

Dynamic Model Analysis of Kartini Beach Development Strategy Using Causal Loop Diagram

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Submitted: 2024-11-11 | Accepted: 2025-08-07 | Published: 31st August 2025

Abstract

Tourism development is a systematic effort to increase the attractiveness of a tourist destination through various strategies and programs. Tourism development faces multiple challenges that must be overcome to ensure sustainable growth and provide maximum benefits to local communities and tourists. Kartini Beach is one of the tourist attractions that has experienced various challenges in its development. The dynamic model approach is expected to be able to analyze the existing conditions in the management of Kartini Beach so that it can be used as a basis for compiling a strategy for developing Kartini Beach Rembang in the future. The model consists of four causal loops, three of which are positive-positive loops (reinforcement) and one negative-positive loop (balancing). A positive causal loop shows a relationship where an increase in one variable leads to an increase in another. Examples include facility development leading to higher taxes and regional income, as well as improved security, boosting tourist visits. The negative loop, such as increased traders generating waste, reduces overall visitor comfort. In the cause-and-effect table, five key strategic factors influencing the development of Pantai Kartini are identified: security, traders, visitors, facilities, and comfort. Security is influenced by the quality of facilities and services like parking, while traders and visitors impact local revenue and environmental cleanliness. Well-maintained facilities play a crucial role in improving the branding and overall comfort of the tourist site. Ultimately, comfort is determined by effective management of cleanliness, safety, and environmental conditions.

Keywords: Strategy; Dynamic Model; Causal Loop Diagram; Kartini Beach.

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1. Introduction

Tourism is one of the largest industries that is growing rapidly in the world, including in Indonesia, with its natural wealth, culture, and different customs, and is the main capital in tourism (Maulana & Koesfardani, 2020). Tourism is a sector that contributes the largest foreign exchange earner for a country and can create jobs; therefore, efforts are needed to explore and develop tourism potential more deeply (Prantawan P & Sunarta, 2015). Tourism development is a systematic effort to increase the attractiveness of a tourist destination through various strategies and programs. This covers many aspects, from improving infrastructure and promotion to preserving culture and the environment. Tourism is one of the leading industries that is expanding and experiencing sustainable diversification (Baloch et al., 2023). The Indonesian tourism industry contributes 5.7% of Gross Domestic Product and absorbed 9.7% of total employment in 2019 (Rahman, 2022). With an integrated and sustainable approach, tourism development can improve local economic welfare, preserve culture and the environment, and provide a satisfying experience for tourists.

Tourism development faces various challenges that must be overcome to ensure sustainable growth and provide maximum benefits to local communities and tourists (Sayuti, 2023). The challenges in tourism development include the availability of basic facilities such as accommodation, sanitation, and health services, which are often inadequate. In general, tourism development can be carried out through infrastructure development, both in the form of roads and bridges and tourism facilities (Moerwanto & Pekerjaan, 2017). State that public facilities in tourism are all facilities that allow tourism facilities to survive and develop, and provide services to tourists to meet their diverse needs, both as basic, complementary, and supporting facilities (Siregar & Kadir, 2019). Explain that destination facilities/amenities are elements in a destination or elements related to the destination and enable tourists to stay at the destination to enjoy or participate in the attractions offered (Nyoko et al., 2023).

In addition to storing potential, tourism activities can cause environmental damage, such as pollution, deforestation, and degradation of marine ecosystems. Stated that environmental damage can be caused by human activities on ecosystems (Cahyaningsih et al., 2022). In addition to activities, waste problems that affect environmental conditions can also be influenced by behavior, knowledge, attitudes, infrastructure, and regulations (Yulida et al., n.d.). The challenge in maintaining a balance between tourism development and nature conservation is that excessive tourist density can cause environmental damage and reduce the quality of the tourism experience.



Figure 1. Piles of Rubbish on The Beach

On the other hand, increasing the quality of tourist attractions will have a positive impact on the level of tourist visits (Bagasta et al., 2021). Stated that tourist facilities affect visitor satisfaction with tourist attractions. Several elements of tourism influence the development of a tourism product, such as tourist attractions, accessibility, and facilities (Aprilia et al., n.d.). Research conducted by Marcelina et al. (2018) entitled *The Influence of Facilities, Services, and Prices on Tourist Satisfaction*. The results of the study showed that the variables of facilities, services, and prices have a positive effect on customer satisfaction. Other research conducted by Rizki Asti Karini & Eka Putri (2023) entitled *The Influence of Tourist Attractions and Service Facilities on Tourist Satisfaction at Balekambang Beach, Malang Regency*. The results of the study showed that Tourist Attractions and Service Facilities together have a significant effect on Tourist Satisfaction, Tourist Attractions have a significant effect on Tourist Satisfaction, and Service Facilities have a significant effect on Tourist Satisfaction.

Addressing these challenges requires a holistic and collaborative approach, involving multiple stakeholders, including governments, the private sector, and local communities. Sustainable and innovative approaches are essential to ensure that tourism can thrive in a way that supports social, economic, and environmental well-being. Kartini Beach in Rembang, Central Java, is one of the famous beach tourism destinations in the area.

Kartini Beach is located in Rembang Regency, Central Java. This beach is easily accessible from the city center of Rembang and is one of the favorite tourist destinations for residents and tourists from outside the area. Kartini Beach Recreation Park (TRP) is included in the development area of the Integrated Marine Area (KBT), with efforts to organize/develop optimally following the tourism potential owned, along with other related aspects that are continuously improved as an effort to increase regional income, especially

income sourced from the Dampo Awang Beach TRP Kartini Rembang Marine Tourism Object levy.

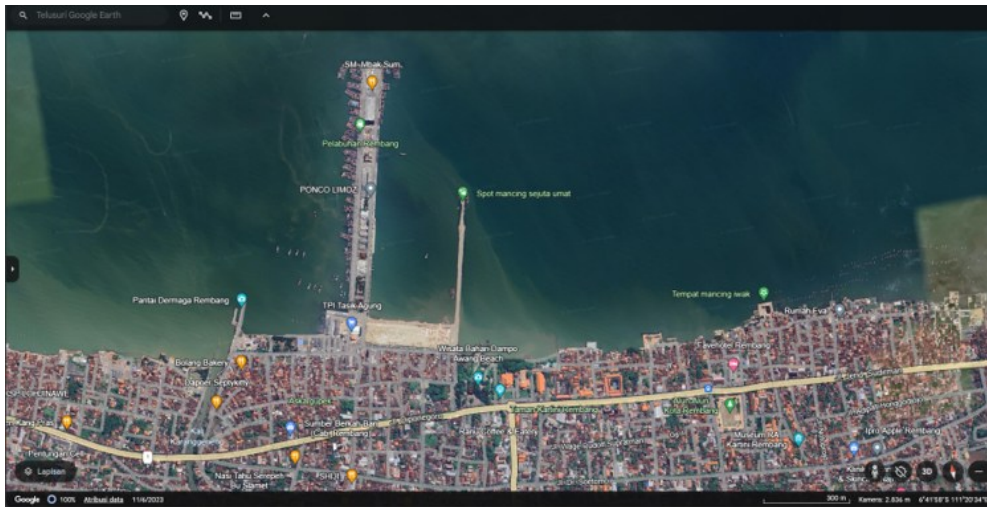


Figure 2. Satellite Image of Kartini Beach

However, the actual condition of Kartini Beach is currently not running as expected by the community and the local government. Although the Kartini Beach Recreation Park (TRP) was once one of the proud tourist attractions of the people of Rembang, Central Java, now the tourist spot, which is located not far from the local regent's office, is in a condition like an abandoned building. In terms of visitors, the following conditions can be seen.

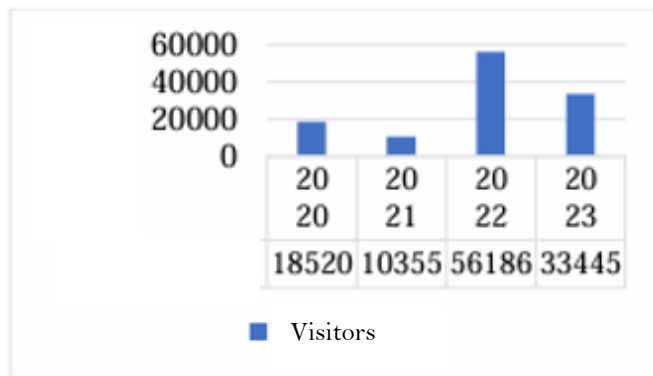


Figure 3. Kartini Beach Visitor Data Table (2020-2023)

From the table above, it can be seen that the level of visitor data for TRP Kartini Rembang from 2020 to 2023 has increased, and visitors have decreased. Based on visitor data for TRP Kartini Rembang in 2020, there were 18,520 visitors. In 2021, it decreased to 10,355 visitors. In 2022, it increased to 56,186 visitors. In 2023, it decreased again to 33,445 visitors.

In the observation conducted, it was found that there were various deficiencies in the aspect of facilities. Such as the building of kiosks located in the southern part of the interior, where the roof has been damaged. There is also a building for the animal shelter, which is in

a damaged and dirty condition, and which used to be a mini zoo. Likewise, other facilities such as prayer rooms and bathrooms seem poorly maintained. Even the jetty or pier is no longer suitable for use, and the concrete support pillars and bases have collapsed, and the wood has looked rotten and can be dangerous for visitors to the area. So, in general, the conditions in a very remote location are said to be suitable for a tourist destination.



Figure 4. The condition of the pier, which is dilapidated and not maintained

Even so, this tourism owned by the Rembang Regency Government is still operating now. Even the Head of the Culture and Tourism Office (Dinbudpar) acknowledged that there was damage to facilities in Kartini Park and also hoped that there would be a budget allocation for repairs. Likewise, even though the condition of the buildings in Kartini Park is concerning due to damage in several places, there is still a figure of financial income figure obtained by the local government from the management of Kartini Park Tourism. Income from the Kartini Park levy itself can be said to be busy during the school holiday season; it was even stated that the source of income from the swimming pool spot could reach IDR 4-5 million. Then, for the daily entrance ticket income from Kartini Park, it is IDR 300,000 for weekdays and IDR 800,000 for weekends. It's just that visitors are more interested in visiting the swimming pool spot because the condition of the zoo, rides, and beach are no longer comfortable as previously explained. This is also in line with the results of observations with the managers of this beach, which stated that it is certain that approximately 80% of the income obtained comes from visitors who come to the swimming pool. The actual condition of Kartini Beach, which is very concerning, is what needs to be executed better by the government. Several reference sources also said that the Development of this Beach Area was planned to be built this year with a budget of around IDR 8.6 billion, but in the end, the planning was confirmed to be canceled. This is due to the Rembang district government, which is currently rationalizing the budget and ultimately causing the delay in the

arrangement of the Kartini TRP. In essence, this unkempt condition is very regrettable to several parties because, in the past, this beach had been one of the most crowded recreation places compared to the current stalled condition. So, a holistic approach is needed in formulating strategies related to the development of the tourism potential of Kartini Beach. The development of tourism potential is related to various parties, from local communities to the government, and funding sources (Of et al., n.d.).

2. Methods

This study is descriptive qualitative, using a Causal Loop Diagram (CLD) and an input-output diagram to understand the variables that form customer satisfaction patterns. By understanding the relationship between factors and the patterns formed, it is expected to find the root cause of the problem of declining customer satisfaction. This is important to find alternative long-term solutions and prevent similar problems from arising again. CLD is a method of depicting the root of the problem through reciprocal relationships. By constructing a causal loop diagram, it becomes possible to systematically identify the critical variables that contribute to the emergence of specific problems. This approach provides a structured framework for understanding complex systems and formulating effective solutions based on the dynamic relationships between variables.

The CLD model is a model that emphasizes its attention to the causal relationship between variables (components) of the system depicted in a diagram in the form of a curved line ending in an arrow connecting one system component to another, where the arrowheads are marked with positive (or S) and negative (or O) signs, which describe the influence of one variable on another that changes dynamically in line with the development of time. CLD will be able to help us explain the dynamics of the causal relationship that occurs in a complex system. The S (sameness) sign indicates that if the influencing variable (as a cause) changes (for example, increases), then the influenced variable (as a result) will change according to the direction of change in the influencing variable (i.e, will also increase). While the O (oppositeness) sign has the opposite effect, meaning that if the influencing variable increases, the influenced variable decreases. In CLD, the arrows will form a loop marked R (reinforcing) and B (balancing). R means mutually reinforcing or weakening. The CLD scheme was built through a literature study that raised the issue of Kartini Rembang Beach management, observation, and others.

3. Results, Analysis, and Discussions

Kartini Beach, once a popular tourist destination in Rembang Regency, is currently facing significant challenges that have led to its decline. After the termination of a contract with a private operator, the management of Kartini Beach was taken over by the local government. However, the transition has been marred by inadequate maintenance and a lack of clear responsibility, leading to further deterioration. Plans for revitalization have been hindered by budget reallocations. Although there were proposals to allocate funds for improvements, financial limitations have delayed necessary renovations. Once bustling with tourists, the beach now sees significantly fewer visitors. Factors contributing to this decline include the COVID-19 pandemic and the deteriorating condition of the facilities. There have

been suggestions to return the management of Kartini Beach to private operators, as previous private management had maintained the facilities more effectively.

CLD provides a visual representation of the feedback structure in a system, making it easier to understand complex interactions and identify leverage points for intervention. By revealing the underlying structure of a system, CLD supports strategic planning and policy formulation. A Causal Loop Diagram (CLD) is a visual tool used in systems thinking to illustrate the dynamic relationships between different variables in a system. It helps identify the root causes of public problems by mapping out feedback loops—both reinforcing and balancing—that drive system behavior over time.

In the context of public problem-solving, CLDs are valuable because many social issues, such as poverty, traffic congestion, or environmental degradation, are not caused by a single factor but by complex interactions of multiple elements. By visualizing these relationships, policymakers and stakeholders can better understand how changes in one part of the system might affect the whole. By identifying these loops, decision-makers can develop more effective, sustainable interventions.

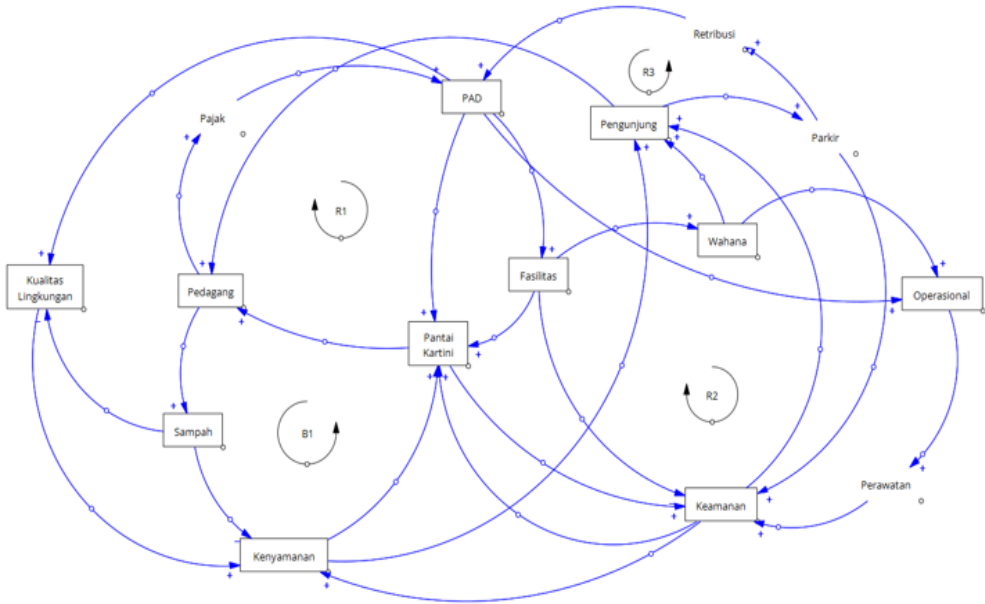


Figure 5. Causal Loop Diagram of Kartini Beach Management, Rembang

This model has several causal loops consisting of positive loops and negative loops. Positive loops indicate a directly proportional relationship between the variables, so that if there is an increase in the value of the variable, it will cause an increase in the value of the variable it influences. Conversely, negative loops indicate an inversely proportional relationship, so that if there is an increase in the value of the variable, it will cause a decrease in the value of the variable it influences. Causal loop analysis shows that there are 4 loops consisting of 3 positive-positive R Loops (Reinforcement) and 1 Negative-positive B Loop (Balancing). The causal loops formed in this model include:

1. R1, Kartini Beach Development > Traders > Tax > PAD > Facilities (+/+)
2. R2, Kartini Beach Development > Security > Visitors > Parking > Retribution > PAD (+/+)
3. R 3, Facilities > Rides > Operation > Maintenance > Security (+/+)
4. B1, Kartini Beach Development > Traders > Garbage > Convenience (+/-)

Table 1. Cause and Effect

| No | Strategic factors influencing the development of Kartini Beach | Cause and effect |
|----|--|--|
| 1 | Security | Tourist attraction security is key to the development of Kartini Beach. Security greatly influences and affects several aspects. Security can affect visitor comfort. In addition, security is also a factor that plays a role in branding Kartini Beach, and branding Kartini Beach will provide a perspective on the level of security at the location. Security is also influenced by facilities, especially in terms of quality or eligibility. In addition, security can also be influenced by services such as parking and operational/maintenance of infrastructure or facilities at Kartini Beach. |
| 2 | Trader | The increasing development of Kartini Beach will attract traders to sell products in the Kartini Beach area. This can be an object of tax or income for the Regional PAD, but on the other hand, the large number of traders also opens up opportunities for the accumulation of waste, which, if not managed properly, will have an impact on the environment. In addition, the above conditions will also lead to a decrease in the comfort of tourist visits. |
| 3 | Visitors | Visitors will have an impact on parking pocket income, which can also be a levy for the region and become income in PAD. In addition, visitors can also increase income from existing traders. However, it should also be noted that the number of visitor visits can also be influenced by various things, for example, Comfort, Rides, and Security. |

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|---|----------|---|
| 4 | Facility | Facilities are highly dependent on PAD; if PAD is large, then there is a possibility for the development of better tourism facilities. Good facilities are linearly correlated with rides both in quality and quantity; the facilities themselves have an influence on the branding of Kartini Beach, besides facilities being one of the factors that guarantee the safety of tourist attractions. |
| 5 | Comfort | Comfort is an aspect that is influenced by many things, including environmental aspects such as the management of the cleanliness of tourist attractions and the safety of visitors to Kartini Beach. |
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4. Conclusion and Recommendation

The causal loop model is used to analyze the development of Pantai Kartini, focusing on the interactions between various strategic variables. The model consists of four causal loops, three of which are positive-positive loops (reinforcement) and one negative-positive loop (balancing).

A positive causal loop shows a relationship where an increase in one variable leads to an increase in another. Examples include facility development leading to higher taxes and regional income (PAD), as well as improved security, boosting tourist visits. The negative loop, such as increased traders generating waste, reduces overall visitor comfort.

In the cause-and-effect table, five key strategic factors influencing the development of Pantai Kartini are identified: security, traders, visitors, facilities, and comfort. Security is influenced by the quality of facilities and services like parking, while traders and visitors impact local revenue and environmental cleanliness. Well-maintained facilities play a crucial role in improving the branding and overall comfort of the tourist site. Ultimately, comfort is determined by effective management of cleanliness, safety, and environmental conditions at Pantai Kartini.

References

- Aprilia, E. R., Pangestuti, E., Administrasi, F. I., & Brawijaya, U. (n.d.). *Pengaruh daya tarik wisata dan fasilitas layanan terhadap kepuasan wisatawan di pantai balekambang kabupaten malang*. 51(2), 16–21.
- Bagasta, A. R., Iswara, C., & Lasally, A. (2021). *ANALISIS POTENSI WISATA MENGGUNAKAN INFORMASI BERKELANJUTAN BERBASIS*

*MASYARAKAT DI DESA SUMBERAGUNG, GROBOGAN, JAWA TENGAH
Tourism Potential Analysis Using Geographic Information and Community- Based
Sustainable Tourism Development Strategy in the Villa. 15(2), 148–157.*

- Baloch, Q. B., Shah, S. N., Iqbal, N., Sheeraz, M., Asadullah, M., Mahar, S., & Khan, A. U. (2023). Impact of tourism development upon environmental sustainability: a suggested framework for sustainable ecotourism. *Environmental Science and Pollution Research, 30(3)*, 5917–5930. <https://doi.org/10.1007/s11356-022-22496-w>
- Cahyaningsih, A. P., Deanova, A. K., & Pristiawati, C. M. (2022). *Review : Causes and impacts of anthropogenic activities on mangrove deforestation and degradation in Indonesia. 12(1), 12–22.* <https://doi.org/10.13057/bonorowo/w120102>
- Marcelina, S. dewi, Febryano, I. G., Setiawan, A., & Yuwono, S. B. (2018). Persepsi Wisatawan Terhadap Fasilitas Wisata Di Pusat Latihan Gajah Taman Nasional Way Kambas. *Jurnal Belantara, 1(2)*, 45–53. <https://doi.org/10.29303/jbl.v1i2.60>
- Maulana, A., & Koesfardani, C. F. P. P. (2020). Pola Musiman Kunjungan Wisatawan Mancanegara Ke Bali Seasonal Pattern of Foreign Tourist Arrivals to Bali. *Jurnal Kepariwisata Indonesia, 14(2)*, 73–90.
- Moerwanto, A. S., & Pekerjaan, K. (2017). *INFRASTRUKTUR WISATA TERINTEGRASI Sambutan Menteri Pariwisata Republik Indonesia pada Peringatan World Tourism Day dan Kementerian Pekerjaan Umum dan Perumahan Rakyat, melalui Direktorat Jenderal. 3(2), 67–78.*
- Nyoko, A. E. L., Fanggidae, R. P. C., Blikololong, P. L., Cendana, U. N., & Timur, N. T. (2023). *Driving and Inhibiting Factors to Tourist Interest in Visiting Lamalera. 1(2), 79–88.*
- Of, O., Daniela, E., Ph, F., & Faculty, C. (n.d.). *I c , m b c s -w o r . 255–280.*
- Prantawan P, D. G. A., & Sunarta, I. N. (2015). Studi Pengembangan Desa Pinge Sebagai Daya Tarik Ekowisata di Kecamatan Marga Kabupaten Tabanan. *Jurnal Destinasi Pariwisata, 3(1)*, 1–8.
- Rahman, A. (2022). The Contribution of the Tourism Sector to the Regional Original Income of Maros Regency as a Favorite Tourism Destination. *Journal of Asian Multicultural Research for Economy and Management Study, 3(2)*, 38–48. <https://doi.org/10.47616/jamrems.v3i2.328>
- Rizki Asti Karini, R. S., & Eka Putri, A. S. (2023). Pengaruh Daya Tarik Wisata dan Citra Destinasi Wisata Terhadap Kepuasan Pengunjung di Jalan Braga. *Manajemen Dan Pariwisata, 2(2)*, 144–164. <https://doi.org/10.32659/jmp.v2i2.293>
- Sayuti, R. H. (2023). *Community Readiness in Implementing Sustainable Tourism on Small Islands : Evidence from Lombok , Indonesia.*
- Siregar, P. S., & Kadir, A. (2019). *International Journal of Multicultural and Multireligious Understanding The Facilities and Infrastructure Provision for Tourism Development in Semangat Gunung Village , Merdeka District , Karo Regency. 479–486.*
- Yulida, N., Sarto, S., & Suwarni, A. (n.d.). *Perilaku masyarakat dalam membuang sampah di aliran sungai batang bakarek-karek Kota Padang Panjang Sumatera Barat. 373–378.*