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River and Watershed Management Based on Community Driven Program

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ABSTRACT

Guo River is one of the 3 upstream branches in Kuranji, located at Lubuak Tampuruang in Guo Village RT 01 RW 06 Kuranji Village. As an upstream of Guo Riverr, it has several waterfalls with great potential as an ecotourism area in Padang City. This potential is threatened with failure due to river damage that often occurs every year. The amount of sediment carried during the rainy season and the presence of plants planted by the community on theriverbanks have slowed the water flow and eventually caused sediment to accumulate on the cliffs of the middle section of the Guo River. Sediment accumulation causes changes in the river's flow patterns and narrowing of the river's area. The lack of basic river and watershed management knowledge among the people of Guo Village leads to the degradation of land and river functions, and the low level of public awareness of the dangers of uncontrolled logging underlies the damage to the Guo River. Therefore, community-based structural and non-structural measures are needed to implement river management. Structural actions in this service focus on river management through river normalization, and non-structural actionstakeake the form of Focus Group Discussion (FGD) activities between the community and related stakeholders. The normalization of the Guo River will be carried out by cutting vegetation, removing sedimentation, and strengthening triverbanks.s. Through these activities, it is hoped that the community will be able to use the river and maintain it self-sufficiently.

Keywords: Focus Group Discussion (FGD), river normalization, sedimentation

INTRODUCTION

A river, as defined by Government Regulation No. 38 of 2011, is a natural and/or manmade canal or reservoir with a network of water flow, extending from ream to downstream, delineated by boundary lines on the right and left. Guo River is one of the three upstream regions in Kuranji Village, situated on Lubuak Tampuruang Street in Guo Village RT 01 RW 06 Kuranji Village. The Guo River, in its upper reaches, features multiple waterfalls that possess significant potential for ecotourism in Padang City. The waterfalls include Lubuak Tampuruang, Lubuak Kudo, Sarasah Duo Tingkek, Sarasah Tigo Tingkek, and Sarasah Sampik. Besides the waterfalls, Guo Village possesses a cultural heritage exemplified by the unique Minangkabau Baatok Bridge, the sole one in Padang City.



Figure 1. Tourism potential of Guo Village

Effective ecotourism management can significantly enhance the economic quality of the community (Maak et al., 2022). The social environment would be impacted as tourist destinations require amiable individuals to interact with numerous visitors. The advancement of this area will be accompanied by environmental stewardship to maintain its aesthetic appeal. The independent management has resulted in minimal progress regarding the condition of the damaged rivers, bridges, and forests, as well as the lack of adequate road access, despite the regular cleaning efforts conducted by the Komunitas Peduli Sungai Guo (KPSG) around the Guo River. The ecotourism potential of this village is jeopardized by annual river damage (Nurhamidah et al., 2022).

Human activities that engage with rivers in all facets of life significantly impact river conditions (Lusiyana et al., 2021). Human anthropocentrism, which prioritizes the fulfillment of life's needs, engenders the notion that humans are entitled to exploit nature without implementing balanced management (Yanti & Hamid, 2023). The prevalence of illegal logging obstructs the natural process of water infiltration into the soil, rendering this area susceptible to landslides and heightened surface runoff (Harisman et al., 2019). The collapse of the Guo River cliff, precipitated by heightened river water flow during the rainy season, resulted in significant sediment deposition on the cliff of the middle segment of the Guo River. Accumulation of sediment results in alterations to river flow patterns and a reduction in river width. This phenomenon culminates in the river inundating the road, resulting in damage and obstructing access to the Guo River tourist destination. The presence of diverse vegetation cultivated by the community in the sediment accumulation zone reduces the river's flow rate, resulting in increased sediment deposition (Lusiyana et al., 2021).



Figure 2. Guo River flooding in the rainy season

The Guo Village community's insufficient understanding of integrated river and watershed management has led to the deterioration of land and river functions, while the low public awareness of the hazards associated with unregulated logging exacerbates the damage to the Guo River. Consequently, both structural and non-structural community-based interventions are essential for river management. Structural measures may encompass land surface modification, soil conservation, flow retardation, and enhanced infiltration. Non-structural actions encompass three categories: regulatory (rules and policies), defense (education and awareness, warning, evacuation, and relocation), and fiscal methods (insurance and grants) (Ni'matussyahara et al., 2022). These two interventions should be implemented concurrently to enhance the efficacy of river and watershed management (Maulita et al., 2023).

The structural interventions implemented in this service concentrate on river management via river normalization. River normalization aims to enhance river conditions by achieving specific width and depth parameters, hence restoring the river's capacity to effectively drain water and mitigate overflow risks (Lestari et al., 2024). Normalization can be achieved by enlarging the river's cross-sectional dimensions in areas prone to runoff, ensuring that the river's cross section is configured to prevent runoff (Chendratama et al., 2013). River normalization has been extensively used in Indonesian rivers. The efficacy of flood disaster management via river normalization is substantial when executed with appropriate methodologies and implementation. Simulations conducted with Arc-GIS software demonstrated a successful reduction of flood points following the normalization of the Batang Maransi River at several locations (Nurhamidah et al., 2021). Effective disaster mitigation necessitates collaboration between the government and the community (Kusuma et al., 2024).

Before implementing river normalization, it is essential to engage with the community for comprehension and consent, as the planned location of the Guo River normalization segment is situated in the heart of the community. River normalization activities must be conducted in phases. Consequently, to commence the river normalization initiative, the service team executed non-structural measures through Focus Group Discussion (FGD) activities including the community, government, and universities. A Focus Group Discussion (FGD) is a method employed to collect information regarding a certain issue (Zulkarnain & Gusti, 2020). This initiative was conducted to impart understanding and knowledge to the community regarding river management practices through river normalization, facilitated by stakeholders with competence in this domain. This community-driven watershed management initiative aims to enhance the local economy and mitigate the risks of floods and landslides through reforestation and the empowerment of stakeholders.

METHOD

The Focus Group Discussion (FGD) constitutes the initial phase of executing this activity. The program's implementation encompasses the planning process, execution of actions (socialization of watershed management, training and community development, particularly KPSG, and the application of BIM technology in river normalization). The approach for executing operations pertaining to the designated areas is illustrated in Table 1 below.

Table 1. Method of activity implementation associated with the target domain

Activities and Implementation Strategies	Environment	Education	Cultural Society
1. River and Watershed Management			
- Utilization of science and technology for river normalization with BIM technology	☐	☐	☐
- Restoration of riverbanks and sediment conveyance			
- Restoration of the Kuranji watershed upstream			
2. Capacity Building and 'Sekolah Sungai' (River Education)			
- National Seminar to Commemorate World Water/River Day	☐	☐	☐
- Development of KPSG, River OP Officers, and Communities			
- Field study of students: River stroll (Assessment of river damage)			
3. Guo Tourism Village Promotion			
- Management of social media for the youth of Guo Village		☐	☐
- Brochure and guidebook for Guo Village ecotourism			

The assessment of partners' shortcomings and issues is conducted by field observation techniques utilizing a photogrammetric methodology. Photogrammetry is the scientific discipline and technology employed to derive a metric characterization of an object via measuring processes and recorded patterns of electromagnetic radiation (Kafiar, 2020). Photogrammetry is executed by drones that generate 2D aerial images, facilitating the extraction of 3D data to detect alterations in flow patterns and the constriction of river bodies (Apriansyah & Harintaka, 2023). These observations revealed that sediment accumulation had altered the river flow pattern and resulted in the constriction of the river body. Consequently, the river can no longer sustain the water volume during the rainy season. The constriction was also instigated by vegetation on the riverbank, which obstructed water discharge and expedited silt accumulation. These findings provide the foundation for developing suitable solutions to address the challenges encountered by partners. Figure 3 illustrates the flowchart of the activity implementation.

Subsequent to the observations, the service team engaged in conversations with the community (Figure 5). The service team, in collaboration with partners and the authorities surrounding the Guo River, endeavored to educate the community of the river's state and potential remedies. Subsequent to securing community approval, the service team convened discussions with pertinent government agencies. Including the Sumatra V River Basin Center, the Padang City Regional Development Planning Agency, and the Padang City Tourism Office. The purpose of this meeting is to articulate the challenges and opportunities of Guo Village as a tourism destination ile also inviting the agency to engage directly with the Guo community through Focus Group Discussion (FGD) activities.

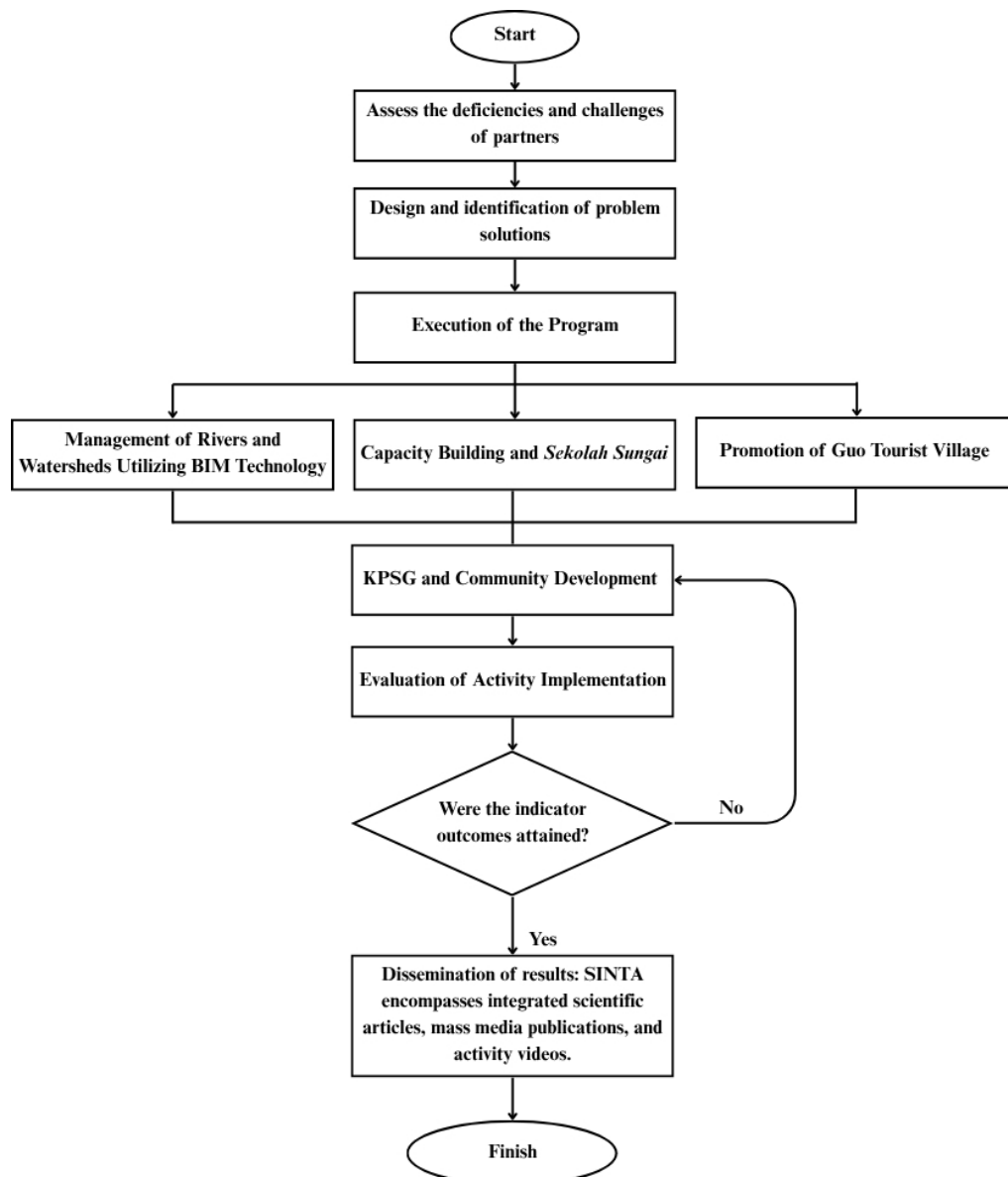


Figure 3. Program Flowchart



Figure 4. Aerial imagery of the constricted section of the Guo River



Figure 5. Preliminary conversation and meeting with the leaders of Guo Village community



Figure 6. (a) Conference with the Tourism Office (b) Conference with the Sumatra V River Basin Center (c) Conference with Bappeda of Padang City

The Focus Group Discussion (FGD) was selected as an effective method for collecting and disseminating diverse perspectives. Consequently, Focus Group Discussion (FGD) activities were conducted to address all issues pertaining to the Guo River with stakeholders and the Guo Village population. The stakeholders involved in this activity comprised the Sumatra V River Basin Agency, Padang City Tourism Office, Padang City Regional Development Planning Agency, Padang City Agriculture Office, and lecturers from Andalas University's Civil Engineering and Architecture departments serving as resource persons. The community, along with students from the civil engineering and architecture programs at Andalas University, participated. The community service team and resource individuals elucidated solutions for river issues, emphasizing river normalization. Furthermore, the community was afforded the opportunity to articulate their demands. The Focus Group Discussion (FGD) enhances communication among stakeholders and the community, consequently augmenting stakeholder participation and direct engagement in village development (Surendra, 2018).

Following community consent for structural enhancements to the river, the program outlined in Table 1 was executed. The elucidation of these programs is as follows.

1. Management of Rivers and Watersheds Utilizing BIM Technology

The river channel has many moderate to severe damages, characterized by a buildup of substantial stone sediments, while the riverbanks are eroded to the limits of residential properties. The implementation of infrastructure enhancements will necessitate the involvement of multiple stakeholders due to the substantial financial investment required. Collaboration with the government and business sector is crucial for the execution of activities. Structural enhancements concentrate on the normalization and rehabilitation of the Guo River bank. Approximately 300 meters of the Guo River is significantly impaired and situated within a residential area. The execution of Guo River normalization and rehabilitation initiatives will be segmented into multiple phases. Each segment will be evaluated beforehand regarding alterations in river morphology that will transpire following the implementation of the operation.

2. Capacity Building and *Sekolah Sungai*

Comprehensive consultations with the Lurah, RW, RT, community leaders, as well as KPSG and POKDARWIS (Kelompok Sadar Wisata), must be undertaken. Subsequently, it is augmented to fortify partnerships with the government and the World of Business and Industry (DUDI). The formulation of proposals is a crucial component of the capacity-building agenda, particularly for KPSG and POKDARWIS, as certain actions cannot be executed independently by the community to attain larger objectives and advantages. The signs of success from this activity are that the community has enhanced its understanding of the issues present in the village and has developed a sensitivity towards problem-solving. If issues can be addressed individually, the community can together resolve them through mutual assistance. Gotong royong activities are organized weekly, with increased participation compared to before this program. Fundamental training is essential for enhancing community competence.

River tracing activities occur concurrently with various events commemorating World Water Day in March and World River Day in September. This is a call to action for all societal elements to collaboratively conserve water, rivers, and the environment. River trips, field lectures, workshops, and social activities constitute a variety of activities at Sekolah Sungai. This initiative is executed perpetually to socialize and empower the community.

3. Promotion of Guo Tourism Village

The promotion of Guo Village ecotourism is executed through the empowerment of KPSG and POKDARWIS via socialization, training, and mentoring. This process encompasses several stages, including the formulation of strategies to target ecotourism visitors, the preparation of social media content, and the evaluation of each social media platform. Furthermore, promotional materials, including brochures and guidebooks, will be disseminated by the Padang City tourism office.

Every activity will undergo an evaluation step to verify accountability and confirm adherence to defined criteria. The evaluation techniques for assessing the execution of activities and program sustainability include conversations, presentations, and the formulation of periodic plans aligned with the prioritized needs of Guo Village.

RESULTS AND DISCUSSION

This chapter provides a summary of the outcomes from the execution of the previously outlined activities. The subsequent initiatives were conducted to tackle significant environmental and social issues, primarily concentrating on enhancing river management, developing community capacity, and fostering hydroecotourism. The outcomes of this initiative are delineated in the subsequent table.

Table 2. Outcomes of the execution of program activities

No.	Solution	Target	Indicators	Description
1.	Management of rivers and watersheds via BIM technology	a. Utilization of science and technology for river normalization with BIM technology	Formation of collaboration with the West Sumatra River Basin Center V Province	Achieved
		b. Restoration of riverbanks and sediment conveyance	Three-dimensional design of the riverbank model, bill of quantities, and implementation schedule	Achieved

No.	Solution	Target	Indicators	Description
			for the normalization of the Guo River (Figure 7)	
		c. Rehabilitation of the Upper Kuranji Watershed	One hundred tree seedlings planted	Achieved
2.	Capacity Building and Sekolah Sungai	a. Seminar for the Commemoration of World Water/River Day	Executed once for each activity	Achieved
		b. Advancement of KPSG, River OP Officers, and Communities	Executed once for each activity	Achieved
		c. Public lecture for students	Executed once for each activity	Achieved
		d. Assessment of River Damage	Executed once for each activity	Achieved
3.	Promotion of Guo Tourism Village	a. Training in social media management for the youth of Guo village	One Instagram account, YouTube channel, and TikTok profile for Guo Tourism Village	Achieved
		b. Training in social media management for the kids of Guo village	Five hundred brochures and twenty-five copies of the Guo Tourism Village Book were printed.	Achieved

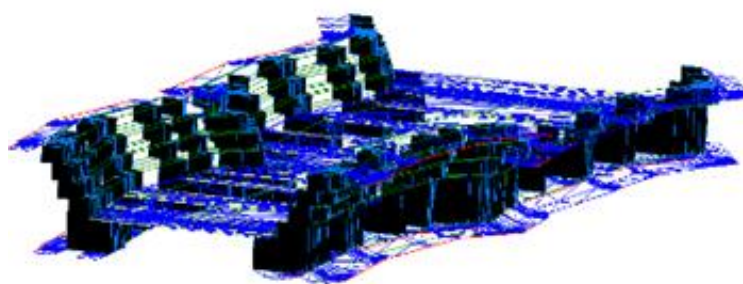


Figure 7. Three-dimensional perspective of the river

CONCLUSION

River normalization works involved the removal of vegetation from the riverbanks conducted between 22 and 25 October 2024. This exercise was conducted in collaboration with the Sumatra V River Basin Center and the Guo Village community. The subsequent phase involves the extraction of sediment from the river and the fortification of the riverbanks. This second step will occur following additional observation of the river's shape, particularly after significant rainfall events. This seeks to guarantee suitable and efficient management protocols. Subsequent to the Focus Group Discussion (FGD) activity, the residents of Guo Village, who had previously opposed river normalization procedures, have now acknowledged and comprehended that such actions represent the most effective approach to restore the river's current functionality. The objectives of the Focus Group Discussion (FGD) activities have been accomplished, as the community and relevant institutions collaborated to advance the village. Intensive interactions with diverse

stakeholders have enhanced the community's competency and awareness in independently resolving issues. Activities at Sekolah Sungai, including river tracing, field lectures, workshops, and other initiatives aimed at socializing and empowering the community, enhance community awareness of environmental issues in the village and promote active involvement in collaborative river conservation efforts. This initiative has established a weekly timetable for gotong royong activities, resulting in significantly increased community participation compared to prior implementation. This demonstrates that increasing awareness and education via Sekolah Sungai has fostered beneficial transformations in cultivating community cohesion and environmental stewardship. This service initiative has effectively generated digital promotional content through YouTube, Instagram, and TikTok accounts, designed to showcase the ecotourism potential of Guo Village to a broad audience. Moreover, brochures and guidebooks for Guo Village ecotourism have been published, encompassing comprehensive information regarding destinations, activities, and the village's distinctiveness. The brochure and guidebook have been ceremonially transferred to the Padang City Tourism Office to promote the advancement of community-based tourism. This initiative aims to enhance tourist appeal and visitation to Guo Village while fostering sustainable local economic development.

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REFERENCES

- Apriansyah, M., & Harintaka. (2023). Pembuatan Model 3D Bangunan LoD3 Dengan Pemanfaatan Foto Udara dan Fotogrametri Terrestri Making 3D Building Models of LoD3 Using Aerial Photography and Terrestrial Photogrammetry. *Geoid: Journal of Geodesy and Geomatics*, 18(2), 243–252.
- Chendratama, E., Dian, P., Sriyana, A. W., & Pranoto, S. (2013). Perencanaan Normalisasi Sungai Blukar Kabupaten Kendal. *Jurnal Karya Teknik Sipil*, 2(2), 228–240. <https://ejournal3.undip.ac.id/index.php/jkts/article/view/4079>
- Harisman, K., Frasetya, B., Sudrajat, A., Birnadi, S., & Sholeha, M. (2019). Penanaman Pohon Sebagai Upaya Menjaga Cadangan Air Tanah Dan Mencegah Bahaya Erosi Di Kecamatan Cibiru. *Al-Khidmat*, 2(1), 34–39. <https://doi.org/10.15575/jak.v2i1.5344>
- Kafiar, M. T. (2020). Visualisasi 3d Modelling Dari Hasil Kombinasi Kamera Dslr Dan Uav Dengan Metode Close Range Photogrammetry (Studi Kasus: Objek Plengsengan, Bendungan [http://eprints.itn.ac.id/4623/%0Ahttp://eprints.itn.ac.id/4623/3/BAB II.pdf](http://eprints.itn.ac.id/4623/%0Ahttp://eprints.itn.ac.id/4623/3/BAB%20II.pdf)

- Kusuma, M. B. A., Yudha, H. F. A., & Al Amin, M. N. F. (2024). Analisis Fishbone Pengambilan Keputusan Kebijakan Normalisasi Sungai di Kota Surabaya. *ARIMA: Jurnal Sosial Dan Humaniora*, 1(4), 106–111. <https://doi.org/10.62017/arima.v1i4.1042>
- Lestari, L. W., Al Qibtiyah, N. D. M., Nugraha, I. C., Qibtiyah, M., & Shafira, S. (2024). Mitigasi bencana banjir melalui normalisasi Daerah Aliran Sungai Beringin dan pemanfaatan flood early warning system di Kelurahan Mangkang Wetan. *Region: Jurnal Pembangunan Wilayah Dan Perencanaan Partisipatif*, 19(1), 211. <https://doi.org/10.20961/region.v19i1.65726>
- Lusiyana, L., Akbar, A. A., & Desmaiani, H. (2021). Pengaruh Aktivitas Manusia terhadap Beban Pencemaran Sub DAS Sungai Rengas, Kalimantan Barat (The Influence of Human Activities on Pollution Load on The Rengas River Sub Water, West Kalimantan). *Jurnal Teknologi Lingkungan Lahan Basah*, 9(2), 090. <https://doi.org/10.26418/jtlb.v9i2.48110>
- Maak, C. S., Muga, M. P. L., & Kiak, N. T. (2022). Strategi Pengembangan Ekowisata terhadap Ekonomi Lokal pada Desa Wisata Fatumnasi. *OECONOMICUS Journal of Economics*, 6(2), 102–115. <https://doi.org/10.15642/oje.2022.6.2.102-115>
- Maulita, R., Parahita, B. N., & Trinugraha, Y. H. (2023). Mitigasi Bencana Banjir Rob di Mangkang Wetan: Tindakan Sosial Masyarakat dan Kapabilitas Struktural. *Jurnal Sosiologi Agama Indonesia (JSAI)*, 4(2), 178–200. <https://doi.org/10.22373/jsai.v4i2.2782>
- Ni'matussyahara, D., Muryani, C., & Wijayanti, P. (2022). Study Of Implementation Of Flood Risk Management (FRM) To Minimize The Impact Of Damage Caused By Flood Disaster Risk In A Region: Literature Review. *Social, Humanities, and Educational Studies (SHES): Conference Series*, 5(4), 281. <https://doi.org/10.20961/shes.v5i4.69072>
- Nurhamidah, N., Junaidi, A., Ferial, R., Syukur, M., & Marliana, D. F. (2022). Identifikasi Kerusakan pada Hulu Sungai Guo melalui Kegiatan Susur Sungai di Desa Guo Kuranji. *Warta Pengabdian Andalas*, 29(3), 329–340. <https://doi.org/10.25077/jwa.29.3.329-340.2022>
- Nurhamidah, N., Junaidi, A., Ramadhan, H., & Putra, R. E. (2021). The effects of river normalization on flood risk. 08003, 1–6.
- Surendra, G. (2018). Komunikasi Antar Stakeholder Dalam Pengembangan Desa Wisata Kubu Gadang Di Kota Padang Panjang. *Energies*, 6(1), 1–8. <http://journals.sagepub.com/doi/10.1177/1120700020921110%0Ahttps://doi.org/10.1016/j.reuma.2018.06.001%0Ahttps://doi.org/10.1016/j.arth.2018.03.044%0Ahttps://reader.elsevier.com/reader/sd/pii/S1063458420300078?token=C039B8B13922A2079230DC9AF11A333E295FCD8>
- Yanti, I., & Hamid, I. (2023). Perilaku Antroposentrisme Masyarakat Terhadap Lingkungan Sungai di Desa Lupak Dalam Kecamatan Kapuas Kuala Kabupaten Kapuas. *Huma: Jurnal Sosiologi*, 2(1), 95–105. <https://doi.org/10.20527/h-js.v2i1.42>
- Zulkarnain, R., & Gusti, R. (2020). Implementasi Teknik Forum Group Discussion (Fgd) Dalam Meningkatkan Kualitas Hasil Belajar Melalui Mata Kuliah Seminar Proposal Skripsi. *Jurnal Obor Penmas: Pendidikan Luar Sekolah*, 3(2), 292. <https://doi.org/10.32832/oborpenmas.v3i2.3613>