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Ecotourism Approach: Lake Maninjau Tourism Governance In Maintaining Environmental Sustainability

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ABSTRACT

Lake Maninjau is an area that prioritizes tourism as its mainstay sector. The implementation of ecotourism in preserving the Lake Maninjau environment is an implementation that has been formulated with concrete actions based on establishing a strategy to make the Lake Maninjau area an ecotourism area. The research method used is a qualitative method using informant determination techniques*key informan*. Data collection techniques use observation, interviews and literature study methods. The results of the research found that the forms of implementing ecotourism in preserving the environment of Lake Maninjau include improvements*catchment area*, regulating hydroelectric sluice gates, cleaning lake surfaces, managing water quality, suctioning lake waste, saving endemic biota, developing tourism, controlling CONTROL OF FLOATING NET CAGES (KJA), strengthening regulations and strengthening institutions. Based on the results of this research, it can be concluded that to realize the Lake Maninjau area as an ecotourism area, the forms of implementation in this research must be carried out well. For this reason, it is recommended that the government and community implement and support every program and policy in managing the Lake Maninjau area.

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INTRODUCTION

In Law Number 32 of 2009 concerning Environmental Protection and Management, it is explained that. Environmental management and protection is a systematic and integrated effort. What is done to preserve environmental functions and prevent environmental pollution and/or damage which includes planning, utilization, control, maintenance, supervision and law enforcement (LOILEWENDAN et al. 2022). In terms of protecting the environment, it has a basis for ensuring that the earth will be a suitable place. This is also in line with what Loilewendan et al said, namely that environmental problems are essentially finding ways to find ways to ensure that the earth and surrounding equipment are habitable spaces. For a peaceful life (LOILEWENDAN et al. 2022).

Sustainable environmental protection and management will produce a beautiful and orderly nature. The beauty of a region's natural landscape is an inherited treasure that must be protected by every generation. This immense wealth is always used for the prosperity of the surrounding community as legal heirs without any discrimination regarding this legacy (Naldi et al. 2023). The beauty created will become capital for the local government in carrying out development in the area which will have an impact on improving the lives of local people. Implementation of development can come from various aspects of community life, one of which is tourism (Santosa, Shaleh, and Hadi 2020).

Tourism is one of the government programs that can increase government income which can increase large foreign exchange for the government in order to support the success of national development, especially in the management and development of industrial zones, especially as existing industries are developing rapidly. In Republic Law. Indonesia Number 10 of 2009 concerning Tourism explains that tourism has. An important role in national development is as a foreign exchange earner and increasing employment opportunities and income, strengthening unity and unity, as well as. The nation's culture.

In the development and development of the tourism sector, tourism has become a promising object on a global scale. So that in its development the concept of ecotourism emerged where the tourism offered not only develops environmental aspects in terms of conservation, but also provides benefits for the community, for. Improving the local economy, where the people of the area are the main control holders (Tanaya and Rudiarto 2014).

Ecotourism is a tourism concept that focuses on environmentally friendly and sustainable tourism activities. The main goal of ecotourism is to preserve local nature and culture, while providing economic and social benefits to local communities. This concept aims to achieve a balance between nature conservation, education and sustainable economic activities (Susanto et al. 2021). Ecotourism focuses on preserving the environment and biodiversity. This involves protecting ecosystems, endangered species, and natural habitats. Ecotourism is also trying. To increase public understanding and awareness of the natural environment (Angela 2023). In an effort to develop sustainable ecotourism by paying attention to the preservation of nature, culture and local communities to promote understanding and appreciation of biodiversity and culture, while providing economic benefits for local communities and preserving the environment (Qomariyah 2017).

One of the areas that is now a tourism object has a beautiful natural landscape with natural riches resulting from biota that lives in fresh water in a large lake and is faced with a beautiful mountain panorama, this lake is Lake Maninjau. Lake Maninjau was formed. The result of the eruption of Mount Tinjau millions of years ago and is closely related to the legend that developed among the Maninjau community, namely***Single Part Time***(Naldi et al. 2023)**.** Lake Maninjau has long been used as a tourist destination in Agam Regency. The charm of one of the tourist destinations in Agam Regency. The soothing views can quickly attract the interest of both domestic and foreign tourists. So many accommodations and restaurants have been established as well as facilities for swimming, diving and fishing. Besides having a beautiful panorama, Lake Maninjau is the main source of water needs. Water is the main element for people in their daily lives and is also used as a driving force for hydroelectric power plants whose electricity is able to meet the electricity needs of people in the Agam Regency area. For this reason, the Lake Maninjau tourism area has become a National Priority.

However, in reality, even though it has been designated as a national priority lake, pollution in Lake Maninjau has not shown any improvement. Previously, the clean water in Lake Maninjau could still be used for daily needs. But now, the water in Lake Maninjau is very polluted and can no longer be used. Even now Lake Maninjau has become an area with high levels of pollution. The results of research conducted by Marganof (2007) show that lake water pollution parameters such as COD, BOD5, DO, TSS and PO4 3- are above the threshold required as a source of drinking water. Activities to utilize the lake area without being accompanied by conservation efforts will ultimately result in the lake's function not being optimal. After the damage to Lake Maninjau, the lost economic value from the tourism sector alone reached IDR 14,965,050,000 per year (Putri, 2015). This value is just the nominal value calculated from the decline*occupancy rate*. If you include other costs such as costs to improve the environment and compensation for workforce reduction, the value will be much greater. Departing from these problems, this research is aimed at explaining how to implement ecotourism in maintaining the environmental sustainability of Lake Maninjau.

Trade off theory

Ecotourism describes a form of tourism that is managed through a conservation approach. Ecotourism is the management of nature and culture of the community that is responsible for sustainability and welfare. While conservation is an effort to maintain the sustainability of the use of natural resources for the present and the future. This is in accordance with the definition made by The International Union for *Conservation of Nature and Natural Resources* (1980) in (Gutierrez &; Martinez, 2010).

Natural areas intended such as river ecosystems, lakes, swamps, peat, upstream areas or estuaries are areas that can be used for ecotourism areas. The approach implemented is by keeping the area sustainable as a natural area. Conceptually, the idea of ecotourism needs to be seen as *a principle* or as the soul of all forms of tourism. It is implementative and not rhetorical in nature, and must be accepted as *obligatorily* for every *tourism stakeholder* (Avenzora, 2008).

Ecotourism is nature-based tourism that involves education and interpretation of the environment / nature and is managed sustainably for ecology. This definition recognizes that the natural environment includes a cultural component and is ecologically sustainable which involves appropriate returns to local communities and long-term

conservation of resources (QuickStart Guide to Tourism Business, 2006). Meanwhile, the meanings that can be characteristic of planning, developing and managing tourism in the context of ecotourism that need to be understood include: (1) *Nature based* (landscape for ecotourism based on nature such as biological, physical and cultural objects), (2) *Ecologically Sustainable (*ecotourism development is carried out with the concept of *back to nature*), (3) *Environmentally educative* (providing education about the environment), (4) Benefiting the local community, and (5) Adding value in satisfaction for tourists.

METHODOLOGY

The method used in this research is qualitative analysis through direct observation, interviews and documentation. The determination of respondents was determined based on key informants or key informants who were considered representative in this research. Respondents in this research were the Head of the Aquaculture and Capture Fisheries Division (Agam Regency Fisheries and Food Security Service), the Head of the Economic, Regional Infrastructure, Spatial Planning and Environment Division (Agam Regency Regional Development Planning Agency), the Head of the Tourism Destination Division (Tourism Service Agam Regency) Staff for Natural Resources Recovery and Conservation (Agam Regency Environmental Service), Young Spatial Planning Functional (Agam Regency Public Works and Spatial Planning Service), Linggai Park Tourism Area Manager, Floating Net Cage Owners (CONTROL OF FLOATING NET CAGES (KJA)) and Traders around the area Lake Maninjau tour. This respondent has detailed knowledge of the program and management of the tourist area at Lake Maninjau and is directly involved in the program. So it is ensured that respondents are able to provide accurate responses to the questions given. The approach in this research uses a qualitative approach, namely research that produces descriptive data about the Implementation of Ecotourism in Maintaining the Environmental Sustainability of Lake Maninjau.

RESULTS

Lake Maninjau is a lake located in Tanjung Raya District, Agam Regency, West Sumatra Province and is located approximately 140 km north of Padang City, the capital of West Sumatra, 36 km from Bukitinggi and 27 km from Lubuk Basung, the capital of Agam Regency. Lake Maninjau is a volcanic lake located at an altitude of 461,500 meters above sea level. It is called a volcanic lake because Lake Maninjau is a caldera from a large volcanic eruption which scattered approximately 220-250 km3 of pyroclastic material.

The caldera occurred due to the eruption of a composite stratovolcano that developed in the tectonic zone of the Great Sumatran Fault system called Mount Sitinjau (according to local legend). This can be seen from the shape of the hills around the lake which are shaped like walls. Maninjau Caldera (34.5 km x 12 km) is occupied by a lake measuring 8 km x 16.5 km (132 km2). Lake Maninjau is also a natural resource that is widely used by the surrounding community in various sectors such as the economic sector, tourism and energy resources.

The Lake Maninjau area plays an important role in the economy of Agam Regency. The leading economic activities lie in the sectors and sub-sectors of food crop agriculture, plantations, fisheries and tourism which are closely related to the use of the Lake Maninjau area. Directly, Lake Maninjau has been used to control floods and droughts by storing excess water in the rainy season from the rivers that flow into the lake and

channeling water reserves during the dry season. Lake Maninjau has also been used since 1983 as an energy source with the construction of the Maninjau Hydroelectric Power Plant (HYDROELECTRIC POWER PLANT (HYDROELECTRIC POWER PLANT (PLTA))), which produces an average of 21.5 MVA of electricity per year which is distributed to the West Sumatra and Riau regions. Apart from that, Lake Maninjau also functions as a place for research and education for scientific and ecological development. Lake Maninjau acts as a local protected area and stabilizes the overall microclimate.

With the increasing complexity of the development process, a synergistic development strategy approach is needed by placing a balance between natural perspectives, environmental, economic and social aspects (Kutarga et al, 2008). It is further explained that a holistic and integrative development strategy approach that is ecologically interconnected can be a solution for improvement in environmental management because an integrative approach provides a greater balance between economic and ecological interests. To restore the lake's function from damage and pollution, 10 revitalization agendas were formed which became regional government priority programs where each relevant OPD was appointed to carry out its program to revitalize the Lake Maninjau area. The 10 agendas for the revitalization of Lake Maninjau include:

Catchment Area Improvements

Maninjau Lake area has*catchment area* covering an area of 13,260 hectares which is dominated by forest functions covering an area of 6,645.92 hectares (50.12%). Apart from forests, water catchment areas are used as mixed gardens, rice fields, bushes, settlements, rivers and roads. In 2016 there was a decrease in forest area by 0.58%, and the area of mixed plantations decreased by 1.34%, the area of rice fields decreased by 3.0%. Meanwhile residential area increased by 5.52%, shrubs increased by 0.68%, and roads increased by 0.09%. Existing land use will affect land cover and will affect erosion and sedimentation in sub-watershed areas.

In improving this catchment area, the Agam Regency Government is reforesting Lake Maninjau and arranging plant types according to topography. This policy is carried out so that water catchment areas are maintained and the community has economic benefits from the results of plant cultivation and reforestation. The problem of forest and land rehabilitation is not just an environmental problem, but is closely related to aspects of the lives of living creatures because it also has a positive impact on improving the economy of residents around Lake Maninjau.

Table 1
Improvement Program Achievements*Catchment Area*

REALIZED	NOT YET REALIZED
1. Community Forest = 200 Hectares 2. People's Nursery = 4 units 3. Fruits = 5000 seeds 4. Plantation = 23000 seeds 5. Rehabilitation of Water Catchment Area = 50 Ha 6. Forest Rehabilitation of 80 Hectares 7. Providing 150,000 plant seeds 8. Controlling and Arranging Lake	1. Conservation-based River Normalization 2. Terracing 3. Mapping and Inventory of Plant Potential 4. Map of Critical Watersheds and DTAs; Research and Monitoring of Soil Conditions (97% of disaster-prone areas)

Boundary Areas and Arranging River Channels 9. Creation of 3 units of People's Nursery and 18,000 productive plant seeds 10. Procurement*Agroforestry* 25 Hectares 11. Land Rehabilitation Outside Forest Area 179 Hectares 12. Rehabilitation of 50 Hectare Water Catchment Area 13. Procurement of 4 units of infrastructure 14. AMDAL Review of Normalization Activities (2019)	5. Development of Community Forests and Community Nurseries

Source: Workshop on Saving Lake Maninjau by the Regent of Agam Regency in 2020

Hydroelectric Sluice Gate Arrangements

Lake Maninjau has one water outlet through it*intake* The Maninjau hydroelectric power plant and a small portion flows through the gate of the Weir Hydroelectric Dam at the upper reaches of the Batang Antokan River which flows into the Indian Ocean. Since 1983, Maninjau Lake water has been used to generate electrical energy with an average production of 205 GWH/year by damming the Batang Antokan river. The dam is equipped with a sluice gate (*weir*) which can be opened and closed according to needs.

Apart from that, a tunnel was built on the Batang Antokan river side*(spill way)* which functions as an overflow and outlet tunnel for irrigation which is channeled through the hydroelectric turbine intake and empties into the Batang Antokan river. The impact of the construction of this hydroelectric power plant area means that the rubbish and waste that has accumulated at the bottom of the lake cannot come out because the hydroelectric power plant's doors are closed. So, to overcome this, in the agenda for the revitalization of the Lake Maninjau area, a program was created to regulate the hydroelectric sluice gates, where the hydroelectric sluice gates are opened occasionally so that the waste that has accumulated at the bottom of the lake can come out.

Table 2
Achievements of the Hydroelectric Water Gate Regulatory Program

REALIZED	NOT YET REALIZED
1. Continuous reporting of the opening of sluice gates from hydropower plants 2. Evaluation of Environmental Management Plan (RKL) and Environmental Monitoring Plan (RPL) reports	1. Environmental Document Evaluation Study 2. Water Utilization Feasibility Study 3. Hydropower Design Study

Source: Workshop on Saving Lake Maninjau by the Regent of Agam Regency in 2020

Lake Surface Cleaning

The surface area of Lake Maninjau is littered with rubbish every day which damages the lake's ecosystem, such as water hyacinth, plastic waste, fish carcasses, including unused marine cages. So, for the agenda of cleaning the lake, goro is being carried out together in areas where there is piled up rubbish that needs to be cleaned up immediately, one of which is near the Linggai Park tourist area. This Goro was facilitated by the Environmental Service and carried out by a cleanliness task force that had been previously formed by inviting local residents.

The Environmental Service is also collaborating with the Tourism Department in cleaning water hyacinth around the Linggai Park area. Because apart from water hyacinth causing a lack of oxygen in the lake waters, it also causes a reduction in aesthetic value in the tourist area managed by the Regional Government. Waste management in the form of mass fish carcasses is still carried out by burying them and taking them to the landfill. There is already a plan from the local government to reprocess it into animal feed, but it has not been implemented because there has been no procurement of a drying machine.

Table 3
Lake Surface Cleaning Program Achievements

REALIZED	NOT YET REALIZED
1. Operational Lake Surface Cleaning Task Force since 2016	1. Procurement of Multifunctional Water Hyacinth Cleaning Vessels with a Minimum Capacity of 17 m3 (± 4.5-6 billion rupiah)
2. Regular Mass Mutual Cooperation	2. Procurement of Garbage Cleaning Ships
3. Procurement of facilities for 2 speed boats and 2 boats	3. Operation of Water Hyacinth Cleaning Equipment
4. Procurement of 4 boats and 4 water hyacinth chopping machines with assistance from the Agam Kuantan River Watershed Management Center (BP-DAS)	4. Development of Communal IPAL and Healthy Latrines
5. Cleaning Domestic Waste and Water Hyacinth	5. Reduce the amount of waste thrown into lakes by providing temporary waste storage areas
6. Integration of Local Lake Care Curriculum	6. Procurement of drying machines for processing fish carcasses into animal feed
7. Bringing in a Team of Water Hyacinth Cleaning Vessel Design Experts	

Source: Workshop on Saving Lake Maninjau by the Regent of Agam Regency in 2020

Water Quality Management

The water quality condition in Lake Maninjau is eutrophic or heavily polluted. The main cause is the large number of marine cages around Lake Maninjau, resulting in increasing contamination by waste substances from fish metabolism. The more fish food waste that pollutes lake water, the greater the amount of dissolved solids contained in it. This is what causes the water quality in Lake Maninjau to get worse. The large amount of CONTROL OF FLOATING NET CAGES (KJA) waste that accumulates at the bottom of the lake also causes the water to become cloudy and the physical and chemical quality of the water decreases. So this has an impact on increasing turbidity, uncontrolled algae growth and decreasing dissolved oxygen levels in the water.

Poor water quality resulting from the accumulation of fish food waste also causes mass fish deaths. The government's effort to overcome poor water quality is by conducting laboratory tests on water quality which are carried out routinely every 6 months by the Environmental Service. This water quality testing is also in collaboration with LIPI institutions and students from various universities.

Table 4
Water Quality Management Program Achievements

REALIZED	NOT YET REALIZED
1. Making*Wetland* and*Nano Tech* in Sungai Batang and Koto Malintang (LIPI and Ministry of Environment and Forestry) 2. Aeration in the Batang River (LIPI) 3. Water Quality Monitoring every 6 months (Environmental Service) 4. Research and Development of Water Quality Management Technology in collaboration with universities (UNAND, UNP, Bung Hatta University, etc.)	Ecotourism-based Water Quality Processing Integration

Source: Workshop on Saving Lake Maninjau by the Regent of Agam Regency in 2020

Lake Waste Suction

The organic load from CONTROL OF FLOATING NET CAGES (KJA) waste since 2001 - 2015 in Lake Maninjau has accumulated as much as 164,937 tons with an average load of 10,995.78/year and 31 tons/day. The loading of organic waste moves linearly according to the level of fish production and has a very strong relationship with fish production. With such a large amount of total waste continuing to increase every day, waste suction is the next program to be carried out. The aim of this activity is to clean the lake from waste and rubbish that has accumulated at the bottom of the lake. Previously, this dredging activity could not be carried out due to budget limitations in the APBD, but since the Lake Maninjau area has been designated a National Strategic Area (KSN), the authority over Lake Maninjau has been taken over by the center so that this waste suction activity is also the responsibility of the central government.

Based on interviews conducted with the Public Works and Spatial Planning Department of Agam Regency, this waste suction activity cannot yet be carried out because it must wait for local government approval regarding the existing waste disposal location. The equipment has been provided and has been placed at several points on the lake. If the landfill location proposed by BWS Sumatra V has been approved by the regional government, then waste suction activities can be carried out. In this case, BWS Sumatra V is collaborating with the Water Resources Management Division of the Public Works and Spatial Planning Service for and the local community.

Table 5
Achievements of the Lake Waste Suction Program

REALIZED	NOT YET REALIZED
1. Examination of Sediment Characteristics 2. AMDAL Study of Sediment Suction Activities 3. Procurement of waste suction equipment	Approval of the location of the disposal area / TPA

Source: Workshop on Saving Lake Maninjau by the Regent of Agam Regency in 2020

Saving Endemic Biota

The occurrence of tubo due to the accumulation of CONTROL OF FLOATING NET CAGES (KJA) feed waste at the bottom of the lake causes endemic biota or fish native to the lake to begin to become extinct or no longer exist. Since the tubo or mass fish death occurred in November 2022, until now the rinuak, which is an endemic species of Maninjau, has no longer been found in the waters of the lake. While usually rinuak can be found and bought in markets around the Lake Maninjau area, until now no one is selling rinuak which is a staple ingredient in the typical Lake Maninjau culinary delight.

Rinuak fish (Psilopsis sp), pensi (a type of small clam) and langkitang (a type of snail) are native animals of the lake that are economically valuable but are increasingly rare. This condition also results in a reduction in fishermen's income from fishing. To overcome the extinction of the endemic biota of Lake Maninjau, endemic biota is being rescued so that extinction does not occur. Saving the lake's endemic biota is very important because of the existence of several species of fish, and*bivalvae* (pension) is decreasing and difficult to obtain. The activities carried out are by doing*restocking* and endemic fish cultivation.

Table 6
Achievements of the Endemic Biota Rescue Program

REALIZED	NOT YET REALIZED
1. Spawning and restocking of endemic biota 2. Distribution of endemic fish seeds (Rinuak, Rasau, Bada Fish, Panjang Fish, etc.) 3. Development*Wetland* and*Nano Tech* 4. Establishment of a Conservation Area in Sungai Batang (LIPI)	1. Development of Nagari-Based Ecotourism in the Batang River and Lake Maninjau area (collaboration with LIPI) 2. Lake Biodiversity Mapping 3. Preparation of Regional and Nagari Regulations related to prohibitions and prohibitions on catching endemic fish*restocking* invasive fish

Source: Workshop on Saving Lake Maninjau by the Regent of Agam Regency in 2020

Tourism Development

To promote tourism in Lake Maninjau, the Tourism Department formed a Tourism Awareness Group (POKDARWIS) which was formed from Nagari, then was coached and given direction by the Tourism Department in managing, promoting, maintaining and

preserving tourist areas, be it natural tourist areas, historical tourist areas, tourist areas. culture and culinary tourism. Apart from promoting through social media, the Tourism Department also held an event called the Maninjau Lake Festival. The Maninjau Lake Festival itself is a festival introducing Maninjau culture by presenting art performances and national scale competitions.

For the tourist area in Lake Maninjau, only the Linggai Park area is managed by the Regional Government, so that only the Linggai Park area enters the Regional Original Income (PAD). The Linggai Park area is a family park and children's play area that offers a direct view of Lake Maninjau. The Linggai Park tourist area is located in Jorong Tanjuang Batuang, Nagari Duo Koto, Tanjung Raya District, Agam Regency, West Sumatra.

Based on the results of observations and direct interviews with area managers, the regional government has set the ticket price at Rp. 5000 for adults, Rp. 4000 for children Rp. 2000 for parking fees for each vehicle. As an effort to support local community businesses, several kiosks are provided around the tourist area for people to trade, with a rental price of 1,000,000/month. Apart from ticket officers, there are also cleaning, beauty and order (K3) officers who are tasked with cleaning up rubbish, cutting grass and caring for flowers.

As a tourist attraction that sells natural beauty, the Linggai Park Maninjau area is not always crowded with tourists. This has led to the term seasonal tourists who only come to travel during long holidays to meet internal needs*refreshing* from daily activities. Moreover, if a tubo occurs which causes mass deaths of fish in the lake, it will have an impact on tourist visits because the Linggai Park area is directly adjacent to the lake area. So the fishy smell from the fish carcasses disturbs the comfort of tourists.

From the results of the observations made, it can be seen that the area is very empty of visitors and is only crowded with visitors during the Eid holidays. This is also confirmed by the area manager, the management of the area is still not optimal from the local government so there are no interesting things that make the Linggai Park area an attraction for tourists to visit. Waste management is still not good even though there are K3 officers who regularly maintain and clean this area and many facilities are not well maintained.

Table 7
Tourism Development Program Achievements

REALIZED	NOT YET REALIZED
1. Development of the Maninjau Tourism Area (Linggai, Muko-Muko Park, Maninjau Geopark)	1. Development of infrastructure and facilities in tourist areas
2. Nagari-based Tourism Development	2. Promotion of tourist areas
3. Establishment of Tourism Awareness Groups (POKDARWIS) in each Nagari	
4. Holding a Lake Maninjau Festival Event	

Source: Workshop on Saving Lake Maninjau by the Regent of Agam Regency in 2020

Control of Floating Net Cages

Being a CONTROL OF FLOATING NET CAGES (KJA) cultivator is a livelihood that has been passed down from generation to generation in the Maninjau community. The majority of the Maninjau community depends on the results of CONTROL OF FLOATING NET CAGES (KJA) cultivation for their livelihood. In 1992, floating net cage fish cultivation was introduced to Lake Maninjau by an alumnus of the Faculty of Fisheries, Bung Hatta University (Ir. Yulinus) with a total of 16 plots at that time. Since its introduction, this cultivation has attracted much interest from the public and has begun to develop in the 2000s until now. From initially only 16 plots, it has now grown to more than 23,000 CONTROL OF FLOATING NET CAGES (KJA) plots in 2023 and the number continues to increase every year.

The large number of cages causes the remaining fish food to accumulate at the bottom of the lake so that the water cycle in the cage area is disrupted. In addition, the cages are made so tightly between one cage and another that the water cannot move freely. The layout and spacing of cages also greatly influences water circulation. This CONTROL OF FLOATING NET CAGES (KJA) activity has exceeded the threshold of ecological balance and has caused aquatic ecosystems to be destroyed and collapsed.

The current condition of the lake is no longer conducive for community use as a source of livelihood. The density of cages has caused the lake waters to become dirty and the loss of several species of fish native to the lake. The current condition of the lake waters is very bad compared to the conditions before the development of cages in Lake Maninjau. The lake waters also look black and have a layer of fat on the surface, this is caused by high cage activity which contributes pollutants to the lake.

Efforts to reduce waste production will be effective if the policy adopted is to reduce the number of CONTROL OF FLOATING NET CAGES (KJA). In the Agam Regency Regional Regulation Number 5 of 2014 concerning Sustainability Management of the Lake Maninjau Area, it is stated that in an effort to maintain and protect the diversity of biological resources, CONTROL OF FLOATING NET CAGES (KJA) business development must be adjusted to the carrying capacity and capacity of the lake waters and the suitability of the location (zoning). The carrying capacity and capacity for CONTROL OF FLOATING NET CAGES (KJA) in the lake area refers to the ability of the waters of Lake Maninjau to digest organic waste from fisheries activities, which is equivalent to 6,000 CONTROL OF FLOATING NET CAGES (KJA) plots with a size of 5x5 M^2/Friday.

Efforts made by the Regional Government include providing information to the community, especially CONTROL OF FLOATING NET CAGES (KJA) owners, about the dangers of the impact of fish food waste which falls into the lake and becomes toxic waste. Providing written directions such as appeals/prohibitions, instructions, regulations, guidelines, laws, installations Billboards and banners are also used as a form of appeal to the public to protect the environment, with the hope that the public can determine their behavior not to pollute and damage the lake. The next effort is to facilitate the community to switch livelihoods from businesses in the water to businesses on land.

In the Lake Maninjau area there are several sectors other than the fisheries sector, such as agriculture, plantations, livestock, entrepreneurship and MSMEs. This effort is being made by the Regional Government to divert livelihoods to various sectors to CONTROL OF FLOATING NET CAGES (KJA) owners so that the number of CONTROL OF FLOATING NET CAGES (KJA) plots spread across the lake can be reduced and can

be adjusted to the predetermined capacity of 6000 plots. However, even though there has been outreach and direct warnings, the community who are CONTROL OF FLOATING NET CAGES (KJA) owners reject the CONTROL OF FLOATING NET CAGES (KJA) reduction program. They do not want to change their livelihood because being a CONTROL OF FLOATING NET CAGES (KJA) owner is a very promising business.

This has also become one of the drivers for the rapid development of CONTROL OF FLOATING NET CAGES (KJA) cultivation in Lake Maninjau because the profits obtained are very large. The success and promising profits from the CONTROL OF FLOATING NET CAGES (KJA) business are what make it difficult for people to switch to other livelihoods. The absence of firm authority from the Regional Government in issuing CONTROL OF FLOATING NET CAGES (KJA) business permits has also led to a significant increase in the number of CONTROL OF FLOATING NET CAGES (KJA) from year to year.

Table 8
Achievements of the CONTROL OF FLOATING NET CAGES (KJA) Control Program

REALIZED	NOT YET REALIZED
1. Ratification of the Agam Regent's Regulation on Environmentally Friendly Floating Net Cages 2. Socialization, appeals and warnings for CONTROL OF FLOATING NET CAGES (KJA) owners	1. It has not been possible to reduce the number of CONTROL OF FLOATING NET CAGES (KJA) according to the carrying capacity and capacity of 6000 plots 2. Not yet able to divert the livelihood of CONTROL OF FLOATING NET CAGES (KJA) owners to other activities or sectors 3. The outreach, appeals and warnings that have been carried out have not been able to reduce the CONTROL OF FLOATING NET CAGES (KJA) in the lake 4. There are no business permits for CONTROL OF FLOATING NET CAGES (KJA) owners so they can carry out free activities in the lake waters

Source: Workshop on Saving Lake Maninjau by the Regent of Agam Regency in 2020

Strengthening Regulations

Lake Maninjau has been designated a National Strategic Area (KSN) and has become a priority program by the central government and regional governments. So that environmentally sound management of the Maninjau Lake area is feasible because it is protected by Law, Government Regulations, Ministerial Decrees, West Sumatra Province Regional Regulations and Agam Regency Regional Regulations as well as Agam Regency Regent Regulations. The policies implemented at Lake Maninjau are directed at managing and saving Lake Maninjau. Some of these policies are contained in formal

regulations issued by the central and regional governments. Apart from these formal regulations, there are also informal regulations in the form of a joint agreement between the nagari guardian and the community.

In utilizing the functions of the Lake Maninjau area, good governance is needed so that it runs in harmony, harmony and balance with sustainable development. This is not only carried out by one institution/agency exclusively, but requires joint efforts from various parties, both private and public. For this reason, integrated lake management is needed which is based on a holistic approach from economic, social, cultural, spatial planning and tourism aspects.

In other words, sustainable management of Lake Maninjau must be a collective action from various stakeholders. Even though regional regulations have been established and have a strong legal basis, the regional regulations that have been made are still not firm enough in following up on violations committed by CONTROL OF FLOATING NET CAGES (KJA) owners. The reason is because authority over the Lake Maninjau area has been transferred to the central government since the Lake Maninjau area was declared a Strategic National Area (KSN). So establishing zoning and licensing policies in water bodies cannot yet be implemented because there is no authority from the central government.

Table 9
Achievements of the Regulatory Strengthening Program

REALIZED	NOT YET REALIZED
1. Regional Regulation no. 5 of 2014 concerning Sustainability Management of the Lake Maninjau Area	1. Acceleration of Issuance of PERDA Prop Water Zoning (synchronization of relevant ministries)
2. Agam Regent's Regulation on Environmentally Friendly Floating Net Cages	2. Business permit licensing policy for CONTROL OF FLOATING NET CAGES (KJA) owners
3. Regent's Regulation on the Lake Maninjau Area Management Body	3. Strengthening and Assistance in the Implementation of PERDA
4. Implementation of the Agam Regency RTRW regarding the Prohibition of Building on Lake Borders	4. Preparation of PERDA and PERNA for the Preservation of Endemic Biota

Source: Workshop on Saving Lake Maninjau by the Regent of Agam Regency in 2020

Institutional Strengthening

Lake Maninjau management institutions play an important role in the success of preserving and restoring damaged Lake Maninjau. Lake management institutions play an active and comprehensive role starting from the planning stage, implementation to monitoring and evaluation of lake management implementation. Directions and policies in establishing lake management institutions must be comprehensive and integrated, involving various sectors from both the government (*policy maker*), legal actors, entrepreneurs and the community (traditional institutions, religious institutions and non-formal institutions and taking into account various existing local wisdom.

Based on this, Lake Maninjau is not only a place of exploitation because it has high economic value, but also has value and rights to be protected, developed, preserved and can be passed on to future generations. Efforts that have been made by the Agam Regency government to strengthen institutions are to strengthen the role and function of institutional associations or associations to participate in saving Lake Maninjau. Lake Maninjau Sustainability Management and policy implementation will be effective if the implementers understand their duties and functions and the ability to implement policies.

Supervision is carried out by the Integrated Lake Maninjau Rescue Team which has the authority and responsibility for carrying out monitoring, asking for information, making copies of documents or making necessary notes, entering certain places, taking samples, checking equipment, checking agencies and transportation and asking for information from parties involved. responsible for business/activities. The person responsible for the business/activity being questioned is obliged to fulfill the request of the integrated team to save Lake Maninjau in accordance with the provisions of the applicable laws. Supervision of the community can be carried out individually or in groups, traditional institutions and/or non-governmental organizations.

The aim of forming an integrated team to save Lake Maninjau is to reduce lake pollution, restore the lake's function as a habitat for endemic lake biota, improve the quality of public health, and reorganize the community's economic activities. With the formation of this integrated team, it is hoped that it will be able to act as a bridge that can achieve the expected conditions. Lake sustainability management is carried out in a planned, integrated, comprehensive, participatory and sustainable manner and adopts local wisdom and is coordinated responsibly.

The objectives to be achieved in the Maninjau Lake management policy are understanding the values that the lake has for the community, maintaining the lake's biodiversity, maintaining the hydrological and ecological functions of the lake, adjusting the CONTROL OF FLOATING NET CAGES (KJA) layout, maintaining the lake's water discharge used by hydropower, expanding employment opportunities and increasing employment opportunities, making the Lake Maninjau area a regional tourism icon, maintaining environmental cleanliness, good fisheries management together with the community, increasing the welfare of the people around the lake, maintaining lake water quality, enforcing regulations, implementing institutional coordination between related agencies.

Table 10
Institutional Strengthening Program Achievements

REALIZED	NOT YET REALIZED
1. Formation of the Nagari and Ninik Mamak Community that Cares for the Environment 2. Formation of Fisheries Groups.	1. Establishment of the Lake Authority 2. Development of the Lake Maninjau Data and Information Center 3. Nagari Community Development and Ninik Mamak Care for the Environment 4. Increasing the Capacity of Wali Nagari and Ninik Mamak

	5. Development of Laboratories and Research Centers.

Source: Workshop on Saving Lake Maninjau by the Regent of Agam Regency in 2020

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the implementation of ecotourism in preserving the environment of Lake Maninjau carried out by the central government, regional government and related agencies has been carried out with various activities and programs from the OPDs involved. However, its implementation was not optimal enough because several obstacles were found in its implementation. The main obstacle that caused this revitalization program to not run optimally was CONTROL OF FLOATING NET CAGES (KJA) control activities. The reason is that apart from this CONTROL OF FLOATING NET CAGES (KJA) being the main cause of pollution in Lake Maninjau, it is difficult to control it because it is hampered by regulations and the governing policies are still not strict enough to discipline CONTROL OF FLOATING NET CAGES (KJA) owners. So they are free to cultivate CONTROL OF FLOATING NET CAGES (KJA) in lake water bodies and the numbers always increase every year. Maintaining environmental sustainability is the responsibility of all parties including the government, private sector and society. Environmental destruction caused by irresponsible hands can result in undesirable impacts both now and in the future. The lake must be saved so that our future generations can survive.

The suggestion to be conveyed in this research is that zoning policies must be managed and legalized as soon as possible by holding more intense discussions with the Central Government involved in making this zoning. The government must ratify the business licensing policy in water bodies and collect data on people who have CONTROL OF FLOATING NET CAGES (KJA) so that the revitalization program in controlling CONTROL OF FLOATING NET CAGES (KJA) can be implemented so that people know the importance of protecting the environment. The community must be able to cooperate with the Government and play an active role in saving lakes from damage and pollution, not just taking profits without considering environmental conditions.

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