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Management of Indonesian Lake Area: Systematic Literature Review (SLR)

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ABSTRACT

This paper aims to identify strategic steps in lake area management by conducting a Systematic Literature Review (SLR) to analyze the management methods of several lakes in Indonesia that have been exploited or degraded due to human activities through various lake area management mechanisms. Research Question is used to determine the previously established problem formulation, also utilizing the PICOC elements. The results of the research found that several types of lake management mechanisms are influenced by community participation and enthusiasm, as well as government policies that affect the success rate of lake management. Finally, this research provides recommendations that can be implemented by studying successful lake area management to improve the effectiveness and efficiency of lake area management.

INTRODUCTION

Lakes as a landscape have their own uniqueness that provides special characteristics to the area that has it because lakes have many functions, both as water reserves, places for people's livelihoods and unique species that support and form the lake ecosystem. According to Augusta (2015), lakes are lentic waters or water bodies that are part of freshwater ecosystems that are often associated with nutrient content. Lake water is influenced by hydrological conditions and physicochemical parameters that support the biota community whose existence enriches the lake ecosystem. It has become common for people to live around water areas, for easy access to water use for daily life. However, nowadays, the unwise use of land around the lake, disposal of household waste and the like, unwise land use has damaged the lake ecosystem (Sudarmadji et al., 2015; N. S. Tobing & Harahap, 2024; S. J. L. Tobing & Kennedy, 2017).

Since the 1st National Conference of Indonesian Lakes in Bali in 2009, the government through 9 Ministries has signed the Bali Agreement on Sustainable Lake Management of 15 Priority

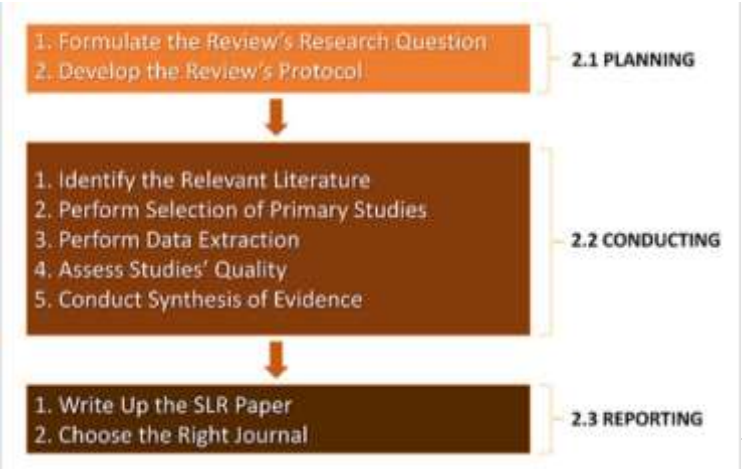
Lakes in Indonesia. There are 7 points of the agreement, including: 1. Lake Ecosystem Management, 2. Utilization of Lake Water Resources, 3. Development of Monitoring, Evaluation and Information Systems, 4. Preparation of Adaptation and Mitigation Steps, 5. Capacity Development, Institutions and Coordination, 6. Increasing Community Roles, and 7. Sustainable Funding (Simatupang et al., 2022). However, efforts to save the environment of lakes in Indonesia have been very slow in their implementation in the field. Along with the issuance of Presidential Regulation (Perpres) of the Republic of Indonesia No. 60 of 2021 concerning the Rescue of National Priority Lakes, the commitment of the government and related parties is awaited by the wider community. Therefore, Perpres No. 60 of 2021 needs to be monitored so that it can produce concrete and sustainable rescue from environmental degradation. The 15 priority lakes are; Lake Toba, North Sumatra; Lake Singkarak and Lake Maninjau, West Sumatra; Lake Kerinci, Jambi; Lake Rawa Danau, Banten; Lake Rawa Pening, Central Java; Lake Batur, Bali; Lake Tondano, North Sulawesi; Mahakam Cascade Lake (Melintang, Semayang, and Jempang) East Kalimantan; Lake Sentaru, West Kalimantan; Lake Limboto, Gorontalo; Lake Poso, Central Sulawesi; Lake Tempe, South Sulawesi; Lake Matano, South Sulawesi and Lake Sentani, Papua (Akbar, Indar, et al., 2023; Lamangida et al., 2017).

The categorization of environmental damage to these 15 lakes includes being in a state of severe, moderate and light threat. The launch of these 15 priority lakes was carried out to anticipate the critical condition of the lake as a buffer for the surrounding ecosystem. Various kinds of research and lake rescue programs have been carried out to preserve through reforestation around the lake area, for example, starting from planting around the lake area, saving and reforesting the river body which is the source of the lake's water, educating the community in the use of natural resources and building institutions or organizations of lake lovers and with the aim of increasing the preservation of the lake and building public awareness and love for the lake in their respective areas (Akbar, Djafar, et al., 2023; Hasim & Akbar, 2020)

In this study, the author focuses on the management of lake areas starting from controlling the use of the potential of the lake area, both natural resources such as water and similar fish, environmental services such as tourism and conservation of the lake area with the aim of restoring the lake area, either by reforesting the area around the lake, dredging the lake to restore the water level of the lake or establishing a special agency or institution for the restoration of critical lakes.

Theoritical Review

This research method is through the System Literature Review (SLR), namely a systematic review method that goes through 3 major stages, namely Planning, Conducting and Reporting.



Planning

Research Question (RQ) is the initial and basic part of the SLR. RQ is used to guide the literature search and extraction process. Data analysis and synthesis, as the result of SLR, are the answers to the RQ that we determined in advance. A good RQ is one that is useful, measurable, and directed towards understanding the state-of-the-art research of a research topic.

The formulation of RQ must be based on five elements known as PICOC:

Population (P): Target group of the investigation

Intervention (I): Detailed aspects of the investigation, or issues of interest to the researcher

Comparison (C): Aspects of the investigation where Intervention (I) will be compared

Outcomes (O): Effects and results of Intervention (I)

•Context (C): Setting and environment of the investigation

Conducting

The conducting stage is the stage that contains the implementation of SLR, which should be in accordance with the SLR Protocol that we have determined. Starting from determining the literature search keyword (search string) which is based on the PICOC that we have designed in advance. Understanding synonyms and alternative word replacements will determine the accuracy of our literature search. Then the next step is determining the source (digital library) of the literature search. Because the literature that we collect will be very large, maybe hundreds or thousands of papers, it is recommended to use software tools to make it easier for us to manage literature such as Mendeley, Zotero, EndNote, etc.

Through the literature filtering process, in addition to inclusion and exclusion criteria, we must also conduct a quality assessment of the hundreds of literatures that we find. Kitchenham et al. (2007) recommend that the assessment of literature quality should be based on the five parameters below:

• Has the data analysis process been carried out correctly?

• Has residual and sensitivity analysis also been carried out?

• Is statistical accuracy taken from raw data?

• How good is the comparison of methods carried out?

• How big is the size of the dataset used in the research?

Reporting

Reporting is the stage of writing the SLR results in written form, either to be published in the form of a paper to a scientific journal or to compile Chapter 2 on the Literature Review of our thesis/dissertation. The writing structure of the SLR usually consists of 3 large parts, namely: Introduction, Main Body and Conclusion. The Introduction section will contain the background and basis for why SLR on a topic is important and must be done. While the Main Section will contain the SLR protocol, the results of the analysis and synthesis of the findings, and ends with a discussion that discusses the implications of the SLR results. The Conclusion section will contain a summary of the findings we obtained, in accordance with the RQ that we set in advance.

METHODOLOGY AND PROCEDURES

The study in writing this article uses Systematic Literature Review (SLR) following the guidelines from Wahono (2015) which in its analysis uses five important stages including (1) Planning, (2) Conducting, (3) Reporting, As an initial step the author determines what Research

Questions (RQ) are the vehicles in conducting research, which are expected to get the state of the art in a research topic. Planning with the SLR method will be interesting when applying the PICOC mechanism. The elements in the PICOC mechanism include the following: (1) Population, Target group used in its analysis related to the formation of a coalition due to the impact of policy issues that are not pro-environment. (2) Intervention, detailed aspects that will be analyzed related to the issues raised, (3) Comparison, Aspects of the issue tracing that will later be compared, (4) Outcomes, Effects and results of Intervention, and (5) Context, which relates to the setting and environment analyzed. The five elements related to PICOC can be seen as follows (Table 1).

Table 1. The Role of Fiscal Decentralization in Enhancing Local Government Service Delivery in the Philippines

Elemen	J0urnal 1	Jurnal 2	Jurnal 3	Jurnal 4	Jurnal 5	Jurnal 6
Population						
Intervention						
Comparison						
Outcomes						
Contexs						

Source: Wahono, 2015.

RESULTS AND DISCUSSION

The discussion section in this article is the conducting section in the SLR study of selected journal articles. Based on the study using SLR, the following data and analysis can be provided.

Tabel 2. Presentation of SLR Study Data Selected Journal Articles

Element	(Widya et al., 2021)	(Soejarwo et al., 2022)	(Yusuf et al., 2023)	(Rahmawati et al., 2023)	(Sihombing et al., 2023)	(Akbar, Djafar, et al., 2023)
Population	The community around Lake Kerinci, Kerinci Regency, relies on the lake for fishing, tourism, agriculture, and drinking water.	Lake Maninjau, KJA at Lake Maninjau	The coastal communities of Lake Tempe in the districts of Tempe, Belawa, Tanah Sitolo, Maniangpajo, and Sabbangparu, Wajo Regency, as well as experts as AHP resource persons.	Local communities, fisheries extension workers, community leaders, and traditional leaders in the Towuti and Nuha sub-districts, East Luwu Regency (51 respondents). Solihin et al. (2012)	The community in 8 districts around Lake Toba, stakeholders (government, investors, tourists), and BPODT informants (Directors, Division Heads). Arsyad (1999), Yoeti (1997)	Stakeholders: local communities around the lake, NGOs (Japesda, Biota), private sector (PT SMS, PT Bumi Karsa), government (BAPPEDA, PUPR, BWSS II Sulawesi), academics, and community leaders. Chaffin et al. (2014), Folke et al. (2005), Koentjaranin grat (2000)
Intervention	Sustainable management of Lake Kerinci uses MDS (Rap-	regulation of KJA Through a moratorium policy for	Management of Lake Tempe as a source of clean water through	Sustainable management using the MDS approach, with a focus on	BPODT's strategic steps: attracting investors (investment	Adaptive governance model: identification

	Lake) to evaluate ecological dimensions (land cover, erosion, water quality), economic dimensions (sedimentation, monitoring tools, technology), and socio-cultural dimensions (regional regulations, population pressure, local wisdom).	affected KJA cultivators	communal water treatment, the establishment of the Lake Tempe Authority, and pre-treatment facilities at the intake location.	mining waste management, endemic fish conservation, and stakeholder conflict resolution. Putra and Wardani (2017), Purnama Wati (2018), Asnil et al. (2013)	forum), increasing tourist visits (social media promotion, W20 events, F1H2O, films), encouraging sustainable tourism (high-tech TCR, community empowerment), and infrastructure development (Silangit Airport, toll roads).	of stakeholder motivations (economic, cultural), cross-sector coordination structure (Limboto Lake Area Forum), resource exchange network (dredging, canals, community education).
Comparison	Sustainability index compared with Kavanagh and Pitcher (2004) categories; current degradation conditions vs. ideal management; MDS results vs. Monte Carlo.Kavanagh and Pitcher (2004), Nontji (2016)	The damage caused by the increase in the number of KJA in Lake Maninjau has caused the water quality in Lake MANINJAU to become polluted due to excessive feed (pellets) and the fish production is of poor quality due to the oxygen in the lake no longer being able to accommodate the number of fish cultivated in KJA.	Comparison of the roles of government, society, and private sector using AHP (Saaty Scale); conceptually compared to current environmental degradation conditions. Bahri (2016), Widiatmaka et al. (2015) (from Malili document)	Sustainability scores are compared with Thamrin categories (Hamdani, 2014) and the reference points of "good" (100%) and "bad" (0%) in the MDS; conceptually compared with Widiatmaka et al. (2015) on land degradation.	BPODT strategic steps vs. authoritative/coordinative tasks of Presidential Decree No. 49/2016; current conditions (slow implementation) vs. super priority destination vision; TCR vs. other super priority destinations (Borobudur, Mandalika, etc.).	Current management (weak coordination, ineffective Perda No. 1/2008) vs. ideal AG model (integrated coordination, active community); current stakeholder involvement vs. ideal involvement in AG.
Outcomes	Multidimensional: 71.89 (quite sustainable); Ecology: 55.63 (quite sustainable); Economy: 62.74 (quite sustainable); Socio-Cultural: 62.90 (quite sustainable). Sensitive attributes: land	reduction of KJA to 6,000 plots from 17,000 plots; water pollution in Lake Maninjau is decreasing; the community's economy is becoming more	Low access to clean water (quality, location, sustainability); government has the largest role (weight 0.45); recommendations of the Tempe Authority Agency and pre-treatment facilities. Istogomah et al. (2022), Connell	Environment: 94.53 (very sustainable); Ecology: 76.52 (very sustainable); Socio-Economy: 71.55 (quite sustainable). Mahida et al.(2019), Barus (2004)	Good strategic planning but slow implementation; innovative TCR (Bobocabin, UMKM, theater), disability friendly; increasing visits through promotion; community empowerment through training and UMKM; challenges: lack of	Strong stakeholder motivation but community activities damage the environment; weak coordination and networks; private revitalization projects

	cover, erosion, water quality (ecology); sedimentation, monitoring tools, technology (economy); Regional regulations, population pressure, local wisdom (socio-cultural).	organized; the fish produced are healthier and have good quality	and Miller (1995), Surur (2019)		investors, lake use conflicts, deforestation.	underway (Rp1 trillion); challenges: environmental degradation (68.3% shrinkage, 91.7% depth), poor coordination.
Contexs	Lake Kerinci, Jambi, 2021, a tectonic lake with water supply from TNKS; challenges of sedimentation, pollution, and community dependency; national priority of the First Indonesian Lakes Conference (2009).	Lake Maninjau, Agam Regency, West Sumatra, Indonesia. National and regional policies, including Presidential Regulation No. 60 of 2021 and Agam Regency Regulation No. 5 of 2014.	Lake Tempe, March-May 2022, with shallowing due to erosion, water hyacinth growth, and water turbidity; communities depend on the lake for clean water and fisheries.KLH (2006, 2012), Bahri (2016), Unicef Indonesia (2012), Wikipedia (2017)	Malili Lake Complex, South Sulawesi, March 2023, with challenges of mining, endemic fish conservation, and socio-economic conflicts.KLH (2014), Pattiselanno & Arobaya (2013), Puspita et al. (2005), Widiatmaka et al. (2015), Setianingtias et al. (2019)	Lake Toba, April-July 2023, authoritative zone (TCR, ±386 ha) and coordinating (8 districts); super priority destination "10 New Bali"; challenges of utilization conflicts, deforestation, weak local wisdom, and developing infrastructure.	Limboto Lake, Gorontalo (30% of Gorontalo City, 70% of Gorontalo Regency); critical condition (shrinking area and depth, sedimentation, pollution); Regional Regulation No. 1/2008 is less effective; the function of the lake is as conservation, water, fisheries, tourism. Chaffin et al. (2014), Hasim (2011), Wyborn (2015)

Source : Diolah oleh Tim Penulis, 2025

Discussion

Based on the table of results of the SLR method, it can be identified that management of areas in several lakes in Indonesia can be carried out using the coalition method and the formation of institutions that increase the intensity of community contributions in managing lake areas.

Population

From the results of the SLR identification in the 6 selected journals, it can be identified that society is always an important subject in influencing a policy by carrying out a policy advocacy

approach carried out by society by forming a coalition that has the same orientation to become a power and at the same time influence a policy.

Intervention

From the results of the SLR identification of the 6 selected journals, it can be identified that in the implementation of lake area management, it is necessary to involve many parties, both the community and investors as managers of potential in the fields of results and tourism as well as the government as a policy maker for lake area management. Increasing local community awareness in lake area management needs to be increased to ensure the continuity of the existence and management of the lake.

Comparison

From the results of the SLR method identification, it was found that lake area management activities carried out by the community are generally destructive and there needs to be socialization and involvement of the relevant government in managing the lake area.

Outcomes

From the SLR Method on 6 journals shows that community contribution in lake area management is very much needed in the success of management in accordance with the target. It can be concluded that the approach through socialization of lake area management with the aim of increasing income in a conservative way can increase community enthusiasm to participate in lake management based on improving facilities and government regulations.

Context

From the results of the SLR method identification that has been carried out, it was found that the context of the problems that occurred was in the regional scope, namely local governments with different problems and management methods.

Based on the discussion above, the SLR method shows that the implementation of lake area management initially tends to be exploitative so that as a researcher there must be actions in the form of coordination and socialization to the government and local communities. Here it can be seen that collaboration between communities who understand the need to maintain the sustainability of the lake area and a responsive and cooperative government increases the success of better lake area management to support the community around the lake in living ecologically.

In fighting for the management of the lake area to be maintained and sustainable, the role of community groups is very important by forming a coalition (social movements, communities, etc.) to influence policies made, especially policies that pay less attention to the sustainability of the lake area ecosystem. SLR has also been able to show a way to apply lake area management methods that are in accordance with conservative principles based on appropriate government regulations and policies.

CONCLUSION

Reflecting on the SLR method, namely Planning, Conducting and Reporting, it can be concluded that building public awareness of the importance of the continuity of the lake area is very necessary as the surrounding community is the party closest to the lake area and directly interacts with it. Likewise, the active role of the local government increases the success of sustainable lake area management

REFERENCES

Akbar, M. F., Djafar, F., & Tolinggi, A. Y. (2023). Limboto Lake Management Model Based on Adaptive Governance. *Journal La Sociale*, *4*(5), 341–356.

Akbar, M. F., Indar, N. I. N., & Abdullah, M. T. (2023). Analysis of Adaptive Governance: Overview of the Concept of Structure in Limboto Lake Management in Indonesia. *1st UMSurabaya Multidisciplinary International Conference 2021 (MICon 2021)*, 608–620.

Augusta, T. S. (2015). Analisis hubungan kualitas air terhadap komunitas zooplankton dan ikan di Danau Hanjalutung. *Jurnal Ilmu Hewani Tropika (Journal Of Tropical Animal Science)*, *3*(2), 30–35.

Hasim, M., & Akbar, F. (2020). *Ecosystem-Based on Bibilo Fishery Management as a Sustainability Strategy at Limboto Lake*.

Lamangida, T., Akib, H., Akbar, M. F., & Aswar, M. (2017). Actors' Role in Public Asset Management--A Study of Limboto Lake in Gorontalo, Indonesia. *International Conference on Administrative Science (ICAS 2017)*, 218–221.

Rahmawati, R., Jompa, J., Budimawan, B., & Arief, A. A. (2023). Pengelolaan Berkelanjutan Kompleks Danau Malili Sulawesi Selatan dengan Menggunakan Pendekatan Multi Dimensional Scaling (MDS). *Juvenil: Jurnal Ilmiah Kelautan Dan Perikanan*, *4*(3), 234–245.

Sihombing, W. M. S., Hutahaean, M., & Panjaitan, M. (2023). Langkah Strategis Badan Pelaksana Otorita Danau Toba dalam Mewujudkan Danau Toba Sebagai Pariwisata Super Prioritas Indonesia. *Jurnal Ilmu Sosial Dan Politik*, *3*(2), 257–273.

Simatupang, K. H., Arlan, A., & Felicia, A. (2022). Urgensi penyelamatan danau prioritas di Indonesia: Studi kasus upaya dan komitmen penyelamatan lingkungan hidup Danau Toba. *Journal of Tourism and Creativity*, *6*(2), 216–223.

Soejarwo, P. A., Koeshendrajana, S., Apriliani, T., Yuliaty, C., Deswati, R. H., Sari, Y. D., Sunoko, R., & Sirait, J. (2022). Pengelolaan perikanan budidaya keramba jaring apung (KJA) dalam upaya penyelamatan Danau Maninjau. *Jurnal Kebijakan Sosial Ekonomi Kelautan Dan Perikanan*, *12*(1), 79–87.

Sudarmadji, S., Supriyono, H., & Lestari, S. (2015). Danau-Danau Volkanik Di Dataran Tinggi Dieng: Pemanfaatan dan Masalah Lingkungan Yang Dihadapi. *Jurnal Teknosains*, *5*(1), 36–48.

Tobing, N. S., & Harahap, R. H. (2024). Dampak Adanya Pertumbuhan Eceng Gondok dalam Skala Besar Terhadap Ekosistem di Kawasan Danau Toba. *Jurnal Ilmu Sosial Dan Ilmu Politik*, *5*(2), 225–234.

Tobing, S. J. L., & Kennedy, P. S. J. (2017). Pengelolaan ekosistem danau toba secara berkelanjutan (sustainable development). *Seminar Nasional Dan Call Papers Seminar Inovasi Manajemen, Ekonomi Dan Akuntansi Blue Economy Menembus Globalisai*.

Widya, K., Muhammad, D., & Rosyani, R. (2021). Analisis Keberlanjutan Pengelolaan Danau Kerinci. *Jurnal Pembangunan Berkelanjutan*, *4*(1), 64–74.

Yusuf, A. R., Cangara, S., Akrim, D., Prasanti, S., & Syahrir, S. (2023). Strategi Kebijakan Pengelolaan Danau Tempe sebagai Sumber Air Bersih Masyarakat di Kabupaten Wajo. *JEBE: Journal of Environment Behavior and Engineering*, *1*(1), 8–13.