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UNNES Green Transportation as a Continuous Effort in Building a Conservation University

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Abstract Universitas Negeri Semarang (UNNES) declared itself as a conservation university with 3 main pillars, namely: (1) values and character, (2) arts and culture, and (3) natural resources and physical environment. UNNES believes the environmental crisis cannot be overcome only through practical and technical actions but it also attempts to change the way humans view and behave towards the environment. One indicator of natural resources pillars and the environment is green transportation. To implement green transportation, UNNES develops an internal transportation system to guide the use of vehicles, roads and parking areas on the campus. The use of regulated vehicles included motorized and non-motorized vehicles. The target of implementing a green transportation system was to reduce emissions in the campus environment to a minimum level. Motorized vehicles must obey the directional traffic signs applied in the campus environment and be only allowed to park in designated parking areas. Sufficient space for bicycle traffic, environmentally-friendly vehicles, and pedestrians on the sideways were preferred. Motor vehicle noise levels must not exceed 55 dB. Special vehicle traffic, among others, such as garbage transporters, watering plants, fire engines, and special-licensed vehicles were regulated under applicable regulations. Inspection tasks were carried out by security vehicles that can go through all roads in the campus environment in the direction of the designated lane, except in unlikely emergencies. Environmentally-friendly vehicles in the form of electric and non-fossil cars operated on Monday-Friday from 6:00 to 18:00 and were free. Markings with different colors, and bicycle lanes were used to differentiate between motorized vehicles. Campus parking points consisted of a central parking point and several auxiliary parking units. The central parking in the Multi-purpose Building was used for motorized vehicles or bicycles and was guarded 24 hours. Meanwhile, the auxiliary parking units were located in each work unit area which also had a security system. People with disabilities were facilitated through special signposts.

Keyword:

green transportation, green university, conservation, UI Greenmetric

1. Introduction

The implementation of tri dharma in university produces human beings who master science and technology (science and technology) in which its use can dominate nature. Excessive human domination of nature is proven to cause destruction and only a part of it can be returned to its ideal condition. Awareness of excessive human activity effect is pushing UNNES to implement tri dharma with the conservation principle to realize safe environmental conditions for life. This determination and effort have been realized since UNNES's declaration as a Conservation University on March 12, 2010 [1].

The future development of UNNES is designed according to the mandate, UNNES responsibilities, and the development of the Indonesian nation challenges. Science and technology development is the most important aspect to achieve the success of the development of every nation in the world. Therefore, the direction of developing UNNES is primarily based on 1) global science and technology development, 2) the direction of Indonesia's development, and 3) the mandate and responsibility of UNNES as an educational institution [2].

UNNES' vision is to realize the University of Conservation and International Reputation. UNNES with the principle of conservation in all steps of science and technology development (including art and sports) upholds the values of humanism to achieve an international reputation. Conservation insight is a perspective and behaviour-oriented towards conservation principles which includes three pillars, namely the pillars of values and character, arts and culture, and natural resources (SDA) and the environment through protection, preservation/preservation, and utilization. The purposes of UNNES as a conservation-oriented university are 1) supporting government efforts in the management of biological and non-biological natural resources and ecosystems, 2) protecting, preserving, and utilizing natural resources sustainably through tri dharma activities to create a balanced ecosystem, and 3) fostering mental attitudes, responsible behaviors and the university community role is to realize the UNNES conservation outlook. Therefore, UNNES emphasizes the importance of providing provisions for students to become human beings who hold the principle of conservation and play a role in protecting and preserving natural resources and the environment, as well as cultural heritage of the ancestors.

Besides, global science and technology developments do not only have a positive impact on development but also harms society. The negative impacts are the degradation of the value and character of our generation that is unique and noble art culture, and also the degradation of natural resources. In national and global scales, these negative impacts are at a serious stage and threaten the safety and sustainability of the entire earth. The application of three pillars in realizing a conservation-oriented university is seen as important [3, 4] because the environmental crisis cannot be overcome only through practical and technical actions but also it needs to change the way humans view and behave towards the environment [5]. One of UNNES's commitments as a conservation-oriented university is realized through a green/environmentally friendly transportation program which is one aspect of the pillars of natural resources and the environment. This pillar aims to create an independent green campus to strengthen the identity of UNNES as a conservation-oriented university.

2. Sekaran Campus Range Supports the Implementation of Green Transportation

UNNES is a comprehensive tertiary institution not a specialized higher education institution in which it consists of educational and non-educational study programs in various fields of science both at the vocational level, undergraduate, graduate, and doctoral levels. UNNES main campus is one of seven campus locations, six are in Semarang and one campus is in Tegal. The main campus is located in Sekaran, Gunungpati Semarang (Figures 1 and 2), at an altitude of less than 300 meters above sea level with a tropical climate of the rainy and dry seasons. The position of the main campus of UNNES is at $7^{o}03'02.5"$ S and $110^{o}23'32.8"$ E in the suburbs of Semarang. The total area of Sekaran campus has been reported as extensive 1511423 m^2, directly adjacent to residential areas. The ratio of open space to the total area is more than 80-90% (calculated based on UI Greenmetric formulation) [6].

Figure 1. UNNES Main Campus in Gunungpati Semarang is now characterized by the existence of a Conservation Monument

Figure 2. Sekaran Campus Setting – Sub-urban (Semarang-Sekaran Campus, Indonesia)

The total campus area is covered in forest 431975 m^2 or more than 22%, and the total campus area covered by extensive plant vegetation 620573 m^2 or more than 40%. This condition provides a shady atmosphere on almost all roads on campus (Figure 3) so that the campus community and the surrounding community are widely used in the afternoon for exercising/jogging.

Figure 3. Pedestrian Pathway in front of Faculty of Languages and Art and LP2M Building

In addition to the shade, the relatively flat road conditions provide comfort, safety, and convenience for drivers and passengers of non-fossil vehicles (electric cars and bicycles) even though vehicles running at speeds far lower than fossil-fueled vehicles. Pedestrians on campus can utilize a comfortable and safe pedestrian both pedestrian around the campus and pedestrian connects one building to another building (Figure 4).

Figure 4. The pedestrian pathway around campus and inter-connection between the building

3. H-BAT Internal Competition Encourages Improvement of Green Campus Performance

The green, clean and healthy (H-BAT) program was launched by the Chancellor in 2016. The program aimed to improve the performance of each unit in the UNNES environment to create a green and clean campus with a healthy campus community. Since 2017, H-BAT assessment indicators had been added with several important indicators on the UI Greenmetric ranking, including indicators in the transportation category. The digital system had been implemented in the H-BAT rating since 2019 so that the process of uploading data, evidence and assessments was much easier than in previous years.

UNNES H-BAT competition among units took place twice a year in July and December. The H-BAT program was integrated with selected UI Greenmetric indicators so that each unit could contribute to the strengthening of the UNNES sustainability campus as a

Conservation Insight University. The transportation indicator included in the H-BAT system was "the availability of bicycles and electric vehicles owned by the unit for operational activities". The results of the 2019 H-BAT competition were presented in Tables 1 and 2 [6], and assessment results for each category including transportation on the 2019 national and international UI Greenmetric ranking were presented in Table 3.

Table 1. Results of the H-BAT Competition Faculty Work Unit of December 2019

No	Faculty Work Unit	H-BAT Total Score	Percentage of Items Filled	Score	Rank
1	FT	141	90.38%	904	1
2	FE	138	88.46%	885	2
3	FMIPA	123	78.85%	788	3
4	FIP	113	72.44%	724	4
5	FBS	108	69.23%	692	5
6	FIS	93	59.62%	596	6
7	FIK	92	58.97%	590	7
8	FH	88	56.41%	564	8
9	Pascasarjana	76	48.72%	487	9

Table 2. H-BAT Competition Results of Non-Faculty Work Unit of December 2019 Period

No	Work Unit of Non-Faculty	H-BAT Total Score	Percentage of Items Filled	Score	Rank
1	BUHK	92	76.67%	767	1
2	LP2M	78	65.00%	650	2
3	LP3	75	62.50%	625	3
4	UPT TIK	53	44.17%	442	4
5	Perpustakaan	53	44.17%	442	5
6	Badan Pengembang Bisnis	47	39.17%	392	6

Tabel 3. Assessment results for each category at the 2019 Greenmetric UI National and International level

University	Total Score	Setting & Infrastructure	Energy &Climate Change	Waste	Water	Transportation	Education & Research	National Ranking	International Ranking
UI	8025	1050	1625	1500	825	1375	1650	1	27
IPB	7775	1400	1200	1425	575	1475	1700	2	40
UGM	7625	900	1300	1500	875	1375	1675	3	47
Undip	7600	750	1575	1350	950	1225	1750	4	50
ITS	7550	975	1350	1275	925	1225	1800	5	59
UNNES	7400	1050	1475	1125	800	1450	1500	6	71
UNS	7050	775	1450	1275	850	1275	1425	7	96
UII	6925	650	1400	1050	800	1275	1750	8	109
Telkom University	6550	775	1250	1350	700	1325	1150	9	135
Unpad	6475	675	1175	1350	725	1150	1400	10	142

The UNNES green transportation category was in the second rank nationally under IPB, overall the performance of the UI Greenmetric UNNES had increased compared to the previous year.

4. Internal Transportation System Strengthens the Implementation of UNNES Green Transportation

One of the strategies to create an independent green campus is reducing all forms of pollution. Environmentally-friendly internal transportation is one of the characteristics of an independent green campus. The support for this program is an environmentally friendly internal transportation system within the UNNES campus. The logical consequence of efforts to minimize pollution, UNNES built and provided the necessary infrastructure such as pollution-free/minimal vehicles and facilities for people with disabilities (Figure 5).

Figure 5. Zero-emission vehicles (ZEV) policy on campus and pedestrian path for disabled user

Green transportation is an environmentally sound transportation device, uses minimal energy and as much as possible produces greenhouse gases that trigger global warming [3]. Sustainable transportation must also guarantee to a minimum the negative impact on the environment. The sustainable internal transportation system must guarantee accessibility and access for all members of the campus community and people on campus including for people with disabilities, children, and the elderly. Therefore, a sustainable transportation system must consider the type of fuel from the performance of the vehicle itself. As many as 70% of air pollution comes from transportation activities that have a direct or indirect impact on health, especially on the respiratory system. Therefore, a green transportation system is an urgent need that needs to be developed. UNNES' determination to implement green transportation since it was initiated in 2014, although it was responded to by pros and cons, continued until the Chancellor Decree Number 11 of 2020 was issued on UNNES Internal Transportation System. The green transportation program must be supported by all

members of the campus community by cultivating walking, biking, and other environmentally friendly transportation in the campus internal movement to foster a healthy and humane culture [3]. A sustainable internal transportation system will reduce the movement of fossil fuel engine vehicles in the campus area.

A transportation system is a unit of physical facilities, traffic and control systems that allow the movement of people or goods from one place to another with or without using a vehicle. Environmentally friendly vehicles intended in this system are vehicles that are driven by human/animal power and or non-fossil fuels (electricity, gas and bio-energy) which do not cause direct air and noise pollution impacts on the surrounding environment. This internal transportation system had been established as a guideline for the use of vehicles, roads and parking areas within the UNNES Campus. The use of regulated vehicles included motorized and non-motorized vehicles. The target of implementing this environmentally friendly transportation system was to reduce emissions in the campus environment to a minimum. The implementation of work from home (WFH) during the Covid-19 pandemic had a direct impact on the reduction in the number of motor vehicles entering the campus area. The average use of motor vehicles per day was decreased 77% for official vehicles, cars were decreased 94%, and two-wheeled motorcycles was down to nearly 100% (only 0.07% entering campus daily) compared to the number of vehicles entering campus in 2019. Total vehicles compared to the total campus population of only 0.0049 so emissions in the UNNES campus environment during the WFH period were minimal.

Motorized vehicles must obey the directional traffic signs that apply in the campus environment and are only allowed to park in designated parking areas (Figure 6). The total parking area of UNNES is 27,400 m2 with a ratio of 1.8% compared to the total area of UNNES. Parking locations are in several places according to the location of the unit and are on the edge.

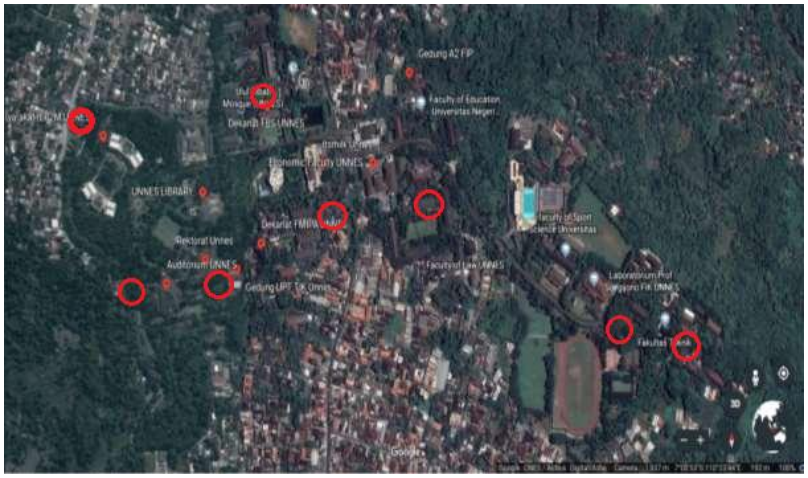

Figure 6. Parking location points on the main campus of UNNES

Motorized vehicles must also provide sufficient space for bicycle traffic, environmentally-friendly vehicles, and pedestrians on the sidewalk. The importance of environmentally-friendly vehicles and pedestrians are preferred. Motor vehicle noise levels must not exceed 55 dB. Special vehicle traffic, among others, such as garbage transporters, watering plants, fire engines, and special-licensed vehicles are regulated under applicable regulations. The use of inspection vehicles carried out by security guards can go through all

roads in the campus environment in the direction of the designated lane, except in emergencies.

Environmentally-friendly vehicles in the form of electric and non-fossil cars operate on Monday-Friday at 06.00 - 18.00 and it is free. Markings with different colors, and bicycle lanes are used to differentiate between motorized vehicles. Campus parking points consist of central parking and parking units. The central parking is in the Multi-purpose Building used for motorized vehicles or bicycles and guarded 24 hours, while parking units are located in each work unit area which also has a guard system. People with disabilities are facilitated through special signposts that have been provided. The guideline for developing the future transportation system is supported by the UNNES's business strategic plan 2020-2024 and completed with activity performance indicators.

The unit could plan its activities specifically related to the procurement of bicycles and electric vehicles for operations as indicators on the H-BAT program. The implementation of the internal transportation system had been proven in which it could improve the performance of UNNES green transportation which was getting better at the UI Greenmetric ranking [7][8]. After the issuance of the measured SK and IKK in the UNNES Business Strategic Plan, it is expected that the performance of environmentally friendly transportation in the national and international ranking will increase and will ultimately improve the performance of UI Greenmetric in the future.

5. Conclusion

UNNES Conservation Insight University was born in 2010. The application of UNNES conservation was carried out by combining 3 pillars, namely 1) values and character, 2) arts and culture, and 3) natural resources (SDA) and the environment. The three pillars were an inseparable unity because the environmental crisis cannot be overcome only through practical and technical actions, changing the way humans look and behave towards the environment into a very important aspect. One indicator of the pillars of natural resources and the environment was environmentally friendly transportation / green transportation. UNNES developed an internal transportation system to guide the use of vehicles, roads and parking areas on campus. The use of regulated vehicles includes motorized and non-motorized vehicles. The implementation of a green transportation system was expected to reduce emissions in the campus environment to a minimum. All motorized vehicles must obey the directional traffic signs that apply in the campus environment, except for vehicles specifically inspection officers in an emergency condition. Motorized vehicles were only allowed to park in designated parking areas. Bicycle traffic, environmentally-friendly vehicles, and pedestrians on the shoulder side of the road took precedence over other vehicles. The maximum motor vehicle noise level was 55 dB.

Special vehicle traffic such as garbage transporters, watering plants, fire engines, and special-licensed vehicles are regulated under applicable regulations. Electric and non-fossil cars operate every weekday on Monday-Friday from 6:00 to 18:00 and can be used free of charge by the community and the community on the campus. The safety and comfort of riders and pedestrians are by creating the marked line, bicycle lane signs are distinguished from motorized vehicle lanes. The eight campus parking points includes central parking in the Multipurpose Building (GSG) for motorized vehicles and bicycles and guarded 24 hours and parking units in the work unit area with a guard system. For people with disabilities, special-marked trails are provided. The implementation of the internal transportation system was proven to be able to improve the performance of Green Transportation UNNES

which was getting better at the UI Greenmetric ranking. The environmentally friendly UNNES transport system in the future is expected to be of higher quality considering the basis of its development is available both at the UNNES Business Strategic Plan 2020-2024 and moniroting and evaluating through the H-BAT program competition.

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