018 (Hutabarat & Tampubolon, 2019). Sigi, Lolu, Jono Oge, and Sibalaya are areas experiencing severe liquefaction (Istianto & Sofiyuddin, 2019). Jono Oge is one of the villages that suffered the most damage among other areas in Sigi Regency. Where Jono Oge is one of the villages that has a large agricultural land (± 436.87 Ha) (Masud et al., 2019). The results of spatial analysis showed that the liquefaction after the Central Sulawesi earthquake (Sulteng) that caused the removal and ambles due to liquefaction in Jono Oge, Sigi Regency, reached 366 units of houses with an area of 202 hectares (Wirawan & Widjajanto, 2020). As a result, the community is homeless, and until now the community is still settled in temporary housing (Huntara). This is the important role of the government in dealing with liquefaction disasters. The government is obliged to provide maximum service with all policy efforts for inclusive disaster recovery.

2. Method

This research analysis uses qualitative research type. This study uses methods of assessing the performance, program management and efficiency of policies implemented by local governments related to better equalization of development. Determination of informants in this study using purposive sampling techniques, with criteria to be in the service being studied, knowing the problem and directly involved in it. Therefore, the Sigi District Disaster Management Agency and community leaders from the affected villages became the key informants who were most aware of the research problems. The data source in this study is primary data obtained directly from research in the field and secondary data obtained from pustaka material and other supporting documents (Dewi & Susilawati, 2019). Primary data collection was first conducted through observation of research objects, to be followed up with interviews with informants. Interviews are digitally recorded and transcribed verbatim. After the transcription, researchers reviewed and improved the transcript of the interview for analysis (Kenney & Phibbs, 2015). Secondary data collection is done by examining and analyzing related documents. Tahapan data management used namely data interpretation, data reduction, drafting data, checking the validity of data, and finally withdrawal conclusions (Napir & Junus, 2019).

3. Results and Discussions

The success of policy implementation will be determined by many variables or factors, and each of these variables is related to one another (Zahrah & Hidayat, 2017). To find out the performance of the local government in handling the liquefaction disaster in Sigi district, the researchers conducted an analysis of policy implementation using the Van Meter and Van Horn variables which consisted of 6 aspects, namely size (standard) and policy targets, resources, implementation activities and communication between organizations, the characteristics of the implementor, the social, economic and political conditions, and the disposition of the implementor.

Measuring the performance of policy implementation, of course, requires clear and measurable standards and objectives so that they can be translated into concrete actions (Atrian Chrisopras Setyowati, 2018). Service standards are a necessity that guarantees the quality of public service delivery, a measure that is determined as a provision that must be obeyed and implemented (Sanjaya & Budiana, 2020). Researchers assess that the implementation of local government policies in dealing with liquefaction disasters in Sigi district, especially in the construction of permanent housing for communities affected by the liquefaction disaster in the Village of South Sibalaya and Jono Oge has been good. With this in mind, there are guidelines for implementing government policies in handling liquefaction disasters in Sigi Regency, especially in the construction of permanent housing for disaster-affected communities. The guidelines are obtained directly from the central government. This shows that in dealing with the liquefaction disaster in Sigi district there are good regulations and clear and binding implementation guidelines. So that local government policies already have a focus on implementation.

Resources are very important in implementing the policies that have been determined and resources can also determine the success of a policy (Maiti & Bidinger, 2020). The process of implementing local government policies

in dealing with liquefaction disasters in Sigi Regency in terms of human resources and infrastructure has not been optimal. This is due to a shortage of workers and the authority for facilities and infrastructure that is still being carried out by the central government. This basis is not sufficient for implementers to provide reasons, when responding to unexpected catastrophic events (Sakurai & Murayama, 2019). Whereas the government should have committed large manpower and resources to restore trans-infrastructure in the affected areas because access is a key factor in comprehensive disaster recovery (Chan et al., 2020). Even so, the current human resources are still carrying out their duties properly.

Regarding the construction of permanent housing, especially in the village of Jono Oge, it is still uneven because they use a lottery system. So, there are some people who have obtained huntap that are ready to live in, there are those who have huntap but are not ready to live in, and there are also people who are only limited to getting huntap locations but are still only a milestone, have not been built huntap at all. Facilities and infrastructure resources for the construction of permanent housing for victims of liquefaction in South Sibalaya Village are still lacking. Because the existing development still prioritizes public facilities, namely schools.

As the organizer of permanent housing development, the role of human resources is very important. By utilizing high-quality human resources, residential development activities can still produce professional services for disaster victims, especially the people of South Sibalaya and Jono Oge villages who are communities affected by the liquefaction disaster.

Communication and coordination are needed because without communication and coordination, no matter how perfect a policy is, it will not work properly (Siwij et al., 2020). From the aspect of communication between organizations and strengthening activities, the regional government of Sigi district has done well in disseminating local government policies in dealing with liquefaction disasters in Sigi district. It's just that the community demands the realization of every socialization carried out by the local government. The communication made by the government has not been comprehensive to people in disaster-prone areas. Only part of the community interacts with the government (Arifin, 2020). In fact, the responsiveness of service providers is an important aspect that every implementing apparatus must be aware of (Andi Pasinringi, 2020).

The attitude of the implementers is very important for implementing policies or organizations, especially organizations that serve directly to the community (Silmi et al., 2019). The behavioral trends or characteristics of policy implementers play an important role in realizing the implementation of policies in accordance with the goals or objectives (Putra & Tukiman, 2019). Characteristics of the implementing agency / implementor, operational indicators can be seen from the commitment and responsibility. Talking about commitments, two years after the disaster, there has been no progress in residential development. Whereas previously the government said it would complete construction a year after the disaster. The public sees the performance of the new government as merely conceptual.

Social, economic and political conditions can be seen from the budget support and support from the political elite. If external agencies are supportive, then the implementation of policies will be successful. Conversely, if you refuse the policy will fail. Therefore, in order to be successful, policy makers and their implementers must share a common vision and perception in the policies they take (Aljurida & Zulkifli, 2019; Daniguelo, 2020). The limited budget for residential development in the implementation process caused by Covid-19, received support from the political elite (the House of Representatives), to continue to encourage the regional government of Sigi regency to budget finances. However, to meet budget needs, financial assistance from the private sector is also needed. The government of course must be able to design which one is more priority, so that it can be adjusted to the conditions of the available budget.

This implementor disposition includes three things, namely (a) the implementor's response to the policy, which will be influenced by his willingness to implement the policy, (b) cognition, namely his understanding of the policy, and (c) the intensity of the implementor's disposition, namely the value preference possessed by the implementor (Iasha, 2020). The attitude / tendency (disposition) of the implementers of the operational indicators can be seen from the respond and understanding of the implementers. The attitude of the implementers can be seen from their adherence to government policies that have been made and they already understand that this policy is basically the desire of the community to maximize the implementation of residential development, especially for victims of the liquefaction disaster in Jono Oge Village and South Sibalaya Village. Policy implementers already understand and understand what they must take step by step.

4. Conclusion

Based on the results of research and discussion of the focus of the problem in this study, it can be concluded that the Sigi regency government handling of post-disaster community housing on 28 September 2018 is still not optimal. Because several aspects were studied, there are several indicators that are still not going well: Size / standard and target aspects are good, resource aspects are not good, communication aspects between organizations and implementation activities are good, characteristics aspects of implementing agencies are not good, aspects of conditions social, economic and political conditions are not good, the aspect of attitude / tendency (disposition) of the implementers is good. So this should be a special concern for local governments, to continue to improve their performance in serving the community.

References

- A. Aidi, Z., Farida, H., Law, F., Diponegoro, U., & Soedarto, J. P. (2020). *Natural disaster insurance for Indonesia disaster management*. 12(2), 137–145.
- B. Aljurida, A. M. A., & Zulkifli, M. (2019). Implementasi Kebijakan Brigade Siaga Bencana Implementation of Disaster Alert Brigade Policy in Emergency Response in Bantaeng. *Journal of Governance and Local Politics (JGLP)*, 1(2), 122–136. <https://doi.org/10.47650/jglp.v1i2.23>
- C. Andi Pasinringi. (2020). The Performance Of The National Narcotics Agency In Illegal Drugs Prevention Efforts Of Palu City, Central Sulawesi, Indonesia. *Journal of Public Administration and Government*, 2(1), 1–7. <https://doi.org/10.22487/jpag.v2i1.33>
- D. Ani Susanti, Rulinawaty Kasmad, & Irwan Waris. (2019). Mewujudkan Komitmen Organisasi. *Journal of Public Administration and Government*, 1(1), 1–8. <https://doi.org/10.22487/jpag.v1i1.10>
- E. Arifin. (2020). Efektivitas Implementasi Kebijakan Penanggulangan Bencana Kabut Asap di Kota Pontianak. *JPASDEV: Journal of Public Administration And Sociology of Development*, 1(2). <https://doi.org/10.26418/jpasdev.v1i2.43654>
- F. Atmojo, S., & Muhandis, I. (2019). Sistem Informasi Geografis Bencana Gempa Bumi Dengan Pendekatan Pga Untuk Mitigasi Bencana. *Jurnal Ilmiah Edutic*, 6(1), 10–14. <https://doi.org/10.21107/edutic.v6i1.6074>
- G. Atrin Chrisopras Setyowati, M. S. (2018). Implementasi Kebijakan Penanggulangan Bencana Pada Tahap Tanggap Darurat Bencana Tanah Longsor di Badan Penanggulangan Bencana Daerah Kabupaten Semarang. *Journal Of Public Policy And Management Review*, 7(2). <https://doi.org/10.14710/jppmr.v7i2.19771>
- H. Bao, H., Ampuero, J. P., Meng, L., Fielding, E. J., Liang, C., Milliner, C. W. D., Feng, T., & Huang, H. (2019). Early and persistent supershear rupture of the 2018 magnitude 7.5 Palu earthquake. *Nature Geoscience*, 12(3), 200–205. <https://doi.org/10.1038/s41561-018-0297-z>
- I. Chan, C. S., Nozu, K., & Cheung, T. O. L. (2020). Tourism and natural disaster management process: perception of tourism stakeholders in the case of Kumamoto earthquake in Japan. *Current Issues in Tourism*, 23(15), 1864–1885. <https://doi.org/10.1080/13683500.2019.1666809>
- J. Chen, J., O-tani, H., Takeyama, T., Oishi, S., & Hori, M. (2019). Toward a numerical-simulation-based liquefaction hazard assessment for urban regions using high-performance computing. *Engineering Geology*, 258(April 2018), 105153. <https://doi.org/10.1016/j.enggeo.2019.105153>
- K. Daniguelo, A. (2020). Ontology in Public Administration Includes Potential, Positivism and Rationalism Approaches. *Journal La Sociale*, 1(6), 41-46.
- L. Daswati, D., Samad, M. A., & Wekke, I. S. (2019). Collaborative Governance Dalam Pengelolaan Integrated Community Shelter Pasca Bencana Di Kota Palu Collaborative Governance in the management of Integrated Community Shelters post disaster (ICS) in the City of Palu. *Politik Indonesia: Indonesian Political Science Review*, 5(2), 229–242.
- M. Dewi, I. K., & Susilawati, S. (2019). Implementation of environmental management policies on the impact of illegal sand mining Implementation of environmental management policies on the impact of illegal sand mining. *IOP Conference Series: Earth and Environmental Science*. <https://doi.org/10.1088/1755-1315/343/1/012129>
- N. Dilek, Y., Ogawa, Y., & Okubo, Y. (2021). Characterization of Modern and Historical Seismic–Tsunamic Events, and Their Global–Societal Impacts. *Geological Society, London, Special Publications Characterization*. <https://doi.org/10.1144/SP501-2021-17>
- O. Gao, X., Aziz, A., Raman, A., Hizaddin, H. F., Buthiyappan, A., & Bello, M. M. (2020). Journal of Loss Prevention in the Process Industries Systematic inherent safety and its implementation in chlorine liquefaction process. *Journal of Loss Prevention in the Process Industries*, 65(March), 104133. <https://doi.org/10.1016/j.jlp.2020.104133>
- P. Ho, J., Hyun, S., & Kim, K. A. (2019). Land Use Policy Disaster management and land administration in South Korea : Earthquakes and the real estate market. *Land Use Policy*, 85(March), 52–62. <https://doi.org/10.1016/j.landusepol.2019.03.040>
- Q. Hutabarat, L. E., & Tampubolon, S. (2019). Peningkatan Kesadaran Masyarakat terhadap Kerusakan

- Bangunan dan Lingkungan Pasca Gempa, Tsunami dan Likuifaksi di Palu Sulawesi Tengah. *Jurnal Comunita Servizio*, 1(2), 208–222. <https://doi.org/10.33541/cs.v1i2.1290>
- R. Iasha, C. (2020). Implementasi Kebijakan Penempatan Pos-Pos Badan Penanggulangan Bencana Dan Pemadam Kebakaran Kota Palembang. *Jurnal Ilmu Administrasi Dan Studi Kebijakan (JIASK)*, 3(1), 1–16. <https://doi.org/10.48093/jiask.v3i1.27>
- S. Istianto, H., & Sofiyuddin, H. A. (2019). Optimasi operasi irigasi pada kondisi darurat pasca bencana gempa di Daerah Irigasi Gumbasa, Sigi, Sulawesi Tengah. *Jurnal Irigasi*, 14(2), 103. <https://doi.org/10.31028/ji.v14.i2.49-58>
- T. Jones, K. G., Morga, M., & Wanigarathna, N. (2021). Improving the resilience of existing built assets to earthquake induced liquefaction disaster events. *Bulletin of Earthquake Engineering*, 0123456789. <https://doi.org/10.1007/s10518-020-00979-w>
- U. Jones, K., Morga, M., Wanigarathna, N., Pascale, F., & Yarovaya, L. (2019). Cost-benefit analysis of liquefaction mitigation strategies. *IABSE Symposium 2019 Guimarães: Towards a Resilient Built Environment - Risk and Asset Management*, 447–454.
- V. Jones, K., Pascale, F., & Wanigarathna, N. (2021). Critical evaluation of the customisation process of the UNDRR disaster resilience scorecard for cities to earthquake - induced soil liquefaction disaster events. *Bulletin of Earthquake Engineering*, 0123456789. <https://doi.org/10.1007/s10518-020-00993-y>
- W. Kenney, C. M., & Phibbs, S. (2015). A Māori love story : Community-led disaster management in response to the Ō tautahi (Christchurch) earthquakes as a framework for action. *International Journal of Disaster Risk Reduction*, 14, 46–55. <https://doi.org/10.1016/j.ijdr.2014.12.010>
- X. Liang, C., Lee, C., Lee, J., & Yu, Z. (2020). The Effects of Government-Announced Soil Liquefaction Potential on Housing Prices in Reported Areas : A Two-Stage Spatial Quantile Regression Analysis The Effects of Government-Announced Soil Liquefaction A Two-Stage Spatial Quantile Regression Analysis. *Journal of Real Estate Research*, 0(0), 1–33. <https://doi.org/10.1080/08965803.2020.1810524>
- Y. Lima, A. T., Bastos, F. A., Jakes, F., Jr, T., Neto, R. R., Cooper, A., & Barroso, G. F. (2020). Strengths and Weaknesses of a Hybrid Post-disaster Management Approach : the Doce River (Brazil) Mine-Tailing Dam Burst. *Environmental Management*, November 2015. <https://doi.org/10.1007/s00267-020-01279-4>
- Z. Maiti, & Bidinger. (2020). Analisis Penerapan Program Mitigasi Bencana Pada Badan Penanggulangan Bencana Daerah. *JOPPAS: Journal of Public Policy and Administration*, 2(1). <https://doi.org/10.31539/joppa.v2i1.1802>
- AA. Masud, S., Robinson, D. F., & Sultana, N. (2019). Deskripsi Dampak Gempa Bumi dan Likuifaksi Terhadap Petani di Desa Jono Oge Kabupaten Sigi Provinsi Sulawesi Tengah. *Agroland: Jurnal Ilmu-Ilmu Pertanian*, 26(2), 148–157. <https://doi.org/10.1080/14486563.2019.1682077>
- BB. Napir, S., & Junus, D. (2019). Penguatan Program Prioritas Pemerintah Daerah Dalam Mewujudkan Good Governance Di Kabupaten Gorontalo. *Journal of Public Administration and Government*, 1(1), 34–38. <https://doi.org/10.22487/jpag.v1i1.15>
- CC. Ohsumi, M., Nanazawa, T., Tanimoto, S., & Nakata, M. (2019). Development of a Seismic-Performance Assessment Method and Retrofitting Technology Against the Liquefaction of Existing Bridges. *Journal of Disaster Research*, 14(2). <https://doi.org/10.20965/jdr.2019.p0269>
- DD. Okanya, A. ., Asogwa, J., & Onyedikachi, I. . . (2021). Indoor Environmental Quality (IEQ) in Nigerian Tertiary Institutions: The Effect on Performance of Building Technology Lecturers. *Middle Eastern Journal of Research in Education and Social Sciences*, 2(1), 172-186. <https://doi.org/10.47631/mejress.v2i1.143>
- FF. Putra, E. P., & Tukiman, T. (2019). Implementasi Kebijakan Layanan Tanggap Darurat Bencana pada Badan Penanggulangan Bencana dan Perlindungan Masyarakat di Surabaya. *Dinamika Governance : Jurnal Ilmu Administrasi Negara*, 9(1). <https://doi.org/10.33005/jdg.v9i1.1417>
- GG. Riady Ibnu Khaldun, Syugiarto, & Yulizar Pramudika Tawil. (2019). Analisis Kebijakan Penanggulangan Bencana (Studi Kasus PERDA Kota Palu Nomor 5 Tahun 2011). *Journal of Public Administration and Government*, 1(2), 62–68. <https://doi.org/10.22487/jpag.v1i2.32>
- HH. Rifaldi, M. (2020). Kewenangan Dalam Penetapan Status Bencana. *Tadulako Master Law Journal*, 4(2). <https://doi.org/10.22487/tmlj.v4i2.203>
- II. Sakurai, M., & Murayama, Y. (2019). Information technologies and disaster management – Benefits and issues -. *Progress in Disaster Science*, 2, 100012. <https://doi.org/10.1016/j.pdisas.2019.100012>
- JJ. Samad, A., Erdiansyah, E., & Wulandari, R. (2020). Evaluasi Kebijakan Pemerintah Pasca Bencana (Studi Kasus Bencana di Sulawesi Tengah). *Publik (Jurnal Ilmu Administrasi)*, 9(1), 15. <https://doi.org/10.31314/pjia.9.1.15-24.2020>
- KK. Sanjaya, S. P. A., & Budiana, I. N. (2020). Implementasi Kebijakan Sistem Peringatan Dini Tsunami di Provinsi Bali. *Sorot: Jurnal Ilmu-Ilmu Sosial*, 15(1). <https://doi.org/10.31258/sorot.15.1.1-11>
- LL. Silmi, N. R., Nur, T., & Purwanti, D. (2019). Implementasi Kebijakan Penanggulangan Bencana Daerah di Kota Sukabumi. *JOPPAS: Journal of Public Policy and Administration Silampar*, 1(1), 30–40.

- <https://doi.org/10.31539/joppa.v1i1.800>
- MM. Siwij, D. S. R., Mokat, J. E. ., & Pilomali, C. C. (2020). Implementasi Kebijakan Pemungutan Pajak Hotel Kategori Rumah Kos di Kecamatan Tondano Selatan. *Jurnal Kajian Kebijakan Dan Ilmu Administrasi Negara (JURNAL ADMINISTRISTRO)*, 1(2), 1–6. <https://doi.org/10.36412/jan.v1i2.1633>
- NN. Sukino, W. G., Samad, M. A., Mangngasing, N., & Rivai, A. (2019). Manajemen Mitigasi Bencana Kota Palu Palu City Disaster Mitigation Management. *Journal of Public Administration and Government*, 1(2), 1–8.
- OO. Varo, J., Sekac, T., Kumar, S., & Tectonism, S. Á. (2019). Demarcation of liquefaction zones and risk reduction in Fiji Islands from a geomatics perspective: a case study of Viti Levu Island. *Spatial Information Research*. <https://doi.org/10.1007/s41324-019-00265-1>
- PP. Vasiliki, K., Georgios, S., Ina, C., Vasileios-, T., Stylianos, S., George, K., & Andrea, T. (2020). *Earthquake induced crises: game tree approached risk communication and lessons learnt*. <https://doi.org/10.4401/ag-8405>
- QQ. Wirawan, A., & Widjajanto, D. (2020). Identifikasi Sifat Fisik Tanah Pada Kawasan Terkena. *Agrotekbis : E-Jurnal Ilmu Pertanian*, 8(1), 64–70.
- RR. Yuan, C., Nai, S., Chen, W., Hsi, Y., & Ryan, L. (2020). The impact of soil - liquefaction information disclosures on housing prices: evidence from Kaohsiung , Taiwan. *The Japanese Economic Review*. <https://doi.org/10.1007/s42973-020-00048-6>
- SS. Vincent, D., Ojo , S. ., & Omeje , H. . (2020). Assessing the Utilization of Building Information
- TT. Modelling Software for Project Planning in Construction Industries in Ondo State. *Journal of Advanced Research in Economics and Administrative Sciences*, 1(2), 134-140. <https://doi.org/10.47631/jareas.v1i2.108>
- UU. Zahrah, Z., & Hidayat, Z. (2017). Implementasi Program Kelurahan Siaga Bencana (KSB) di Kecamatan Ngaliyan Kota Semarang. *Journal Of Public Policy And Management Review*, 6(2). <https://doi.org/10.14710/jppmr.v6i2.15605>