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Stakeholder Knowledge of Sustainable Road Implementation In Buru Regency

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Abstract: *Sustainable road development is an activity for the planning, implementation and use of environmentally friendly road construction products, efficient in resource use, low cost and with due consideration to the principle of expediency, equity, balance and harmony of its environmental infrastructure. The stakeholders are a community of road builder's profession. This research aims to determine the extent of understanding and attitude of stakeholder support for the implementation of sustainable roads in Buru Regency. This research is explorative research, field research, using qualitative methods and measure with Likert scale level of understanding and attitude of stakeholder support. Analysis of stakeholder knowledge is understanding and desire support implementation using Customer Satisfaction Index (CSI) method, and statistical tests. The result of the research shows that the level of stakeholders' understanding of sustainable road in general is quite understandable and desire support implementation is quite high, although there is the average difference desire of stakeholder support to natural resource variables.*

Keywords: *sustainable road, social, economic, environmental.*

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I. Introduction

The road infrastructure is very important in supporting the economic growth of a region. Extensive growth and road construction impacts on the use of non-renewable natural resources and has a significant role in environmental degradation, from construction to operation and maintenance. Environmental impacts are emissions, greenhouse gases, waste and land conversion to global warming issues, so it is necessary to construct environmentally friendly roads to minimize negative impacts on the environment [1,2,3]. The implementation of sustainable road development becomes a commitment of the Ministry of Public Works and Public Housing (PWPH) to realize road construction starting at planning, execution and use of environmentally friendly construction products, efficient use of energy and resources and low cost [4]. Infrastructure implementation must comply with environmental management requirements and support sustainable development with due regard to the principle of expediency, safety, balance and harmony of its environmental infrastructure [2,5]. Roads should be designed, built, operated and maintained with sustainable criteria [6,7,8]. The benefits of green roads include at least the following: i) environmental benefits (*ecocentric*) i.e. reducing the use of materials, fossil fuels, water, air pollution, greenhouse gas emissions, water pollution, solid waste and able to recover habitat, ii) the benefits for humans (anthropocentric) is to improve access, mobility, health and human safety, local economy, awareness, aesthetics, and reduce the cost of life cycle [9,10,11,12]. To know how readiness of the Buru Regency Government apply road construction it is necessary to conduct a research aimed at explaining how far the understanding and support of local government, consultant planners, contractors and academics towards the implementation of sustainable road. The results of this research are expected to be used as reference material, especially for Buru Regency Government in preparing the study for the implementation of sustainable road development.

II. Result and Discussion

Indicators used to look at the nature of road sustainability are: (1) social aspects with safe and convenient indicators, and community participation, (2) economic aspects with efficient indicators, mobility, and accessibility, (3) environmental aspects with emission indicators, natural resources and flora and fauna habitats associated with 14 performance indicators on national transport systems and systems [5,13]. Limit indicators of stakeholder understanding using the method of Customer Satisfaction Index (CSI) [14].

Different perceptions of stakeholders' perceptions of understanding and support attitude towards the implementation of sustainable roads use the IBM SPSS Statistic version 22 program. The number of questionnaires distributed is 50, 40 returning questionnaires consisting of 40% owners, 20% consultants, 20% contractors, 15% community, and 5% academics.

Validation test [15] is done by comparing the correlation between variable / items with a total score, done by testing 40 questionnaire result with 5% significance level. Of the 50 indicators studied, the reuse use indicator is invalid (R_{hitung} = 0.076 <R_{tabel} = 0.312). The reliability test of the indicated reliability of the Cronbach's Alpha value. The eight variables tested were reliable with Cronbach's Alpha> 60%.

The average understanding of stakeholders (owners, consultants, contractors, community and academia) of the Social Aspects with Variable Congratulations and Comfortable and Public Participation is sufficiently understood (attachment Table 1). Indicator X1.4 The provision of trees at construction stage is poorly understood by Academics. In general, respondents understood all indicators presented in the indicators of community participation. There is one indicator that is not understood by academics, namely community involvement in road planning / construction to avoid activities that can damage the environment and culture (X2.3).

The level of understanding of stakeholders from the economic aspect is that there are 5 indicators that are not well understood by the community, namely the non-steep sluggish planning indicator (X3.1), balancing the work of excavation and heaping (X3.5), long-life pavement planning (X3.6), pavement usage porous (X3.7), and the use of noise-reducing pavement (X3.9). At a speed of 80 km / h, the use of open asphalt pavement (uniformly grained) can reduce traffic noise levels up to 4dB. [16] Understanding of indicators providing pedestrian paths, cyclists and public transport (X4.1) is well understood. Indicators Accessibility in general is well understood, an indicator poorly understood by academics is the availability of safe, convenient, affordable, and timely transportation modes (X5.8).

From the environmental aspects of emission indicators and maximizing the use of local materials (X7.3) are generally understood by stakeholders, the indicators of reducing the use of fossil fuels outside construction work (X6.1) are poorly understood by academia. Natural resource indicators are well understood by stakeholders. Stakeholders on flora and fauna habitat indicator shows an understanding interpretation.

Of the 49 indicators (table 1 appendix) analyzed, there are 13 indicators that are not understood by the stakeholders that there are 3 indicators are not understood by the consultant, 4 indicators are not understood by academics and 6 indicators are not understood by the community. Overall, the average indicator index indicates an understanding of sustainable road. When viewed per group of stakeholders, the value of the owner's understanding index is the lowest and the highest is the contractor.

The support of stakeholders towards the implementation of sustainable road is quite supportive that is 78.73%. When reviewed per stakeholder group the percentage of the biggest support attitude criteria is given by the community of 82.72% and the lowest by a consultant is 67.43%.

Table 1. Understanding the level (○) and stakeholder support attitude (△)

Aspect		Variable		Owner 1		Consultant 2		Contractor 3		Society 4		Academia 5		Average	
				TP	SD	TP	SD	TP	SD	TP	SD	TP	SD	TP	SD
Social	1	Safe and Convenient	X1	0,76	0,79	0,72	0,65	0,85	0,88	0,77	0,92	0,77	1,00	0,77	0,85
	2	Society Participation	X2	0,79	0,81	0,73	0,54	0,81	0,67	0,84	0,94	0,78	0,67	0,79	0,73
Economic	3	Efficiency	X3	0,75	0,87	0,75	0,61	0,84	0,88	0,89	0,75	0,82	0,90	0,77	0,80
	4	Mobility	X4	0,74	0,88	0,80	0,75	0,95	1,00	0,80	0,83	0,70	0,50	0,80	0,79
	5	Accessibility	X5	0,76	0,83	0,80	0,71	0,90	0,82	0,78	0,85	0,74	0,78	0,80	0,80
Environmental	6	Emission	X6	0,69	0,70	0,80	0,78	0,80	0,75	0,70	0,71	0,71	0,88	0,74	0,76
	7	Natural Resources	X7	0,74	0,80	0,87	0,73	0,85	0,85	0,74	0,73	0,76	0,70	0,79	0,76
	8	Flora and Fauna Habitat	X8	0,75	0,86	0,79	0,63	0,79	0,75	0,78	0,88	0,79	0,93	0,78	0,81
		Average		**0,75**	**0,82**	**0,78**	**0,67**	**0,85**	**0,82**	**0,76**	**0,83**	**0,76**	**0,79**	**0,78**	**0,79**

Description: TP = Level of Understanding SD = Support Attitude

Source: Results of data processing,

Table 1. Understanding the level (○) and stakeholder support attitude (△)

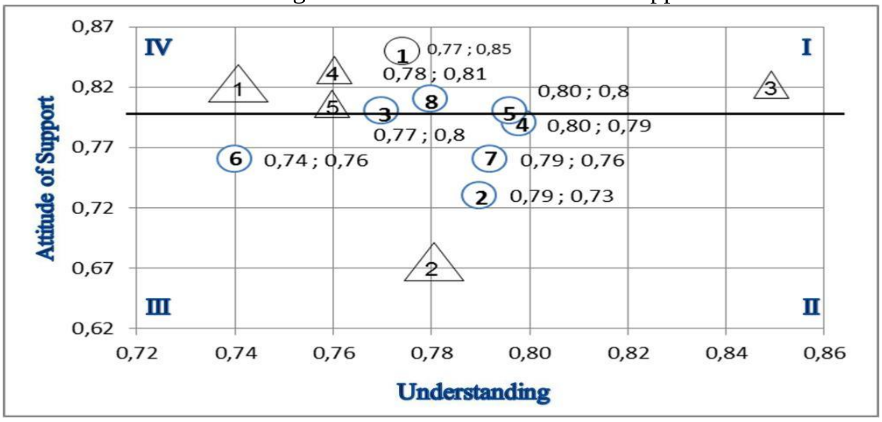

Figure 1. Understanding and attitude of stakeholder support

Normality test results are obtained only two indicators that are normally distributed, i.e., Efficiency and Emission, with parametric test method (ANOVA), there are six indicators not normally distributed by non-parametric difference test method (Kruskal Wallis) [15].

Table 2. ANOVA test results

		Sum of Squares	Df	*Mean Square*	F	Sig.
Efficiency	*Between Groups*	191.942	4	47.985	1.576	.202
	Within Groups	1065.833	35	30.452		
	Total	1257.775	39			
Emission	*Between Groups*	46.167	4	11.542	.995	.423
	Within Groups	405.833	35	11.595		
	Total	452.000	39			

Analysis:Ho = There is no difference in the average attitude of stakeholder support to a sustainable road.

H1 =There is an average difference in attitude of stakeholder support towards the implementation of sustainable roads

From the Anova test (Table 2) it is concluded that there is no difference in the average attitude of stakeholder support to the Variable Efficiency and Emission Variables.

Table 3. Kruskal Wallis test results

	Safety and Convenient	Society participation	Mobility	Accessibility	Natural resources	Flora and Fauna Habitat
Chi-Square	2.772	1.570	9.062	4.373	14.455	1.736
Df	4	4	4	4	4	4
Asymp. Sig.	.597	.814	.060	.358	.006	.784
a. Kruskal Wallis Test						
b. Grouping Variable: Respondents						

The output of Kruskal-Wallis difference test results (Table 3) obtained 5 indicators with Asymp Sig value. > 0,05 i.e. on safe and comfortable indices, community participation, mobility, accessibility, and Flora and Fauna Habitat stated there is no difference in average attitude of support of stakeholders to the indicator (HOT accepted). Natural Resource Variables have *Asymp Sig value*. 0,006 <0,05 it can be concluded that there is a difference in attitude of stakeholder support toward that variable (Ho is rejected).

III. Discussion

Economic indicators (mobility and accessibility) and environmental indicators on flora and fauna habitats are well understood for their role in sustainable road development, especially contractors. Understand and supportive stakeholders are consultants. Understandable indicators are safety and comfort indicators, efficiency and emissions, especially for communities and academics. By maximizing the use of local materials the value of a construction project can be pressed [12]

It needs socialization of sustainable road implementation so stakeholders can better understand, especially for owner, consultant, community and academia. Social aspects of indicators (safety and comfort) and economic (efficiency) and environmental aspects related to emission impact.

The development program of the Government of Buru regency has a bottom approach system, since the beginning of the planning activities has involved the community so that adverse impacts of development can be minimized. The use of non-motorized vehicles and mass transit to reduce carbon emissions, but the existing mode of transportation has not been able to answer the demand for public transport so that choose to use *ojek* (motorcycle or bicycle used for public transport) for a reason more quickly. Road construction still relies on gasoline and diesel fuel with the average age of equipment / vehicles over 5 years, so inefficient, minimize the use of equipment / fleet operating hours is one effort to reduce the use of fossil fuels and the impact of global warming, where pollution air became the biggest contributor to global warming.

IV. Conclusions and Recommendations

Conclusion

The level of stakeholders' understanding of sustainable roads is generally understood. There are 13 indicators of 49 indicators of sustainable road aspects that are not understood by the stakeholders are as follows: (1) Social Aspect: pre-construction safety audit, tree provision and community involvement in road planning / development; (2) Economic aspect: availability of efficient and effective transportation modes, geometric design of roads, minimize work volume, design and use of porous pavement and noise reduction; (3) Environmental Aspects: reduced use of fossil fuels and emissions, provision of trees at construction stage and signs be careful, as well as the use of renewable energy.

The attitude of stakeholder support towards the implementation of sustainable roads in Buru Regency is quite supportive. There is a difference in the average attitude of stakeholders' support towards natural resource variables.

Recommendation

It is necessary to socialize the implementation of sustainable roads to all stakeholders ranging from design, planning, implementation and maintenance, and the need to improve the quality of human resources through sustainable construction training to increase awareness and environmental insight to minimize the impact on the environment, especially those related to social, economic and environment.

References

[1] Adi, P, C, S, Hatmoko, D., Setiadji H, B., 2016. Rating System Model For Environmental Performance Assessment for Highway Construction Project, Simposium XIX FSTPT, Universitas Islam Indonesia, 11 - 13 October 2016

[2] Jinca, M.Y., 2015. Transportation Planning, Course Module Master Program in Transportation Engineering, Hasanuddin University, Makassar

[3] Turu H., and Jinca, M.Y., Asdar M. 2014. The Effect of Concrete Rigid Construction for Development of Rural Road Transportation on Land Values. IRJES, Volume 3, PP. 20-23, (July 2014).

[4] Hasan, M., 2011. International Seminar on The Green Road Construction and International workshop on The Vetiver System, Bandung. http://www.pu.go.id/punetnew2010/indexa.asp?site_id=berita&news=ppw061011lyl.htm&ndate=10/6/2011%2010:04:21%20AM#contents. Accessed on October 1, 2017.

[5] Minister of Public Works and Public Housing., 2015. Ministerial Regulation No. 05 / PRT / M / 2015 on General Guidelines for the implementation of sustainable construction on the implementation of Public Works and Settlement infrastructure, Jakarta

[6] Government of the Republic of Indonesia, 2009. Law Number. 32 Year 2009 on Environmental Protection and Management, Jakarta

[7] Government of the Republic of Indonesia. 2006. Government Regulation No. 34/2006 on Roads, Jakarta

[8] Herawaty, H., and Wunas S, Wikantari R. 2017. The Impact of Vegetation on the Arterial Road Median to the Convenience of the Road Users in Pangkep Regency South Sulawesi. International Journal of Engineering Inventions, Volume 6, Issue 5 (May 2017) PP: 20-26.

[9] Wartoyo, BP., and Jinca, M.Y., Rahim J., 2017. An Analysis of the Noise Level at the Residential Area as the Impact of Flight Operations at the International Airport of Sultan Hasanuddin Maros in South Sulawesi Province. IJCER, Volume 07, May 2017.

[10] Green roads., 2012. Green roads. URL: http://www.greenroads.org/1/home.html. Accessed on September 26, 2017.

[11] Public Works Department. Director General of Spatial Planning. 2006. Green Open Space as the main element of Urban Spatial Planning. Jakarta

[12] Mulmi, AD., 2009. Green Road Aproachin Rural Road Construction for the Sustainable Development of Nepal. Journal of Sustainable Development, Vol. 2 No. 3 November 2009.

[13] Department of Transportation., 2005. Regulation of the Minister of Transportation Number: KM 49 Year 2005 regarding the National Transportation System, Jakarta

[14] Bhote, K.R., 1996. Beyond Customer Satisfaction to Loyalty: The Key to Greater Profitability. New York: AMA Membership Publications Division, American Management Association.

[15] Sugiyono., 2013. Statistics for Research. Bandung: Publisher CV. Alfabeta.

[16] http://digilib.mercubuana.ac.id. Accessed on February 2, 2018.

Attachment:

Table 1. The level of understanding of stakeholders

Aspects / Variables / Indicators		Value of the Understanding Index					Average
		Owner	**Consultant**	**Contractor**	**Community**	**Academia**	
I. Social Aspects							
Safe and Convenient(X1)							
Safety audit at pre-construction stage	X1.1	0.68	0.65	0.78	0.73	0.80	**0.73**
Audit at construction stage	X1.2	0.76	0.78	0.88	0.73	0.80	**0.79**
Audit at construction stage	X1.3	0.75	0.73	0.85	0.70	0.80	**0.77**
Provision of trees at construction stage to catch dust	X1.4	0.76	0.70	0.83	0.83	0.60	**0.74**
Doing water spraying on the job site to reduce dust.	X1.5	0.89	0.80	0.95	0.87	0.80	**0.86**
Put the trees to reduce the source of noise	X1.6	0.73	0.68	0.80	0.77	0.80	**0.75**
	Average X1	**0.76**	**0.72**	**0.85**	**0.77**	**0.77**	**0.77**
Society participation (X2)							
The government submits the project plan to the community	X2.1	0.79	0.73	0.78	0.83	0.80	**0.78**
The government involves the community in planning the creation	X2.2	0.79	0.75	0.80	0.87	0.90	**0.82**
The government involves the community in road planning	X2.3	0.79	0.70	0.85	0.83	0.60	**0.75**
	Average X2	**0.79**	**0.73**	**0.81**	**0.84**	**0.77**	**0.79**
II. Economic Aspects							
Efficiency (X3)							
The design of the elongated gradient is not steep	X3.1	0.76	0.76	0.90	0.63	0.90	**0.79**
Design that takes into consideration the ease of maintenance in the future	X3.2	0.76	0.76	0.90	0.77	0.80	**0.80**
Design that avoids ecological damage	X3.3	0.76	0.76	0.80	0.77	0.80	**0.78**
Enforcement of warranties	X3.4	0.81	0.81	0.88	0.73	0.90	**0.83**
Balances the volume of excavation and heap	X3.5	0.81	0.81	0.90	0.60	0.80	**0.79**
Design of pavement for long life	X3.6	0.70	0.70	0.80	0.60	0.90	**0.74**
The use of porous pavement	X3.7	0.71	0.71	0.80	0.63	0.70	**0.71**
Use of warm asphalt mixture	X3.8	0.70	0.70	0.80	0.73	0.80	**0.75**
Use of pavement that can reduce noise	X3.9	0.68	0.68	0.70	0.57	0.80	**0.68**
Use of environmentally friendly equipment	X3.10	0.75	0.75	0.90	0.77	0.80	**0.79**
	Average X3	**0.75**	**0.75**	**0.84**	**0.68**	**0.82**	**0.77**
Mobility (X4)							
Provision of pedestrian paths, cyclists, and public transport	X4.1	0.74	0.80	0.95	0.80	0.70	**0.80**
	Average X4	**0.74**	**0.80**	**0.95**	**0.80**	**0.70**	**0.80**
Accessibility (X5)							
Provision of access and viable pedestrian facilities	X5.1	0.78	0.85	0.95	0.83	0.80	**0.84**
Repair / rehabilitation of existing pedestrian paths with access to parcels, slabs and tiles with disabilities	X5.2	0.73	0.80	0.88	0.73	0.80	**0.79**
Complete pedestrian path with utility	X5.3	0.78	0.83	0.93	0.80	0.80	**0.83**
Providing cyclists access and facilities	X5.4	0.71	0.80	0.93	0.77	0.80	**0.80**
Design a special path for cyclists	X5.5	0.75	0.78	0.90	0.73	0.70	**0.77**
Design a cyclist space used with other vehicles (lane share).	X5.6	0.74	0.63	0.85	0.70	0.70	**0.72**
Complementing cyclists' signposts	X5.7	0.73	0.80	0.88	0.77	0.70	**0.77**
The availability of safe, convenient, affordable, and timely transportation modes	X5.8	0.79	0.85	0.93	0.87	0.60	**0.81**
Provide public transport stops with bus stops	X5.9	0.81	0.83	0.90	0.83	0.70	**0.81**
	Average X5	**0.76**	**0.79**	**0.90**	**0.78**	**0.73**	**0.79**
III. Environmental Aspects							
Emission (X6)							
Reduction in the use of fossil fuels outside construction work	X6.1	0.70	0.78	0.83	0.67	0.50	**0.69**
Use of renewable energy by utilizing alternative energy during construction	X6.2	0.68	0.78	0.75	0.70	0.70	**0.72**
Penggunaan energi terbarukan dengan memanfaatkan energi alternatif untuk penerangan jalan	X6.3	0.74	0.85	0.80	0.80	0.80	**0.80**
Emission reduction at the time of mixing of asphalt mixture	X6.4	0.66	0.80	0.83	0.60	0.80	**0.74**
	Average X6	**0.69**	**0.80**	**0.80**	**0.69**	**0.70**	**0.74**
Natural Resources (X7)							
Use of recycled materials	X7.2	0.64	0.80	0.78	0.70	0.80	**0.74**
Maximize the use of local materials	X7.3	0.78	0.90	0.93	0.80	0.80	**0.84**
Arrange the drainage system with open / closed channels	X7.4	0.78	0.88	0.90	0.80	0.80	**0.83**
Provision of irrigation facilities	X7.5	0.78	0.88	0.85	0.77	0.80	**0.81**
Prepare sediment traps during construction	X7.6	0.71	0.85	0.85	0.70	0.70	**0.76**
Replace a hardened median with a water-permeable layer	X7.7	0.79	0.90	0.90	0.80	0.70	**0.82**
Provide a temporary water catchment drainage pool	X7.8	0.76	0.88	0.83	0.67	0.70	**0.77**
Provides bioretention and bioswales	X7.9	0.66	0.80	0.80	0.70	0.70	**0.73**
Provide water catchment wells	X7.10	0.74	0.90	0.80	0.73	0.80	**0.79**
	Average X7	**0.74**	**0.86**	**0.85**	**0.74**	**0.76**	**0.79**
Flora and Fauna Habitat (X8)							
Replacing trees to be felled for construction	X8.1	0.76	0.90	0.85	0.77	0.80	**0.82**
Increase the number of special plants and plants typical of the region through preservation or new planting crops	X8.2	0.74	0.90	0.80	0.77	0.70	**0.78**
Avoid damage to trees and plants at work sites.	X8.3	0.78	0.70	0.80	0.77	0.80	**0.77**
Minimize potential planning and implementation of habitat loss	X8.4	0.75	0.78	0.73	0.73	0.80	**0.76**
Conducting habitat mitigation is thought to be disturbed	X8.5	0.71	0.70	0.68	0.77	0.80	**0.73**
Provide careful guard against the animals around	X8.6	0.74	0.65	0.78	0.80	0.80	**0.75**
Undertake training for construction personnel to raise awareness and environmental insight	X8.7	0.80	0.83	0.90	0.83	0.80	**0.83**
	Average X8	**0.75**	**0.78**	**0.79**	**0.78**	**0.79**	**0.78**

Source: Analysis results, 2018

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