INDONESIA MONITORING CENTER FOR UNWTO SUSTAINABLE TOURISM OBSERVATORIES

ANNUAL REPORT

2019

MINISTRY OF TOURISM AND CREATIVE ECONOMY

DEPUTY OF DESTINATION AND INFRASTRUCTURE DEVELOPMENT

2020

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STO LAKE TOBA

STO LOMBOK

STO BOROBUDUR - YOGYAKARTA - PRAMBANAN (BYP)

2019 MONITORING REPORT

University of Sumatera Utara – STO Lake Toba

Monitoring Centre for UNWTO Sustainable Tourism Observatory

ANNUAL REPORT 2019

Lake Toba Tourism Observatory

University of Sumatera Utara

Medan, Indonesia

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1. Introduction

The Lake Toba Tourism Observatory, hosted by the University of Sumatera Utara (USU) was established in 2017, in line with the purpose of UNWTO on developing sustainable and inclusive tourism in destinations around the world. Monitoring and reporting activity is coordinated by the Monitoring Center for Sustainable Tourism Observatory (MCSTO) under Toba Lake & Sustainable Tourism Working Group USU. This activity meant to support planners, policymakers, tourism managers, and other relevant stakeholders in strengthening institutional capacities in formulating and implementing sustainable tourism policies, plans, and management strategies. The monitoring areas of MCSTO of USU in 2018 only covered four villages (Lumban Suhi-suhi, Situngkir, Hota Bolon, Siopat Sosor) in Pangururan, Samosir. Meanwhile in 2019, MCSTO of USU expanded the monitoring area to become the whole of the Lake Toba area, which includes 31 sub-districts in 7 regencies. The broad STO's area coverage was based on the Indonesian Presidential Regulation No. 81/2014 that classifies Lake Toba into Key Tourism Areas (KTA) and Non-Key Tourism Areas (non-KTA). KTA consists of 4 districts in the lakesides with significant tourism activities, namely Girsang Sipangan Bolon, Simanindo, Pangururan, and Balige. Meanwhile, non-KTA are the rest 27 sub-districts in the lake's surrounding.

Due to the expansion of the monitoring area, MCSTO of USU restricted the issues of monitoring sustainable tourism in Lake Toba. Monitoring activity in this first year (2019) only focused on five sustainable tourism issues, namely (1) wastewater management (issue 8); (2) solid waste management (issue 9); (3) water management (issue 7); (4) water quality (issue 7); and (5) tourism product diversity (issue 7). The five main issues are the most pressing problem and must be addressed immediately. In the KTA, the five main issues are present for monitoring. Meanwhile, in the non-KTA, attention is given to only 2 issues, i.e. wastewater and solid waste. However, the other mandatory issues and one of supplementary issue will be developed in a five-year program (2019-2023) by MCSTO of USU to monitor sustainable tourism in Lake Toba. The issues that will be added in future monitoring are (1) local satisfaction with tourism (issue 5); (2) energy management (issue 6); (3) community participation in tourism; (4) employment (issue 2); (5) developing tourism destination economy (issue 3); and (6) governance (issue 4).

Since January to December 2019, steps were taken in conducting the monitoring program which purpose is to find the first year baseline for future monitoring strategies. The MCSTO's activities carried out on each issue are divided into 3 phase; (1) data collection, (2) data analysis, and (3) participative stakeholder engagement approach. MCSTO of USU were helped by the expert team from multidisciplinary backgrounds; tourism, sustainability, regional planning, economic development, and environmental science for doing the monitoring activity. The first year's existing data of each issue will become the baselines for future monitoring program. The five years of monitoring were programmed to optimize and strengthened sustainability in Lake Toba to achieve the ultimate goal.

Within one year there have been many changes that occurred in the monitoring area. One of the most significant improvements is the increase in income through tourism provided from the monitoring area. The following is a table of increasing destination profiles in the monitoring area, Lake Toba, Sumatera Utara. Infographics on the key developments are also given in Annex 1 of this report.

Table 1. Destination Profile

		2018	2019
1	Tourism Satellite Account/s (TSA) in the destination country	☒ YES Last time a TSA was conducted: 2014 in Indonesia **(Sourc: Tourism Ministry of Indonesia)**	☒ YES Last time a TSA was conducted:
2	Sector relevance: Contribution of (a) tourism and (b) other economic sectors to the local GDP (%) – latest figures	☒ YES In Samosir Regency 2018 = 107,735 USD 2017 = 30,810 USD 2016 = 18,752 USD In Pangururan District 2018 = 31,754 USD 2017 = 8,277 USD 2016 = 6,312 USD **(Tourism Office of Samosir Regency) *2018 only until September**	a) Tourism 6% b) Agriculture 13.9% c) Industry 40.3%
3	Arrivals of inbound (non-resident) visitors for last three years – Thousands	☒ YES In Samosir Regency Overnight: Total: 2018 = 33,063 2017 = 55,771 2016 = 35,823 In Pangururan District 2018 = 903 There is no detail information for same day visitors	☒ YES **North Sumatera** 2019: 2018:236.431 2017: 270.792 **Lake Toba Region** 2019: 2018: 77.844 2017: 117.323 **Source: BPS of North Sumatera**

		(Tourism Office of Samosir Regency) *2018 only untill September	
3.1	Percentage of total annual arrivals of inbound (non-resident) visitors occurring in peak month and in peak quarter (please indicate which month and quarter)	☒ YES 2017 = 18,6% (51,964) on June, 37% (102,224) in the middle quarter (May – August);); 2016 = 22% (42,107) on July, 41% (79,744) in the middle quarter (May – August); **(Source: Tourism Office of Samosir Regency)**	☒ YES 2018 = 6,74% (15.952) on January, 8,16% (19.286) on June, and 9,21% (21.787) on December. (**Source: BPS of North Sumatera)**
4	Trips of domestic visitors for the last three years – Thousands	☒ YES In Samosir Regency Total: 2018 = 243,146 2017 = 222,288 2016 = 154,905 In Pangururan District 2018 = 99,852 **(Tourism Office of Samosir Regency) *2018 only untill September**	☒ YES **North Sumatera** 2019: 2018: 12.100.000 2017: 14.000.000 **Lake Toba Region** 2019: 2018: 2.134.988 2017: 2.455.236 **Source: BPS of North Sumatera**
5	Tourism industries: accommodation for visitors in hotel and similar establishments - Units	☒ YES Number of establishments: 22 Total rooms: 376 Total bed-places: 475 Homestay : 13 **In Pangururan District** Number of establishments: 95 Total rooms: 2077 Total bed-places: 2999 Homestay : 66 **In Samosir Regency** **(Tourism Office of Samosir Regency)**	☒ YES **North Sumatera** Total rooms: 11.513 Total bed-space: 48.571 **Lake Toba Region** Total rooms: 8.325 Total bed-places: 13.581
6	Current top 5 primary source markets for the destination	☒ YES Malaysia Singapura Tiongkok Australia Taiwan **In North Sumatera Province** **(Source: Samosir Regency Tourism Office)**	☒ YES Malaysia Singapore Tiongkok Germany French Netherlands
7	Research & Journal related to Sustainable Tourism	**Lecture Reseacrh & journal** 2018 : 16 **Student Research & Thesis** 2018 : 20 (Only from USU and not all recorded yet)	**Lecture Research & Journal** 2019: 30 **Student Research & Thesis** 2019: 43
8	Please describe the destination's	In 2018, an observatory has been established in the Lake	At present, the monitoring will be expanded into the whole lake's

	experience with other monitoring initiatives/systems	Toba area that focused on the Pangururan sub-district.	surrounding, consists of 30 more sub-districts.
9	Are there strategies in place for sustainable development of the destination?		☒ YES Name of those of relevance: STDev program of the Indonesian Ministry of Tourism.
10	DMO(s) in monitoring area: Yes/No and year of establishment		☒ YES Year of establishment: Badan Pelaksana Otorita Danau Toba / The Agency of Lake Toba Authority (2017); Badan Pengelola Geopark Kaldera Toba / The Management Board of Toba Caldera Geopark (2017)

2. Monitoring activities on issues areas and monitoring results

2.1 Monitoring activities

Monitoring activities of MCSTO of USU was started by doing the engagement with all of the tourism stakeholders in Lake Toba. This step aims to make collecting data easier for MCSTO of USU to fulfill the data needs in the monitoring of five main issues. In broad outline, the monitoring activities held by MCSTO of USU carry out as the diagram shown below:

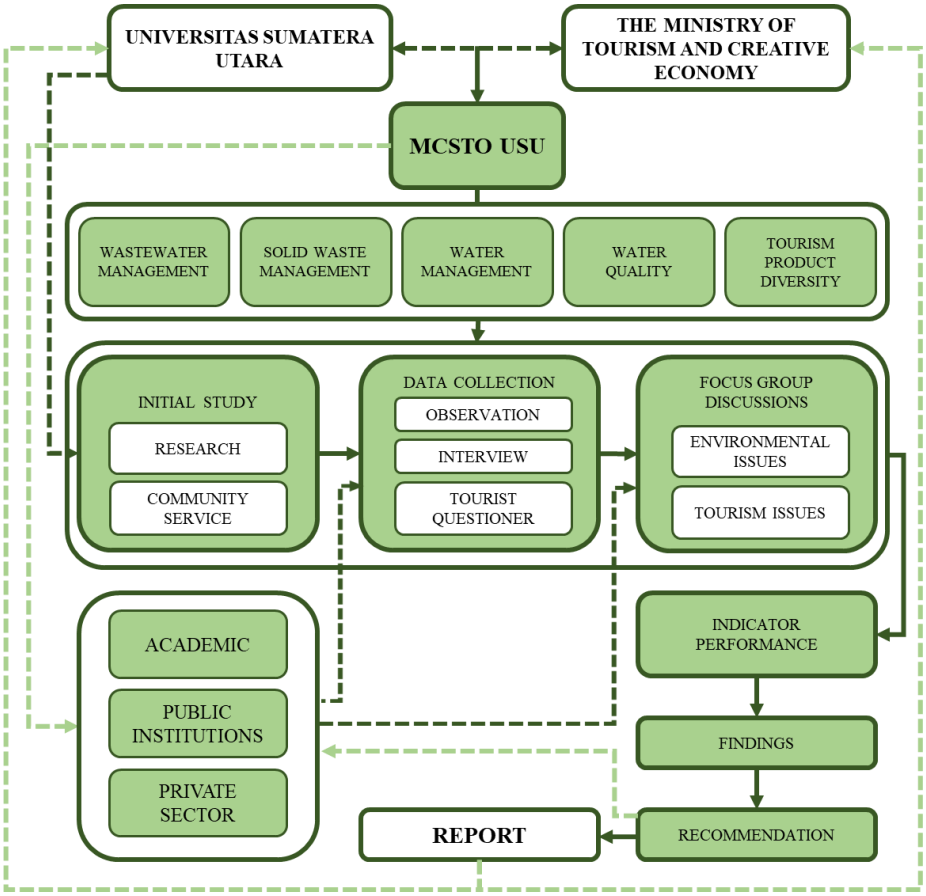


Figure 1. The scheme of MCSTO USU's monitoring activity

2.1 Monitoring results

The monitoring conducted on the issue *wastewater management* finds that domestic wastewater and industrial wastewater from tourism establishments, for example, accommodations and restaurants, are yet to have specific sewage treatment, except for star-hotels and non-star hotels that are required to obey the Law No. 32/2009 to regularly report their current sewage management systems, including wastewater, every 6 months at the very least. Moreover, wastewater management in ranch and aquaculture is not present at all thus the waste from these industries go directly throughout small creeks to the lake. The only existing wastewater installation is found in Ajibata (Toba Samosir) that manage domestic sewage from areas around Ajibata and Parapat.. The absence of adequate wastewater management in most parts of the monitoring areas carries harmful impact on the lake's ecosystem and the surrounding environment. On average, based on the laboratory test on 21 sampling locations in the lake conducted by the Provincial Environmental Agency, pollution is found in the lake's water. The report suggests that most parts of the lakesides are polluted in low to medium intensity. The heaviest pollution level happened in Haranggaol (Simalungun) and Silahisabungan (Dairi). These two districts are identified to host intense aquaculture industry (Haranggaol) and pig farms (Purba and Silahisabungan). Adding to this issue is the identified passenger ships that carelessly discharge the toilet waste to the lake. The findings on wastewater issue are alarming for the community who use the lake's water for cleaning activities as they are highly vulnerable for water diseases contamination.

Monitoring conducted on the issue *solid waste management* found that conventional system is used in the lake's KTA and non-KTA. Periodically, domestic and industrial solid waste are carried by garbage trucks without prior sorting activities to classify the waste's types. The existing final disposal landfill uses open-dumping system, which is terribly bad for the environment as the waste is left unprocessed. Among all districts, sanitary landfill is not available at the moment.. On average, 42% of the total solid waste from districts around the lake is not transported to the final disposal landfill. To remove the waste, the community practices open-burning and garbage-dumping to the small creeks. Some residents pay retribution for waste collection, for example, in Balige (Toba Samosir). It is observed that constrain in the current solid waste management system is solely the deficient number of trucks, which is essential since the on-going system of manual garbage collection is conventional. At the moment, some of the trucks and arm-rolls are donated from several authority bodies and companies, such as Badan Otorita Asahan and Indonesia Asahan Aluminium, and University

of Sumatera Utara, to name a few. Meanwhile, hazardous waste in all districts is not properly managed at the moment, though the rule is strictly written on the Government Regulation No. 101/2014. Overall, though solid waste management is a serious issue in the villages' KTA and non-KTA where residents live in the lakesides, tourism spots are relatively neat and clean, resulting to the satisfied score on tourist perception towards the sanitation in Balige, Simanindo, and Pangururan.

The monitoring conducted on the issue *water management* in the KTA found that more than 50% of the overall households are not receiving freshwater distribution from the in-charge water companies. To meet the demand, alternative water sources are the options for those who do not subscribe to the water company. Freshwater from the lake, wells, and springs are used, though these alternatives are not adequately managed and no assurance for the water quality. Another identified constraint on water management issue is the high percentage of water loss from the reticulated system, which is 30–38% on average. Diversification on water providers is central to address this issue, because the current water companies are unable to fulfill the water demand. Adding to this problem is the unsafe quality of the lake's water for community consumption. Waterborne diseases are a serious threat to those who keep consuming and using water from the lake for daily activities.

Monitoring on the issue water quality is conducted on the lake's KTA. It is found that the provincial government sets the water quality of Lake Toba in the first-class degree. This regulation affirms that the lake's water must achieve and maintain its quality to be as equal as potable water. This expectation is unlikely to happen, pointing to the great loads of pollutants and contaminants in the water from domestic, agriculture, and aquaculture effluents. The report from the Agency of Environmental Affairs confirmed that all parts of the lake is polluted in low intensity. Referring to the Government Regulation No. 81/2001, biological oxygen demand (BOD) and chemical oxygen demand (COD) found on the lake is too excessive thus damaging the water quality. This fact suggests that water pollution has transcended its capacity that would further affect the lake's ecosystem and environments.

On the issue tourism product diversity, the monitoring conducted in Lake Toba's KTA resulted in three conclusions. Firstly, peak months in Lake Toba occur three times a year, there are at the beginning of the year (January), mid-year (June), and the end of the year (December). Tourism Seasonality in Lake Toba is strongly influenced by the presence of long holiday students and religious holidays. A comparison of the intensity of tourist visits, which is most

visible during peak month, is in the number of local tourist arrivals in the Lake Toba. The ratio of tourist arrival between peak months and lowest months that happen in Lake Toba is 2.4 : 1. Secondly, there were so many events that have been conducted to increase tourist arrivals in Lake Toba. Unfortunately, the objective of organizing the event has not been specific to animate tourism activities during the lowest months. The benefits of organizing events to overcome the lowest month have not been realized by the stakeholder and tourism businesses. Conducting various events in the low season will have a positive impact on economic stability in the Lake Toba tourism industry. Third, even though tourism seasonality occurs in the Lake Toba region, but this condition does not affect the availability of tourism support facilities. Accommodations, restaurants, and other supporting facilities on Lake Toba remain open throughout the year.

3. The operation of the INSTO

MCSTO USU team was formed to carry out the Lake Toba Tourism Observatory duty in 2019, according to the decree of the rector of the USU No. 769/UN5.1.R/SK/KPM/2019. The operating structure of MCSTO USU is filled by USU's academic community, i.e., the lecturers, administrative staff, and alumnus of USU. To monitor the five main sustainable tourism issues in Lake Toba Tourism Observatory, MCSTO USU was helped by eight experts and three research assistants. The composition of the experts is a leader of the expert team, an expert on tourism development, two experts on tourism management, two experts on the environment, an expert on urban planning. The structure of the operation of the Lake Toba Tourism Observatory could illustrate as the diagram below:

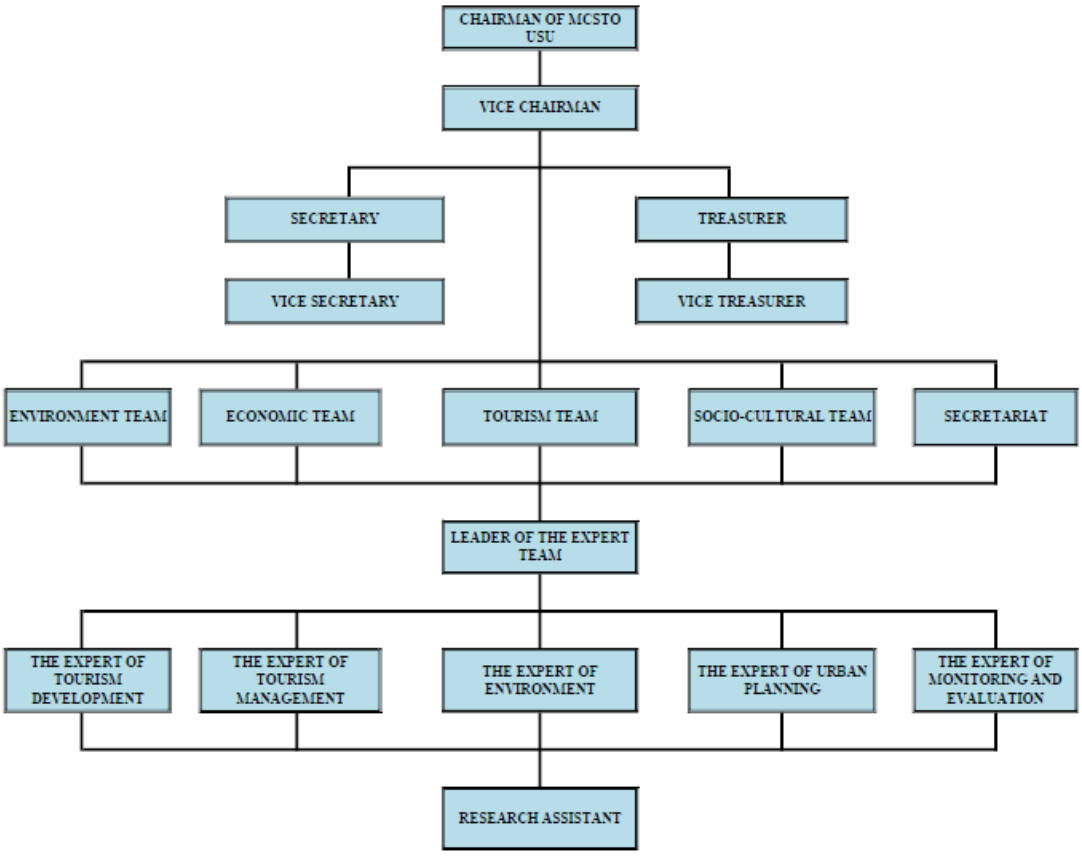


Figure 2. The structure of the operation of the Lake Toba Tourism Observatory

In early 2019, MCSTO USU started activities by carrying out regular monitoring activities, especially in the previous year's monitoring area, Pangururan District. Besides, MCSTO USU also assisted potential tourist destinations in Samosir and Karo districts to achieve the ISTA (Indonesia Sustainable Tourism Award) award. To increase the insight into the development of sustainable tourism, the MCSTO USU, represented by the MCSTO chairman, also participated in the STD assessor training held by the GSTC in May. MCSTO USU also conducted a public lecture on sustainable tourism and attended by more than 1000 USU students who wanted to carry out community service. In July, MCSTO monitored the use of Biogas technology as a continuation of last year's activities implemented by the community in Pangururan District. The multistakeholder meetings, public forums, FGD on tourism & environment issues, and the WINSTO forum were carried out in Lake Toba to approach stakeholders related to sustainable tourism development. These forums invited representatives from the government, organizations, NGOs, and communities. Apart from being a forum for hospitality, the forums also aim to gather views from various stakeholders and develop stakeholder insights regarding sustainable tourism with experts and competent speakers.

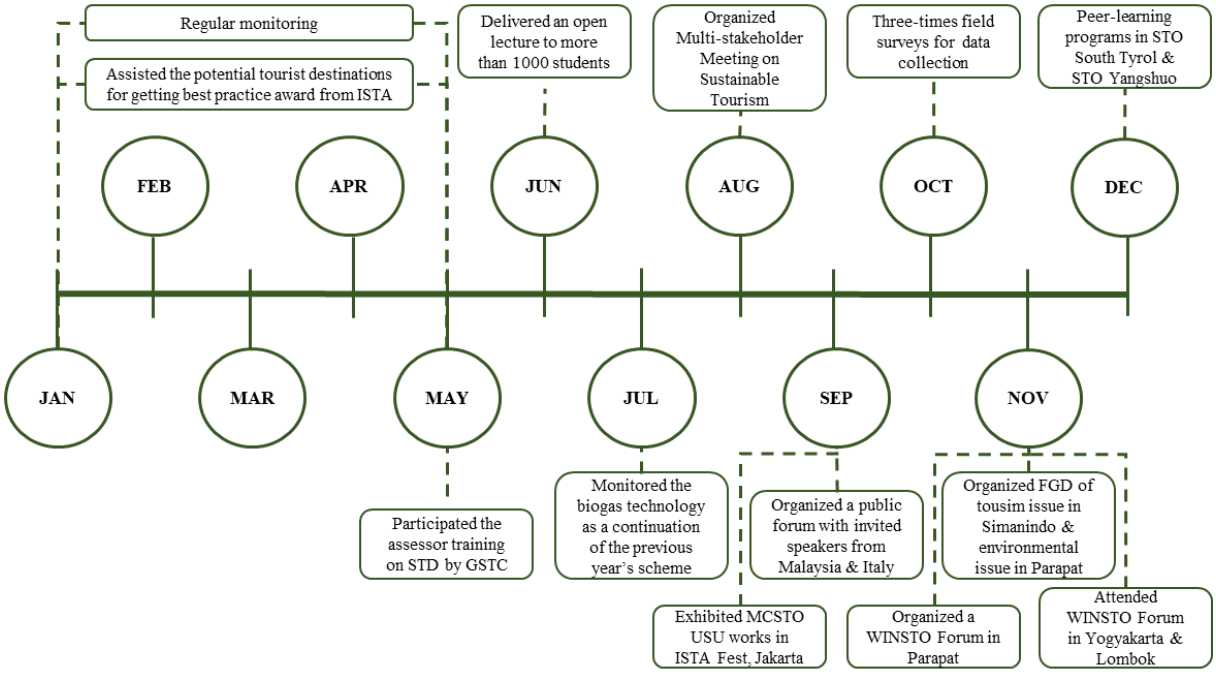


Figure 3. The activity of MCSTO USU in 2019

MCSTO USU had carried out all of the monitoring activity to achieve the short term objectives of the observatory in the first year. From the monitoring activity conducted in 2019, the MCSTO USU could develop the baseline data and indicator performance for the five main issues in Late Toba Tourism Observatory (wastewater management, solid waste management, water management, water quality, tourism product diversity). The annual multistakeholder meeting and WINSTO Forum held by MCSTO USU had a warm welcome not only from the local government but also the community in Toba Lake Tourism Observatory Area. Supporting from the local stakeholder in Lake Toba for the monitoring activity can be seen from their participation on provided the data that is used as the basis for writing the preliminary and annual report.

4. Review of Issues and Indicators – adjustments to the monitoring program

4.1 Wastewater Management

The only existing wastewater installation is present in one location Ajibata (Toba Samosir). The other districts in both KTA and non-KTA have no adequate sewage treatment plan. At the moment, domestic wastewater is channeled to the lake throughout small creeks around the villages. Possible scenarios to address this issue are (1) developing small scale wastewater treatment in villages where residents are smaller than 200 households, (2) creating a larger integrated wastewater treatment plan through 1 installation for several villages combined, and (3) building and empowering the community to maintain and manage the proposed installation.

Wastewater treatment plants can be managed by private parties or in collaboration with government institutions, which in this case, are under the Sanitation Department Office. With the management of sewage receiving treatment can help maintain Lake Toba's water quality.

The current recorded data is limited to the existing private and communal toilets only. In the 4 KTA districts, 92.2% utilize private toilet installed in each house. This number suggests that there is still the rest 7.8% of the population still practicing careless defecation. It is also recorded that there is 2% who use communal or public toilet which waste go to installed septic-tank. Meanwhile, in the 27 non-KTA districts, 90.1% households have private toilet, where the rest 10% are using communal toilet as well as practicing careless defecation on the lakeshore. At the moment, public initiative to clean up the drainage creeks in the villages is still unavailable thus creating shabby and smelly environment. Therefore, a suggestion is given to the ITMP to develop plans on future wastewater plumbing and installation (IPAL) plan for domestic and tourism establishments. Moreover, in the next 4 years, a target must be set for the KTA to have their own wastewater installation. A communal toilet management system is needed, especially at tourist destination spots. This management system can be an alternative economic income for the local community.

On the indicator impact of sewage treatment, the level of water pollution in the lakesides where settlements and aquaculture industries are present is high, based on the published report from the Provincial Agency of Environmental Affairs. The absence of sewage treatment in the lake's KTA and non-KTA leads to unpleasing smell and sight of the environment, particularly on the districts where pig farms and fish cultures are located (Haranggaol, Purba, and Silahisabungan).

4.2 Solid Waste Management

Garbage collected from temporary disposal bins or arm-rolls located in the KTA and non-KTA neighborhoods are transported to open-dumping final disposal area. In the KTA, 57% of waste is transported in Samosir, followed by 58% in Simalungun, and 66% in Toba Samosir. In the non-KTA, Karo performed the best in solid waste collection where 100% of waste in the sample village is transported (the sample village of Tongging is a crowded tourism destination, howbeit, other villages in Karo could have un-identical performance), whereas Humbang Hasundutan performed the weakest with only 23% transported waste. To address this issue, strategies are needed in all districts surrounding the lake to reduce the high production of waste, for example, charging extra fee for plastic use, implementing fines for careless littering,

creating specific law in local level concerning solid waste, initiating compost-making activities, and recycling useful resources for waste recovery program.

Though informally, scavenger activities that collect garbage with economic value are present in the KTA, but it does not provide significant impact on the amount of waste reduced. Based on this fact, raising community awareness on this issue through economic and regulatory approach could be implemented to retrieve benefits from valuable resources in the waste, for example, composting, applying fines, and disseminating knowledge on hygiene and sanitation concerns. Government institutions such as the Sanitation Department or the Environmental Society can be invited to work together to raise community awareness

Conventional system in waste collection services is implemented by the local governments in all 7 regencies with regard to serving the community in collecting and managing solid waste. The in-charged agencies on environmental affairs and sanitation affairs collected the waste manually and transported them to final disposal landfill areas. At the moment, an identified disposal landfill is found in Laguboti (Toba Samosir). On average, around 55% of solid waste is transported, where the rest 45% is left unmanaged and harm the environment sustainability. Counseling about waste recycling can increase the income of the community can help the performance of the local sanitation department. Knowledge of the urgency in managing hazardous substance must be disseminated among the government institutions and the community members to raise awareness and develop initiative on this matter.

Tourist perception towards clean image of the destination, in the KTA where tourism activities play a considerable portion, only Simanindo received the rate satisfied in every parameter, followed by respectively Pangururan, Balige, and Girsang Sipangan Bolon.

4.3 Water Management

The production capacity from the water companies is achieving the needs of consumers. However, service distribution from the water companies on freshwater is highly limited in the KTA. The percentages are 55.6%, 41.53%, 39.4%, and 30.5% respectively for Girsang Sipangan Bolon, Pangururan, Simanindo, and Balige. To comply the needs, alternative sources are used by the community, such as lake water, well water, and spring water. The supply of clean water sources is a significant problem that must be resolved. The provision of clean water by local companies can be an alternative business community. This solution can answer the need for freshwater supply and can improve the health of the local community.

Steps are taken to conserve the upstream water through reforestation program integrated with torism areas in Lake Toba.. However, conservation efforts in the downstream is not present at the moment. It is also observed that the absence of vegetation along the Asahan River that flows the water from Lake Toba is influencing the hydrology system hence it is not working optimally.

Each location applies different tariffs according to the volume of water production and business calculation from the in-charge water company. The variety in water pricing is caused by geographical factors, water loss incidents, and management in water production and distribution issue. For instance, in the lowlands of Balige, the water cost is 685 IDR/m^3, while in Girsang Sipangan Bolon that settled in hilly landscape, the cost is 2000 IDR/m^3, which is three times higher. To address the pricing issue, steps could be taken by upgrade the water production capacity, improve the water distribution system, and lessen the water-loss events.

A major issue is the water loss from the reticulated system which reached more than 30% of the total water volume. It is also recorded that freshwater could only be accessed 3 hours per day at two sample villages in Simanindo and Balige. This limited time operation could only provide drinking water thus the community go to the lake for cleaning purposes. In addition to that, boundaries in the investment on freshwater infrastructure and the limitation in human resources are among the causes of water distribution in the KTA not achieving its optimum service. In fact, in Simanindo, Pangururan, and Balige, specific companies that provide water service to these districts are not present. To distribute freshwater, the capital's PDAM Tirtanadi is in charge in the KTA (except of Girsang Sipangan Bolon) with certain agreement with local operators. The quality status of the distributed water is on decent level, based on the reports from the serving water companies in Simanindo, Pangururan, and Balige that refers to the Health Minister Decree No. 492/2010. Meanwhile, similar report in Girsang Sipangan Bolon is not available at the moment. It is also important to note that 27.5% of the community members that use the lake freshwater for daily consumption and cleaning activities are sensitive for waterborne diseases.m the lake for daily activities.

4.4 Water Quality

The quality status of the lake's water is polluted on low intensity, based on the parameters of biological oxygen demand (BOD) and chemical oxygen demand (COD). Algae blooms is frequently present as well in the KTA lakesides, informing that the water receives nutrients from inappropriate waste treatment from agriculture and aquaculture businesses. To address

this issue, controlling the contaminant sources is highly essential. In addition, formulating an appropriate regulation to conserve the designated potable water is also required to reduce the level of contamination.

There is no recorded data with regard to incidents on tourism activities caused by lake water contamination. Howbeit, the absence of international tourists bathing or swimming in the lake is obviously visible hence indicates that the tourists are doubtful on the lake's water cleanliness. The regular test results on the lake's water quality need to be transparently published so that tourists could become convinced towards the lake water. Balige scored the highest among all KTA's districts concerning beach cleanliness and lake water quality. Respondents scored Simanindo and Pangururan as relatively satisfied. Meanwhile, Girsang Sipangan Bolon received the lowest score on tourist perception towards the lake's water quality.

4.5 Tourism Product Diversity

There is two low season period that occurs during a year at Lake Toba, namely from February to May and from July to November. Even though there are only three months that become peak months in a year (January, June, and December), but it can contribute 44% of the total tourist arrivals to Lake Toba in a year. Hotels, restaurants, and other tourism businesses hang their hopes on tourist visits during peak month. Especially in the hotel business, which during the peak month can reach an occupancy rate of 75-100%. While the average occupancy rate of lodging in the Lake Toba area in a year is 45%. The pattern of tourist visit rates in Lake Toba can be seen in the graph below.

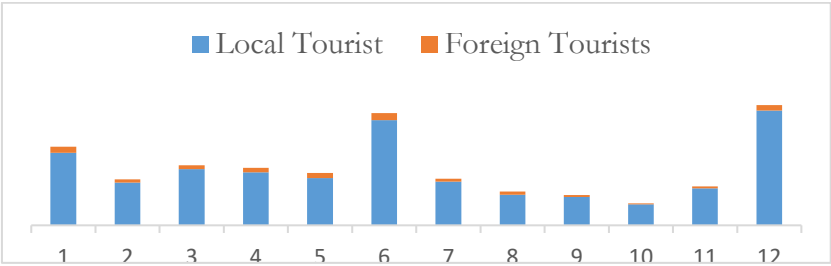


Figure 4. Tourist arrivals by month in Lake Toba

Various attempts have been made to increase tourist arrival as well as at the lowest month. One of the efforts is a tourism promotion that was not only carried out by the tourism ministry but also collaborates with ASITA in selling Lake Toba tour packages at domestic and abroad. Various events have also been held to increase the number of visits to Lake Toba, but the timing is not intended to increase tourist arrivals during low seasons. There are no unique tourist attractions which were only open during peak season, all tourist attractions on Lake Toba are

available throughout the year. Number of different types of tourist attraction in the four KTA Lake Toba can be seen in the table below.

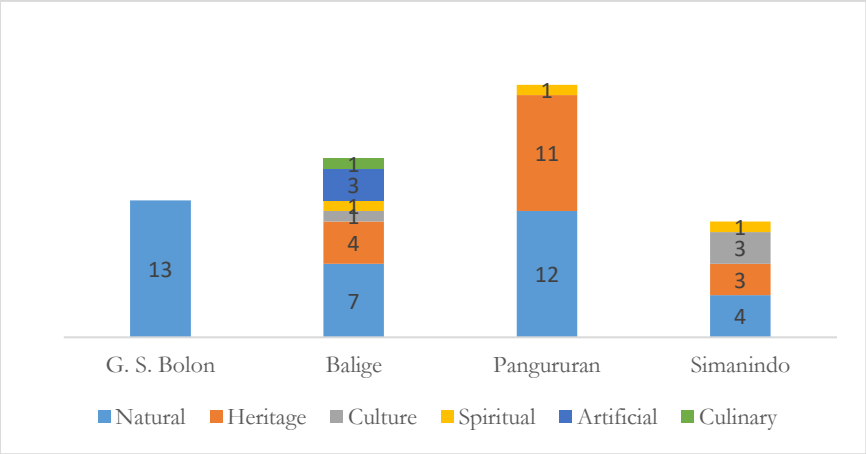


Figure 5. Tourist Attraction Diversity in Lake Toba

Businesses engaged in the tourism industry such as hotels, restaurants, souvenir shops, travel agencies, and others remain open throughout the year and continuously serve tourists who come. The condition of tourism seasonality that occurred in the Lake Toba region did not lead to the closure of tourism businesses, even though the average hotel occupancy rate in the low season only reached 27%. Although on the other hand, the condition of tourism seasonality that occurred in Lake Toba resulted in the low revenue of the tourism business at the lowest month. In general, the business of tourism service providers is quite stable throughout the year, but the unstable is about job opportunities to the workers. The availability of facilities that are open all year long in the four KTA Lake Toba can be seen in the table below.

Table 2. Provision of Tourism Product and Services in Lake Toba

KTA	Accommodation			Restaurant		Transportation			Tourist Information		
District	Hotels	Rooms	Beds	Dining	Chairs	Water	Land	Air	TIC	Guide	Tour
G. S. Bolon	25	1081	2162	94	3089	✓	None	✓	None	✓	2
Balige	19	395	790	287	2870	✓	None	✓	None	33	None
Pangururan	21	376	475	116	1160	✓	✓	✓	✓	1	3
Simanindo	76	1656	2460	109	1090	✓	✓	✓	✓	33	4

Girsang S. B.District has 25 accommodations, 8 certified accommodations with specifications: 2 four-star hotels, 2 three-star hotels, and 4 two-star hotels. Meanwhile, 17 other accommodations are not certified. Balige District has 19 accommodations with details of 11 hotels, 7 motels, and 1 guest house. In Samosir Regency, there are 245 accommodations with details of 4 star hotels, 97 non-star hotels, 2 resorts, 15 guest houses, and 127 homestays. Of the total, 21 accommodations are in Pangururan District and 76 accommodations in Simanindo District. There are 137 restaurant in Simanindo, 253 restaurant in Pangururan, 71 restaurant in

Balige, and 65 restaurant in Girsang Sipangan Bolon. In the four KTAs, there were no tour and travel agencies that were officially registered as members of the Association of The Indonesian Tours and Travel Agencies (ASITA). Balige is the only KTA that has not to have a tourist information center.

5. Performance of the indicators – trends observed; remedial actions identified; accountabilities

5.1 Wastewater Management

Data shows that star hotels in KTA and non-KTA, already have wastewater treatment plant (WWTP) but small-scale hotels do not have wastewater management facilities. The existing wastewater treatment system is only in Ajibata (Toba Samosir). It manages domestic waste from the area around Ajibata and Parapat. Meanwhile, other locations that are not connected to the communal WWTP, domestic wastewater flows directly into sewers and water bodies.

Table 3. The data of wastewater management in Lake Toba

Regency	Indicators			
	Wastewater treatment and reuse	**Wastewater treatment system**	**Impact of wastewater treatment**	
			Load-P total (tons / year)	
Simalungun	Star hotels already have wastewater treatment plant (WWTP), but the implementation is not known	Does not have a domestic wastewater treatment systems. Domestic wastewater (gray water) flowed into the sewer and water bodies.	1. Settlement 2. Hospitality 3. Agriculture 4. Meadow 5. Rice fields 6. Forest 7. Ranch 8. Rainfall 9. Fishery	1. 196,51 2. 8,86 3. 6,19 4. 6,19 5. 1,89 6. 2,78 7. 384,08 8. 2,05 9. 2.124,16
Samosir	Star hotels already have wastewater treatment plant (WWTP), but the implementation is not known	Does not have a domestic wastewater treatment systems. Domestic wastewater (gray water) flowed into the sewer and water bodies.		
Toba Samosir	Star hotels already have wastewater treatment plant (WWTP), but the implementation is not known	Ajibata has a wastewater treatment system in the form of a communal wastewater treatment plant (WWTP).		
Dairi	Star hotels already have wastewater treatment plant (WWTP), but the	Does not have a domestic wastewater treatment systems. Domestic wastewater (gray water) flowed		

Regency	Indicators			
	Wastewater treatment and reuse	Wastewater treatment system	Impact of wastewater treatment Load-P total (tons / year)	
	implementation is not known	into the sewer and water bodies.		
Karo	Star hotels already have wastewater treatment plant (WWTP), but the implementation is not known	Does not have a domestic wastewater treatment systems. Domestic wastewater (gray water) flowed into the sewer and water bodies.		
Tapanuli Utara	Star hotels already have wastewater treatment plant (WWTP), but the implementation is not known	Does not have a domestic wastewater treatment systems. Domestic wastewater (gray water) flowed into the sewer and water bodies.		
Humbang Hasundutan	Star hotels already have wastewater treatment plant (WWTP), but the implementation is not known	Does not have a domestic wastewater treatment systems. Domestic wastewater (gray water) flowed into the sewer and water bodies.		

Very few areas have wastewater management systems in Lake Toba. Only one sub-district has a wastewater management systems. Moreover, wastewater in Lake Toba has not been treated and reused for daily water needs.

Table 4. Performance of the wastewater management indicators

Indicators	Baseline Data	Target	Indicator Performance
Wastewater treatment system	Only one sub-district has a wastewater management system	All 31 sub-districts have wastewater management systems	3%
Wastewater treatment and reuse	All 31 sub-districts does not reuse the wastewater	All 31 sub-districts carry out wastewater reuse	0%
Impact of wastewater treatment	Lightly polluted	Not polluted	50%[1)]

Note: 1) lightly polluted is assumed to be 50 points, not polluted is assumed to be 100 points

The calculation of each indicator performance shows that sewage receiving treatment performed as low as 3% because among 31 districts, the identified wastewater treatment is available in one location only.. Meanwhile, the indicator impact of sewage treatment performed 50% as the absence of sewage treatment is frequently identified in the monitoring areas.

5.2 Solid Waste Management

The community has not carried out solid waste management in the Lake Toba area. Until now, there have been no efforts to reduce the amount of solid waste in the entire Lake Toba area. Performance of the solid waste management indicators can be seen in the table below.

Table 5. Performance of the solid waste management indicators

Indicators	Baseline Data	Target	Indicator Performance
The pattern of waste management	57% waste transported	100% waste transported	57%
Activities to reduce waste production	0% of the waste is sorted and composted	100% of the waste is sorted and composted	0%
Government activities of waste management services	55%	100%	55%
Handling of hazardous waste	hazardous waste treatment does not exist	hazardous waste management in 31 sub-districts	0%
Tourist perception of the level of cleanliness	The average value of tourist perception is 3.63	Tourists have a good perception with a perfect score of 5	73%

The calculation of each indicator performance shows that managing total waste collected in the destination performed 57% on average in all monitoring areas, while there is no available efforts on reducing waste produced and handling of hazardous substance thus these indicators could not be measured at the moment. The indicator providing waste collection services performed 55% on average. Meanwhile, tourist perception towards clean image of the destination performed 73% in the KTA. The table below shows the volume of solid waste in KTA and non-KTA based on observations.

Table 6. Volume of solid waste in Lake Toba

Regency	Amount of waste generation	Waste not transported (%)	Coverage Area (%)	Recycle (%)	Waste sorting	Hazardous waste management
Key Tourism Area						
Simalungun	170,83	41,99	40,28	No	No	No
Samosir	32,23	57,25	28,88	No	No	No
Toba Samosir	129	33,72	52,55	No	No	No

Non Key Tourism Area						
Dairi	45	60	40	No	No	No
Karo	32	0	100	No	No	No
Tapanuli Utara	3,6	30,55	70	No	No	No
Humbang Hasundutan	5,9	76,77	56,66	No	No	No

Several locations in KTA and non-KTA, have made efforts to sort waste by providing different trash cans based on the characteristics of the waste. However, during the transportation process, the waste is put back together. So it can be said that there is no waste sorting process, except for the collection of used goods that have economic value by scavengers. In addition, the monitoring area also does not carry out hazardous waste management. Sources that have the potential to produce hazardous waste such as used oil and hospital septic waste have not been managed.

5.3 Water Management

The monitoring results show that water management in the Lake Toba area has been going well. The calculation of each indicator performance shows that water use relative to supply the consumers' basic needs. Performance of the water management indicators can be seen in the table below.

Table 7. Performance of the water management indicators

Indicators	Baseline Data	Target	Indicator Performance
Water use	The ability of clean water production meets the needs	The ability of clean water production meets the needs	100%
Conservation/ water savings	waste water reuse does not exist	100% reuse of waste water	0%
Water management constraints	The level of water loss from the system: 30%	The level of water loss from the system: 0%	70%
The purity of water channeled	42% service area	100% service area	42%
Tourist perception of water management	The average value of tourist perception is 3.67	Tourists have a good perception with a perfect score of 5	73%

Overall, the service area coverage in the KTA is limited to the average 42% for Girsang Sipangan Bolon, Pangururan, Simanindo, and Balige. Optimum efforts on conservation initiatives and results is not present at the moment thus the performance could not be measured.

Water pricing performance is as well unable to be measured since each location applies different tariffs according to the volume of water production and the technical problems on the distribution system. The performance of seasonal water shortage is 38% for Girsang Sipangan Bolon and equally 30% for Simanindo, Pangururan, and Balige. Meanwhile, water purity achieved satisfying performance as the water distributed is on decent level in Simanindo, Pangururan, and Balige (there is no available data for Girsang Sipangan Bolon). Tourist has an excellent perception of water management and availability in Lake Toba (73%).

The Table below shows the source of clean water in Simalungun Regency, Samosir Regency, and Toba Samosir Regency based on the observations.

Table 8. Source of clean water in Lake Toba

Regency	Water Springs	Plumbing/ PDAM	Wells	Rivers	Rain	Bottled Water	Others
Simalungun	39.864	50.346	105.800	789	-	1.009	658
Samosir	9.513	4.384	3.100	5.400	3.950	-	220
Toba Samosir	14.321	5.738	14.632	908	76	365	-

5.4 Water Quality

The eutrophication process occurs due to the fertilization of the waters by fish feed waste around the floating net cage cultivation sites, thus encouraging water hyacinth and algae plants' growth. Community waste and restaurant businesses, including ship oil, also pollute Lake Toba's water. It is stated that the potential damage is due to the activity of floating net cages, both owned by the community and companies. Every year floating nets continue to increase in Lake Toba. If in 2005 the number of floating net cages was 2,845 units, in 2007 it increased to 5,612 units. Two years later (2009), the number became 6,269 units, with an area of 6,169 hectares spread over 51 points. According to the report of the 2012 Lake Toba Pollution Load Carrying Capacity by the BLH of North Sumatra Province, the floating net cages owned by the community personally and the company had reached 8,428 units and owned by a company as many as 484 units with a total fish production of 54,935.5 tons/year.

The data of pollution in Lake Toba found that just from aquaculture activities, organic loads released into the waters (in the form of feces and uneaten feed) are estimated at 14,265.4 tons/year while the phosphorus load (in the form of TP) is 570.33 tons/ year. This amount has exceeded the permissible loading levels and changed the trophic status of the Lake Toba waters.

Apart from aquaculture, the land area's pollutant load reaches 90,712 tons/year, while the nutrient load (in the form of TP) reaches 138 tons/year. This is because surrounding Lake Toba is volcanic soil that makes the area prime land for agriculture. In May 2016, eutrophication was the main cause of the mass fish asphyxiation, where the oxygen levels in Lake Toba are unable to support the amount of fish in the lake.

Table 9. Performance of the water quality indicators

Indicators	Baseline Data	Target	Indicator Performance
Contamination level	Lightly polluted	Not polluted	75%[1)]
Contamination levels of tourist activities	There are no data records in 31	Data has been recorded in 31 district	0%
Tourist perception of lake water	The average value of tourist perception is 3.6	Tourists have a good perception with a perfect score of 5	72%

Note: 1) lightly polluted is assumed to be 75 points, not polluted is assumed to be 100 points

The calculation of each indicator performance shows that the indicator level of lake water contamination performed equally 75% in Girsang Sipangan Bolon, Simanindo, Pangururan, and Balige. The water quality in the KTA is polluted in light intensity. Meanwhile, data on contamination events that influence tourism activities is not available at the moment thus no performance could be measured on this basis. In addition, tourist perception of lake water quality performed 72% as the average of Girsang Sipangan Bolon, Simanindo, Pangururan, and Balige.

5.5 Tourism Product Diversity

Tourism products in the Lake Toba area have varied in terms of the availability of tourist attractions and the availability of supporting facilities. There is diversification of accommodation available, ranging from star hotels, non-star hotels, and guesthouses. The seasonality level of tourist visits in the Lake Toba area is still relatively high. Overall, the performance data from the indicators of tourism product diversity can be seen in the table below.

Table 10. Performance of the tourism product diversity indicators

Indicators	Baseline Data	Target	Indicator Performance
Measuring the degree of seasonality	the ratio of tourist visits between peak tourist month and low tourist month is 2.5:1	the ratio of tourist visits between peak tourist month and low tourist month is 1.5: 1	60%

	The average occupancy rate for accommodations in a year is 40%	The average occupancy rate for accommodations in a year is 60%	66%
Strengthening tourism activities in low season	Percentage of main tourist attractions open in low seasons is 100%	Percentage of main tourist attractions open in low seasons is 100%	100%
	Percentage tourism authority budget spent promoting low seasons is 23%	Percentage tourism authority budget spent promoting low seasons is 50%	46%
Provision of sufficient infrastructure throughout the year	Total accommodation is 3613 rooms	Total accomodation is 3736 rooms	96%
	All of the accommodations and other facilities open throughout the year	Accommodations and other facilities open throughout the year	100%
Perception of the diversity of tourism products	The average value of tourist perception is 3.6	Tourists are satisfied with the diversity of tourism on Lake Toba so they want to come back again 4,5-5	73%

Based on the calculation of the level of tourist visits per month, it was found that the average peak month was able to contribute 15% of the total tourist visits per year, where the lowest month was only able to provide 6% of the total tourist visits per year. The trend that occurs at average occupancy rates in a year is 40%, while the expected target to be achieved is 60% in Lake Toba. Notably, in the low season, Lake Toba only reaches average occupancy rates around 27%. From the monitoring of tourism product diversity, show that the performance of the indicator has not met the expected target. It is necessary to increase activities and promotions to maximalizing tourist arrival during the low season.

6. Lessons identified

Through the comprehensive analysis on the issues and indicators, as well as a wide range of MCSTO's research and activities, the following lessons are identified in the 2019 scheme.

Firstly, although the control on water contamination has been regulated by the state's central government since 2001 (Government Regulation No. 82/2001), wastewater management issue is still impacting Lake Toba's water quality. Pollution that is happening in Lake Toba is an obvious fact. It means that the responsible institutions' capacity is not effectively working to counter the arising problems with regard to wastewater concerns. It is important for the ITMP to create a countermeasure plan on improving coordination among institutions on this matter.

Secondly, the use of conventional method and the lack of innovation in managing solid waste on 31 districts surrounding Lake Toba suggest that there is no advancement and improvement on this issue. Garbage being transported to final disposal landfill without further process means that, instead of resolving, the problem is simply being moved to another place. This fact is conflicting with the principal of material balance.

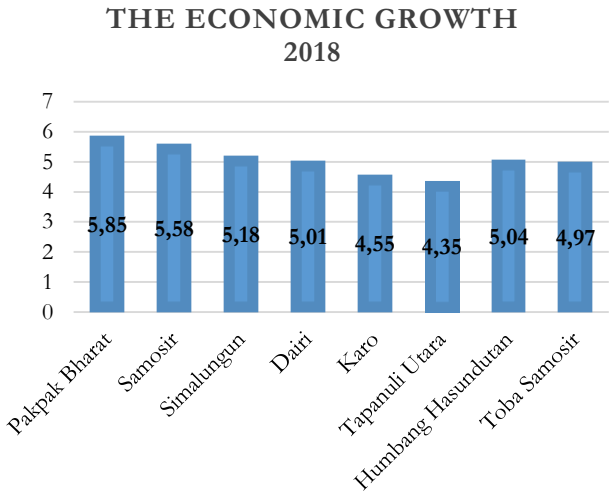
Thirdly, water management could not rely to one entity only. Since the current in-charge water companies in the lake's KTA are not complying the overall needs of freshwater, if possible, another providers could support the existing companies in distributing water to residents and tourism establishments.

Fourthly, the setting that put Lake Toba's water as equal as drinking quality is unreasonable and unlikely to happen, unless immediate actions to restore and rehabilitate the lake's water quality are taken by the ruling local government institutions. The trophic status, the level of contaminants, and the lake's carrying capacity have proven that the current lake water is polluted. Sampling on the laboratory test must be classified and separated between the water in the shore and the water in the middle of the lake, because the quality in both mentioned locations are obviously dissimilar. Measuring and testing the lake's water quality have been going on for long yet to date, rehabilitation and improvement are far to take place.

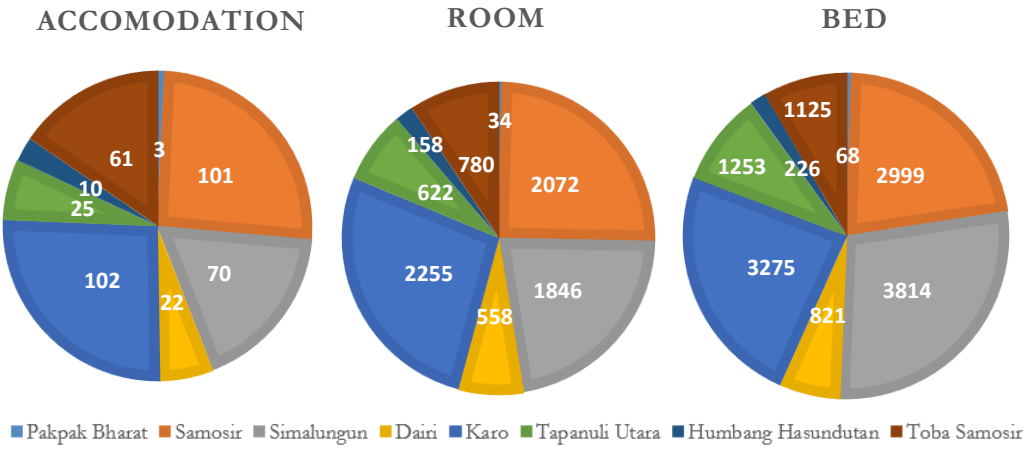
Fifthly, Lake Toba has various offerings on tourism products, howbeit, it is important to learn that various options on attractions do not literally mean that the attractions are adequately diverse. Instead of adding the quantity, attractions in the lake destination need to upgrade the quality to escalate the number of visitors.

Annex I. Destination Infographics

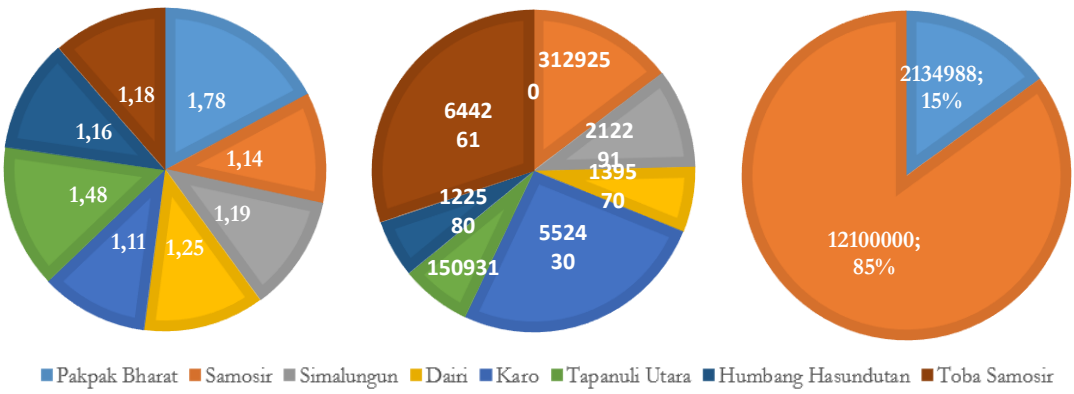
Here is an infographic for destination profile update



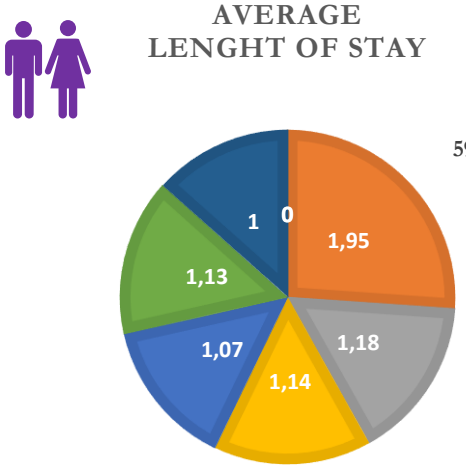
The Economic Growth in 8 Regencies, Lake Toba

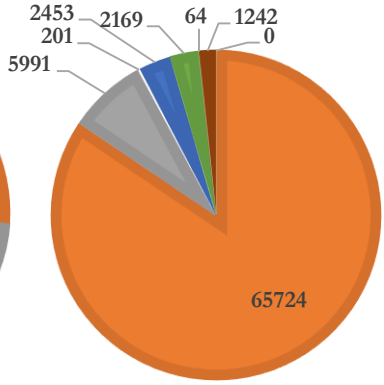


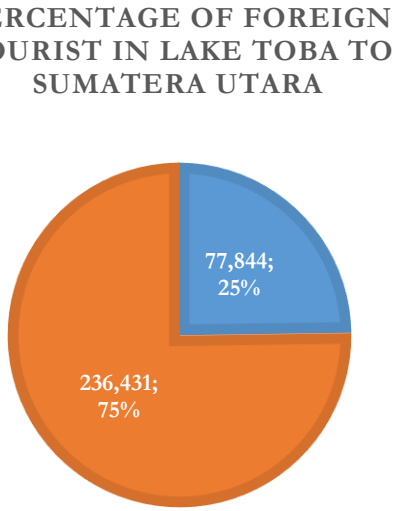
Precentage of Accomodation in 8 Regencies to Lake Toba Region



Local Tourism in 8 Regencies, Lake Toba

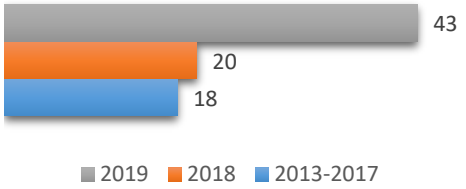




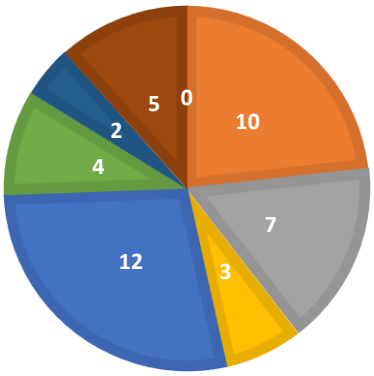


Pakpak Bharat Samosir Simalungun Dairi Karo Tapanuli Utara Humbang Hasundutan Toba Samosir

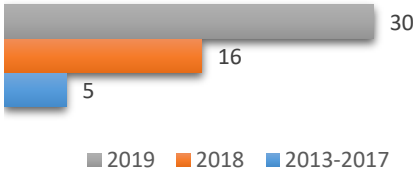
Local Tourism in 8 Regencies, Lake Toba



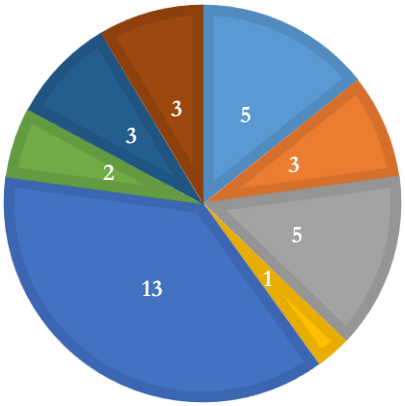
USU Student Reseacrh & Thesis in Lake Toba



Pakpak Bharat Samosir
Simalungun Dairi
Karo Tapanuli Utara
Humbang Hasundutan Toba Samosir



USU Lecture Reseacrh & journal in Lake Toba



2019 MONITORING REPORT

Mataram University – STO Lombok

Monitoring Centre for UNWTO Sustainable Tourism Observatory

ANNUAL REPORT MCSTO UNRAM 2019

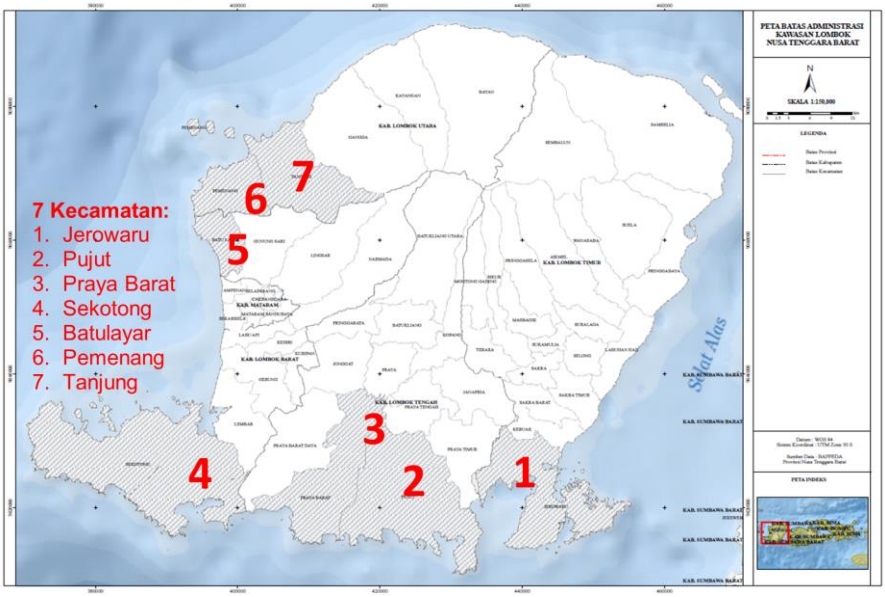
Introduction

Monitoring Center of Sustainable Tourism Observatory of Mataram University (MCSTO UNRAM) has been conducting two monitoring activities including: (1) Monitoring and providing assistance to destination communities in Sesaot Tourism Village. And (2) Identifying tourism potentials and collecting preliminary data of five main indicators of sustainabel tourism development in seven sub-districts within Lombok.

Monitoring activities in the Sesaot tourism village have been conducted by MCSTO UNRAM since 2016 in collaboration with the Research and Community Service Institute of Mataram University. One of the monitoring regular programs is organising community service for lecturers and final semester students on the village. In 2019, the lecturers' community service programs focus on empowering the community with particular knowledge related to tourism, particularly, waste management, tour package creation and recreational park management. Meanwhile, the students' community service consists of a six-week stay in the village, with programs focusing on the preparation of the village to take part in the Indonesian Sustainable Tourism Award Competition 2019. The student community service succesfully supported Sesaot village in achieving the award as the second best for the Environmental governance.

The second MCSTO UNRAM activity is to identify tourism potentials and collect preliminary data on tourist destinations which are located in seven sub-districts along the coastline that stretch from the southeastern tip to the northwestern part of Lombok, as shown in Figure 1. The seven sub-districts have mainstay tourist attractions on Lombok, where there are various interesting natural and unique cultural attractions.

Figure 1. Monitoring area of MCSTO UNRAM



Among those sub-districts, Pujut number 2 and Praya Barat number 3 at Figure 1, have the highest population density, as shown in Table 1. The two sub-districts are located at Central Lombok Regency and currently becoming the center of tourist development in Lombok. The development of Mandalika beach at Pujut Subdistric as Lombok's mainstay

projects, has transformed the two sub-districts into an emerging tourism activity center but vulnerable to various environmental and socio-cultural problems. Further, the development has also brought impacts to other sub-districts in its deliniation.
Jerowaru sub-district in East Lombok is a delineation or main buffer zone for Mandalika tourism. The main impacts of tourism activities have been evident in the daily lives of local communities in the form of security disturbances to tourists.

Table 1. Total Population in MCSTO UNRAM work area

District	Sub-district	Village number	Total Population		
			Male	Female	Total
Lombok Timur	Jerowaru	15	28 335	30 640	58 978
Lombok Tengah	Pujut	16	440 292	490 505	930 797
	Praya Barat	10	436 155	485 933	922 088
Lombok Barat	Sekotong	9	30 576	30 871	61 447
	Batulayar	9	24 761	24 838	49 599
Lombok Utara	Pemenang	7	18 138	17 728	35 866
	Tanjung	4	23 838	24 573	48 411

Sumber: *Nusa Tenggara Barat in Figure, 2018*

Meanwhile, two sub-districts (number 4 and 5 at Figure 1), are located in West Lombok Regency, dealing with different tourism issues. Sekotong District has a topographic and coastal area which has the potentials to support the Lombok tourism industry. However, the activities of illegal gold mining carried out by the local community has yet to find solution. In fact, these mining activities often obstruct and impair the conservation efforts both on land and in the sea. Batulayar sub-district with its Senggigi Beach is one of the oldest tourist destinations in Lombok. At this time, Senggigi Beach, as a tourist destination, is dealing with destination lifecycle issues. Senggigi Beach requires destination rejuvenation efforts and tourism revitalization programs to redefine destination positioning with more sustainable principles.

The other two sub-districts (Numbers 6 and 7 in Figure 1) are located in the North Lombok Regency. These two sub-districts are wellknown among tourists as they have various tourist attractions including three small islands (Gili) namely Gili Trawangan, Gili Meno and Gili Air. The three gilis, however, currently face crowd management challenges as a result of the increasing number of tourist visitations, and high demand on tourism facilities on the islands. Thus, crowd management and carrying capacity are the serious issues on the three small islands.

The seven sub-districts are the monitoring areas of the MCSTO UNRAM, in which the focus will be made on nine core issues, including: local satisfaction, destination economic benefits, employment, seasonal tourism, energy management, water management, liquid waste management (sewerage), solid waste management, and governance. However, in its implementation, the nie core issues will be adjusted (added / subtracted) to the main issues according to the characteristics of the observatory destination. In this regard, MCSTO UNRAM will focus his monitoring activities on five main issues as presented in Table 2. These five issues have arisen as a result of several contexts, some of which include: the rapid development of tourism tourism facilities in Lombok in the last five years; the types of tourism activities in Lombok; and the unique characteristics of tourist destinations, including the characteristics of destination communities within Lombok.

Table 2. Issues on main duty of MCSTO UNRAM

Monitoring issues	Indicators
Liquid waste management	Percentage of wastewater recycled by the destination (or a number of companies operating in the tourism sector that have managed a wastewater recycling system)
Solid waste management	Amount of rubbish littered in public places (amount of rubbish)
Water Manajement	Number of companies participating in water conservation practices / programs, implementing water conservation policies and techniques
Conservation and protection of important ecosystems (coral)	Percentage of protected coral
Security	Number of security issues reported to the police, hotels, etc. by tourists

Sumber: *Terms of Reference Sustainable Tourism Observatory (STO) monitoring and reporting as part of UNWTO International Network of Sustainable Tourism Observatories (INSTO) in destination, 2019*

The different characteristics of each key tourism area (KTA) in Lombok raises different monitoring issues, as seen in Table 3. Water management issues are the focus of monitoring in all districts while security issues only focus on four districts located on the southern part of Lombok. Monitoring on solid and liquid waste management is undertaken in five districts where most of the tourism businesses such as hotels and restaurants are located. Meanwhile, monitoring on coral reef conservation is conducted in two locations namely Sekotong and Pemenang Districts, whose many small islands (Gilis) with the most extensive coral reef conservation areas.

Table 3. Monitoring focus in each sub-district

Sub-district	Monitoring Issues				
	Solid Waste	Liquid Waste	Water Management	Corral Reef Conservation	Security
Jerowaru			X		X
Pujut	X	X	X		X
Praya Barat	X	X	X		X
Sekotong			X	X	X
Batu Layar	X	X	X		
Pemenang	X	X	X	X	
Tanjung	X	X	X		

Source: Summerized from preliminary observation

The objectives of monitoring activities in the seven Key Tourism Areas (KTA) sub-districts in 2019 are:

1. Identifying sustainability issues on to the 5 main indicators areas in the monitored KTA.
2. Finding monitoring methodology for each region and indicator area
3. Finding a methodology for stakeholder participation in each monitoring area
4. Compiling based-line data that underlies the implementation of ongoing monitoring starting from 2019.

Data Collection Methods

Data was collected by using several techniques and instruments. Primary data was qualitatively collected through several mechanisms including observation, in-depth interviews, Focus Group Discussions (FGD) and auto-ethnography. The adoption of the qualitative methods was aimed at identifying problems in each KTA while involving the destination communities in the process of data collection and analysis. The secondary data was collected from various sources, some of which include research documents particulary published jurnals, research reports and other documentary sources obtained from village offices, tourism department and relevant tourism agencies.

The MCSTO team has conducted several initial observations and in-depth interviews in the seven districts to collect initial data for the monitored indicators prior to the undertaking of monitoring activities. The initial data was then discussed with tourism stakeholders, including government officials, tourism industry representatives, tourism scholars and professionals, the National Police officers, and the tourism observer community, in three main Focus Group Discussions (FGD) during the monitoring activities.

The first FGD took place at the Aruna Hotel, West Lombok, on 20 November 2019, discussing about the five sustainable indicators in the context of Lombok in general. The second, FGD was organised at the Lombok Garden Hotel on December 4, 2019, discoursing about sustainable indicator issues in the context of Key Tourism Areas of Tanjung and Pemenang Districts (North Lombok Regency), and Narmada and Batu Layar Districts (West Lombok Regency,). And the third FGD was made at D Max Central Lombok Hotel, in December 5, 2019, talking about monitoring issues in the Key Tourism Areas of Jerowaru District (East Lombok Regency), Pujut and West Praya (Central Lombok Regency), and Sekotong District (West Lombok Regency).

Monitoring results

The monitoring activities were undertaken for one semester from July to December, 2019) in a number of tourist objects within the the seven sub-districts KTAs. The reports below follow the geographical position of the seven KTAs sub-districts as listed in Figure 1, starting from Jerowaru Subdistrict in East Lombok to Tanjung Sub-district in the North Lombok.

1. Jerowaru Sub-distric, East Lombok

Jerowaru Sub-district is located in the East Lombok Regency. The geographical position is indicated by number 1 in Figure 1. The sub-district consists of 15 villages with total area of 142,78 km2 and total population 59,880 people in 2017 (Jerowaru, 2018). As a KTA, Jerowaru has a number of tourist attractions particularly beaches, and is becoming a favorite destination for surfing. Monitoring activities in this KTA are focused on two main

issues namely water management and the level of security dsiturbance against tourists in the tourist destinations.

Water Management

KTA in Jerowaro sub-district does not have a good water conservation management. Most of population (around 80%) obtain water from dug wells called "Tutuk", meaning a very deep wells. In dry season (September - November) more than 40% of the population have to import water from other places using tank trucks, and spend for 100 - 300 thousand rupiah per week per household on water. To solve this problem, local government of Jerowaru sub-district is currently building a reservoir that is expected to meet water needs of around 60 liters/family/day. Such project is funded by local government of East Lombok Regency.

Security Disturbance

Jerowaru sudistrict is yet to have a well-documented report on security disturbance against tourists. However, data from FGD with the Chief of sub-district Police of Jerowaru and other related tourism steakholders unveils that most villages within the sub-district are still vulnerable to security disturbances that target tourists, such as theft with violence and theft of motorcycles.

In most cases, the security disturbances in Jerowaru subdistrict were triggered by economic factors and lack of local community participation in tourism activities. As security is a crucial issue in tourism activities, it is urgent to increase community involvement in tourism development within this KTA. To do so, the non-government organisations, such as village tourism aware groups should be included in order to help increase locals awareness and provide empowerment. One interesting example is in one particular tourism village within the Jerowaru subdistrict, where security for tourists was assured as almost 90% of the tourism workers are locals.

2. Pujut sub-district

Pujut Sub-district is the widest amongst 12 sub-districts in Central Lombok. The sub-district controls 23,355 ha or 19.33% of the total area of Central Lombok Regency. Geographically, Pujut Sub-district is located in the southern part of Central Lombok and is bordered by the Indonesian Ocean. There are four main KTAs in Pujut District, as shown in Table 4.

Table 4. KTA within Pujut sub-district

Namde	Tourist objects	Object type	Visitor number (per year)	Total area (ha)
Pujut	• KutaBeach • Aan Beach • GerupukBeach • Rembitan Traditional village	• Natural site • Natural site • Natural site • Cultural site	• 705.794 • 458.766 • 230.000 • 705.794	1.175 1.175 20 5,5

Source: Village Office of Pujut 2019

This sub-district is where the Mandalika Beach take place, which currently becoming the center of tourism development in Lombok, and one of the top prioritised tourist destinations in Indonesia. As a center of various tourist activities, this KTA is vulnearable to tourism negative impacts, particularly social and environmental impacts. Therefore, the MCSTO UNRAM has four main monitoring issues in KTA Pujut, including solid and liquid waste management, water conservation, and security issues, as described below.

Solid and liquid waste management

Observation was conducted towards two groups of respondents in four tourist objects as displayed in Table 4. These included the group of destination community, and the group of tourism industry. The observation findings are presented in Table 5, where the data obtained are only about waste generation. In Pujut District, there is no solid waste and liquid waste management system. The villagers collect and transport the solid waste to the final disposal site. While the liquid waste produced by the community is disposed in the community's own septic tank. The amount of waste generated by the destination community is shown in Table 5.

Tabel 5. Estimated Waste Production

District	Population	Waste Production (m^3/day)
Pujut	74.409	73,1

Source : Regional Environmental Statistics (SLHD Central Lombok Regency

In the tourism industry group, observations were made in nine hotels including five small-scale hotels with maximum nineteen rooms, and four medium-scale hotels (20 to 99 rooms). While access to large hotels that have over 100 rooms has not been obtained. Data on solid and liquid waste management by the tourism industry is presented in Table 6.

Tabel 6. The Management of Solid and Liquid Waste by the Tourism Industry

Hotel name	Number of Room	Guest number / day	IPAL	Non-IPAL	Waste Bin	Waste type	Total waste per day
Rido Malik Hotel	15	3	T	Y	T	M	120 ltr
Family House Lombok	14	5	T	Y	T	M	240 ltr
Grand Kute Hotel	17	4	T	Y	T	M	240 ltr
Purnama Beach	13	4	T	Y	T	M	120 ltr
Family Beach	10	3	T	Y	T	M	240 ltr
Segara Anak Hotel	25	18	T	Y	T	M	290 ltr
Surf Garden	20	3	T	Y	T	M	120 ltr
S Hotel & Restaurant	31	10	T	Y	T	M	120 ltr
JM Hotel Kuta Lombok	24	4	T	Y	T	M	240 ltr
Desa Sade	N/A		N/A	N/A	T	M	0,5 ton
Pantai Kuta	N/A	4.100	N/A	N/A	Y	M	6 ton
Pantai Aan	N/A	4.500	N/A	N/A	Y	M	1 ton
Pantai Gerupuk	N/A	2.750	N/A	N/A	Y	M	3 ton

Note: Waste Type M= Mixed; Waste management bin: T= No bin available, Y= Yes (large bin container /Komposting etc)

Data from Pujut Sub-district provided three main conclusions: (1) There is no Wastewater Treatment Plant (WWTP) observed in the areas of small and medium hotels. As a result, there is no quality monitoring on waste water has been made on small and medium hotels. (2) All hotels have inadequate waste management facilities. There are only trash bins available in hotel areas, yet, there are no adequate containers nor compost houses. Waste sorting has not been done optimally either in hotels or tourist sites. And, (3) There are insufficient number of garbage bins in tourist areas which cannot cope with waste amount. Tourist area should have composting facilities in order to help educate visitors about waste management.

Water Management

The tourism industry and destination communities within Pujut Sub-district KTA obtain water from three main sources: the Regional Water Supply Company (PDAM), Drilled Wells, and Water Springs. There are no water conservation systems in the level of destinastion. Yet, some hotels have made efforts on water conservation by educating their employees and hotel visitors through the provision of flyers or information. Indeed, the Indonesia Tourism Development Corporation (ITDC), the developer of Mandalika Beach, has planned to build reverse osmosis project to supply water demand in the Mandalika area. However, such projects is yet to its realization as the phase of construction on Mandalika is currently focused on the basic infrastructure.

Security Issues

Pujut Sub-district is yet to have well documented reports regarding security disturbance against tourists within the KTA Mandalika. Meanwhile, local communities still see the potential security disturbance against tourists in several places. Therefore, it is highly recommended for this KTA to have security documents in the future.

3. Praya Barat Sub-district

West Praya Sub-district consists of ten villages, and authorizes the third largest area in Central Lombok Regency. The area of Praya Barat sub-district is 15,275 ha consisting of 6,196 ha (40.62%) of paddy fields, 4,925 ha (32.17%) of non-rice fields and around 4,154 ha (27.21%) of non-agricultural land. (https://lomboktengahkab.bps.go.id). This sub-district is located between Pujut Sub-district in the east, and Sekotong Lombok Barat Sub-district in the west.

Table 7. The KTA of Praya Barat Sub-district

Sub-district	Tourism object	Tourist objet type	Number of visitor (per year)	Total area (Ha)
Praya Barat	• Selong Belanak Beach • Semeti Beach	• Natural site • Natural site	458.766 458.766	18.200 18.200

There are two main KTA in the Praya Barat Sub-district namely, Selong Belanak Beach and Semeti Beach, as shown in Table 7. The development of the two KTAs is not yet as advanced as those located in Pujut Sub-district in terms of tourist facilities. However, the two KTAs are very well known among local and foreign tourists, and become a busy tourist

destinastion for short time visitors. As a result, the two KTAs are dealing with four main issues of sustainable destination indicators: solid and liquid waste management, water management, and security issues for tourists.

Solid and Liquid Waste Management

Data on solid and liquid waste management was collected from two groups of respondents namely the destination community and the tourism industry group. Data on waste generation from destination communities is presented in Table 8 below.

Table 8 Estimation of waste generation at Praya Barat KTAs

Sub-district	Population	Waste production (m^3/day) [2)]
Praya Barat	103.656	52,7

Source : Regional Environmental Statistic (*SLHD) Central Lombok Regency*

Meanwhile, data on solid and liquid waste management was obtained from industry groups consisting of seven different hotels that have room number varying from 5 - 90 rooms, as presented in Table 9.

Tabel 9. Solid and Liquid Waste Management

Location	Room number	Number of guest /day	IPAL	Non-IPAL	Wast manage ment fas	Waste type	Waste amount / day
Mawun Beach	N/A	125	N/A	N/A	T	M	8 Kg
Tampah Beach	N/A	15	N/A	N/A	T	M	2 Kg
Selong Belanak Beach	N/A	225	N/A	N/A	T	M	20 Kg
Bungalow Selong Belanak Indah	5	3	T	Y	T	M	5 Kg
Bungalow The Gazebo	16	6	T	Y	T	M	25 Kg
Holiday Selong Belanak	8	3	T	Y	Y	M	3 Kg
Villa Sempiak	5	15	T	Y	Y+	M	50 Kg

Note: Waste Type: M=Mixed
Non-IPAL: Y=Septic Tank; Waste Management Fas: T= no bin, Y= Ya (big container/Komposting etc), Y+=bins + komposting

The condition of solid and liquid waste management in Praya Barat Sub-district is similar to those in Pujut Sub-district, where all hotels do not have WWTP for processing wastewater. Septic tanks is commonly used for liquid waste disposal so that quality of liquid waste have never been measured. Furthermore, due to limited facilities and infrastructure as well as lack of visitor awareness, rubbish heaps are visible in many tourist areas.

Comparing waste issues in the KTAs of Pujut and West Praya, there are several conclusions: first, Pujut Subdistric produce more waste than Praya Barat Sub-district. This obviously indicats that tourism industry contributes to the generating of solid waste. Second, there are six locations in both KTAs that have managed their liquid waste using WWTP; namely seven units of individual WWTP treatment systems, and 65 septic tanks. In such process, both KTAs recycle the liquid waste into safe water for flower and plants. Third, there is a number of NGOs practicing waste management in both Pujut and Praya Barat KTAs, which help overcome waste problems. Fourth, despite the efforts of hotels and

restaurants in the two KTAs to manage their waste through Composting, Sorting and Transporting process, only 25 - 29% of all waste production can be processed. As a result, the two KTAs should develop a better system of waste management in the near future.

Water Management at Praya Barat Sub-district

The tourism industry and destination communities in Praya Barat Sub-district obtain water from three main sources namely the Regional Drinking Water Company (PDAM), Drilled Wells, and Water Springs, as those in Pujut KTA. Unfortunately there is no water conservation system yet to maintain the availability of water sources. Water conservation, as practiced in several hotels, is still associated with efforts to provide employees and hotel visitors with information about how to use water efficiently.

Security Issues at Praya Barat Sub-district

As that with Pujut Sub-district, West Praya is yet to have a specific document on the security disturbance against tourists. Meanwhile, such security-related data is needed to be a benchmark in evaluating the level of community participation in the KTA. Furthermore, the security data is also needed to encourage investment in the tourist destinations.

4. Sekotong Sub-district

Sekotong Sub-district in West Lombak Regency has a very interesting marine tourism attraction because it has more than ninety (90) small islands (Gili) whose white sandy beaches and beautiful marine life. This area has become one of the mainstay destinations of Lombok, for beach and sea activities such as surfing, snorkeling and diving.

Table 10 The number of boat operating for tourists at Sekotong District

No	Boat location	Total number	Daily trip
1	Tawun	41	Low Season = 3-4 trip/day/dock High Season = 7-8 Trip/day /dock
2	Batu Leong	20	
3	Batu Kijuk	30	
4	Tembowong	20	
5	Batu Putih	10	
6	Medang	10	
	Total	**121**	

Source: Primer Data

The number of tourist visitation to KTA Sekotang per 2018 was 15,775 people consisting of 12, 556 foreign tourists and 3219 domestic tourists (West Lombok Tourism Office, 2018). Meanwhile, there are six Dive Center that operate to support marine tourism activities in the KTA Sekotong. The sea transportation uses 121 boats owned by local residents which are operated as tourist transportation, as shown in Table 10.

Indeed, KTA of Sekotong Sub-district is less developed than those KTAs of Pujut and Praya Barat. However, the KTA Sekotong has a vital role in the development of Lombok tourism, not only as this KTA can act as a deliniation and bumper zone of KTA Mandalika but also as a mainstay of Lombok tourism. The develoment of KTA Sekotong will influence

the future carrying capacity of KTA Mandalika. Furthermore, having unique characteristics of marine attraction, the KTA Sekotong can be the main tourist destination for marine activity in the future. As a result, sustainable principles should be adopted particularly related to water management, coral reef conservation, and security issues.

Water Management

In general, people in Sekotong Sub-district obtain water from four main sources; dug wells, drilled wells, reservoirs and regional water company (PDAM), as shown in Table 11. The community obtain water from dug wells as this was considered as the cheapest method to do. Meanwhile, to obtain better water quality, some of the people make drilled wells.

Table11. Acquisition method, Proportion of Water Use and Consumption

Water Acquisition Method	Users	Consumption level (Liter/Day/person)
Digging well	> 75%	15-20
Drilled well	< 10%	
Reservoir	< 20%	
PDAM	< 5%	

Sorce :*Primary data*

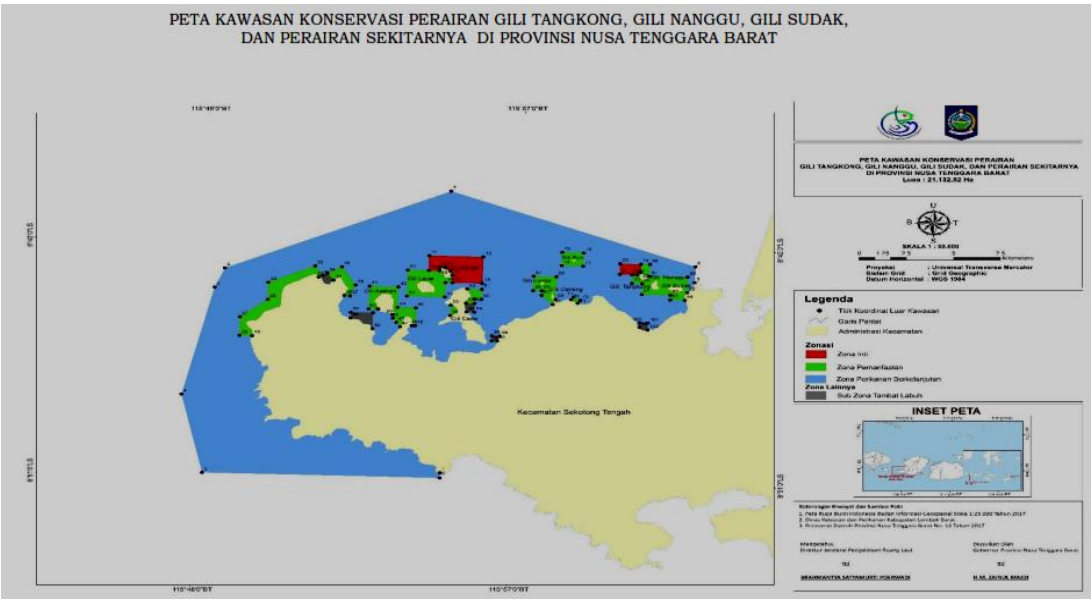
A program called PAMSIMAS run by the village government is also one of the ways for the community to obtain clean water, but the limited water source and reservoirs have resulted in PAMSIMAS not being able to become the main way of meeting the community's water needs. Meanwhile, the PDAM program run by the West Lombok Regency Government is the least used method by the community. This is due to the PDAM's limited capacity and can only reach two villages.

Tourism industry such as hotels and restaurants located on the main island, they get water from drilled wells, while those in small islands (Gili), they buy from the people who are water supply agents. There is no industry (hotel and restaurant) that gets water from alternatives other than the two methods.

Coral Reef Conservation

The Sekotong Subdstrict water area is designated as a Water Conservation Area through the Decree of the Minister of Maritime Affairs and Fisheries No. 93 of 2018 in which the regulation stipulates 21,132.82 hectares which includes the 495.31 Ha of Core Zone, 1,800.10 Ha of Utilization Zone, 18,663.40 Haof Sustainable Fishing Zone, and 174.01 Ha of Other Zones (Figure 2). These conservation areas include the waters of Gili Tangkong, Gili Nanggu, Gili Sudak which came to be known as the KKP GITANADA and Surrounding Waters. This area is spread over 4 villages in Sekotong sub-district, namely Sekotong Barat, Pelangan, Batu Putih and Buwun Mas. Based on the Decree Number 93/2018, the management of the KKP GITANADA was handed over to the Province of West Nusa Tenggara which in this case the West Nusa Tenggara Maritime and Fisheries Service (DKP NTB). Thus all forms of utilization and activities under the authority of DKP NTB.

Figure 2. Map of Coral Reef Conservation Area in Sekotong Subdistrict.



In its implementation, supervision of all forms of marine resources in KKP GITANADA is not carried out exclusively by DKP NTB but it is still assisted by various parties such as the West Lombok Water Police, NGOs, Community Monitoring Groups (POKMAWAS) and other related institutions as seen in Table 13.

Conservation activities in the Sekotong District are carried out in two main ways, namely Marine ecosystemsmonitoring and Transplantation or Replantation. Monitoring was carried out from 2015 to 2018 by the Institute of Oceanographic Research Center of Indonesian Research Institution (LIPI) together with the University of Mataram with the aim of evaluating the condition of the coral reef, seagrass and mangrove ecosystems. While the coral transplant and mangrove replantation activities are carried out by national and regional government agencies, NGOs, hotel management and village government with the aim of improving the condition of coral reefs and mangroves in the KKP GITANADA.

Condition of Coral Reef in KTA Sekotong

In general, in 2019 the condition of coral reefs in Sekotong Bay is mostly in the low category and three coral reefs in a conditions of medium category. The monitoring results in 2019 (Bachtiar, 2019) showed that the average (± SD) of coral reef cover at 12 research stations (SKTC) was 13.58 ± 10.61%. Coral cover at the twelve stations (SKTC01 - SKTC12) varies greatly, between 1.73% (SKTC01) to 32.67% (SKTC12). Most of these coral reefs are non-acropora corals. Dead coral cover covered by algae (DCA) is very large, which is 61.77 ± 10.04%(see Figure 2). The sponge and other fauna cover were relatively similar, which is 6.1% and 3.5%, respectively. Soft coral and macroalgae cover is very small, both are under 2%.

Between the outer reefs and the inner reefs, there are some differences, although both also show some similarities. Both groups of coral reefs have an average coral cover that is almost the same, which are 13.43 ± 10.58% on the inner reef and 13.72 ± 11.66% on the outer reef. Both also have a rock community which is dominated by non-acropora corals. The difference between the two groups is the presence of acropora coral cover in the amount of

3.07% in the outer coral reefs, while in the coral reefs the cover is only 0.24%. Besides that, sponge cover also stands out only (11%) on the outer coral reefs, while the inner coral reefs have a sand and fine sand cover that attracts attention because the proportion is more than 5%.

The results of the 2019 study also revealed that of the 12 research stations, only 3 stations had moderate coral reef conditions, namely SKTC07, SKTC09 and SKTC12. All three have coral cover above 25%. The high proportion of coral reefs covered by algae is still found in all research stations. The condition of coral reefs in 2019 has no differences from 2018 and 2016.

One indicator of the health of coral reefs is the presence of Coralivorous Fish which is a group of fish that eat coral polyps. The higher diversity and density of coralivorous fish in a coral reef ecosystem, the healthier the condition of the coral reef, and vice versa. Monitoring data for 2019 found that diversity of corallivor fish species between observation stations in Sekotong Bay varied greatly, between 1 - 6 species.

Figure 3. Corporal fish diversity in Sekotong Bay in 2019

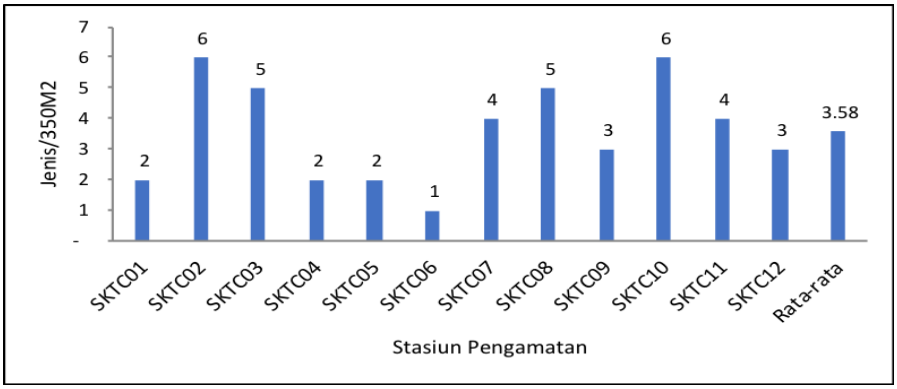


Figure 3 shows that the health level of coral reefs in Sekotong Subdistrict is at a moderate level. Therefore the conservation program must involve various elements of the destination community that have activities directly or indirectly related to the conservation area. The activities of fishing communities directly affect the health of coral reefs and the availability of coralivorous fish species in conservation areas. While indirectly various community activities on land often affect the quality of sea water with various types of pollution.

Security Issues in KTA Sekotong

Sekotong Subdstrict has no record of special security disturbances to tourists. Data on security disturbances recorded are those that occur in the destination community in general,in the form of theft with violence (CURAS), theft with objections (CURAT) and Motor vehicle theft (CURANMOR), as shown in Table 12.

Table 12. Number of Security Disruptions in Sekotong Subdistrict

No	Year	EVENT			
		LIDIK	*SIDIK*	P21	TOTAL
1	2019*	11	1	24	36

2	2018	30		30	60

Source: Intelligence and Criminal Investigation Unit Sekotong Subdistrict Police, 2019
Note: * Number of cases from January to November 13.

However, primary data from the results of the FGD (2019) found that there was a security disturbance in tourists that occurred in Sekotong Subdistrict in the form of cases of theft with violence. This indicates the need to have special data on security disturbances to tourists to determine the level of community participation in tourism activities.

5. Batulayar Subdistrict

Batulayar Sub-district is located in West Lombok Regency, directly adjacent to North Lombok Regency in the North, Gunungsari Subdistrict in the East, Mataram City in the South and Lombok Strait in the West. The famous Key Tourism Area (KTA) in Batulayar District is Senggigi Beach which is a tourism destination that was first developed in Lombok in the early 1980s. In addition, there are several other KTAs with a number of tourist visits until November 2019, as shown in Table 13.

Table 13 Number of visitors and area of tourist areas in Batulayar Subdistrict

Subdistrict	Tourism Site	Number of visitor (person per year)	Area (Ha)
Batulayar	Senggigi Beach MangsitBeach MenintingBeach Kerandangan Natural Park Batu Bolong Temple Batulayar Cemetery	67.561/tahun 2019 (Domestic and international)	34,11 Km²

Source: *Tourism Agency of West Lombok Regency, 2019*

To date, there are more than 3500 hotel rooms in Batulayar sub-district, where more than 60% of the workforce is employed in hotels and restaurants (NTB Tourism Agency, 2018). Therefore, the Senggigi KTA has three main issues that need to be monitored; solid waste management system, liquid waste management systems, and water management.

Solid Waste Management

Batulayar subdistrict has a large population of 51,545 people that spread across eight villages. However, most of the pile of garbage comes from hotels, villas, restaurants and other businesses that take place in all KTA in this district. Everyday, Batu Layar Subdistrict produces 122 M^3 of landfill, as shown in Table 14. All the garbage is transported by the garbage officers from the West Lombok Regency Sanitation Department and it brought to the final disposal site. Outside of this mechanism, there is no other waste treatment system. There is no hotel or tourism business that has its own waste management system in this area.

Table 14. Estimated number of waste generation per day in Batulayar Subdistrict

Population	Waste Management Facilities / Units	Amount of waste generation / day (m^3)	The amount of manged waste generated / day(m^3)
51.545person	Community	39	0,2
	24 StarHotel 45 Non Star Hotel	56	29
	School	10	6
	Restaurant	17	7
Total		**122.0**	**43 (35.2%)**

Source: West Lombok Environmental Agency 2019

Indeed, KTA Batulayar Sub-District has placed garbage bins in public places. However, the number of the bin still needs to be increased and composting facilities need to be held to educate tourist who visit the site.

Liquid Waste Management

All star hotels in Batulayar KTA have independent liquid waste management systems. The observation was carried out by creating three hotel groups namely: (1) large-scale hotels, for hotels that have more than 100 rooms; (2) medium-scale hotels, for hotels with 50-100 units, and small-scale hotels, with rooms under 50 units. Observations were made at 5 hotels consisting of a hotel with 154 rooms, 1 hotel with 88 rooms, and 3 hotels with a number of rooms varying each from 14 to 18 units. The results of observations of the five hotels are shown in Table 15.

Table 15. Management of Liquid and Solid Waste by hotels in Batulayar Subdistrict

Location	Number of rooms	Number of guests / day	IPAL	Non-IPAL	Waste Management Facility	Kind of waste*	Amount of waste/day
SheratonHotel	154	50	Y	Y	Y	M	2000 ltr
Blue Coral Hotel	18	1	N	Y	N	M	40 ltr
Centrall Inn	88	3	N	Y	N	M	120 ltr
TransitHotel	16	1	N	Y	N	M	40 ltr
Alam Mimpi	14	7	N	N	N	M	280 ltr

Source: Compiled from Field Observation

Note:

- Kind of waste: M=Mixed;
- Waste Management Facility: N= No (small bin), Y= Yes (Big Bin/Container/Composting)

Furthermore, things that need to be considered in Batulayar Subdistrict related to liquid waste management are:

a. Wastewater Treatment Plant (IPAL) only exists in large-scale hotels. Small scale hotels do not have liquid waste management facilities. So the percentage of liquid waste management in Batu Layar Subdistrict is still around 10-20%.

b. Small-scale hotels still hold liquid waste in septic tanks. Meanwhile there has never been any monitoring of the quality of sea water or ground water to evaluate the possibility of the impact of this liquid waste on the environment.
c. Some hotels, especially the large scale ones, have begun to use recycled water from liquid waste to irrigate flowers and other ornamental plants.

Water Conservation

Data shows that residents and tourism businesses in Batu Layar KTAobtain water from three main sources; wells, reservoirs and Regional Water Company (PDAM). There is no water treatment mechanism aside from the three sources. Starred hotels in the Senggigi and surrounding areas do not have a water management system such as the use of sea water as bath and drinking water.

6. Pemenang Subdistrict

Pemenang Subdistrict has a famous KTA consisting of three small islands (Gili) namely Gili Trawangan, Gili Meno and Gili Air. It can be said that tourism activities in Lombok are currently centered in the three gilis, where there are 626 hotels, two of which are starred. The number of tourists visiting the three gilis reaches an average of 2,728 tourists per day (NTB Tourism Office, 2018). However, not all visitors spend the night on Gili. The density of tourism activities in the three gilis makes this KTA has problems that need to be monitored, related to waste management, water management and coral reef conservation.

Solid Waste Management

Pemenang Subdistrict KTA has a waste management service unit run by the local community. Besides that, some hotels have their own waste management. Therefore, more than 30% of waste generation can be managed every day, as shown in Table 16 below.

Table 16. Estimated amount of waste generation in Pemenang Subdistrict

Population	Waste Management Facilities / Units	Amount of waste generation (tons / day)	Amount of solid waste managed (Ton / Day)
35.866 person	5 Community group	2.5	1.154
	25 Hotels	2.5	0.45
	4 Schools	0.5	0.15
	3 Restaurants	0.45	0.0075
	2 Waste Collectors	0.8	0.5
Total		**6.75 Ton/day**	**2.2615 Ton/Hari**

Source: North Lombok Regency Environmental Agency 2019

Liquid Waste Management

Related to liquid waste management, only a few of the hotels in Gilis manage their wastewater. One of them is the Aston Hotel in Gili Trawangan, which manages to recycle its liquid waste by storming water for watering the plants. Moreover, there are no data on liquid waste management either carried out by the industry nor by the destination community.

Considering the data, all hotels and restaurants in the three gilis in Pemenang Subdistrict should have a liquid waste treatment system that is adjusted to the size of their respective businesses. Starred hotels should have Wastewater Treatment Plant (IPAL) in accordance with established standards whereas non-star hotels have simple IPAL in accordance with the capacity of the hotel.

Water Conservation

Community in Pemenang sub-district KTA obtain clean water through digging wells (surface water). While the tourism industry such as hotels and restaurants obtain water from PDAM, Drilling Wells and / or in cooperation with private water suppliers. There is no other mechanism for obtaining water such as reverse osmosis.

Coral Conservation

The conservation of coral reefs in the 3 Gili areas is called Gili Matra (Gili Meno, Air and Trawangan) in Pemenang sub-district with an area of 2,273.56 ha managed by the Kupang National Water Conservation Area Office (BKKPN). The BKKPN working area in the Gili Matra Aquatic Park has a program and Zoning implemented through three main activities, namely: institutional strengthening of the BKKPN Gili Matra working area, strengthening the management of regional resources, and strengthening social, economic and cultural.

7. Tanjung Subdistrict

KTA in Tanjung subdistrict is adjacent to KTA of Pemenang Subdistrict. Interestingly, Tanjung subdistrict has variety tourism objects, including sea, beach, traditional villages, valleys and mountains. The center of tourism activities in Tanjung Subdistrict is located on two beach destinations namely Sira Beach and Medana Beach, thanks tothis locationas a center for tourism facilities such as hotels and restaurants, as shown in Table 18. There are 16 hotels in Tanjung Subdistrict, 3 of which are star hotels. The number of visits recorded in 2018, before the earthquake was 66,985 tourists (Tourism agency ofNorth Lombok, 2019).

KTAs in Tanjung Subdistrict are less popular than the three gilis in Pemenang Subdistrict KTA. However, the existence of the Tanjung Subdistrict KTA is important to support the existing tourism activities in the Pemenang Subdistrict KTA. For this reason, Tanjung Subdistrict needs to have a regional strategic planing to improve the destination image and community participation in tourism activities. In this regard, there are three main issues that are the focus of monitoring in this KTA; solid waste, liquid waste, and water management.

Solid Waste Management

Although Tanjung Subdistrict has a larger area and more population than Pemenang Subdistrict, the daily waste production produced by the community and the tourism industry in this sub-district is much smaller, which is around 30% of the total waste generation

generated by the three Gilis in PemenangSubdistrict. Half of the amount of waste is managed by the community independently, as shown in Table 17.

Table. 17 Estimated amount of waste generation per day in Tanjung Subdistrict

Population	**Waste Management Facilities / Units**	**Amount of waste generation (tons / day)**	**Amount of solid waste managed (Ton / Day)**
47.918 person	5 stalls / stores	0,087	0.0153
	7 Hotels	0.229	0.0184
	4 Restaurants	0.09	0.005
	4 Modern Retailer	0.065	0.0207
	3 Industries	0.0505	0.025
	1 Government office	0.015	0.003
	1 Boarding school	0.04	0.005
	2 Schools	0.055	0.01
	2 Community group	0.00495	0.0015
	1 Clean Movement Community *(Meleah)*	1.5	1.2
Total		**2.13645 Tons/day**	**1.3039 Tons/day**

Source: North Lombok Environmental Agency, 2019

An independent waste management that is carried out is the implementation of the 3R program which is reduce, reuse and recycle. This program is actively promoted by the village government. North Lombok Regency has had an environmental cleanliness program since decades ago, which is called the *Jumpa Berlian* (*Jumat pagi bersihkan lingkungan anda* or clean your environment on Friday morning), which is a government program with the community to work together to clean up their neighborhoods every Friday morning.

Liquid Waste Management

In Tanjung Subdistrict, liquid waste management is carried out independently by starhotels. While 13 other non-star hotels do not yet have a liquid waste management system. The management of liquid waste by a star hotel is carried out through the process of filtering waste so that wastewater can be used (recycle) for other activities such as watering plants and irrigation systems. The management of liquid waste in TanjungKTA is still around 19% of the total liquid waste produced every day.

Water Management

Tanjung Subdistrict has a reservoir that is still functioning. However, the destination communities in theTanjung KTA obtain water for daily needs through drilled wells and PDAM. This source is also used by the tourism industry to obtain clean water. The average water usage per person in Tanjung District is 200 liters / day. While the use of water by tourists around 150 liters per day. Tourists use less water because they do not use water for activities such as those carried out by local people such as washing clothes and so on.

Conclusion and Recommendation

First, in general, waste management efforts in all KTA in Lombok are still not optimal. Indeed, waste management is the work priority of the elected Governor of NTB in 2018, but the implementation of the waste management program has not yet reached the

community in the tourist destination. Some hotels have good waste management systems, but they are still limited to the environment of each hotel. This is caused by the absence of a solid waste management system at the final level managed by the regional authority. During this time, the waste management system is still limited to the 3R program: reduce, reuse and recycle. The focus of attention is mostly on creating a garbage shredder that is safe for the environment. In fact, investments need to be made to create the substitution of plastic functions as wrappers with materials that are more sustainable and safer for the environment.

Second, most hotels and restaurants in all KTAs do not have a good liquid waste management system. To start a liquid waste management program at each hotel, regulations are needed at the provincial and district levels which require all hotels and restaurants to treat their wastewater according to environmental safety standards. Furthermore, law enforcement is needed with discipline and strict enforcement.

Third, there is no water management system in the destination that is sustainably controlled by a competent body. Related to water management, a management system that is oriented to the quantity and quality of water is needed. The water quantity oriented here means a management system by hotels and restaurants so that it can save water use. Meanwhile, to maintain water quality, destination management needs to be included with the health department or related agencies which can periodically evaluate the water health level for both the destination community and tourists. Water health must include land water and sea water.

Fourth, there are already coral reef conservation programs, especially in KTAs in West Lombok and North Lombok by involving local communities. However, this program needs to be socialized more intensely especially to elements of the community in the destination such as fishermen, youth groups, students, and business people.

Fifth, there has not been a good record keeping (documentation system) in several KTAs related to security disturbances to tourists. Therefore, the recording of security disturbances needs to be made in each village in collaboration with the police to determine the level of KTA's security and strategies to overcome them. To reduce the level of security disturbances to tourists, it is necessary to increase the role of the community in tourism activities both directly and indirectly. The community can be directly involved as part of tourism management by recruiting them into workers in the tourism industry, and empowering them to become tourism managers in their areas. Indirectly, the community can be involved in empowering the creative economy and continuing socialization of tourism in each KTA.

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2019 MONITORING REPORT

Gadjah Mada University – STO Borobudur-Yogyakarta-Prambanan (BYP)

Monitoring Centre for UNWTO Sustainable Tourism Observatory

ANNUAL REPORT YEAR 2019

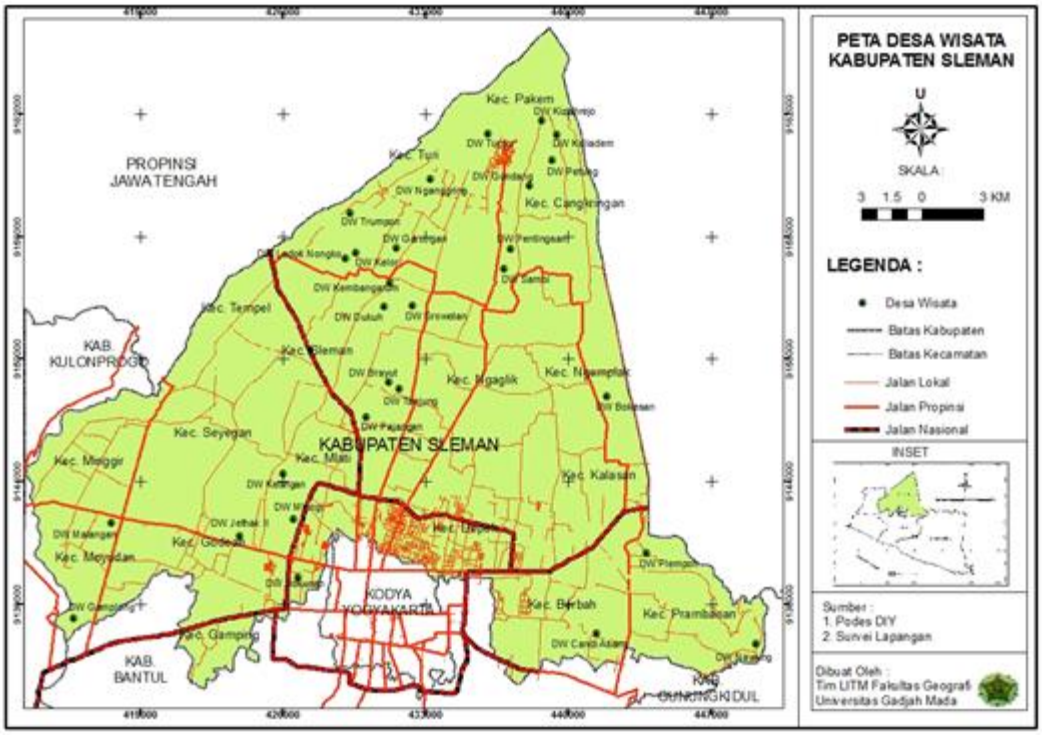
MONITORING CENTRE FOR SUSTAINABLE TOURISM OBSERVATORIES

MCSTO UNIVERSITAS GADJAH MADA YOGYAKARTA

ACTIVITIES AND ACTIONS OF SUSTAINABLE TOURISM OBSERVATORY (STO) SUSTAINABLE TOURISM DEVELOPMENT (STO), SUSTAINABLE TOURISM DEVELOPMENT (STD) IN SLEMAN DISTRICT.
IN 2019
(MONITORING PANCOH AND PULESARI)

INTRODUCTION

The MCSTO UGM monitoring area in Sleman Regency is a hilly and mountainous area, which extends up to the slopes of Mount Merapi with an altitude between 100 m and 2,500 m above sea level. The southern region is relatively flat except for the hills to the southeast, namely the Prambanan Sub-District and the southwest, namely some of the Gamping Sub-District. Further to the north of the land, the conditions are increasingly bumpy. In the northern part of the Sleman region (Merapi slopes) the natural conditions are relatively steep, but the level of soil fertility is high and there are many sources of water. This position has made the Sleman Regency region as the up-stream of the Special Region of Yogyakarta (DIY). As an integral part of the Special Region of Yogyakarta, known as an education and culture city, the development of Sleman Regency is directed as an education center, cultural center, food producer, tourist destination, small scale industry development, agricultural industry, and service industry.



Picture: Map of tourism in Sleman Regency

Information in the map:

Skala (scale)

Legenda (Caption)

Desa Wisata (Tourism Village)

Batas Kabupaten (Regency Boundary)

Batas Kecamatan (District Boundary)

Jalan Lokal (Local Road)

Jalan Propinsi (Province Road)

Jalan Nasional (National Road)

Source: Technology and Innovation Student Contest (LITM) Faculty of Geography, 2018

The tourism sector is one of the sectors relied to contribute to the economic recovery of the regency, especially Local Own-source revenue (PAD), and employment which can improve the welfare of the community. Potentials and opportunities, problems faced, economic scenarios of regional development in Sleman Regency are based on the development of economic sectors that carry competitive advantages. In the manner of developing economic sectors that carry competitive advantages, high regional productivity growth will be achieved so Sleman Regency will have a strong economic base.

Sectors that have a competitive advantage are sectors that have a large multiplier effect on other economic activities and the development of the surrounding area, have high market demand and attract private interest to invest. One of many sectors that has a competitive advantage in the framework of economic development in the Sleman Regency is the tourism sector. This has been proved by tourist visits and acquisition of fees from the tourism sector which has increased every year. The increase was obtained from 2010-2020 compared to previous years. The acquisition of these fees will continue to increase in line with the policies of the Sleman Regency government, which develops the tourism sector continuously.

- The trade, hotel, and restaurant sectors made the biggest contribution in the formation of Gross Regional Domestic Product (PDRB) at current prices, followed by the services, manufacturing, building and agriculture sectors.

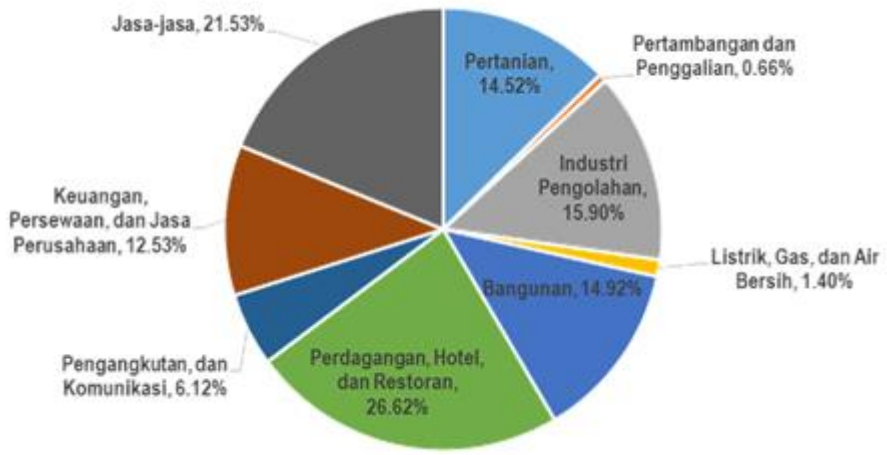


Image 3: Diagram of Economic Activities Portion of Sleman Regency
Source: Central Bureau of Statistics (BPS), Sleman in 2018

The tourism sector in Sleman Regency is the connection link of tourism activities in the Special Region of Yogyakarta (DIY) and Central Java. According to the map of national tourism, DIY's potential is on the third rank after Bali and Jakarta. Special Region of Yogyakarta has a diversity of attractions, specificity of objects with unique characters such as nature tourism, village tourism, culture, and historical heritage. These are supported by the readiness of supporting tourism facilities as well as the quality of its human resources.

The strategic position of Sleman Regency, located between DIY and Central Java, has made Sleman Regency as a channel for DIY-Central Java tourism activities. Strengthened by the presence of Adisutjipto Airport in the Sleman Regency region, it provides easy accessibility for tourists to DIY-Central Java in general and Sleman Regency in particular. This advantage makes Sleman the center of tourism activity.

The vision of tourism development in Sleman Regency is as follows: "To Achieve Sleman Regency as a competitive destination based on culture and creative economy in tourism development for sustainable welfare of people" this vision can be operated as follows:

1. Developing destinations in the Sleman district as a competitive, innovative, varied, safe and comfortable which supported by quality infrastructure, professional services, and community support to be a good host;

2. Developing the Sleman tourism industry based on cultural character and prioritizing the strength of the local economy to support community and regional income;
3. Developing tourism institutions and credible, reliable, competent, and professional human resources in the government, private sector and the community as well as encouraging effective and efficient regulation and operations towards the achieving of sustainable tourism;
4. Developing integrated, synergistic, effective and efficient tourism marketing to increase tourist visits, especially to Sleman and DIY in general.

Sustainable tourism development in Sleman Regency is based on the elements in the vision and mission mentioned previously. The development of tourism villages in Sleman regency is based on the elements of sustainable development. In determining the tourism village, it must be balanced with an understanding of the community's social and cultural characteristics settings. This is intended to be used in developing the economic aspects of the village. In another aspect required to be done to determine the type and level of community empowerment appropriately to be effective and recognize the level of acceptance/willingness of the community to tourism activities. The principles of tourism villages development in the Sleman Regency which need to be accomplished:

a) No contradiction with the customs or culture of the local community. The development of a tourism village must consider various aspects related to the socio-cultural life and livelihood of the village;
b) Physical development and infrastructure are aimed at improving the quality of the village environment. The development of tourism in a village does not in essence change what is already in the village, but there is a purpose to package it in such a way that it is interesting to be a tourist attraction;
c) Consider the elements of locality and authenticity;
d) Empower the community. An important element in the development of a tourism village is the involvement of the village community in every aspect of tourism in the village;
e) Consider the carrying capacity as well as environmental sustainability.

Development of rural areas into tourism villages need to consider those capacities, both physical capacity, and community readiness. The principles of sustainable tourism development strongly underpin the development of tourist villages which have a lot of potentials for tourism villages to be developed, as in the table follows:

Table: Profile of Tourism Villages in the MCSTO UGM monitoring area in Sleman Regency

DEVELOPMENT	GROWING	DEVELOPING	INDEPENDENT
NATURE	Trumpon, Kadisobo, Pancoh, Gabungan Garongan	Ketingan Tunggul Arum	Pentingsari Pulesari
CULTURE	Dukuh, Mlangi	Sambi, Srowolan, Plempoh	Grogol, Tanjung Brayut
CREATIVITY	Nganggring, Sendari, Palgading, Malangan, Brajan, Ledoknongko, Bokesan	Gamplong, Mangunan Sukunan, Dome	Kelor Sidoakur
TOTAL	**14 Growing Villages**	**9 Developing Villages**	**7 Independent Villages**

Sources: from various sources, 2017

Tourism development policy in Sleman Regency emphasizes on 4 (four) Principles, as follows: **environmentally sustainable**, emphasize on the tourism development process must be responsive and consider the efforts to preserve the environment (both natural and cultural), and be able to prevent negative impacts which able to reduce environmental quality and disturb the ecological balance.

Tourism development is developed with the approach of economic growth and equity for the welfare of the people and development which oriented to regional development, relies on the community and is empowering the community to cover various aspects, such as human resources,

marketing, destinations, science and technology, cross-sectoral linkages, partnership between countries, empowering small businesses. There is a responsibility in utilizing the nation's natural and cultural resources as one of the tourist attractions, having noble values must be preserved to improve the quality of life, strengthen national personality and national pride, strengthen national unity, and improve the welfare of the community as the life direction of a nation.

One of the biodiversity and natural resources needed to be maintained and managed in an integrated protection and management system. Protection and management must be able to provide economic, social and cultural benefits based on the principle of sustainability for the life of the community.

The policy of determining the area to be a sustainable tourism destination on the resources contained therein can be sustainably used by stakeholders starting from the process of planning, implementation, supervision, until the evaluation stage. The essence of the policy is not only able to maintain or change the environment to be more sustainable, but also able to change the behavior of stakeholders to protect, develop, and utilize the environment in an integrated and sustainable manner.

Sustainable tourism continues to grow currently: consumer demand is increasing, service providers in the travel industry continue to develop environmentally friendly new programs, and the government creates new policies to encourage sustainable practices in tourism. However, what is the true meaning of "sustainable tourism"? How is it credibly measured and demonstrated, to build and ensure sustainability?

An approach to the concept of sustainable tourism is tourism that fully takes into account current economic, socio-cultural and environmental impacts in the future, which leads to the needs of tourists, industry, the environment and the community at the local destination. Efforts to develop sustainable tourism in various destinations have been initiated by various countries which then publish indicators as a referral program to build and implement sustainable tourism destinations. The concept of sustainable tourism in Indonesia addresses the following issues:

In the current global era, tourism is developed by many countries in the world as an alternative in development through various approaches and methods based on the uniqueness of the attraction they have. The facts prove that our country has a spreading wealth of assets in the diversity of cultural and natural attractions which are rare and endemic. Based on that, the government aspires to sustainably manage (protect, develop, and utilize) the unique assets of each

attraction in the region, through the approach of developing sustainable tourism destinations. The facts prove that our country has biodiversity which is a rich asset of diversity in cultural, natural and rare endemic attractions that spread across the archipelago.

This natural wealth is the basis for the government to aspire and sustainably manage (preserve, protect, develop, and utilize) the unique assets of each attraction in the region, through an approach of sustainable tourism destination development. The development of this sustainable tourism destination is expected to be a reference in synergy while strengthening the traditions and local wisdom of multicultural communities in managing the attractiveness of the natural and cultural environment in tourism destinations in an integrated and sustainable manner. The most important objective of this annual reporting is as follows:

a. Reporting a description of the activities carried out by MCSTO during 2019 which equipped and a description of the monitoring methods carried out by MCSTO UGM
b. Acknowledge the general picture of the current condition of the destination equipped with data that describe the condition of the destination associated with sustainable tourism.
c. Acknowledge the data which needs to be available regarding the development of international tourist visit; domestic tourist visit; tourist activity trends; tourism facilities including infrastructure and accessibility; and service performance at the destination
d. Determine the strategic issues of the destination we monitor, a minimum of 5 issues, related to indicators of sustainable tourism development that occur in the MCSTO monitoring destination which equipped with documentation and related data, monitoring indicators which are available to be selected:
    - Tourism Season
    - Occupations and Employment
    - Building the Economy of Tourism Destination
    - Governance and Ecosystems of Tourism
    - Local Satisfaction of Tourism
    - Energy Management
    - Water Management
    - Liquid Waste Management
    - Solid Waste Management

e. Follow up of each issue's findings to stakeholders

Monitoring locations are appointed by the Ministry of Tourism and are destinations recognized by UNWTO, namely Pulesari and Pancoh tourism villages. The method of collecting data is conducted by using Primary Research Data obtained independently through the method of Interview, Observation, Test, Questionnaire (List of Questions), and Physical Measurement. Retrieval of other data in Pancoh and Pulesari tourism villages using Secondary Data in the form of data obtained from the second source, institutional documentation obtained from Sleman Regency Central Bureau of Statistics (BPS) and other supporting data from the Tourism Office in Sleman Regency. Stages of Activities Implementation with the involvement of Tourism Studies master's students within the learning framework obtained directly from the destination by conducting direct monitoring in the form of a rapid assessment.

The Sustainability Tourism Development (STD) assessment by GSTC in Pulesari and Pancoh in the snapshot assessment of Sleman Regency obtained the results of a score that needs improvement. There are four red indicators required to be fixed/improved, including Sustainability Standards, Solid Waste Management, and Liquid Waste. Analysis of the Strategic issue of the Tourism Development of Sleman Regency developed by MCSTO UGM, indicate that Pulesari and Pancoh as tourism villages are alternative attractions which are considered capable of supporting the existence of existing tourist attractions.

Pulesari and Pancoh tourism villages are one of around 16 tourism villages in Turi Sub-District which are monitored by MCSTO UGM based on monitoring with various development themes (core product), ranging from natural, cultural, to artificial tourism-based villages (creative economy). Both villages are encouraged to be the best examples of applying the basic principles of sustainable tourism. Both of these tourism villages as nature-based tourism villages without closing the possibility there has been a cultural uniqueness that is always offered to tourists. Other policies related to the existence of a tourism village are:

a) At the moment the Sleman Regency Tourism Office is designing a Head of Regent Regulation regarding the Management of Tourism Village
b) There are three categories of tourism villages in Sleman Regency, namely: independent, growing and developing tourism villages.

c) The tourism village has become an attraction that can attract tourists to stay temporarily in Sleman Regency, thus extending Length Of Stay (LOS).
d) Sleman tourism village market segment is generally students, especially those from big cities. There is a courageous and willing tourism village in Sleman (Brayut Tourism Village) which takes on foreign guests, such as tourists from Singapore Victoria Middle School.
e) The experience of the tourism village manager in providing excellent service for guests has a positive impact on the image of the tourism village in Sleman.
f) Partnership with the hotel and inter-village tourism has been formed and runs quite balanced.
g) Tourism village managers have been able to become tour leaders because they dare to develop packages outside the managed village, even across regency and provincial packages.

Tourism Industry

Based on monitoring carried out by MCSTO UGM, industrial development to support tourism in Pulesari and Pancoh, especially in the availability of services and products of the tourism industry, is still considered to be lacking. Several factors which support the development of the tourism industry and destinations include those that need to be developed:

a) The existence of several universities in Sleman has the potential to become an educational tourist attraction.
b) The existence of the hotel encourages the development of MICE tourism activities.
c) There are several violations in the use of residential houses as tourist accommodation without official permission.
d) The necessity for control and enforcement of rules to manage the rise of unlicensed tourist accommodation.

Efforts to support marketing to support the importance of introducing tourism products required a strategic role in developing tourism marketing in the Sleman Regency.

a) Overseas marketing activities do not appear to have been adjusted to the potential target market which is expected to enter Sleman, including the archipelago market.

b) Merapi is one of the main magnets to bring tourists to both the Sleman Regency and Special Region of Yogyakarta has not been cultivated and developed optimally. Therefore, it is necessary to develop not only the Merapi and surrounding areas but also all matters relating to Merapi and its derivative components by involving the community.
c) The marketing of tourist destinations cannot be done separately. 'Selling' Sleman cannot be separated from the Special Region of Yogyakarta as its main destination. Thus, synergy is needed between the regencies and cities in the Special Region of Yogyakarta.
d) Institutionally, lack of quality in Sleman Regency tourism management human resources and the lack of integrated programs between institutions

Sustainability of Tourism Development in Pulesari and Pancoh

The sustainability of the program that has been carried out by MCSTO has explained that sustainable tourism products are products that are operated in harmony with the environment, the community, and local culture so that they continue to be the beneficiaries rather than victims of tourism development. Besides, the document implies that making changes towards sustainable tourism requires a fundamental change in work orientation.

Image: Routine discussion of the MCSTO UGM Program about program sustainability
Source: MCSTO Documentation, UGM

The role of the MCSTO UGM as an institution that monitors the implementation of sustainable tourism development as a whole has a responsibility in achieving sustainable tourism, to arrange a follow-up program for all tourism actors. Government responsibility in terms of monitoring has occurred a significant shift of authority from the central government to regional governments. Thus, a sizable portion is given for the action program for local governments. The monitoring carried out by MCSTO UGM is strongly supported by several local government policies and national policies to realize sustainable tourism development, the following programs as follows:

a. Awareness about the responsibility for environmental preservation of all tourism stakeholders including village tourism destination, hence the action program to develop a strong legal foundation and framework, law enforcement, increase public awareness through public education, develop and enhance the role of non-governmental organizations, and the development of information systems proponents of sustainable tourism are prioritized programs.
b. Shifting the role of the central government in tourism development which contains various actions that need to be taken by the central government in planning, implementing, monitoring and controlling tourism development in the era of regional autonomy.
c. Increasing the role of local government in national tourism development which contains actions required to be taken by the regional government in planning, implementing, monitoring and controlling tourism development for its sustainability in the era of regional autonomy.
d. The stability of the tourism industry which contains actions required to be taken by tourism businesses in increasing their competitiveness through increasing reliability and credibility, managing business sustainably, establishing a diagonal partnership, and promoting local values in the tourism business.
e. Partnerships and community participation in tourism development which contains action programs to foster local leadership, development of aid schemes, institutionalizing community participation, creating forward and backward linkages with tourism businesses, increasing tourism opportunities, and increasing awareness of the risks of tourism development.

Monitoring conducted by MCSTO UGM from 2016 to 2019 assess that awareness of environmental, social, cultural and economic issues caused by the development model and the practice of normal or mass tourism activities encourage several tourism actors to make more environmentally friendly, socially and culturally products; creating new forms of tourism products such as ecotourism, alternative tourism, appropriate tourism, culture tourism, adventure tourism, green tourism, soft tourism, wildlife tourism, community-based tourism, etc. as the answer to mass tourism practices.

Meanwhile, WTO developed Indicators of Sustainable development for Tourism Destinations, which becomes the evidence of its commitment to support Agenda 21, as the follow up of the Agenda 21 drafting of Tourism Sector with WTTC and EC in 1995. Indicators available to be used as a measurement level of sustainability in Sleman Regency:

a. The wellbeing of the community in Sleman Regency
b. Protection of local community cultural assets
c. Society participation
d. Tourist satisfaction of tourist attractions
e. Health and safety guarantee for tourists and tour operators
f. Economy benefits for the community, government, and investors involved in tourism activities
g. Protection of existing natural assets
h. Management of existing human resources
i. Impact limitation; and
j. Planning and Control of Development

These indicators are interpreted as the direction in which the tourism development program should be carried out or the measure of success that must be achieved, not only to base it on the number of visitors. Therefore, it is necessary to elaborate on a more detailed action plan.

TOURIST DESTINATION AS MONITORING REGION DESTINATION UPDATE

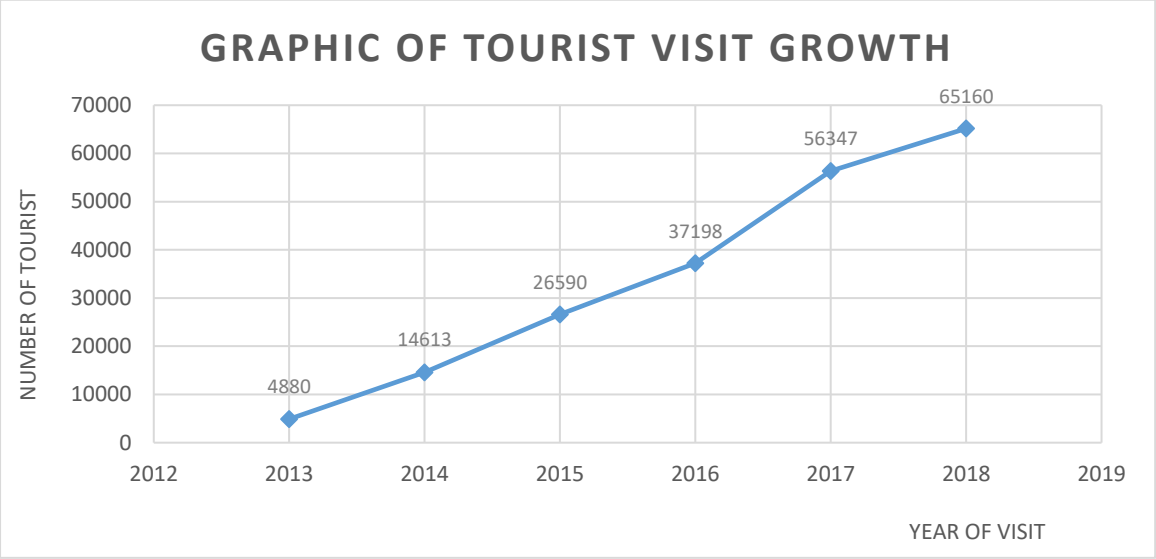
The existence of Pulesari Village and Pancoh Village in Turi Sub-District is an area in Sleman Regency which has an average height of between less than 100 to more than 1000 m above sea level. Land located at > 1000 m above sea level. Areas with a height of > 1000 m above sea level covering an area of 1,495 ha or 2.60% are Pulesari Village and Pancoh Village of Turi District, along with Pakem and Cangkringan Sub-Districts. These region are also rich in water resources and nature tourism, centered on the activities of Mount Merapi and its ecosystem.

MCSTO UGM monitoring area has a large part of the Sleman Regency which is an upstream area that is included in the protected area. Ecologically, the protected area is a water resource and water catchment area that helps the supply of groundwater in the surrounding environment and areas in the downstream, namely the city of Yogyakarta and Bantul Regency. Unplanned development and a look over to the carrying capacity of the environment will harm the environment itself and brings natural disaster such as floods, erosion, and scarcity of groundwater resources. Besides, if the water catchment area is not properly maintained, Sleman Regency will have a shortage of groundwater soon, due to the lack of water catchment areas. The water catchment area is located in the upstream area, this will cause problems in the upstream area of the Sleman Regency majority.

Many supporting potentials for business investment in Sleman Regency are agricultural, livestock, plantation, fishery, and tourism commodities, which include: nature tourism, temple tourism, museums, sports tourism, education, cultural tourism, and agro-tourism. Also, some industries include the packaging industry, processing industry, and class C mineral processing industry.

The MCSTO UGM monitoring area in Pulesari and Pancoh villages has a pleasantly cool air with neatly panoramic snake fruit (salak pondoh) trees. There are 17 types of snake fruit and several types of plant in herbal remedies in the two hectares agro-tourism area. The activity of tourists who visit the snake fruit plantation is to roam around the garden while enjoying their fruit. The access to reach this place is still only available for private vehicles of motorbike and car.

Graph of tourist growth in Pulesari Tourism Village



Source: Analysis of processed data, 2019

Pulesari Village Tourism Attraction

Pulesari Tourism Village is located in Wonokerto Sub-Village, Turi Sub-District, Sleman Regency. Pulesari is taken from the name of the village itself, Pulesari. This village area consists of agricultural land, plantations, settlements, industry, trade services, and community forests. Tours offered at Pulesari Turi Tourism Village are river tacking, snake fruit (salak) garden tours, cultural arts, crafts, fishing tourism, batik making, and last but not least, culinary tours and lodging. A unique attraction such as historical caves is offered: such as Dampar Cave, Canguk Cave, Leri Cave, Wayang Cave, Ular Cave, and Maling Cave.

“Pulesari Nature Tourism Village: Nature and Cultural Traditions Tourism ". Visitors are not only presented with natural beauty, but also the culture in the Pulesari Tourism Village. One of the examples of the villagers' annual routine is held every last Wednesday in a month of Sapar, the second month in the Arabic calendar (Rabu Pungkasan). It is a traditional ceremony called *Pager Bumi*. Visitors who come to this tourism village are offered many packages, ranging from tour packages and outbound with tracking of natural rivers, culinary packages, to homestay packages. At present, there are more than 10 outbound tour packages prepared by the management of Pulesari Tourism Village for tourists. The package is: Rocking bridge, leaking bamboo, catching fish, crawling the spider webs, tire infiltration, rain huts, bamboo walkways, rocking rocky steps, and other similar games that challenge tourists.

Pulesari Tourism Village is unique because every lodging/homestay offered to visitors is located in each of the residents' houses so that tourists or visitors can directly interact with them. Furthermore, the air is pleasantly cool and the atmosphere is comfortable because the village is located in a mountainous/hilly area, the texture of the soil is sandy and rocky. The land in this village is so fertile, there are a lot of agricultural lands and most of the population work as farmers.

The existence of Pulesari tourism village which was formed on May 26th, 2012, after the eruption of Mount Merapi in 2010, tried to rise and create alternative businesses other than agriculture. Following the agreement of citizens and their potential, this place is used as a tourism village to empower existing Human Resources and Islamic Resources so that the existence of this Tourism Village can be known and recognized by the wider community. Pulesari Tourism Village at this time has developed and has a diversity of potential required to be preserved and developed. The attraction developed is an effort to attract tourist visitors who have increased from year to year. The characteristics of most tourist visitors in Pulesari tourism village is that the visitors can enjoy the typical fresh air of the mountains and nature tourism by tracking the river from the clear mountains as well as experiencing making batik and picking snake fruit which is also an icon for other villages.

Pulesari tourism village has an increasing number of tourist visits from year to year. In 2018, the tourist arrivals are 37,592. It is estimated that tourist arrivals will increase in 2019 by 10% to 20% or around 3417 so that is a total of 37592.5 or more (based on an interview with the management of Pulesari tourism village). It is highly influential on the income from Pulesari Tourism Village in 2018 and combined with 2019's and has reached the amount of **Rp 4,352,883,227**. The income is distributed in the development of tourism villages with a pattern of percentage distribution for each development theme. The development of tourism villages, among others, is focused on:

Format of Table for Program Development in Pulesari Tourism Village

PROGRAM	SOURCE OF FUNDS (SUMBER DANA)			COST (BIAYA) (Rp)	YEAR OF ACTIVITIES PLANNING				
	Village Budget (APBDes)	State Budget (APBN)	Non-governmental (SWADAYA)		2016	2017	2018	2019	2020
SOCIAL INSTITUTIONAL (SOSIAL KELEMBAGAAN)									
Development of Others (Pengembangan lain-lain)									

Source: Pulesari Tourism Village, 2019

In the table below is the income and expenditure obtained from tourism activities in Pulesari Tourism Village. Expenditures and revenues obtained are intended for the development of programs such as institutional development, social development, development of facilities and infrastructure, development of tourist attractions in the arts and culture sectors, including tourism promotion.

NO	MONTH	CODE	INCOME (Rp)	EXPENDITURE (Rp)	BALANCE (Rp)
1	January	100	365.698.000	232.848.000	132.850.000
2	February	100	255.779.000	145.410.000	110.369.000
3	March	100	467.451.000	270.193.000	197.258.000
4	April	100	524.650.000	298.366.000	226.284.000
5	May	100	388.216.000	207.727.000	180.489.000

6	June	100	71.361.000	41.019.000	30.342.000
7	July	100	260.276.000	162.809.000	97.467.000
8	August	100	117.263.000	71.297.000	45.966.000
9	September	100	295.311.000	172.721.000	122.590.000
10	October	100	587.220.152	340.248.868	246.971.284
11	November	100	453.152.795	271.745.439	181.407.356
12	December	100	566.505.280	323.046.000	243.459.280
TOTAL (Rp)			**4.352.883.227**	**2.537.430.307**	**1.682.602.920**

Pulesari Tourism Village Table of Income and Expenditure in 2019

Source: Pulesari tourism village and interviews with tourism awareness group (kelompok sadar wisata), 2019

Pancoh Village Tourism Attraction

The monitoring area of MCSTO UGM other than Pulesari Tourism Village is Pancoh Village. It is similar to other villages in Turi Sub-District in Sleman Regency regions which have an average altitude of between less than 100 to more than 1000 m above sea level. The land is located at > 1000 m above sea level. Areas with a height of > 1000 m above sea level covering an area of 1,495 ha or 2.60% are Pulesari Village and Pancoh Village Turi Sub-District, along with Pakem and Cangkringan Sub-Districts. This region is also rich in water resources and its nature tourism centered on the activities of Mount Merapi and its ecosystem.

Pancoh tourism village is a sub-village located in Girikerto Village, Turi Sub-District, Sleman Regency. Administratively, Pancoh's territorial boundary is as follows:

Northside: Sukorejo Sub-Village

Southern side: Glagahombo Sub-Village

Westside: Nangsri Sub-Village

East: Candi Sub-Village, Pakem Sub-District

The development as a tourism village which was initiated since 2012 until now is based on the local nature as well as its cultural resources and the Pancoh Tourism Village has tourism activities as the main attraction in the Pancoh Sub-Village which includes nature and culture tourism consist of:

a) Educational tourism: handicrafts (caping-the farmer's hat-art, making batik, recycled handmade workshops), introducing cultural arts (nyadran, karawitan, madyo barrels, bungbeh), salak fruit gardening, planting flowers, making biogas, rice plows, and catching fish.
b) Outbound tourism: exploring along the river, fun games, and fishing
c) Historical Tourism: a visit to the Londo Building, a legacy from the Netherlands' colonization period

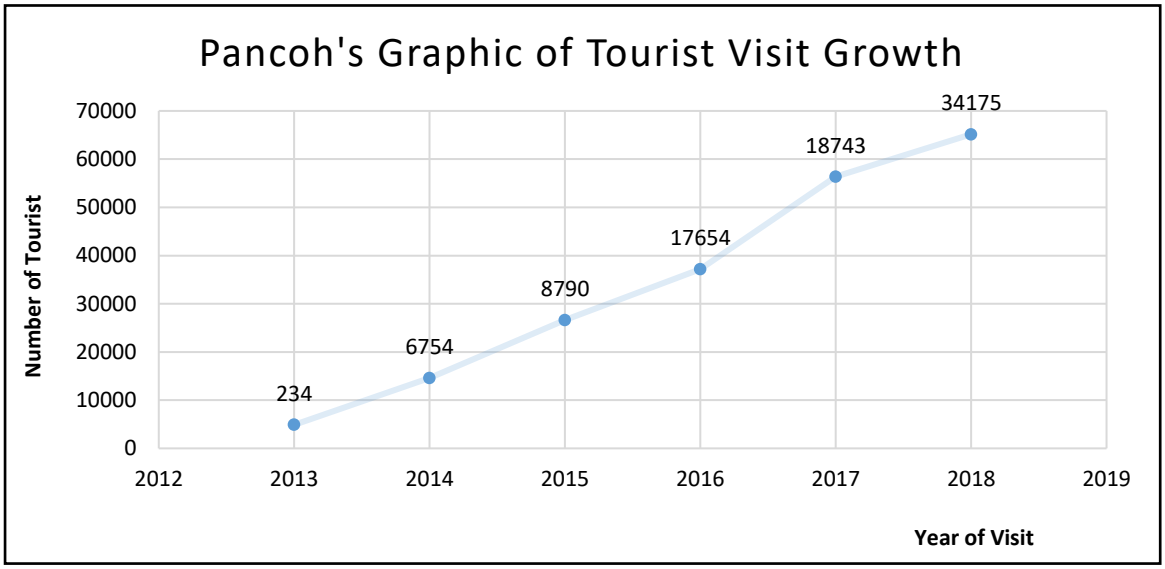
Pancoh Sub-Village was designated as a tourist village in 2012 after the Merapi eruption disaster, similar to Pulesari Village. The establishment of this tourism village is driven by the declining economic conditions of society due to the damage of the agricultural land after the Merapi eruption. Identification of the potential and development of Pancoh Sub-Village as a tourist area is carried out together with social institutions that assist the residents and residential environment recovery after the eruption disaster. Considering the natural and cultural potential owned by Pancoh Sub-Village, it was then developed as an ecotourism village. Potentials that were considered to be special during the initial establishment were the snake fruit plantation, agricultural land, and vegetables, as well as the traditional art of *surthong* which can be found in almost all parts of Pancoh Sub-Village.

In its development, Pancoh Sub-Village provides a variety of outbound tourism activities by utilizing the resources they owned. The nature tourism activities offered include river and village exploration. Educational tourism activities carried out through the participation of tourists in the activities of rice plows, catching fish and picking snake fruit or vegetables. Art and cultural activities are organized through dance, *gamelan*, batik making, and bamboo weaving training. The various village tourism activities were followed by various groups of age from various regions.

The development and growth of the number of tourists visiting the village of Pancoh tourism have increased from year to year. The performance of the Pancoh tourism village destination has increased from the aspect of tourist attraction as well as an increase in the development of facilities and infrastructure.

Table: Graphic of Tourist Visit Growth in Pancoh Tourism Village

Source: Processed Data and Interview, 2019



Snapshot Assessment in Pulesari and Pancoh

The snapshot assessment system conducted by GSTC in 2016 is the beginning of the development of a tourism village which able to implement sustainable tourism development. Sleman Regency got the best assessment results conducted by GSTC along with three other regencies, but there are four red indicators which need to be fixed/improved, namely: Sustainability Standards, Solid Waste Management, Greenhouse Gas Effects, and Environmentally Friendly Transportation, as shown in the image below:

A2 Destination management organization	
A3 Monitoring	
A4 Tourism seasonality management	
A5 Climate change adaptation	
A6 Inventory of tourism assets and attractions	
A7 Planning regulations	
A8 Access for all	
A9 Property acquisitions	
A10 Visitor satisfaction	
A11 Sustainability standards	
A12 Safety and security	
A13 Crisis and emergency management	
A14 Promotion	
B1 Economic monitoring	
B2 Local career opportunities	
B3 Public participation	
B4 Local community opinion	
B5 Local access	
B6 Tourism awareness and education	
B7 Preventing exploitation	
B8 Support for community	
B9 Supporting local entrepreneurs and fair trade	
C1 Attraction protection	
C2 Visitor management	
C3 Visitor behavior	
C4 Cultural heritage protection	
C5 Site interpretation	
C6 Intellectual property	
D1 Environmental risks	
D2 Protection of sensitive environments	
D3 Wildlife protection	
D4 Greenhouse gas emissions	
D5 Energy conservation	
D6 Water Management	
D7 Water security	
D8 Water quality	
D9 Wastewater	
D10 Solid waste reduction	
D11 Light and noise pollution	
D12 Low-impact transportation	

Image: Results of the Sleman Regency Snapshot Assessment by GSTC in 2017
Source: MCSTO UGM, 2019

The report in 2017 made by the MCSTO is based on the results of the assessment conducted in 2016, it is found that the GTSC results of the evaluation are an important input for the Sleman Regency local government to encourage sustainable tourism development. Schematically, the pattern of implementing sustainable tourism in Sleman Regency as mentioned in the report 2017 result of study: the STD assessment standards and criteria therein have been met through programs/activities carried out by several Regional Government Agency (Satuan Kerja Perangkat Daerah-SKPD) in Sleman Regency such as the Regional Development Planning Agency (Bappeda), the Public Works and Housing Agency (PUPR), the Office Tourism, Office of Culture, Office of Environment, and other agencies. Overall, MCSTO UGM sees that the involvement of related SKPDs can work together in putting efforts into implementing sustainable tourism development. Furthermore, based on an evaluation conducted by the MCSTO UGM, which is monitoring within the framework of the subject

practice in Master of Tourism Studies, UGM is trying to find several findings of sustainable tourism indicators that have not yet been assessed or attended less by the GSTC and Indonesia Sustainable Tourism Award (ISTA) assessors in 2019, as follows.

a) Attractions do not yet characterize the uniqueness of each tourism village, the tourist attraction are all almost the same in every destination
b) Proximity to Disaster Prone Areas (KRB) in the form of disaster mitigation from the threat of Mount Merapi eruption, earthquakes, and so forth.
c) Access for all visitors, especially for toddlers, elders, pregnant women, and people with disabilities.

Based on the mentioned indicators, MCSTO UGM will make more focused monitoring of the indicators mentioned previously and attempt to offer some recommendations to support sustainable tourism development in the Sleman Regency region for years to come. The monitoring of these indicators will be able to provide input for relevant agencies, especially the Office of Tourism and Creative Economy. Monitoring conducted by UGM MCSTO in 2018 - 2019 is periodic monitoring adjusted to the STD, STO and STC programs that have been announced by the Ministry of Tourism and Creative Economy until 2020.

Table of MCSTO UGM Activities Plans for 2018-2019

No.	Program	Activities	Year		PIC
			2018	2019	
1	Monitoring Center Sustainable Tourism Observatories (MCSTO) UGM Program in implementation framework of Sustainable Tourism Destination in Sleman Regency	Preparation of program planning which involves all Programs of Study at Universitas Gadjah Mada			Vocational School Program, Undergraduate Studies of Tourism Program, Master's in Tourism Studies, Sleman Regency Tourism Office
		The Monitoring Program socialization within the scope of the MCSTO UGM including the expansion of monitoring area (2 villages expanded to 14 villages), and expansion in Borobudur Prambanan, Yogyakarta.			Vocational School Program, Undergraduate Studies of Tourism Program, Master's in Tourism Studies, Sleman Regency Tourism Office
		Focus drafting of monitoring in UGM MCSTO scope which includes the expansion of the monitoring area (2 villages expanded to 14 villages), and expansion in Borobudur Prambanan Yogyakarta			Vocational School Program, Undergraduate Studies of Tourism Program, Master's in Tourism Studies, Sleman Regency Tourism Office
		Mapping the role of each UGM MCSTO program which will be carried out in each program of study, (2 villages expanded to 14 villages), and expansion in Borobudur Prambanan Yogyakarta			Vocational School Program, Undergraduate Studies of Tourism Program, Master's in Tourism Studies, two tourism village: Pulesari and Pancoh, Sleman Regency Tourism Office
		Determining the sustainability program by involving the tourism industry and other related sectors			Vocational School Program, Undergraduate Studies of Tourism Program, Master's in Tourism Studies, two tourism village: Pulesari and Pancoh, Sleman Regency Tourism Office
		Monitoring evaluation of the sustainable tourism development application in the tourism villages of Pancoh and Pulesari on aspects of			Vocational School Program, Undergraduate Studies of Tourism Program, Master's in

		environmental preservation and disaster mitigation.			Tourism Studies, two tourism village: Pulesari and Pancoh, Sleman Regency Tourism Office
2	Institutional Partnership with College	Increased collaboration with Monash University and the development of In-Park (incubator of Sustainable Tourism Development)			Master's in Tourism Studies Graduate School of Universitas Gadjah Mada
3	Comparative Study	A comparative study in Pengandaran area of Monitoring area of the Bandung Institute of Technology			Government of Sleman Regency Tourism Office, MCSTO UGM
4	Environmental Preservation monitoring program	Treatment of handling liquid and solid waste			Tourism destinations Desa Pancoh and Desa Pulesari, Donokerto, Turi, Sleman Regency
5	Monitoring and Evaluation in Pancoh and Pulesari tourism destinations	To this date (total of 14 villages; Pancoh and Pulesari Tourism Villages are encouraged to become pilots)			MCSTO UGM

A. DESTINATION TRENDS AND KEY MONITORING INDICATORS

Water Resources Management

Spatially, the problem of water in rural areas is when many villagers use river banks as a place for bathing and washing as well as serving as a lavatory or toilet (MCK), drinking water, and as a tourist attraction. The purpose of this water resource conservation study is to determine the availability of clean water resources for tourists and their tourism activities. The provision of clean water is obtained by digging the soil to the proximity of the groundwater level to get an abundant volume of water. However, even the effort is through related institutions/companies, such as the Indonesian regional water utility company (PDAM), the result is still insufficient. There are still many problems with water resources in how they are used, for example, for tourism and the vital needs of people in the village. This study looks at the efforts of Pulesari tourism village community in the use of water for tourism activities and the necessity for snake fruit plantations during the dry season as well as fish ponds. The method used is survey, observation, and in-depth interviews. The findings show that the Pulesari tourism village community can make use of the water resource to the maximum, by storing 12 M^3 of water in each house's water tank.

Information on Subject Matter

Research conducted by a group of Tourism Studies' master students (2016) shows that the use of water by tourists at tourist sites per capita is usually two to three times greater than the daily consumption of the local community. This situation has caused an escalation in water demand at almost every tourist destination. Therefore, this can be a big problem especially for tourist destinations with a limited supply of groundwater and water from PDAM. Water use in Pulesari Tourism Village is used as a tourist village attraction, household needs, tourist needs, and snake fruit plantation needs. As the need for water is in demand, then a question arise: how to manage the water resources?

These days, problems tend to be faced by the government and the community concerning the utilization of water resources include; (1) drought in dry

season and flood in rainy season; (2) competition and struggle over water between upstream and downstream areas or conflicts between various sectors; (3) excessive and inefficient use of water; (d) narrowing and silting of rivers as well as lakes due to pressure of providing land to be used for settlements and industry; (e) surface and groundwater pollution; (f) erosion as a result of deforestation.

The increasingly complex water problem requires us to manage water resources to support people's welfare. Based on Legislation No. 7/2004 on Water Resources, Management of water resources to plan, implement, monitor, and evaluate the implementation of water resources conservation, utilization of water resources, and control of water damage.

It has become a daily view and easy to spot that water has become a problem. Increasing community demand for water has switched the important value of water from its social value and function to an economic good. This condition has the potential to cause conflicts of interest between sectors, between regions and various parties related to water resources. On the other hand, water resources management that relies more on economic values tend to favor the owners of capital and neglect social functions.

The formulation of management pattern required the involvement from the broadest possibility of roles in the community and business world, both cooperatives, state-owned enterprises, regionally-owned enterprises, and private business entities. In line with the democratic principles, the community is not only given a role in the preparation of water resources management pattern but also plays a role in the planning, construction, operation and maintenance, monitoring and supervision of water resources management. To adapt with the paradigm shift and anticipate the complexity of water resources problems development; to position water in social, environmental and economic dimensions in harmony; achieve integrated water resources management; accommodate the demands of decentralization and regional autonomy; provide better attention to the basic right of water for all people; achieve the mechanism and process of formulating policies and plans for a more democratic water resources management.

Discussion and Findings

The hydrological condition of Pulesari Sub-Village in Wonokerto Village, Turi Sub-District is an agricultural area with 26 wellsprings that flow into Krasak and Bedog rivers; fulfilling the needs of agricultural irrigation. The average rainfall is 3.908 mm per year with temperatures of 24 °C up to 28 °C. The source of groundwater flows below the surface is in the Turi - Sleman wellspring which used for clean water and irrigation. However, during the dry season, some areas are lacking water for agriculture, while groundwater/well provides drinking water in Pulesari Sub-Village is sufficient enough. Geological conditions or soil conditions in the Pulesari Sub-Village area are fertile hill/ mountainous areas with a soil structure that is both sandy and rocky.

Water conservation methods required to be considered in water management are management based on 'watershed' (Daerah Aliran Sungai/DAS) which is a source of groundwater that flows below the surface in the Turi - Sleman wellspring waterway. A watershed is an area land which is a unity with the river and its tributaries, which functions to accommodate, store, and flow water coming from rainfall to the lake or the sea naturally. Its boundary on land is the topographic separator, while the boundary in the sea is an area of waters still affected by land activities.

The concept of analysis is schemed in the form of pieces of each segment grouped according to the position of the region, as such is the Sleman Regency as a mountainous area for storing water. The water in the upstream region has 26 wellsprings flow into several rivers and the water is classified as clean and can be consumed directly.

Water management in the Pulesari Sub-Village using a conceptual approach based on the watershed (DAS), it is expected to create sustainable water resources as water required to be seen in the whole region. Water management in an area cannot just use hydrological variables in that region as a measurement. Water resources management issues must take into account the whole watershed (DAS) as even a point at the outermost end of the watershed (DAS) influences the presence and quality of water in the main river. Therefore, partial management of water

resources no longer required to be used. Besides, to manage watershed (DAS)-based water resources, we must refer to the aspects of the watershed (DAS). "It is not only limited to physical aspects, social-cultural, water quality, tourism activities, politics, economy, demography (population) as well. In a way to form a sense of responsibility for the community is to make people feel the sense of belonging and responsibility for maintaining the future by taking care and protecting water on the surface, as one example is how the community do their daily activities.

Figure 2: Pulesari tourism village community carries out tree planting activities to protect the boundaries and river to prevent abrasion as well as taking out garbage passes through the river.
Source: Pulesari tourism village, 2019

CONCLUSION

Management of water resources as one part of the conservation of water resources in the tourism village of Pulesari and Pancoh is seen as a vehicle of tourist attraction which attend to the great demand. The water resource is used as a fish pond and as water storage, carried out by observing harmony between conservation and utilization, between upstream and downstream, between the surface and groundwater utilization, as well as between fulfilling short-term and long-term interests. In this case, development the availability of small-scale pure water, especially in the tourism village of Pulesari, will be prioritized so that the community including tourism activities, tourists can enjoy it The main priority is to fulfill the basic needs of the household of the Pulesari tourism village community

as an effort to maintain the upstream area (Conservation area) to maintain the sustainability of water resources.

ENERGY CONSERVATION AND HANDLING OF LIQUID AND SOLID WASTE

This study discusses a 1-semester monitoring focus on understanding sustainable tourism observatories through the MCSTO of Universitas Gadjah Mada which was held in Pulesari and Pancoh Tourism Village, Wonokerto, Turi Sub-District in Sleman Regency. Monitoring refers to the measurement of the Monitoring Center on indicators of sustainable tourism within a certain period to produce valid and updated data. The main purpose of monitoring is to measure destination indicators, which are the focus of energy conservation, using descriptive and qualitative methods in the form of measuring the amount of bio-mass energy generated from the population of cattle owned by the people there. From the results of monitoring, the energy produced can meet the needs required by the community as an alternative energy. The alternative energy produced is 12 kWh which means, it can be used to light 6 houses @ 200 W for 10 hours. This concept is the basis for the alternative energy in substitute of conventional fuel usage in the tourism villages of Pancoh and Pulesari.

Information on Subject Matter

Sustainable tourism development is a process and scheme to meet the needs of tourists and surrounding communities today, without compromising the fulfillment of future generations' needs. This concept is based on the principle of carry on to keep an eye on ecosystems following carrying capacity, achieve the interests of local communities, improving the quality of human life in physical, spiritual, social and cultural aspects in the long run, and encouraging the effective and efficient use of natural resources. Economic, social and aesthetic needs can be fulfilled without neglecting the preservation of cultural integrity, important ecological processes, biodiversity, and various life support systems; the capital of Indonesia's tourism strength, which are competitive and sustainable.

The problem of answering to meet the needs of tourists and the surrounding community at present, without sacrificing the fulfillment of the needs of future generations is something required to be accounted for. This concept is based on the

principle of keep on paying attention to ecosystems in accordance with carrying capacity as the biggest challenge required to be answered at present.

Alternative energy as an alternative refers to all energy able to be used, aiming to replace conventional fuels without any repercussion. Generally, this term is used to reduce the use of hydrocarbon fuels causing environmental damage due to high carbon dioxide emissions, which contribute greatly to global warming based on the Intergovernmental Panel on Climate Change. Over the years, what is meant as alternative energy has changed due to a large number of energy choices available for different purposes in their use.

The term "alternative" refers to a technology other than the technology used in fossil fuels to produce energy. Alternative technologies are used to produce energy by overcoming problems and not producing problems such as the use of fossil fuels, namely with appropriate technology (Teknologi Tepat Guna-TTG).

Another problem is the scarcity of fuel oil, one of which cause is a significant increase in world oil prices; that has encouraged the government to invite the public to overcome the energy problem together (Kompas, 2008). The increasingly high prices of fuels, especially gas and fuel oil for household needs, are increasingly become unsettling for the community. Other than due to its expensive price, the fuel is getting increasingly rare in the market. Efforts to overcome these things encourage surge of ideas to find alternative energy sources while solving the fuel need problem without damaging the environment.

The results of monitoring energy conservation program in the tourism villages of Pancoh and Pulesari

The aim of concentration of monitoring the studies on energy conservation is primarily to raise awareness and initiative for tourism villages and its actors to use renewable energy. The following are some of the components in the energy management issue in the tourism village of Pulesari and its surroundings: This conservation analysis is aiming to measure energy use, namely energy consumption per capita from all sources (overall and usage in the tourism sector - people per day) in the tourism village.

The sample used is the communal cage of farmer groups as a source of manure which collected into the inlet, a place to mix livestock manure and water, before put together into a Biogas (methane) reactor, the flow of Biogas distributed to people's homes through special Biogas stoves for cooking as explained in the pictures follows.

Image: Utilization of cow manure as a renewable energy source (Biogas)
Source: Documentation, 2019

Utilization of Cattle Manure as an Alternative Energy Source is due to the fact that Indonesia is an agricultural country with a tropical climate that has considerable agricultural and livestock resources. Other than used for food necessities, these resources are also potential as an energy source by utilizing livestock manure into biogas. The utilization of livestock waste (livestock manure) is one of the most appropriate alternatives to overcome the rising prices of fertilizers and fuel scarcity. Moreover, the use of raw material in the form of biogas is new to the community of farmers and ranchers. The use of livestock manure as an energy source, does not reduce the amount of organic fertilizer that comes from livestock manure since the production of biogas manure that has been processed is returned to its original condition, only methane (CH4) is used as fuel. Processed livestock manure in the making of biogas is moved to a drier place, and when it is dry it can be stored in a sack for further use.

In regards to this, the Pulesari Village Government and the surrounding area together with STO UGM, as well as master students tourism studies are conducting research with breeders groups to utilize their cow manure to produce biogas as an alternative energy source. Therefore, it is necessary to know the amount of energy produced from biogas made of cow manure. After discovering the amount of energy

produced, it will be known how many families can use biogas produced from the cow manure. Also, from the socio-cultural aspect, the application of new technology to the community is a challenge in itself due to the low educational background, knowledge, and insight they have. Similar to the application of biogas technology.

It was never imagined by the Pulesari tourism village community that cow manure could produce fire. Although there is a feeling of discomfort towards food cooked using biogas. This is done to discover the amount of energy conversion produced from biogas made of cow manure and to socialize the biogas product to the public so that it can be used as an initiation for new entrepreneurs as well as tourist attractions.

Table 1. Content of Nutrient in Manure Originating from a Few of the Available Livestock

No	**Type of livestock**	**Nutrient (kg/ton)**		
		N	**P**	**K**
1	Dairy Cattle	22,0	2,6	13,7
2	Beef Cattle	26,2	4,5	13,0
3	Sheep	50,6	6,7	39,7
4	Poultry	65,8	13,7	12,8

Source: From various sources, 2019

Biogas in Pulesari tourism village and its surroundings provides a solution to the problem of providing low cost and environmentally friendly energy. The study identified an average of 1-2 cattles in each house, as raising cows is the people's side job after farming and snake fruit gardening. Each day an average of a cattle produces 30 kg of manure. If there are 2,000 cattles, 60 tons of manure will be collected every day. Following is the calculation based on real data obtained through monitoring system to measure, monitor, reduce and report energy consumption:

- 1 cattle produces 25 kg of manure/day or 1 m^3 of biogas

• 6 houses who have 20 cattles can produce 20 m^3 of biogas/energy and is calculated to produce energy worth of 12 kWh

• 12 kWh energy can be used for lighting of 6 houses @ 200 W for 10 hours (2 houses have used renewable energy in the form of cooking equipment and lighting lamps throughout the whole house in at least 10 rooms.)

• Energy savings: Turn on the 1200 W generator set for 10 hours□3 l of gasoline

• Costs incurred = 3 x Rp 8,000 = Rp 24,000 / day

= Rp. 720,000 / month

= Rp 8,640,000 / year

The existing analysis of energy savings resulting an equivalent of a 20 watts generator that can last until 10 hours. The biggest advantage of this tourism village is to avoid the problem of piling dirt that will be carried by water entering the ground or river which then pollutes groundwater and river water. Cow manure contains poison and colly bacteria which has the potential of endangering human health as well as the environment. The burning of fossil fuels also produces carbon dioxide (CO2), contributes to the greenhouse effect which then leads to global warming.

Biogas provides resistance to the greenhouse effect in 3 ways. First, Biogas provides substitutes for fossil-fuels for lighting, electricity, cooking, and heating. Second, methane (CH4), which produced naturally by the accumulating manure is the biggest contributor to the greenhouse effect, even greater than CO2. The burning methane in Biogas converts it to CO2, thereby reducing the amount of methane in the air. Third, with the preservation of forests, the CO2 in the air will be absorbed by the forests, producing oxygen that counteracts the greenhouse effect. Biogas produces environmentally friendly fuels because it is made from natural materials, such as human and animal feces, and other organic wastes. Other than useful as a substitute for fuel, some advantages obtained from the use of biogas for the environment, include:

a) Reducing the number of trees cut down to be used as firewood.

b) The cooking process becomes cleaner and healthier since it does not emit smoke.

c) The livestock cages become cleaner since the manure is treated directly.

d) The remaining waste released from biodigester can be utilized as fertilizer to prevent them from polluting the environment.

e) Contribute to reducing greenhouse gas emissions by reducing the use of fossil fuels

Conclusion

Based on the observations of monitoring energy conservation in the form of livestock manure utilization as an alternative fuel source and its socio-cultural aspects, here are the following results obtained in the field.

a. This energy conservation process can be developed into an alternative energy-based natural tourism attraction
b. Farmers and / or cattle breeders in the Pulesari tourism village understand and recognize the use of biogas residues from livestock manure
c. The socio-cultural aspects of biogas technology application in the context of initiating new entrepreneurs have been recognized by the community of farmers and / or cattle breeders in the tourism village of Pulesari and its surrounding areas
d. In the context of community based tourism for a longer term, the community in tourism village of Pulesari and its surrounding areas recognizes the prospects which capable to be developed, in regards to the application of appropriate biogas technology

Conclusion

Challenges and Agenda

1. The sustainability of monitoring conducted by MCSTO UGM has received requests for monitoring by the Sleman Regency Government in 14 additional villages, especially those in the Turi Sub-District area of Sleman Regency. Monitoring will be carried out starting in 2019 involving MCSTO UGM members consist of Tourism Vocational Schools, as well as Masters and Doctoral programs of Tourism Studies. The monitoring in two previous villages, Pulesari and Pancoh tourism, are encouraged to become champions (as best examples) to serve as examples of sustainable tourism.
2. The most important monitoring agenda is the government's mandate and request from the Ministry of Tourism and Creative Economy concerning the Key Tourism Area through the ITMP scheme.
3. Based on monitoring through field observations and monitoring the process of energy conservation in the form of utilizing livestock manure as an alternative fuel source and its socio-cultural aspects, it is one of the applications of sustainable tourism development in the field, which obtained the following results.
    a. The community has managed to produce innovation with the use of renewable energy.
    b. This energy conservation process can be developed into an alternative energy-based natural tourism attraction.
    c. Farmers and/or cattle breeders in the Pulesari tourism village understand and recognize the use of biogas residues from livestock manure.
    d. The socio-cultural aspects in the application of biogas technology within the context of initiating new entrepreneurs have been recognized by the community of farmers and/or cattle farmers in the tourism village of Pulesari and surrounding areas
    e. In the context of community-based tourism for a longer-term, the community in tourism villages of Pancoh, Pulesari and their surrounding areas recognizes the prospects which capable to be

developed, in regards to the application of appropriate biogas technology