Eduvest – Journal of Universal Studies
Volume 5 Number 2, February, 2025
p- ISSN 2775-3735- e-ISSN 2775-3727

WEIGHING OF PERFORMANCE INDICATOR COMPONENTS NATIONAL ROAD CONDITION PROGRAM IN MALUKU PROVINCE

Burhanuddin Hasri[1], Buri Hartanto Susilo[2], Hamkah[3]
Fakultas Teknik Sipil dan Perencanaan, Universitas Trisakti, Indonesia[1]
Fakultas Teknik, Universitas Kristen Maranatha Bandung, Indonesia[2]
Politeknik Negeri Ambon, Indonesia[3]
Email: burhanuddinhasri82@gmail.com, budiharsus@yahoo.com, hamkah@polnam.ac.id

ABSTRACT

The Program Performance Indicator (PPI) stipulated in the Guidelines for the Road and Bridge Sector No.07/P/BM/2021 is an indicator to measure the fulfillment of the level of road network services. The PPI consists of four components where the PPI value is the average value of the four components. The four components of the PPI are unevenness (IRI), pavement surface condition (PCI), remaining pavement life (RSL), and drainage effectiveness with the weight of each component set in the guidelines, namely IRI 60%, PCI 10%, RSL 15%, and drainage effectiveness 15%. The weight can also be adjusted to the specifics of each Center or Province. This study aims to examine the components of PPI in West Papua and West Java Provinces. The research was conducted using the Analytical Hierarchy Process (AHP) method to obtain a ranking of each PPI component. The results of the study were obtained that the weight of the PPI component based on the guidelines could be accepted and applied to the review area, except for the weight of the PCI for Maluku Province where less than 75% of respondents stated that it was appropriate. The weight of the components obtained based on the AHP analysis for the Maluku region is IRI 28%, PCI 27%, RSL 23%, and drainage effectiveness 22%. The results of the study can be considered as a reference for the preparation of component weights for other provinces in Indonesia.

KEYWORDS *performance indicators, component weights, national roads, Maluku*

How to cite: Burhanuddin Hasri, et al. (2025). Weighing of Performance Indicator Components National Road Condition Program in Maluku Province. *Journal Eduvest. 5*(2), 1590-1609
E-ISSN: 2775-3727

INTRODUCTION

Programming for road handling in Indonesia is always carried out by the PPK every year to prepare a work plan for road section managers. Road condition assessment data, traffic data, and growth, as well as other supporting data are needed to be used as a basis in determining a preservation program on national roads (Sihombing et al., 2019).

In the Strategic Plan of the Directorate General of Highways 2020-2024, it is written that the connectivity infrastructure policy in 2020-2024 must be able to solve a number of problems that are strategic issues where in general the problems are categorized into 2, namely: problems or strategic issues regarding the achievement of connectivity infrastructure performance, road safety, road accessibility, and road condition ratings, and internal problems in infrastructure management connectivity, including related to human resources, funding, provision of NSPK (Norms, Standards, Procedures, Criteria), equipment and materials, and information systems (Sowolino, 2023).

The results of the work of the Directorate General of Highways when carrying out road preservation activities are shown by the ranking of national road conditions which is measured through the level of overall condition of the road section (road pavement, road shoulders, drainage, road complementary buildings, and road equipment) in accordance with the expected life of the plan (Setiawan, 2023; Wibowo & Mabui, 2023). The availability of road conditions that are in accordance with the minimum service standards (SPM) based on Government Regulation No. 34 of 2006 concerning Roads is indicated through the IRI (International Roughness Index) value or the flatness of the road surface. Furthermore, technically, the IRI indicator as well as other indicators such as PCI (Pavement Condition Index), road structure age, and drainage conditions are used to classify road conditions with a road condition ranking method with a score of 1 for excellent or new road conditions and a score of 5 for severely damaged road conditions (Strategic Plan for Highways 2020-2024).

Based on the Road and Bridge Sector Guidelines No.07/P/BM/2021 concerning Planning and Programming of Road Network Preservation Work has been determined the weight of the four components where the weight of each component is determined based on Table 1, namely Unevenness/IRI with a weight of 60%, Pavement Surface Condition/PCI with a weight of 10%, Remaining Structural Life of Pavement (RSL) with a weight of 15% and Drainage Effectiveness with a weight of 15%. The four components will determine the value of the Program Performance Index (PPI) where the target PPI value for each Province has been set in the Strategic Plan of the Directorate General of Highways for 2022-2024 (Faisal, 2020).

Table 1. Weight of PPI Components of Road Condition Rating

Components of PPI Road Condition Rating	Weight (%)
Inequality (IRI)	60
Pavement Surface Condition (PCI)	10
Remaining Pavement Life (RSL)	15
Drainage Effectiveness (ED)	15

Source: Bina Marga (2020)

The weight of each PPI component is determined based on the priority of road handling from the Directorate General of Highways. The weight of each component can be adjusted specifically for each BPJN or Province, so further research is needed to obtain a weight that is suitable for each province in Indonesia (Kheirati & Golroo, 2022).

Sinaga (2011) stated that there are differences in indicators in the assessment of road conditions. Where Indonesia still uses IRI and SDI as indicators, in contrast to India and Nepal which use RCI and Structural Distress Index. For countries that use the same indicators, for example Indonesia, Malaysia, and the United States that use IRI, for one good road condition, the value of the IRI indicator has a difference. This shows that there are differences in perception and philosophy in each country for a certain type of road condition (Jannat & Tighe, 2015).

Guidelines for the Road and Bridge Sector No.07/P/BM/2021 article 5.5.3.5 concerning the Calculation of the National Road Condition Rating PPI states that the National Road Condition Rating PPI is the weighted average value of the four components of the Road Condition Rating PPI with the weight of each component determined (Hanandeh, 2022). The weight of each component is determined in accordance with the priority of road handling from the Directorate General of Highways. The guideline in question states that the weight of components can also be adjusted specifically in each Provincial area or the National Road Implementation Center. This weighting must be reviewed and re-established periodically taking into account the availability of data, the influence of data, and the level of confidence in the quality of the data.

Research has been conducted (Sowolino, 2023) in 2 provinces using questionnaires each to 35 respondents in the West Java Province and 40 respondents in the West Papua region. The results of the analysis using AHP obtained a different component weight from the Road and Bridge Field Guidelines. Based on the results of research in the previous two provinces, this study chose the Maluku province as one of the provinces in Eastern Indonesia (Shtayat et al., 2022).

The research aims to determine the four weights of PPI components that have never been done before, even by the National Road Implementation Center in the Maluku region. The results of the study were used to calculate the value of the Maluku Province PPI to be an evaluation material for periodic reviews of existing guidelines.

RESEARCH METHOD

Data Collection

Secondary data collected is in the form of IRI, PCI, RSL data which is approached by deflection in the form of measurement data using the Falling Weight Deflectometer method and drainage data. Primary data collection was carried out by a questionnaire method that focused on respondents' perception of the Program Performance Index (an existing component of the performance index), the determination of data trust (the level of data trust from each PPI component), and the influence of data from each PPI component (Sholevar et al., 2022).

PPI Weight Analysis

An initial analysis of the weight of the PPI components based on the Guidelines for the Road and Bridge Sector No. 07/P/BM/2021 was carried out, then it was checked for compatibility with the condition of the representative road section of the review area. From the secondary data that has been obtained, an analysis is carried out to obtain the weight of each component of the program performance index (PPI) reviewed. After the weights of each PPI component are obtained, an analysis of the program performance index is carried out to obtain the PPI value on each road section in the representative area reviewed (Ibrahim et al., 2020).

Verification was carried out using primary data in the form of a questionnaire containing the respondents' perception of the suitability of the analysis results with field conditions on each road section in the representative area reviewed. The next analysis is the determination of the weight value of the PPI components. From the collection of questionnaire data, data on respondents' responses regarding the influence of data and the level of data confidence from each component were obtained. The data was then analyzed using the Analytical Hierarchy Process (AHP) method to determine the priority of each component. From the determination of priorities, the weight value of each component that has a high level of suitability with field conditions is then determined.

Primary Data Collection Instruments

To collect primary data, an instrument in the form of a questionnaire is needed. The flow chart of the data collection instrument with the questionnaire is shown in Figure 1.

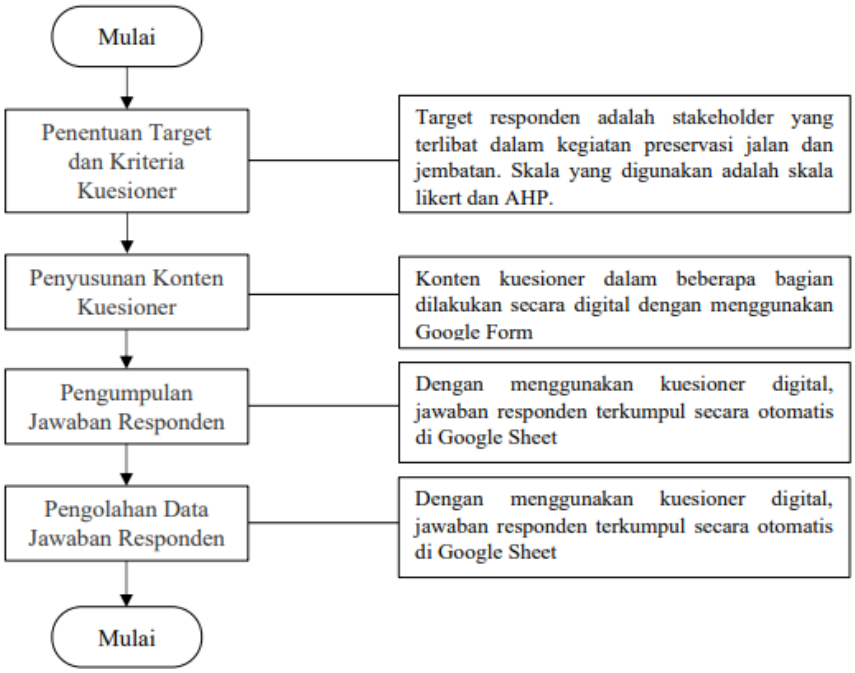

Figure 1. Flow Chart of Data Collection with Questionnaire

The targets and criteria of the questionnaire are determined based on the data to be obtained through the questionnaire. The target data to be obtained is data for the analysis of the conformity of component weights, additional components and new component weights for PPI. The questionnaire content is prepared comprehensively and is easy for respondents to understand. The questionnaire survey was conducted on regional representatives determined based on the PPI score. The target respondents are stakeholders involved in preservation activities in the review area. The data obtained is then processed and analyzed to become input data for further analysis.

Measurement Scale

The Likert Scale is used to measure respondents' opinion responses to the suitability of PPI components based on the Guidelines for the Road and Bridge Sector No.07/P/BM/2021. The Likert scale (Sugiyono, 2013) is used as many as 5 scale points shown in Table 2. The measurement scale for the AHP method consists of 9 points (Saaty, 2012).

Table 2. Scale Likert

Scale	Information
5	Strongly agree
4	Agree
3	Unable to determine
2	Disagree
1	Strongly disagree

Source: Sugiyono (2013)

Conformity of the Weight of the Program Performance Index Component

The analysis of the suitability of the weight of the PPI component is carried out by applying the weight of the initial component of the PPI in accordance with the Guidelines for the Road and Bridge Sector No. 07/P/BM/2021. The parameters analyzed include the weight of the PPI components that have been regulated in the guidelines and their suitability with the conditions of the area being reviewed. Based on the percentage of weight given, namely IRI with a weight of 60%, PCI with a weight of 10%, RSL with a weight of 15%, and Drainage Effectiveness with a weight of 15%, an analysis was carried out for each road section based on secondary data obtained from representatives of the Maluku National Road Implementation Center (BPJN) to obtain the PPI value of each section and the average PPI value of the Maluku provincial area.

The analysis method is used with a calculation approach based on the Road and Bridge Sector Guidelines No. 07/P/BM/2021 for each component of the PPI. In this analysis, the value of each PPI component that has a different unit must be converted into a single unit of value called the Component Program Performance Index with values in the scale range of 1 to 5. The Road Condition Rating PPI is calculated as the weighted average of the 4 components. The PPI road condition rating is then verified with the PPI target value based on the Strategic Plan for Highways (2020-2024) and the results of the running program of the Indonesian Road Management System-Version 3 (IRMS-V3). To ensure the suitability of the analysis with field conditions, verification was carried out using a questionnaire which was then validated with inferential statistical analysis to test the validity and reliability of the questionnaire results.

Priority with the Analytical Hierarchy Process Method

The Analytical Hierarchy Process method is used to determine the priority of each component so that the weight of each component that affects the PPI can be determined. The ranking of each component of the program performance index obtained by this method is used to determine the amount of weight of each component in accordance with the conditions of each road in the area being reviewed. The criteria and alternatives used obtained from primary and secondary data must meet the following requirements:

a. Maintaining the objectivity of the research, the criteria can be assessed with quantitative variables
b. Variable data collection and update is easy to do,
c. The criteria must represent the condition of the road section in the area being reviewed.

The criteria are determined based on the Road and Bridge Sector Guidelines No. 07/P/BM/2021, where the weight of the components in the guidelines is determined based on how much it contributes to the determination of road condition ratings and considers how far the availability and accuracy of data for these components are. The criteria and alternatives in this study are presented in Table 3.

Table 3. Criteria and Alternatives

Criterion	Alternative
Data available	Inequality (IRI)
Data is easy to obtain	Pavement surface condition (PCI)
Data is always updated	Remaining pavement life (RSL)
Describe the condition of the road work	Drainage effectiveness
Determining the type of handling	

The criteria are compiled to determine the level of data trust and the level of data influence. The level of data reliability was obtained by 3 criteria, namely the availability of component data, the ease of obtaining component data, and the freshness of component data and the level of influence of the data was obtained with 2 criteria, namely component data representing pavement conditions and component data determining the type of handling. The decomposition of the problem into a hierarchy is shown in Figure 2. The weight of the proposed components is in the form of a percentage of each component that is in accordance with the conditions of the Maluku Province area.

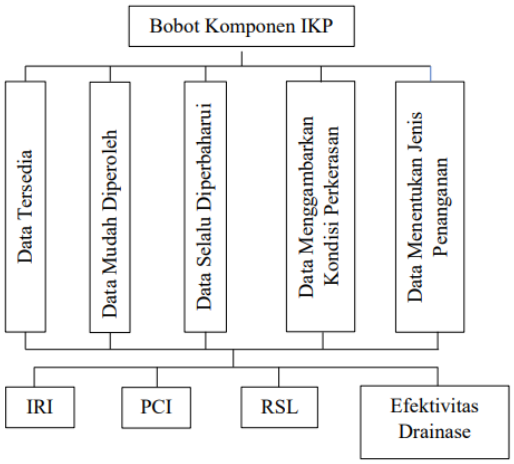

Figure 2. Decomposition of Problems into Hierarchies

RESULT AND DISCUSSION

Data Survei International Roughness Index dan Pavement Condition Index

The secondary data collected is IRI and PCI data obtained from the Ministry of PUPR. The data comes from Maluku Province, and is available on the SMD Application from 2020 to 2023. The previous year's data was collected to see the fluctuations in the change in IRI values each semester in the review area.

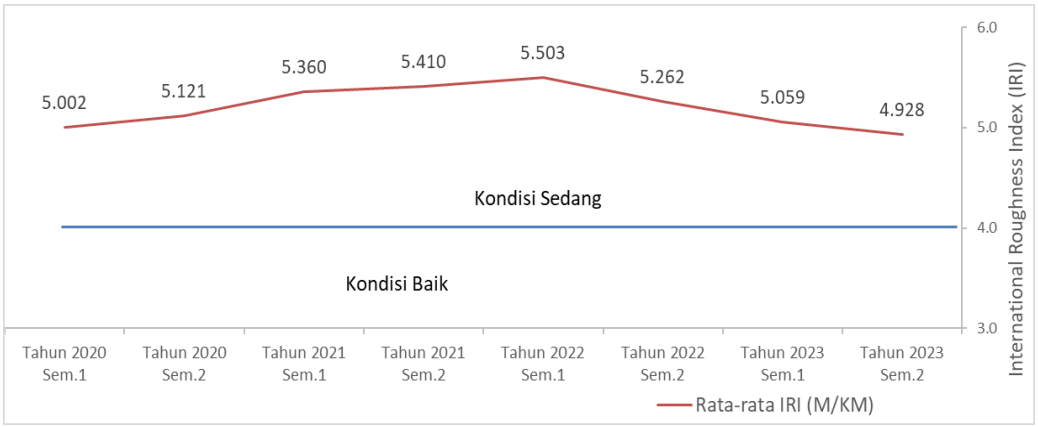

Figure 3. Recapitulation of the International Roughness Index in 2020-2023

Based on Figure 3, the range of IRI values for Maluku province is between 4 to 6, which indicates a steady road condition. In 2023 semester 2, there was an increase in the IRI value from 5,002 M/KM in 2020 semester 1 to 5,503 M/KM in 2022 semester 1 which represents a decrease in road stability, although the IRI value is still in the range of above 4 and below 8 (moderate road conditions). In 2022 semester 2 to 2023 semester 2, there was a decrease in the IRI value, with the lowest IRI value of 4,928 M/KM in 2023 semester 2, representing an increase in road flatness and showing moderate conditions, so it can be concluded that road conditions in Maluku Province are still in stable condition.

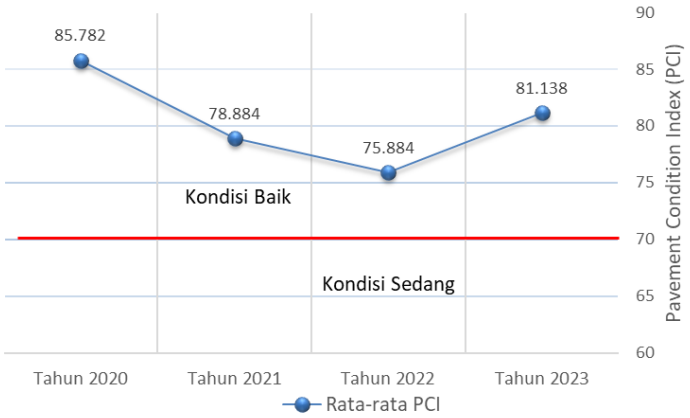

Figure 4. Recapitulation of the Pavement Condition Index in 2020-2023

Based on Figure 4, the annual average national road PCI in Maluku Province is in good condition above the value of 70. The decline in the PCI value from 85,782 in 2020 to 75,884 in 2022 is close to moderate conditions, but the increase occurred in 2023 to 81,138 indicating improved conditions. The decline in the PCI value indicates that the condition of road pavements in 2022 in Maluku Province had experienced a decline (degradation), but improved again in 2023.

Analysis of Program Performance Index Based on Secondary Data

Identification of national road sections in the review area, given a numbering for each road section as shown in Table 4. There are a total of 89 national roads in Maluku Province analyzed in this study.

Table 4. Numbering of National Road Sections in Maluku Province

Number	Street Names	Number	Street Names
1	Amahai – Mashi	45	Jln. Jend. Sudirman (Langgur)
2	Masohi – Makariki	46	Tual - Ngadi – Tamedan
3	Macquarie - Sp. Fletcher	47	Ilwaki – Forbidden
4	Sp. Waipia – Saleman	48	Dobo - Pertamina Pier
5	Saleman – Besi	49	Larat - East Lamdesar
6	Iron – O	50	Adaut – Kandar
7	Marie – Pasahari	51	Lingkar P. Marsela
8	Pashahari – The Poet	52	Tiakur – Weet
9	Kavisanta – Bangoi	53	Laitutun – Tutukei
10	Banggoi - Life	54	The Great - Nuwewang
11	Sp. 3 Kotania – Road	55	Port - Wonreli - Lapter
12	Lisabata – Saleman	56	Port – Manoha
13	Sp. Pelita Jaya – Taniwel	57	Jln. Pelabuhan (Ambon)
14	SP. AT – Piru	58	Jln. Yos Sudarso (Ambon)
15	Sp. Waipirit - Sp. Eti	59	Jln. Pala (Ambon)
16	Sp. Waipirit – Waiselan	60	Jln. Pantai Mardika (Ambon)
17	Waiselan – Latu	61	Jln. Pantai Batu Merah (Ambon)
18	Latu – Liang	62	Jln. Sultan Hasanuddin (Ambon)
19	Yings - Sp. Waipia	63	Jln. Jend. Sudirman (Ambon)
20	Amahai – Tamilouw	64	Jln. Rijali (Ambon)
21	Tamilow - Haya	65	Jln. A. Yani (Ambon)
22	Haya – Tehoru	66	Jln. Diponegoro (Ambon)
23	Tehoru – Laima	67	Jln. Am. Sangaji (Ambon)
24	Lyme – Werinama	68	Jln. Kapten P. Tendean (Ambon)
25	Crocodile Water - Teluk Bara	69	Jln. Walter Monginsidi (Ambon)
26	Samalagi - Crocodile Water	70	Jln. Laksd. Leo Wattimena
27	Hanging Namliya – Samalagi	71	(Ambon)
28	Jln. Pier (Namlea)	72	Jln. J. Syaranamual (Ambon)
29	Sp. Namlea – Marloso	73	Jln. M. Putuhena (Ambon)
30	Marloso - Mako	74	Passo – Tulehu
31	Mako – Madanmohe	75	Tu tuuu -Ul
32	Madanmohe – Namrole	76	Piru - Sp. 3 Kotania
33	Arma - Siwahan (P. Yamdena)	77	Mop Access. Asdp Waipirite
34	Aruidas – Weapon	78	Mop Access. Asdp Namlea
35	Sp. Ilngei – Arud	79	Popjetur - Rock Rock
36	Prof. Boediono (Saumlaki)	80	Tepa - Masbuar – Letwurung
37	Jln. Ir. Soekarno (Saumlaki)	81	Sp. Wearlilir - Ibra Airport
38	Jln. Mgr. Albertus	82	Jl. Leimena (Jem Access. Red
	Soegiyapranata (Saumlaki)	83	and White)

39	Jln. Dr. Latumeten (Saumlaki)	84	JLN. Gend. A. Yani (disambiguation)
40	Jln. Yos Sudarso (Saumlaki)	85	Langgur - Sp. Wearlilir
41	Jln. Mathilda Batlayeri (Slki)	86	Sp. 3 Kotania - Sp. Pelita Jaya
42	Jln. Pelabuhan (Tual City)	87	Masiwang - Air Nanang (With Pel.Pen)
43	Jln. Pattimura (Tual City)	88	Life – Mamasiwang
44	Jln. Trikora (Tual Langgur)	89	Danwel - Lisabata
			Siwahan-Larat (P. Yamdena–P. Larat)
			Ibra - Danar Airport

Validation was carried out for road sections based on IRI semester 2 data and PCI data from the 2023 survey. The validation results were carried out to match the length of the road section based on IRI road section data and PCI road section data. The validation results shown in Table 5 show that there is no difference in segment length based on IRI data and PCI data. There are 2 segments where the IRI data is longer (Samalagi - Air Buaya, double sta. 3+000 to 5+600) PCI is not available, namely the Furwata-Wamena and Aroba-Furwata sections. The difference in the length of this section will affect the calculation value of the Program Performance Index.

Table 5. Non-Conformity of International Roughness Index and Pavement Condition Index

IRI Section	PCI Segments	Validation of Segments	IRI Length (Km)	PCI Length (km)	Validation Long
Amahai – Mashi	Amahai – Mashi	Same	7.08	7.08	Same
Masohi – Makariki	Masohi – Makariki	Same	6.11	6.11	Same
Macquarie - Sp. Fletcher	Macquarie - Sp. Fletcher	Same	21.68	21.68	Same
Sp. Waipia – Saleman	Sp. Waipia – Saleman	Same	47.54	47.54	Same
Saleman – Besi	Saleman – Besi	Same	50.75	50.75	Same
Iron – O	Iron – O	Same	52.99	52.99	Same
Marie – Pasahari	Marie – Pasahari	Same	21.97	21.97	Same
Pashahari – The Poet	Pashahari – The Poet	Same	43.88	43.88	Same
Kavisanta – Bangoi	Kavisanta – Bangoi	Same	47.09	47.09	Same
Banggoi - Life	Banggoi - Life	Same	47.88	47.88	Same
Sp. 3 Kotania – Road	Sp. 3 Kotania – Road	Same	34.509	34.509	Same
Lisabata – Saleman	Lisabata – Saleman	Same	50.79	50.79	Same
Sp. Pelita Jaya – Taniwel	Sp. Pelita Jaya – Taniwel	Same	56.88	56.88	Same
SP. AT – Piru	SP. AT – Piru	Same	5.29	5.29	Same
Sp. Waipirit - Sp. Eti	Sp. Waipirit - Sp. Eti	Same	35.41	35.41	Same
Sp. Waipirit – Waiselan	Sp. Waipirit – Waiselan	Same	7.37	7.37	Same
Waiselan – Latu	Waiselan – Latu	Same	42.71	42.71	Same
Latu – Liang	Latu – Liang	Same	41.05	41.05	Same
Yings - Sp. Waipia	Yings - Sp. Waipia	Same	24.72	24.72	Same
Amahai – Tamilouw	Amahai – Tamilouw	Same	35.23	35.23	Same

Tamilow - Haya	Tamilow - Haya	Same	41.11	41.11	Same
Haya – Tehoru	Haya – Tehoru	Same	11.63	11.63	Same
Tehoru – Laima	Tehoru – Laima	Same	46.03	46.03	Same
Lyme – Werinama	Lyme – Werinama	Same	34.991	34.991	Same
Crocodile Water - Teluk	Crocodile Water - Teluk	Same	28.69	28.69	Same
Bara	Bara	Same	50.35	47.55	Same
Samalagi - Crocodile Water	Samalagi - Crocodile Water	Same	48.3	48.3	Same
Hanging Namliya –	Hanging Namliya – Samalagi	Same	1.1	1.1	Same
Samalagi	Jln. Pier (Namlea)	Same	18.2	18.2	Same
Jln. Pier (Namlea)	Sp. Namlea – Marloso	Same	19.86	19.86	Same
Sp. Namlea – Marloso	Marloso - Mako	Same	43.5	43.5	Same
Marloso - Mako	Mako – Madanmohe	Same	45.91	45.91	Same
Mako – Madanmohe	Madanmohe – Namrole	Same	44.18	44.18	Same
Madanmohe – Namrole	Arma - Siwahan (P.	Same	51.02	51.0	Same
Arma - Siwahan (P.	Yamdena)	Same	45.4	45.4	Same
Yamdena)	Aruidas – Weapon	Same	7.1	7.1	Same
Aruidas – Weapon	Sp. Ilngei – Arud	Same	4.16	4.16	Same
Sp. Ilngei – Arud	Prof. Boediono (Saumlaki)	Same	0.73	0.73	Same
Prof. Boediono (Saumlaki)	Jln. Ir. Soekarno (Saumlaki)	Same	0.6	0.6	Same
Jln. Ir. Soekarno (Saumlaki)	Jln. M.A. Soegiyapranata	Same	0.55	0.55	Same
Jln. M.A. Soegiyapranata	(Saumlaki)	Same	0.26	0.26	Same
(Saumlaki)	Jln. Dr. Latumeten	Same	0.19	0.19	Same
Jln. Dr. Latumeten	(Saumlaki)	Same	0.71	0.71	Same
(Saumlaki)	Jln. Yos Sudarso (Saumlaki)	Same	0.5	0.5	Same
Jln. Yos Sudarso (Saumlaki)	Jln. Mathilda Batlayeri (Slki)	Same	2.57	2.57	Same
Jln. Mathilda Batlayeri (Slki)	Jln. Pelabuhan (Tual City)	Same	17.77	17.77	Same
Jln. Pelabuhan (Tual City)	Jln. Pattimura (Tual City)	Same	44.544	44.544	Same
Jln. Pattimura (Tual City)	Jln. Trikora (Tual Langgur)	Same	12.91	12.91	Same
Jln. Trikora (Tual Langgur)	Jln. Jend. Sudirman	Same	50.71	50.71	Same
Jln. Jend. Sudirman	(Langgur)	Same	20.3	20.3	Same
(Langgur)	Tual - Ngadi – Tamedan	Same	34.53	34.53	Same
Tual - Ngadi – Tamedan	Ilwaki – Forbidden	Same	27.4	27.4	Same
Ilwaki – Forbidden	Dobo - Pertamina Pier	Same	8.0	8.0	Same
Dobo - Pertamina Pier	Larat - East Lamdesar	Same	7.088	7.088	Same
Larat - East Lamdesar	Adaut – Kandar	Same	11.46	11.46	Same
Adaut – Kandar	Lingkar P. Marsela	Same	7.76	7.76	Same
Lingkar P. Marsela	Tiakur – Weet	Same	0.23	0.23	Same
Tiakur – Weet	Laitutun – Tutukei	Same	0.473	0.473	Same
Laitutun – Tutukei	The Great - Nuwewang	Same	0.05	0.05	Same
The Great - Nuwewang	Port - Wonreli - Lapter	Same	0.84	0.84	Same
Port - Wonreli - Lapter	Port – Manoha	Same	0.47	0.47	Same
Port – Manoha	Jln. Pelabuhan (Ambon)	Same	2.34	2.34	Same
Jln. Pelabuhan (Ambon)	Jln. Yos Sudarso (Ambon)	Same	2.82	2.82	Same
Jln. Yos Sudarso (Ambon)	Jln. Pala (Ambon)	Same	1.32	1.32	Same
Jln. Pala (Ambon)	Jln. Pantai Mardika (Ambon)	Same	0.54	0.54	Same
Jln. Pantai Mardika (Ambon)	Jln. Pantai Batu Merah	Same	0.62	0.62	Same
Jln. Pantai Batu Merah	(Ambon)	Same	0.28	0.28	Same
(Ambon)	Jln. Sultan Hasanuddin	Same	3.42	3.42	Same
Jln. Sultan Hasanuddin	(Ambon)	Same	4.41	4.41	Same
(Ambon)	Jln. Jend. Sudirman (Ambon)	Same	5.74	5.74	Same

Jln. Jend. Sudirman (Ambon)	Jln. Rijali (Ambon)	Same	3.69	3.69	Same
Jln. Rijali (Ambon)	Jln. A. Yani (Ambon)	Same	13.9	13.9	Same
Jln. A. Yani (Ambon)	Jln. Diponegoro (Ambon)	Same	13.14	13.14	Same
Jln. Diponegoro (Ambon)	Jln. Am. Sangaji (Ambon)	Same	12.27	12.27	Same
Jln. Am. Sangaji (Ambon)	Jln. Kapten P. Tendean	Same	8.3	8.3	Same
Jln. Kapten P. Tendean	(Ambon)	Same	0.62	0.62	Same
(Ambon)	Jln. Walter Monginsidi	Same	0.21	0.21	Same
Jln. Walter Monginsidi	(Ambon)	Same	11.2	11.2	Same
(Ambon)	Jln. Laksd. Leo Wattimena	Same	62.84	62.84	Same
Jln. Laksd. Leo Wattimena	(Ambon)	Same	14.37	14.37	Same
(Ambon)	Jln. J. Syaranamual (Ambon)	Same	2.48	2.48	Same
	Sum		1,842.833	1,842.833	

Several roads in Maluku Province are in poor condition with IRI values but have good PCI values where IRI and PCI are not correlated. From Figure 5, information is obtained that most of the roads in Maluku province have an IRI value greater than 4 which indicates that the road sections are in a condition between moderate to damaged.

From Figure 6, information is obtained that the PCI value for each road section in Maluku is above 70 which indicates that the road sections are in good condition.

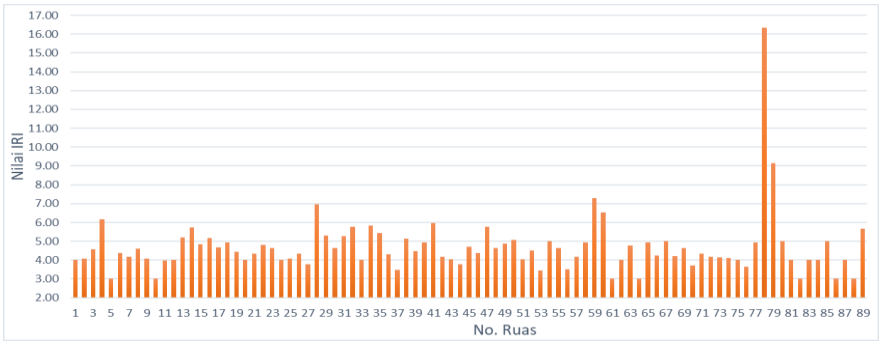

Figure 5. International Roughness Index Value of National Roads in Maluku Province

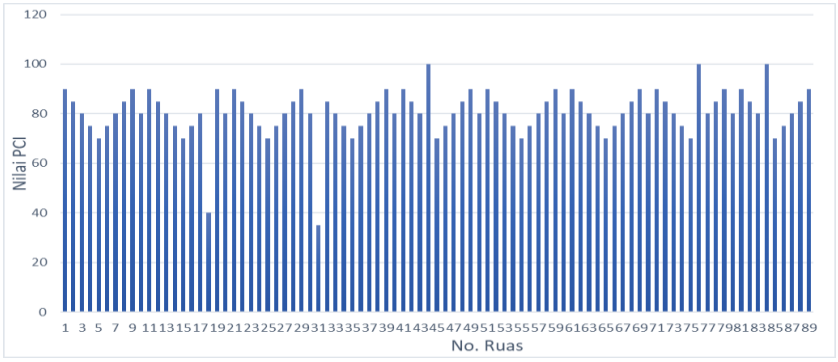

Figure 6. Pavement Condition Index Value of National Roads in Maluku Province

Maluku Province Program Performance Index Based on Secondary Data

By recapitulating the results of secondary data analysis, the Program Performance Index value was obtained with the weighting of each component based on the Road and Bridge Sector Guidelines No.07/P/BM/2021. Table 6 presents the PPI and component PPI values in the Maluku province area.

Table 6. Maluku Province Regional Program Performance Index

Data Seconds	Value
Number of Sections	89
Length of IRI section	1850.224
PCI segment length	1845.042
IRI Value	4,97
PCI Values	88,343
RSL (IRI Approach) Value	8,518
PPI IRI	3
PPI PCI	1
PPI RSL (IRI Approach)	3
Drainage Effectiveness PPI (PCI Approach)	1
PPI Maluku Province	2,5

The PPI target for Maluku province in 2022 is 2.56. From the results of the analysis based on secondary data displayed in Table 6, the PPI value of Maluku province is close to the target PPI value based on the 2020-2024 Strategic Plan for Highways, where the PPI value obtained is 2.5 with a difference of 0.06 from the target PPI value.

Conformity of the Weight of the Program Performance Index Component

The initial analysis carried out was an analysis of the suitability of the weights of the PPI components based on questionnaire data. Table 7 presents the percentage of respondents' perception of the suitability of the weight of the PPI component based on the Guidelines for the Field of Roads and Bridges No. 07/P/BM/2021 in the review area, namely Maluku Province.

Table 7. Conformity of Component Weights of Maluku Province

Question	Frequency					Percentage (%)				
	SS	S	TM	TS	STS	SS	S	TM	TS	STS
The weight of the International Roughness Index (IRI) is 60% of the PPI according to and can describe the damage and determine the type of handling.	5	29	6	0	0	12,5	72,5	15	0	0
The weight of the Pavement Condition Index (PCI), which is 10% of the PPI, is appropriate and can describe	3	29	5	3	0	7,5	72,5	12,5	7,5	0

the damage and determine the type of handling.										
Weight of Remaining Pavement Life (RSL) which is 15% from the PPI is appropriate and can describe the damage and determine the type of handling.	3	33	3	1	0	7,5	82,5	7,5	2,5	0
The weight of Drainage (Drainage Effectiveness) which is 15% of the PPI is appropriate and can describe the damage and determine the type of handling.	6	27	3	4	0	15	67,5	7,5	10	0

The results of the analysis for the suitability of the weights of each component in the Maluku region are shown in Table 7, where the perception of respondents is that more than 75% of respondents agree and strongly agree with the weights of each component that have been regulated in the Guidelines for the Road and Bridge Sector No. 07/P/BM/2021. Based on the results obtained, it can be concluded that the weight of each component, namely IRI 60%, PCI 10%, RSL 15%, and Drainage Effectiveness 15% based on respondents' perceptions, is appropriate for the Maluku region.

Analysis of the Weight of Program Performance Index Components

After the questionnaire data was collected and processed, the weight analysis of the Performance Index component was carried out using *the analytical hierarchy process* method using the Expert Choice program on 43 respondents. The purpose of the analysis to obtain the ranking of PPI components from 5 criteria consists of: Data availability, ease of obtaining data, data freshness, data describing road pavement conditions, and data determining the type of handling. Alternatives in the analysis consist of: International roughness index (IRI), pavement condition index (PCI), remaining structural life of pavement (RSL), and drainage effectiveness (ED).

Criteria ranking

The ranking of 5 criteria, namely data availability, ease of obtaining data, data freshness, data describing the condition of road pavement, and data determining the type of handling, is shown in Figure 10. The results of the analysis were ranked on 5 factors, namely consecutively, data determining the type of handling, data describing pavement conditions, data freshness, data availability, and ease of obtaining data with an inconsistency value of 0.676%.

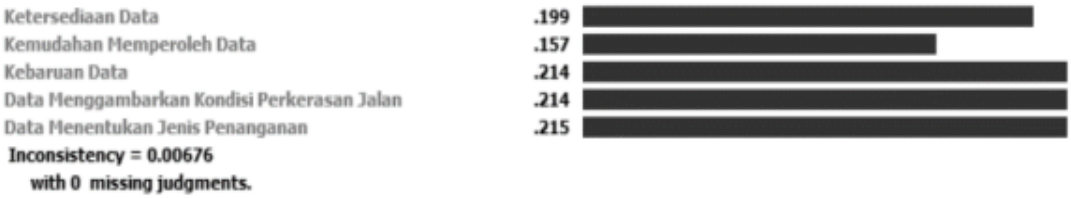

Figure 10. Criteria Ranking for Maluku Province

Data availability factors

Based on the data availability factor, analysis was carried out for 4 alternatives, namely IRI, PCI, RSL, and ED. The analysis was carried out on the review area presented in Table 8.

Table 8. Ranking of PPI Components Based on Data Availability Factors

Alternative	Components of the Program Performance Index
IRI, International Roughness Index	0,250
PCI, Pavement Condition Index	0,269
RSL, Remaining Structual Life	0,237
ED, Drainage Effectiveness	0,244

The results of the analysis show that the ranking of components based on data availability factors for Maluku according to Figure 11, respectively, is PCI, IRI, ED, and RSL. The component rankings were PCI (0.269), IRI (0.250), ED (0.244), and RSL (0.237) with an inconsistency value of 0.228%.

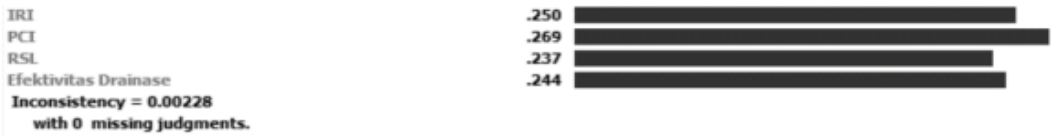

Figure 11. Component Ranking Based on Data Availability Factor

Ease of data acquisition factor

Based on the factor of ease of obtaining data, an analysis was carried out for 4 alternatives, namely IRI, PCI, RSL, and ED. The analysis was carried out in the review area presented in Table 9.

Table 9. Ranking Based on Ease of Data Acquisition Factor

Alternative	Components of the Program Performance Index
IRI, International Roughness Index	0,250
PCI, Pavement Condition Index	0,269
RSL, Remaining Structual Life	0,237
ED, Drainage Effectiveness	0,244

The results of the analysis show that the ranking of components based on the ease of obtaining data for Maluku according to Figure 12, respectively, is PCI, IRI, ED, and RSL. The component rankings were PCI (0.269), IRI (0.250), ED (0.244), and RSL (0.237) with an inconsistency value of 0.228%.

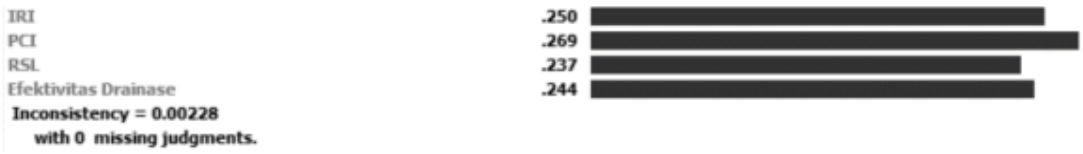

Figure 12. Component Ranking Based on Ease of Data Acquisition Factor

Data freshness factor

Based on the factor of ease of obtaining data, analysis was carried out for 4 alternatives, namely IRI, PCI, RSL, and ED. The analysis was carried out in the review area presented in Table 10.

Table 10. Ranking of PPI Components Based on Data Freshness Factor

Alternative	Components of the Program Performance Index
IRI, International Roughness Index	0,250
PCI, Pavement Condition Index	0,269
RSL, Remaining Structual Life	0,237
ED, Drainage Effectiveness	0,244

The results of the analysis show that the ranking of components based on the ease of obtaining data for Maluku according to Figure 13, respectively, is PCI, IRI, ED, and RSL. The component rankings were PCI (0.269), IRI (0.250), ED (0.244), and RSL (0.237) with an inconsistency value of 0.228%.

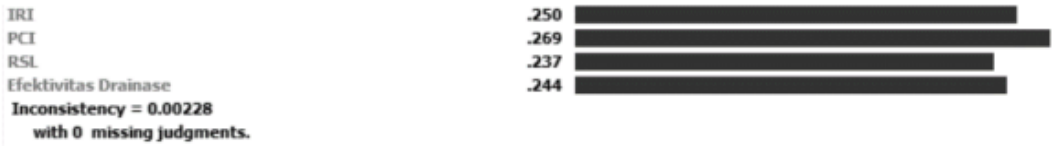

Figure 13 Component Ranking Based on Data Freshness Factor

Data factors describe the condition of road pavement

Based on the factor of ease of obtaining data, an analysis was carried out for 4 alternatives, namely IRI, PCI, RSL, and ED. The analysis was carried out in the review area presented in Table 11.

Table 11. Ranking Based on Data Factors Describing Road Pavement Conditions

Alternative	Components of the Program Performance Index

IRI, International Roughness Index	0,250
PCI, Pavement Condition Index	0,269
RSL, Remaining Structual Life	0,237
ED, Drainage Effectiveness	0,244

The results of the analysis show that the ranking of components based on the ease of obtaining data for Maluku according to Figure 14, respectively, is PCI, IRI, ED, and RSL. The component rankings were PCI (0.269), IRI (0.250), ED (0.244), and RSL (0.237) with an inconsistency value of 0.228%.

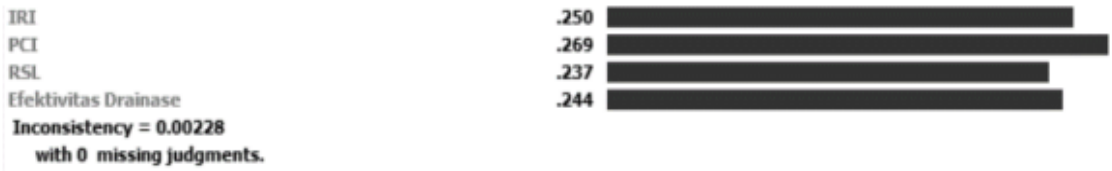

Figure 14. Component Ranking Based on Data Factors Describing Road Pavement Conditions

Data factors determine the type of handling

Based on the factor of ease of obtaining data, an analysis was carried out for 4 alternatives, namely IRI, PCI, RSL, and ED. The analysis was carried out in the review area presented in Table 12.

Table 12. Ranking Based on Data Factors Determining the Type of Handling

Alternative	Components of the Program Performance Index
IRI, International Roughness Index	0,250
PCI, Pavement Condition Index	0,269
RSL, Remaining Structual Life	0,237
ED, Drainage Effectiveness	0,244

The results of the analysis show that the ranking of components based on the ease of obtaining data for the Maluku province according to Figure 15, respectively, is PCI, IRI, ED, and RSL. The component rankings were PCI (0.269), IRI (0.250), ED (0.244), and RSL (0.237) with an inconsistency value of 0.228%.

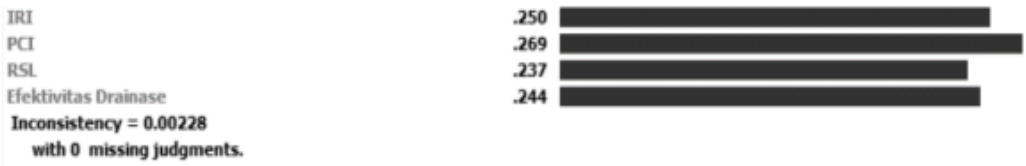

Figure 15. Component Ranking Based on Data Factors Determines the Type of Handling

Ranking of program performance index components

The weight of the PPI component was obtained from the ranking results of 4 alternatives, namely IRI, PCI, RSL, and ED with a combination of each criterion. The results of the analysis are shown in Table 13.

Table 13. Ranking of Maluku Province Program Performance Index Components

Alternative	Ranking Value	Percentage
IRI, International Roughness Index	0,285	28,5
PCI, Pavement Condition Index	0,267	26,7
RSL, Remaining Structual Life	0,227	22,7
ED, Drainage Effectiveness	0,222	22,2

The results of the analysis obtained that the component rankings for Maluku Province were IRI (0.285), PCI (0.267), RSL (0.227), and drainage effectiveness (0.222). The ranking of 4 components for the province of Maluku, where IRI is ranked first and drainage effectiveness is ranked 4th. When compared to the regulations in the Road and Bridge Sector, IRI has the largest component weight of 60%, while PCI has the smallest component weight of 10%.

Comparison of Analysis Results with Guidelines for the Road and Bridge Sector No.07/P/BM/2021

The results of the analysis of the weight of the PPI components are then compared with the weight of the components based on the Guidelines for the Road and Bridge Sector No. 07/P/BM/2021. Rounding was carried out for the weight value of the PPI component as a result of the analysis shown in Table 14.

Table 14. Comparison of Component Weights of Analysis Results and Guidelines No.07/P/BM/2021

Component	IRI (%)	PCI (%)	RSL (%)	ED (%)
Guidelines	60	10	15	15
Maluku Province	28	27	23	22

The results of the comparison were obtained that there was a significant difference between the weight of the components analyzed and the weight of the components based on the Guidelines for the Road and Bridge Sector No. 07/P/BM/2021. The biggest difference occurred in the IRI component, where the component weight value had a difference of 32% for Maluku province. The difference in the PCI component for Maluku province is 17%, furthermore, the difference in the RSL component is 8% for Maluku province. Finally, the difference in the drainage effectiveness component is 7% for Maluku Province.

CONCLUSION

The value of the Program Performance Index obtained from secondary data analysis for Maluku province is almost the same as the target value of the Program Performance Index, with a very small difference. The PPI value for Maluku Province based on secondary data analysis is 2.5, while the target PPI value based on the 2020-2024 Strategic Plan for Highways is 2.56, so the difference is only 0.06. Respondents' perception of the appropriateness of the weight of the Program Performance Index components (IRI, PCI, RSL, Drainage Effectiveness) is as follows: for Maluku Province, the percentage of respondents who stated that they agreed and strongly agreed for each component, namely IRI 77.2%, PCI 62.9%, RSL 77.1%, 77.2%. The weight of PCI for West Java Province based on the perception of respondents is less than 70% of respondents stated that they agree and strongly agree.

The results of the analysis for the weights of the PPI components were obtained that the weights for each component for Maluku province were consecutive, namely: IRI 28%, PCI 27%, RSL 23%, and drainage effectiveness 22%. Comparison of component weights based on the results of the analysis and Guideline No. 07/P/BM/2021 for Maluku provinces consecutively, namely: IRI 32%, PCI 17%, RSL 8%, and drainage effectiveness 7%.

The results of the analysis obtained for the weight of the component of the program performance index which has a difference in the percentage of values with the weight of the components set out in guideline No.07/P/BM/2021 can be considered for the preparation and renewal of the next guidelines as well as as consideration in decision-making. Further analysis can be carried out in other provinces in Indonesia to obtain the appropriate Program Performance Index value for each province in Indonesia. Additional components also need to be adjusted to the conditions of each province in Indonesia.

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