

Strengthening the Governance of the Toba Caldera Geosite Through Adaptive Governance: Opportunities and Challenges

Siti Hajar¹; Kholilul Kholik²; Azizul Kholis³

¹*Universitas Muhammadiyah Sumatera Utara
Departement of Public Administration Science, Faculty of Social and Political Sciences,
Universitas Muhammadiyah Sumatera Utara, Indonesia; email: siti_hajar@umsu.ac.id*

²*Universitas Pembangunan Panca Bud, Indonesia*

³*Universitas Negeri Medan, Indonesia*

Abstract

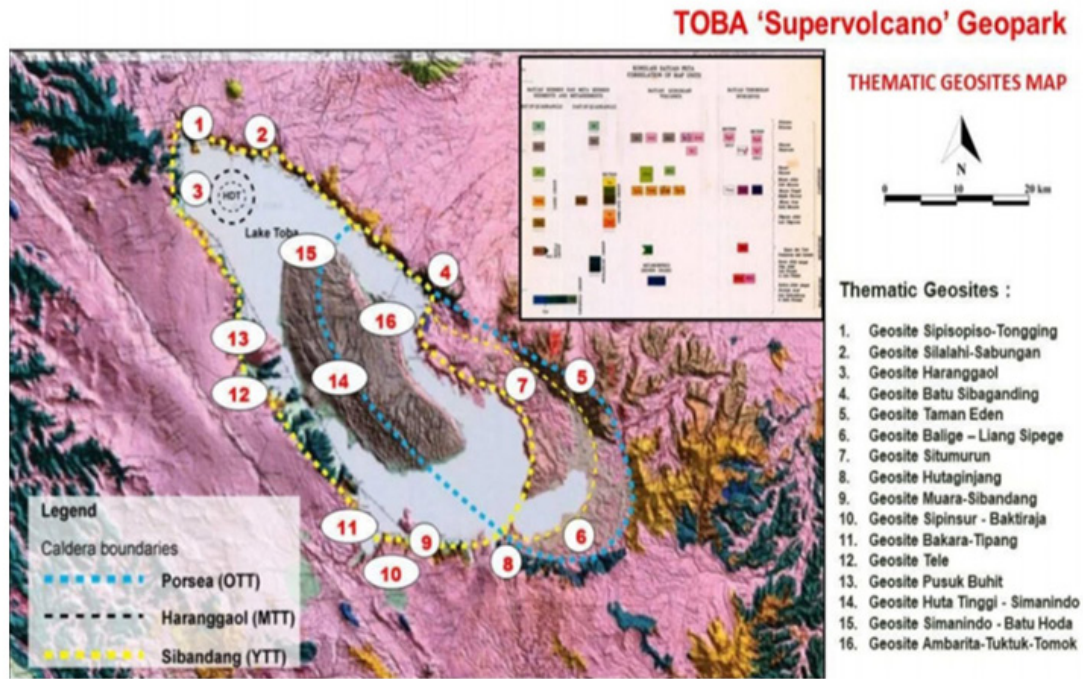
The adaptive governance approach is an important instrument in realizing sustainable tourism, thus the importance of managing Geopark areas that are not only oriented towards economic aspects, but also emphasize social, cultural, and environmental dimensions. The purpose of this study is to analyze the opportunities and challenges in strengthening the governance of the Toba Caldera Geosite in Samosir Regency. The method used is a qualitative case study. The results show that strengthening geosite governance has the opportunity to develop, because it is supported by UNESCO geopark regulations and has a GreenCard, local community involvement, although not optimal, and the potential for a creative economy based on Batak culture. However, the main challenges faced are limited inter-institutional coordination, low human resource capacity, and poor integration of cross-sectoral policies.

Keywords: Adaptive Governance; Collaborative Policy; Geopark Kaldera Toba; Geosite

INTRODUCTION

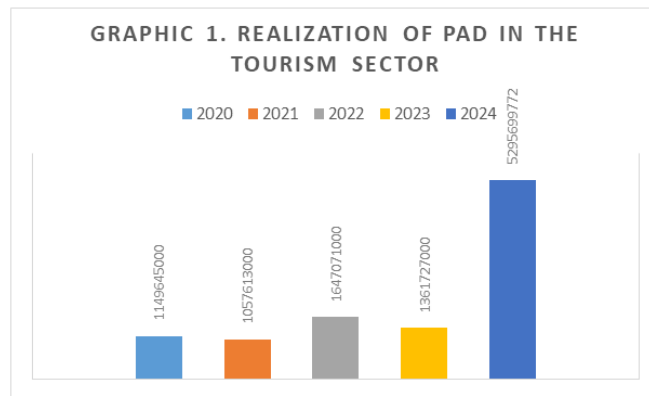
The Toba Caldera Geopark is located in North Sumatra Province and was designated by UNESCO as a Global Geopark in 2020. The designation of this Geopark area not only places Lake Toba as one of the largest natural tourist destinations in the world, but also emphasizes the importance of the area as a geological, cultural and ecological heritage that needs to be managed sustainably. (Pariwisata, 2025) that the Toba Caldera Geopark as one of the UNESCO Global Geoparks (UGGp) faces complex challenges in maintaining a balance between conservation, education and economic development of local communities. (Utara, 2025) that the Toba Caldera Geopark Area has 16 Geosites located in seven districts in the Lake Toba area, and 5 of them are in Samosir Regency, as shown below:

Figure 1 shows the geosite locations in the Lake Toba area, spread across seven districts. Samosir Regency, as one of the core areas of the Toba Caldera Geopark, has superior geosites, namely 1) Pusuk Buhit located in Sianjur Mula-mula District; 2) Tele-Euphrata located in Harian District; 3) Lake Hutatinggi Sidihoni located in Pangururan District; 4) Batu Hoda located in Simanindo District; and 5) Ambarita-Tuktuk-Tomok located in Simanindo District. Thus, the geosites in Samosir Regency are not only geological formations but also include cultural and historical sites that strengthen the identity of the Toba Caldera Geopark as a world geological and cultural heritage.



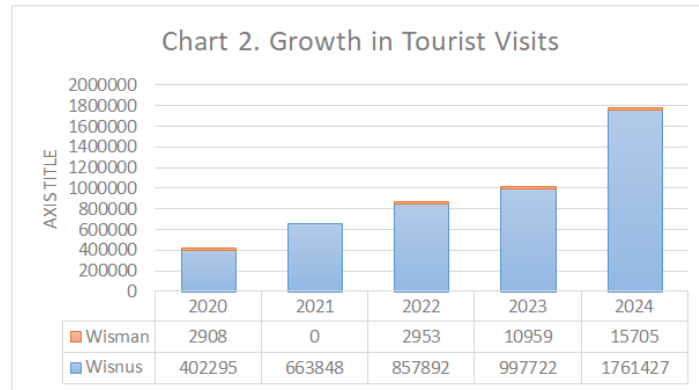
Gambar 1. 16 Geosite di Kawasan Geopark Kaldera Toba
<https://tagar.id/dipertanyakan-pengembangan-16-geosite-kaldera-toba>

In addition, the management of the geosite is also influenced by the condition of the existence of the Toba Caldera Geopark which previously received a yellow card from UNESCO, but in September 2025 the Toba Caldera Geopark again received a green card from UNESCO so that the development of the geosite in the future can be further developed and excel at the international level. According to (Hajar, Siti; Ramlan; Kholik, 2025) The management of the Toba Caldera Geopark geosite in Samosir Regency is an integral part of the development agenda to realize sustainable tourism in Indonesia. The management of the geosite located in the Toba Caldera Geopark area in Samosir Regency still faces limitations, particularly in terms of inter-agency coordination, community participation, and the integration of local wisdom. The achievement of sustainable tourism in Samosir Regency is also evidenced by the realization of PAD from the tourism sector, as follows:



Source: Department of Tourism and Culture 2025

Graph 1 above shows that the increase in PAD in the tourism sector is also supported by the growth rate of tourist visits in Samosir Regency, namely:



Source: Department of Tourism and Culture 2025

Graphs 1 and 2 show a significant increase in tourist visits, which is an indicator of the realization of increased PAD in the tourism sector. However, despite the increase in tourism growth, there are still problems that need to be solved regarding geosite governance, especially the Toba Caldera Geopark in Samosir Regency. This increase in visits is not commensurate with the quality of governance, which still faces various challenges, ranging from limited infrastructure, institutional coordination, to low local community participation in decision-making.

The management of geosites in Samosir Regency shows a phenomenon that indicates an imbalance between the large potential of the area and its management capacity. Where, according to (Briggs et al., 2022; Halim et al., 2024) that on the one hand, UNESCO Global Geopark status provides a strategic opportunity to improve Indonesia's tourism image at the international level, but on the other hand, without adaptive and sustainable management, the risk of environmental degradation, social conflict and marginalization of the Toba Batak indigenous community is increasing. This is reinforced by research from (Hajar et al., 2021; Pariwisata, 2016) which shows that the management of the super priority destination of Lake Toba still faces problems of coordination between stakeholders, limited funding, and a lack of integration of regional development programs with geopark development plans. In accordance with what was stated by (Fathani et al., 2023; Thi et al., 2024), The problems faced in the management of the Toba Caldera Geosite can be seen from three main dimensions, namely:

1. The institutional dimension, namely that the geopark management structure remains fragmented, with the involvement of many actors (central government, regional governments, the Toba Caldera Geopark Management Agency, indigenous communities, and business actors), but with minimal effective coordination.
2. The socio-cultural dimension, namely that although the Toba Batak people possess rich local wisdom in preserving nature, their involvement in decision-making is often limited. This creates a gap between local aspirations and top-down policies.
3. The environmental dimension, namely that the uncontrolled pace of tourism infrastructure development has the potential to threaten the sustainability of the ecosystem, such as increasing pollution of Lake Toba and damage to geological sites due to tourism exploitation.

Thus, adaptive governance policies involving all parties are crucial for maintaining the sustainability of tourism that is oriented towards local wisdom through the preservation of nature and culture, as well as preparing resources to face the continuation of the Toba Caldera Geopark program in maintaining UNESCO's Green Card status. This demands a holistic and adaptive governance approach to ensure the sustainability of tourism and the preservation of the geosite. According to, (Cleaver & Whaley, 2018; Folke et al., 2005; Sharma-Wallace et al., 2018) This research concludes that adaptive governance is an effective and relevant approach to solving the problems faced due to its dynamic, collaborative, and responsive nature to change. Furthermore, the geosite is a location with significant geological significance from a scientific and educational perspective. Meanwhile, (Hartman, 2015; Nandini et al., 2024) He stated that adaptive governance is a governance approach that emphasizes multi-stakeholder collaboration, flexibility, and adaptive capacity in the face of socio-ecological uncertainty. Therefore, the relevance of adaptive governance in this study emphasizes collaboration between stakeholders to accommodate environmental changes, policies, and local community needs, while minimizing conflict in the governance of the Toba Caldera Geopark geosite.

In accordance with this explanation, adaptive governance is a flexible management approach, based on participation and able to adapt to changes in social, economic and environmental conditions. This approach is also oriented towards collaboration between various stakeholders through more dynamic mechanisms in facing challenges so as to create responsive and sustainable policies. Then, supported by (Nandini et al., 2024; Sadat, Anwar; Lawelai, 2025), The concept of adaptive governance focuses on the interaction between structures and agencies, explaining the formation of dynamic relationships within the broader social and cultural landscape, thus providing space for adaptation to transformative change. Thus, adaptive governance is an approach that refers to resource management that needs to adapt to environmental and social changes that occur, so that it can support the realization of sustainable tourism in Samosir Regency. Furthermore, this adaptive governance approach can synergize collaboration between stakeholders in geosite management and economic development and the welfare of local communities around the Toba Caldera Geopark area.

METHODS

The method used in this research is a qualitative research method. According to, (Sidney, 2020), that qualitative research is an approach used to explore and understand the meaning ascribed to social or humanitarian problems. Then, (Strauss, 2016) This qualitative research is not only about collecting descriptive data but rather an effort to deeply understand the meaning, experiences, and perspectives of the research subjects within socio-cultural concepts. This method was chosen because the research focuses on social phenomena, specifically the governance of the Toba Caldera Geosite, which involves complex interactions between various actors, from the government, local communities, indigenous communities, to tourism businesses. This approach also allows researchers to explore the meaning, interpretation, and dynamics that occur in the governance process that cannot be fully explained through quantitative figures alone.

This research is also a type of case study used because this research is specific and in-depth, namely the management of the Toba Caldera Geosite in Samosir Regency. According to, (Yin, 2011) Case studies are an appropriate method for examining contemporary phenomena in real life, especially when the boundaries between phenomena and concepts are disparate and unclear. The Toba Caldera Geosite is seen as a unique case that represents the challenges of global geopark governance with

distinctive local socio-cultural characteristics. The reason for choosing this method is because the aim of this research is to explore how the challenges and opportunities for adaptive governance can be realized in the Toba Caldera Geopark Geosite. Through this case study, researchers can examine the interactions between actors, policy mechanisms, and inhibiting and supporting factors more comprehensively. Thus, the results of this study are expected to not only describe the factual conditions but also provide a deeper conceptual understanding regarding the application of adaptive governance in the governance of the Toba Caldera Geopark Geosite in Samosir Regency. Next, the collected data was analyzed using interactive analysis techniques, as proposed by (Saldana, 2014) namely data reduction, data presentation, and drawing conclusions. Then, it is analyzed using a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) as explained by (Hajar, 2020) that through this SWOT analysis it is hoped that it can be used for a sharper and more focused assessment of the opportunities and challenges specifically related to the governance of the Toba Caldera Geopark Geosite in Samosir Regency.

RESULTS AND DISCUSSION

The Toba Caldera Geopark Geosite is a rapidly developing tourist destination in Samosir Regency, especially after receiving the latest status of the Toba Caldera Geopark, namely the Green Card in 2025. (Pariwisata, 2025; Utara, 2025) that the determination of this status is a source of pride for tourism development in the Lake Toba area, including Samosir Regency, which has 5 geosite locations designated as priority geosites that are synergized with sustainable tourism. According to, (Hajar, Siti; Ramlan; Kholik, 2025; Sibarani et al., 2025) The Toba Caldera Geopark Geosite is not only a vital asset for the region but also possesses significant geological, ecological, and cultural value. Therefore, it is crucial to have the support of all parties to collaborate in maintaining and preserving it as a sustainable tourism heritage. Therefore, theoretically, this research relates to the New Public Governance (NPG) theory, as explained by (Lindsay et al., 2014; Mergel et al., 2021) which emphasizes multi-actor collaboration in the provision of public services. The collaboration required in Geosite governance can be seen in the involvement of local governments, the Toba Caldera Geopark Management Agency, the Toba Batak indigenous community, tourism businesses, and civil society organizations. However, this study found that existing collaboration is still weak and tends to be formal, as it is not accompanied by clear coordination and accountability mechanisms.

The adaptive collaboration required in this research also takes the form of a deliberative and participatory process in formulating policies related to the governance of the Toba Caldera Geopark Geosite. This research shows that there is a significant opportunity for the implementation of adaptive governance in the governance of the Toba Caldera Geopark Geosite, supported by rich and diverse local potential. However, in practice, community involvement in decision-making is still very limited, reaching only the consultation level and not reaching the stage of substantial decision-making. The concept of adaptive governance as developed by (Challies et al., 2017; Farsari, 2023; Pak et al., 2020), it is a form of governance that is able to respond to uncertainty and change through social learning, policy flexibility, and the involvement of various actors. In the governance of the Toba Caldera Geopark Geosite, the main components of adaptive governance are beginning to emerge, but they are still partial and not yet fully integrated into governance practices.

When combined with a public administration perspective, the results of this study emphasize the need for a transformation in the governance of the Toba Caldera Geosite from a traditional to an

adaptive and collaborative model. Therefore, based on the existing research findings, several important developments warrant attention, including:

1. Future public administration must place greater emphasis on governance, namely multi-actor involvement in the policy process. The management of the Toba Caldera Geopark Geosite is not solely dominated by the government, but also provides space for indigenous communities, business actors, and civil society organizations.
2. As global awareness of climate change increases, public administration in the tourism sector will increasingly focus on sustainable management, which requires the integration of environmental, social, and economic policies in the governance of the Toba Caldera Geosite.
3. The development of digital technology will bring about significant changes in public administration, where digitalized Geosite governance can be utilized for data transparency, tourism promotion, and online public participation in decision-making.

Thus, the research results indicate that the governance of the Toba Caldera Geopark Geosite is at a critical point that demands transformation. In accordance with what was stated by (Arbolino et al., 2021; Morris, C John; Stevens-Miller, Katrina; Williams, 2016) From a public administration perspective, it provides a strong theoretical framework for understanding the dynamics of governance, emphasizing the importance of multi-actor collaboration, community participation, and cross-sector policy integration. Therefore, the governance of the Toba Caldera Geosite must not only be adaptive to environmental and social changes, but also integrate modern public administration theory with local wisdom values. Furthermore, it is crucial to educate the public about geosite tourism to support the development of the Toba Caldera Geopark through geosite tourism in the Samosir Regency tourism area. Therefore, in practice, the existing governance system still faces limitations, particularly in the areas of inter-agency coordination, community participation, and the integration of local wisdom. Therefore, it is crucial to implement an adaptive governance approach that is able to provide flexible, participatory, and responsive solutions to local dynamics and global demands. This way, the management of this geosite can become a model for sustainable tourism governance that is not only relevant at the local level but can also be used as a reference in geopark development at the national and global levels. The challenges and opportunities for the governance of the Toba Caldera Geopark through adaptive governance can be seen in the table below:

Table 1. SWOT Analysis Results

Internal	(Strenghts)	(Weakness)
	1. UNESCO recognition as a Global Geopark through obtaining a Green Card. This international status enhances the legitimacy and attractiveness of the Toba Caldera as a world-class tourist destination. Successfully obtaining a UNESCO Green Card confirms that governance meets global standards for conservation, education, and sustainable development.	1. Limited inter-agency coordination. Although a multi-actor forum has been established, coordination between local governments, geopark management bodies, and communities is not yet fully established, often leading to program duplication.

- | | |
|--|---|
| <ol style="list-style-type: none"> 2. The beauty and uniqueness of geology, culture, and ecology. The Toba Caldera boasts a unique geosite, spectacular landscapes, and authentic Batak cultural heritage. This is a winning combination for geopark-based tourism. 3. Implementation of Adaptive Governance. This approach encourages multi-actor collaboration, combining top-down policies with bottom-up participation, thereby enhancing socio-ecological resilience. | <ol style="list-style-type: none"> 2. Partial community participation. Not all local communities feel they have a strategic role in decision-making. Some are only involved in the implementation stage, not the planning stage. 3. Limited human resource capacity. Limitations in digital literacy, waste management, and foreign language skills still hinder the competitiveness of local communities in the global tourism industry. 4. Limited supporting infrastructure. Road access, sanitation, and waste management are not yet fully adequate to accommodate the growing number of tourists. This has the potential to reduce the quality of the tourism experience and damage the environment. |
|--|---|

Eksternal

(Opportunity)	Alternative Strategies (SO)	Alternative Strategies (WO)
<ol style="list-style-type: none"> 1. Pressure on the environment. The surge in tourism has the potential to cause environmental degradation, including pollution, waste, and damage to geosites if not properly managed. 2. Cultural commercialization. If not managed carefully, Toba Batak culture could become trapped in excessive commodification, thereby losing its spiritual and social significance. 3. Global uncertainty. External factors such as pandemics, climate change, or global economic instability could drastically reduce tourist visits. 4. Potential conflicts of interest between actors. Differing interests between the government, investors, and local communities can create socio-political friction that weakens adaptive governance. 	<ol style="list-style-type: none"> 1. Using the principle of marsiadapari as a social bulwark to prevent conflicts of interest between actors. 2. Establishing strict regulations based on adaptive governance to control environmental pressures caused by mass tourism. 	<ol style="list-style-type: none"> 1. Strengthen participatory monitoring and evaluation mechanisms to anticipate environmental degradation and the commercialization of culture. 2. Develop a crisis protocol (contingency plan) to address global uncertainties, such as pandemics or climate disasters.

Source: Researcher, 2025

The table shows that there are opportunities that can be exploited. For example, the global trend toward sustainable tourism provides momentum for the Toba Caldera to assert its position as an environmentally friendly and authentic destination. Furthermore, national and international support through priority tourism policies in the Lake Toba area and UNESCO recognition through its Green Card open access to funding, promotion, and broader global networks. Furthermore, the development of digital technology can also provide opportunities for innovation for more effective promotion, marketing, and even management of educational tourism. This is in line with the opinion of (Amin et al., 2025; Rodrigues et al., 2024; Yang & Ning, 2025) That reduces dependence on conventional systems, which often have limited reach. However, the challenges faced are significant, one of which is the pressure on the environment from the surge in tourism, which can lead to ecosystem degradation, pollution, and geosite damage. If left unchecked, this will erode the Toba Caldera's primary strength as a world-class Geopark.

Beside that, (Jessica Ignatia Tambunan & Apriliani Lase, 2023; Sitompul et al., 2020) The risk of cultural commercialization poses a real threat due to the potential for the Toba Batak culture, rich in spiritual significance, to be trapped in excessive commodification if not managed wisely. Other external challenges such as the pandemic, climate change, and global economic instability demonstrate that tourism governance must be equipped with a well-developed contingency plan. Equally important, the potential for conflicts of interest between actors (government, investors, and the community) poses a socio-political challenge that can weaken social cohesion. Therefore, to address this challenge, an adaptive governance approach must be employed in developing regulations related to the governance of the Toba Caldera Geopark Geosite, aimed at protecting the environment and strengthening participatory monitoring mechanisms and crisis protocols to address global uncertainty.

Viewed from a public administration perspective, this strategy reflects a transformation toward a more adaptive, collaborative, and locally value-based governance model, (Dredge & Jamal, 2015; Kridasakti et al., 2025; Zwang, 2019) that this strategy can strengthen the legitimacy of public policy, improve the welfare of local communities, and maintain environmental and cultural sustainability. Very strong relevance to the principles of adaptive governance, namely multi-actor collaboration, policy flexibility, social learning, and inclusive public participation are the four main components that must be strengthened in the governance of the Toba Caldera Geosite. Therefore, the success of the Toba Caldera Geopark, especially in the governance of the Geosite in Samosir Regency, has several implications, namely: 1) For local policy, that adaptive governance must be used as a model in tourism policies in other regions in Indonesia; 2) For the community, that participation based on local wisdom is an important social capital in maintaining sustainability; and 3) For the global, that the Green Card confirms Indonesia's position as an important actor in international geoparks and sustainable tourism.

Overall, this study demonstrates that the governance of the Toba Caldera Geopark Geosite through an adaptive governance approach is able to address governance issues, increase community participation, and bring significant achievements in the form of a UNESCO Green Card. These findings strengthen the argument that sustainable tourism cannot be separated from the integration of local values with adaptive regulations that comply with global standards. This study confirms that adaptive governance is a key variable capable of bridging the influence of local wisdom and geosite governance on sustainable tourism. Thus, adaptive governance is not merely a complement, but rather central to efforts to create a resilient, competitive, and sustainable tourist destination. These findings strengthen

the theory of tourism governance that emphasizes the importance of multi-actor collaboration, policy flexibility, and the integration of local values within the framework of destination development.

CONCLUSION

The governance of the Toba Caldera Geosite in Samosir Regency is a complex process, involving the interaction of various actors with different interests, capacities, and perspectives. As part of a UNESCO-recognized Global Geopark, this area enjoys international legitimacy that demands governance that meets global standards, yet remains rooted in the local context of the Toba Batak community. An adaptive governance approach is relevant because it offers the flexibility, participation, and continuous learning mechanisms needed to address the dynamics of sustainable tourism. Strengthening governance depends not only on formal regulations or central government intervention, but also on how local communities are meaningfully involved in every stage of management. This aligns with contemporary public administration theory, which emphasizes the importance of collaborative governance and the synergy between top-down policies and bottom-up participation.

Sustainable governance requires the integration of ecological, economic, and cultural aspects. Geological and environmental conservation efforts are inseparable from local economic development through MSMEs, crafts, and Batak-based culinary arts. Likewise, international tourism promotion must go hand in hand with the protection of cultural values to prevent over-commercialization. A public administration perspective that emphasizes public value is a crucial foundation for ensuring that every management policy and practice not only benefits a select few but also provides collective benefits to the wider community. Going forward, governance of the Toba Caldera Geosite needs to be directed at strengthening the capacity of local communities, through digital literacy, foreign language skills, and environmental awareness. This will enable them to play an active role as key actors in sustainable tourism. Furthermore, inter-institutional coordination also needs to be strengthened through more robust collaborative forums to prevent overlapping policies and program duplication. The principle of adaptive governance, which emphasizes adaptive learning mechanisms, can serve as a guideline for addressing these dynamics.

This research confirms that the governance of the Toba Caldera Geosite is not only about natural resource management or tourism development, but also about building a socio-political system capable of adapting to change. The adaptive governance approach has proven to provide a conceptual and practical framework for addressing these challenges, emphasizing collaboration, flexibility, and strengthening local wisdom. If implemented consistently, the Toba Caldera Geosite could become a model of sustainable tourism that not only brings national pride but also makes an important contribution to global geopark governance practices.

ACKNOWLEDGEMENT

We would like to thank the Ministry of Higher Education, Science, and Technology of the Republic of Indonesia, and the Muhammadiyah University of North Sumatra through the Institute for Research and Community Service, for facilitating the implementation of this research and for publishing the results as research outputs. We also thank the Samosir Regency Tourism and Culture Office for providing data and information related to the topic of this article.

REFERENCES

- Amin, S. Bin, Khandaker, M. K., Samia, B. I., Khan, F., & Taghizadeh-Hesary, F. (2025). Fostering sustainable tourism through digital innovation and green tourism initiatives in Bangladesh. *Sustainable Futures*, 10(December 2024), 100841. <https://doi.org/10.1016/j.sftr.2025.100841>
- Arbolino, R., Boffardi, R., De Simone, L., & Ioppolo, G. (2021). Multi-objective optimization technique: A novel approach in tourism sustainability planning. *Journal of Environmental Management*, 285(February), 112016. <https://doi.org/10.1016/j.jenvman.2021.112016>
- Briggs, A., Newsome, D., & Dowling, R. (2022). A proposed governance model for the adoption of geoparks in Australia. *International Journal of Geoheritage and Parks*, 10(1), 160–172. <https://doi.org/10.1016/j.ijgeop.2021.12.001>
- Challies, E., Newig, J., Kochskämper, E., & Jager, N. W. (2017). Governance change and governance learning in Europe: Stakeholder participation in environmental policy implementation. *Policy and Society*, 36(2), 288–303. <https://doi.org/10.1080/14494035.2017.1320854>
- Cleaver, F., & Whaley, L. (2018). Understanding process, power, and meaning in adaptive governance: A critical institutional reading. *Ecology and Society*, 23(2). <https://doi.org/10.5751/ES-10212-230249>
- Dredge, D., & Jamal, T. (2015). Progress in tourism planning and policy: A post-structural perspective on knowledge production. *Tourism Management*, 51, 285–297. <https://doi.org/10.1016/j.tourman.2015.06.002>
- Farsari, I. (2023). Exploring the nexus between sustainable tourism governance, resilience and complexity research. *Tourism Recreation Research*, 48(3), 352–367. <https://doi.org/10.1080/02508281.2021.1922828>
- Fathani, A. T., Azmi, N. A., Purnomo, E. P., Tham, S. A., & Ahmad, R. (2023). A Systematic Review of Tourism Governance: Sustainable Tourism Governance Model Post COVID-19. *Jurnal Borneo Administrator*, 19(1), 35–50. <https://doi.org/10.24258/jba.v19i1.1125>
- Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. *Annual Review of Environment and Resources*, 30, 441–473. <https://doi.org/10.1146/annurev.energy.30.050504.144511>
- Hajar, Siti; Ramlan; Kholik, K. (2025). *Kebijakan Tata Kelola Geosite Geopark Kaldera Toba Berbasis Kearifan Lokal Melalui Pendekatan Adaptive Governance untuk Pariwisata Berkelanjutan di Samosir*.
- Hajar, S. (2020). *Perencanaan pembangunan pariwisata kawasan danau toba disertasi* (- (ed.); 1st ed.). Universitas Brawijaya.
- Hajar, S., Supriyono, B., Muluk, M. R. K., & Said, A. (2021). Tourism Potential Planning Based Governance in the Lake Toba Area. *Italienisch*, 11(2), 549–558. <https://doi.org/https://doi.org/10.1115/italienisch.v11i2.150>
- Halim, J. M., Lubis, D. P., Hasibuan, A. P. R., Syardhi, R. D., Ningsih, R. W., & Alda, T. (2024). Interactive Mixed Reality Museum for Ulos Batak Cultural Heritage Preservation and Global Recognition. *International Journal of Architecture and Urbanism*, 8(3), 371–376. <https://doi.org/10.32734/ijau.v8i3.18103>

- Hartman, S. (2015). Towards adaptive tourism areas? A complexity perspective to examine the conditions for adaptive capacity. *Journal of Sustainable Tourism*, 24(2), 299–314. <https://doi.org/10.1080/09669582.2015.1062017>
- Jessica Ignatia Tambunan, & Apriliani Lase. (2023). Cultural Innovation Ulos Design to Promote Tourism Ulos Batak in Toba. *NAWASENA/ : Jurnal Ilmiah Pariwisata*, 2(3), 92–101. <https://doi.org/10.56910/nawasena.v2i3.1247>
- Kridasakti, S. W., Rizkiana, R. E., Wahyuni, P. M., Senastri, N. M. J., & Yuningsih, H. (2025). The Legitimacy Crisis of Customary Villages Under Indonesia's Village Law. *Sriwijaya Law Review*, 9(2), 432–456. <https://doi.org/10.28946/slrev.v9i2.3998>
- Lindsay, C., Osborne, S. P., & Bond, S. (2014). The “New Public Governance” and employability services in an era of crisis: Challenges for third sector organizations in Scotland. *Public Administration*, 92(1), 192–207. <https://doi.org/10.1111/padm.12051>
- Mergel, I., Ganapati, S., & Whitford, A. B. (2021). Agile: A New Way of Governing. *Public Administration Review*, 81(1), 161–165. <https://doi.org/10.1111/puar.13202>
- Morris, C John; Stevens-Miller, Katrina; Williams, P. A. et al. (2016). Advancing Collaboration Theory: Models, Typologies, and Evidence. In K. Morris, C John; Stevens-Miller (Ed.), *Routledge Research in Public Administration and Public Policy* (Vol. 3, Issue 1, pp. 1–15). Routledge Taylor & Francis. <https://doi.org/http://dx.doi.org/10.1016/j.bpj.2015.06.056>
- Nandini, D., Eddy, A. A. N., Gorda, S., Subanda, N., Oka, A. A. N., & Gorda, S. (2024). Adaptive Governance in The Transformation Process of Kintamani Tourism Attraction Management By Bangli District Government. *JHSS (Journal of Humanities and Social Studies)*, 08(03), 978–984. <https://doi.org/https://doi.org/10.33751/jhss.v8i3.10328>
- Pak, K., Polikoff, M. S., Desimone, L. M., & Saldívar García, E. (2020). The Adaptive Challenges of Curriculum Implementation: Insights for Educational Leaders Driving Standards-Based Reform. *AERA Open*, 6(2), 1–15. <https://doi.org/10.1177/2332858420932828>
- Pariwisata, K. (2016, March). Kebijakan pengembangan destinasi pariwisata indonesia 2016 - 2019. *Deputi Bidang Pengembangan Destinasi Dan Investasi Pariwisata Kementerian Pariwisata*.
- Pariwisata, K. (2025). Fakta-fakta Geopark Toba Caldera. *Kementerian Pariwisata Republik Indonesia*. <https://kemenpar.go.id/berita/fakta-fakta-geopark-toba-caldera>
- Rodrigues, V., Breda, Z., & Rodrigues, C. (2024). The implications of industry 4.0 for the tourism sector: A systematic literature review. *Heliyon*, 10(11). <https://doi.org/10.1016/j.heliyon.2024.e31590>
- Sadat, Anwar; Lawelai, H. N. (2025). Optimizing Sustainable Tourism Governance and Its Impact on Employment Opportunities Through a Dynamic Governance Approach. *Journal of Information Systems Engineering and Management*, 10(27s), 965–979. <https://doi.org/10.52783/jisem.v10i27s.4756>
- Saldana, M. B. M. A. M. H. J. (2014). *Qualitative Data Analysis* (Third, Vol. 11, Issue 1). Sage Publications.
- Sharma-Wallace, L., Velarde, S. J., & Wreford, A. (2018). Adaptive governance good practice: Show me the evidence! *Journal of Environmental Management*, 222(November 2017), 174–184. <https://doi.org/10.1016/j.jenvman.2018.05.067>

- Sibarani, R., Kimura, T., & Simanjuntak, P. (2025). The schematic structure of folk discourses of Toba Caldera Geosites as the collective memory for tourist destinations at lake Toba area. *Cogent Arts and Humanities*, 12(1). <https://doi.org/10.1080/23311983.2025.2451491>
- Sidney, F. F. G. J. M. M. S. (2020). Handbook of Public Policy Analysis (Theory, Politics, and Methods). In *Handbook of Public Policy Analysis*. CRC Press. <https://www.crcpress.com>
- Sitompul, R., Alesyanti, & Ridwan, M. (2020). Domestic violence as initiated by Batak culture in East Medan, Indonesia. *Journal of Human Behavior in the Social Environment*, 30(7), 835–842. <https://doi.org/10.1080/10911359.2020.1750526>
- Strauss, B. G. G. and A. L. (2016). *The Discovery Of Grounded Theory: Strategies For Qualitative Research* (Vol. 4, Issue 1). A Division of Transaction Publishers.
- Thi, H. N., Thi, T. N., Trong, T. V., Duc, T. N., & Nghi, T. N. (2024). Sustainable Tourism Governance: a Study of the Impact of Culture. *Journal of Governance and Regulation*, 13(2 Special Issue), 474–485. <https://doi.org/10.22495/jgrv13i2siart22>
- Utara, P. P. S. (2025). Geopark Kaldera Toba Kembali Raih Green Card GM BP Kaldera Toba: Kerja Keras Semua Pihak. *Pemerintah Provinsi Sumatera Utara*. <https://sumutprov.go.id/artikel/artikel/geopark-kaldera-toba-kembali-raih-green-card-gm-bp-kaldera-toba-kerja-keras-semua-pihak>
- Yang, L., & Ning, W. (2025). Mechanisms and effects of the sustainable integration of digital-driven rural cultural tourism from the perspective of symbiosis. *Sustainable Futures*, 10(February), 100867. <https://doi.org/10.1016/j.sftr.2025.100867>
- Yin, R. K. (2011). *Qualitative Research from start to finish*. The Guilford Press.
- Zwang, A. (2019). Web communication of french geoparks in education: The expression of their legitimacy. *UNESCO Global Geoparks: Tension Between Territorial Development and Heritage Enhancement*, 644015, 199–213. <https://doi.org/10.1002/9781119681489.ch11>