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Roadside Environmental Evaluation System for Road Network Planning

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----------***ABSTRACT***----------
Air pollution and noise pollution from vehicles is a factor included in the assessment of the environmental impact of road. In order to carry out this assessment it is necessary to have a method to know the environmental condition of the road. In the relation to the roadside environmental problems, the planner should be know the environmental condition of each road section or road side, such as which roadside have bad environmental condition. This is very useful for planning and improving purpose. This paper describes the method of evaluating the environmental condition of road through the comparison of each roadside. To support this evaluating works, the preference analysis method were developed is used to find the designated output. Through this evaluation method, the ranking of roadside in relation to the environmental condition is proposed. The ranking is presented from the roadside with bad environmental condition this micro level presentation is then practicable and enormously useful for further inspire in roadside environmental evaluation.
KEYWORDS - *Roadside, environmental, Air pollution, Preference analysis method, Ranking of roadside.*

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I. INTRODUCTION

Consideration to environment must be made as an important factor in planning of urban road network in present days. The environment and particularly the effects of man's activity on it have recently become a major focus of attention and conflict. Transportation sources make up a large percentage of environmental pollution generated by human activities in the urban areas. The influence of a rapid increase in traffic volume, a change into large sized motor vehicles and inharmony between the road and land use along the roadside, environmental problems arising from road traffic have become a matter of social concern[1].

The criteria on which environmental impact can be related to peoples's annoyance such as noise and air pollution from road traffic are considered[2]. Noise and air pollution from vehicles is a factor included in the assessment of the environmental impact of road traffic[3]. Environmental impact analysis, however, is still of major concern to the transportation planner. Consequently, in the preparation of any plan it is necessary to examine the noise and air pollution in relation to the environmental condition of road[4].

For this study, a system in order to carry out this assessment it is necessary to have a method of evaluating the environmental condition of road for various roadway configuration and traffic flows. This research is to evaluate the environmental condition of road through the comparison of roadside pair for the priority ranking of urban roads.

II. FORMULATION OF THE PROBLEM

2.1. Preference analysis method approaches.

This method is used for the identification of attribute utility functions and to the priority rating of urban roads. In relation to the roadside environmental problems, the evaluation characteristic of roadside environment system as an attributes in this model[5].

To identify the utility function of that each attributes, comparison of alternatives is required. Through the comparisons of alternatives, the orders of examined attributes and the preferences of decision maker are gathered. With respect to the roadside environment, the comparison of roadside pairs and the alternatives is required. The alternatives are selected such as which roadside have bad environmental condition and the other hand which roadside have not bad environmental condition. To select one of that alternatives are based on the evaluation characteristic value and decision making.

After the preferences of decision maker are recorded, this data are analized and the derivation of the utility function is formulated as a linear programming problem[6]. As for this research our purpose is to find the values of the characteristic of the each roadsides, and based on these values, the priority ranking condition of each roadsides are provided. To find those values, the comparison of roadside pair are required and by means of the preference analysis method, the values of the characteristic of each roadside are found.

2.2. Identification of utility function.

To identify the utility function, evaluation structure of the decision maker are supposed by the attributes. To evaluate the environmental condition of each roadsides, preference analysis method of identification of attributes utility function is used. From the analysis of preference record, the type of utility function are evaluated may be expressed such as the following :

1. In the case of attributes are continuous variate (traffic volume, noise value etc.), the parameter of utility function are provided.
2. In the case of attributes are rank or category (number of lane, zoning code, road structure code etc.), the utility value of each rank or category are provided.
3. The weight coefficient of each attributes.

2.3. The decision model.

In order to proceed with the decision making analysis, then, we require a numerical assessment by the decision maker of his preferences among there outcomes. To consider about the utility value of the substitution idea, superior or unsuperior decision is expressed by decision maker. To decide the alternative condition of the substitution idea, the decision are based on the value of each attributes. Number of the attributes are examined depend on the preference of the decision maker.

Let us assume that comparison between substitution idea *p* and substitution idea *r***,** and would prefer substitution idea *p* is selected. The preference relation of those condition is expressed such in following.

$$\sum_{i\in I} W_i \left\{ U_i \left(X_{pi} \right) - U_i \left(X_{ri} \right) \right\} - \sum_{j\notin I} W_j \geq 0 \qquad (1)$$

Where,

X_{pi} = value of attribute *i* of substitution idea *p*

U_i = utility function of attribute *i*

W_i = weight coefficient for attribute *i*

W_j = weight coefficient for attribute *j*

I = set of attribute on the accasion of comparing

Furthermore, one times only the preference attribute decision are made for selecting one of the pair of the substitution idea, in the example above would prefer to select the substitution idea *p* than the substitution idea *r*. for the next attribute, need or not to investigate, the preference decision is depend on the decision maker. In the case of substitution idea *p* is could not decided, the formula is expressed in the following.

$$\sum_{i\in I} W_i \left\{ U_i \left(X_{pi} \right) - U_i \left(X_{ri} \right) \right\} - \sum_{j\notin I} W_j \leq 0 \qquad (2)$$

2.4. Estimation of weight coefficient.

By the comparison pairs, the large number of preference relation should be obtained. The value of weight coefficient is depend on the ranking of the evaluation standards of decision maker. Evaluation standards are the preference attributes is selected by decision maker in relation to decide the alternatives of the substitution idea. The problem in relation to obtain the weight coefficient can be proposed such as linear programming problem, and the problem is formulated as follows[7].

$$\min Z = \sum_{m} n_m y_m \qquad (3)$$

$$\sum_{i\in I_m} W_i U_i^m - \sum_{j\notin I_m} W_j + y_m \geq 0 \quad \left(m \in P_p \right) \qquad (4)$$

$$\sum_{i \in I_m} W_i U_i^m - \sum_{j \notin I_m} W_j - y_m \le 0 \qquad (m \in R_p) \qquad (5)$$

$$\sum_{i \in N} W_i = 1 \qquad (6)$$

$$y_m \,,\; W_i \ge 0 \qquad (7)$$

Where,

n_m = number of comparison belonging to decision pattern *m*

y_m = different in the decision pattern *m*

U_i^m = utility function of attribute *i* on decision pattern *m*

P_p = set of decision pattern of substitution idea was decided

R_p = set of decision pattern of substitution idea was not decided

N = set of all attributes

Formula (3) indicates that the objective function is to minimize the preference relation of substitution idea and the utility function. Formula (4) and (5) represents the preferences relation of each decision pattern. For the decision belonging to the same pattern, coefficient for the attributes are investigated, can be expressed such as formula (8).

$$U_i^m = \frac{1}{n_m} \sum_{k \in K_m} \left\{ U_i\left(X_{pi}^k\right) - U_i\left(X_{ri}^k\right) \right\} \qquad (8)$$

Where,

U_i^m = utility function of attribute *i* on decision pattern *m*

K_m = set of comparison belonging to decision pattern *m*

X_{pi}^k = value of attribute *i* of the preference substitution idea *p* on comparison *k*

2.5. Identification process.

To identify the attributes utility function, basically as same to evaluate the weight coefficient. The attributes are classified into 3 kind such as :

1. Attributes value are devided into rank.
2. Attributes value are classified by category.
3. Attributes value are expressed as continuous variate.

2.5.1. Attributes value are devided into rank

The attribute h is devided into L_h items of rank. Utility value of rank 1 is 1, utility value of rank L_h is 0, and the rank is higher than rank L_h , the utility value of that rank should be bigger than 0. the decision model is same with the model to evaluate the weight coefficient. Identification problem to identify the utility function of attribute is presented as follows.

$$\min Z = \sum_k y_k \qquad (9)$$

$$W_h \left\{ U_h\left(X_{ph}^k\right) - U_h\left(X_{rh}^k\right) \right\} + y_k \ge -\sum_{i \ne h} W_i \left\{ U_i\left(X_{pi}^k\right) - U_i\left(X_{ri}^k\right) \right\} + \sum_{j \notin I_k} W_j \qquad (k \in p) \quad (10)$$

$$W_h \left\{ U_h\left(X_{ph}^k\right) - U_h\left(X_{rh}^k\right) \right\} - y_k \le -\sum_{i \ne h} W_i \left\{ U_i\left(X_{pi}^k\right) - U_i\left(X_{ri}^k\right) \right\} + \sum_{j \notin I_k} W_j \qquad (k \in R) \quad (11)$$

$$U_h(1) = 1 \qquad (12)$$

$$U_h(r) - U_h(r+1) \ge 0 \qquad (r = 1, \ldots\ldots, L_h - 1) \qquad (13)$$

$$U_h(L_h) = 0 \qquad (14)$$

$$y_k \ , \ U_h(r) \geq 0 \qquad (15)$$

Where,

y_k = different in the comparison *k*

$\mathbf{P}$ = set of comparison of substitution idea is decided

$\mathbf{R}$ = set of comparison of substitution idea is not decided

W_h = weight coefficient for attribute *h*

U_h = utility function of attribute *h*

X_{ph}^{k} = value of attribute *h* of the preference substitution idea *p* on comparison *k*

Formula (9) is indicates that the objective function is to minimize the preference relation. Formula (10) is set of attributes are investigated including the attribute h, in the case of decision of substitution idea is decided. Formula (11) is set of attributes are investigated including the attribute h, in the case of decision of substitution idea is not decided.

2.5.2. Attributes value are classified by category.

Formula (12) (14) are put and may exchange into formula (16).

$$U_h(r) \leq 1 (r = 1, ..., L_h) \qquad (16)$$

2.5.3. Attributes value are expressed as continuous variate.

In this case, the parameter of utility function are provided. The value of utility function is depend on the value of attribute.

III. EVALUATION OF ROADSIDE ENVIRONMENT

In the present, the large influence to the roadside environment came from the increase of road traffic, noise pollution and air pollution[8]. To evaluate the roadside environmental condition, measures were taken at each road section or roadside. Local countermeasure is not sufficient. To evaluate all of road section or roadside countermeasure should be considered on a network scale is required. The roadside environment have a large number of evaluation characteristic and database. In order to find the evaluation characteristic of each roadside, prediction of environmental characteristic such as noise and air pollution is required[9].

As for this research, the evaluation characteristic is used for evaluating the environmental conditions of each roadsides through the comparison of roadside pairs. To consider of all evaluation characteristics, we can decided the road section or roadside environmental condition such as which road have bad environmental condition. For the roadside environmental problem, this is more useful for the planner to know the environmental condition of each road for improving purpose[10]. Furthermore, from the preference record of road network planner, and from environmental evaluation function of each characteristic, to suppose the ranking of environmental condition of each roadside. With respect to the preference analysis method, is used to evaluate the roadside environment, and by this system to indicate the case study is proposed.

3.1. Evaluation characteristic.

From the database and the prediction of environmental characteristic such as prediction of noise and air pollution, we find the evaluation characteristic. In this case the noise and air pollution are produced by vehicles. In the occasion of comparing of roadside, the evaluation characteristic conforming 10 items corresponding to the roadside environmental are used in this evaluation.

3.2. Comparison of roadside.

The comparison of roadside pair, are based on the evaluation characteristic. To select one of the roadside for example which roadside are bad environmental condition are based on the decision making of the planner. This comparison of the roadside are collected and based on the preference of decision maker, are used for evaluating of environmental condition of roadside.

The comparison of roadside pairs, for example one pair of roadside are extracted from the set of roadside by the decision maker, and decision are made for determining one of the roadside pair based on the

alternatives condition through the decision making. The alternatives condition such as which roadside are bad or not bad environmental condition.

Decision making are based on experience can sometimes suggest the relative frequency with which a particular action succeeds in a given situation. When day to day choices are made under similar condition, such experience can from the basis for decision making. One may not know with absolute certainty whether a particular decision will result in success or failure. But the concept of expected value can often tell us which among some alternatives has the most to offer when many successes. Figure 1 shows the procedure step to collect the preference record by comparison pairs. The procedure of comparison of roadside pair are presented such as below

1. One pair of the roadside are presented (for example, roadside A and B).
2. The evaluation characteristic are indicated and the preference of evaluation characteristic are selected by decision maker, each value of roadside A and B are shown by that each evaluation characteristic.
3. Which of roadside A or B is selected by superior decision are depend on decision maker and based on the value of evaluation characteristic of each roadside.
4. After decision is done, the next of roadside pair (roadside C and D) are presented again, and do over again to select one of those roadside with same procedure above.

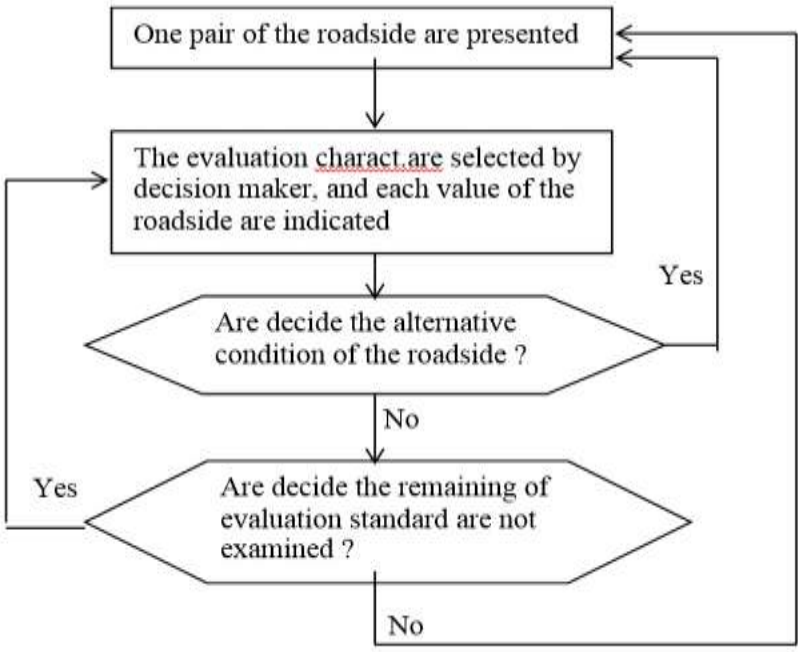

Fig. 1 Procedure step of preference record by comparison of roadside pair

3.3. Evaluation method

After the comparison of roadside, the comparison record are collected. To find the output, with respect to the preference analysis method, the comparison record are used for calculating the evaluation function of each evaluation characteristic. From the total of each evaluation function, we find the evaluation value of each roadside. In generally route which have bad environmental condition have big evaluation value. To show the result of this evaluation system, the total evaluation characteristic of roadside environment are used for example in the case study for evaluating the environmental condition of road system in Manado city of Indonesia.

IV. STRUCTURE OF ROADSIDE ENVIRONMENTAL EVALUATION

In order to evaluate the environmental condition of each road side, the evaluation characteristic are required. The evaluation characteristic are found from the database and the prediction of environmental characterisric such as noise level and air pollution concentration. To find the environmental characteristic of each roadside, the structure of this system are devided into :

1. Evaluation of environmental characteristic, in relation to the noise level and air pollution concentration.
2. Evaluation of each roadside.
3. Evaluation of the sets of roadside.

In relation to the case study of road system in Manado city, this system have been developed, but the purpose of this research is to find of all evaluation characteristic and the evaluation value of each roadside[11].

Through the comparison of each roadside and based on that evaluation characteristic, the evaluation of environmental condition of each roadside such as which roadside have bad environmental condition are found.Fig. 2 shows the scheme of actifity roadside environmental evaluating system structure.

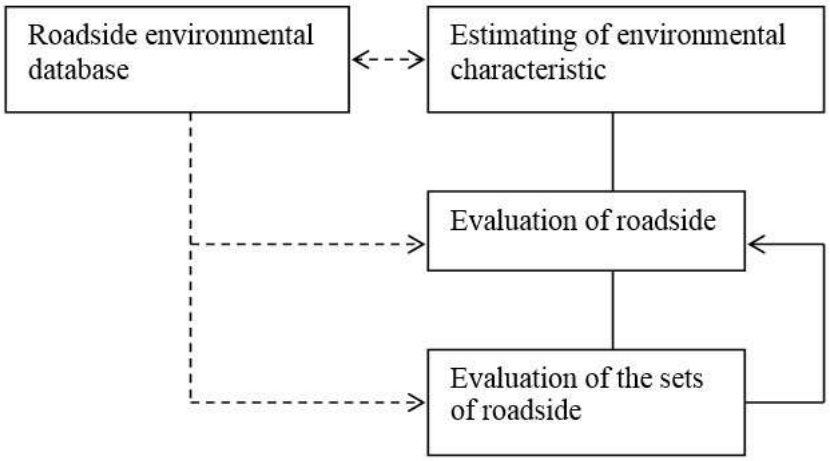

Fig. 2 Scheme of activity to support the roadside environmental evaluation process

4.1. Database.

To support and to find the evaluation characteristic, the database and the prediction of environmental characteristic is required. The kind of database are devided into such as below :

1. Segment data
2. Roadside data
3. Weather data

V.APLICATION TO THE ROAD NETWORK IN MANADO CITY

The system developed in the above is applied to the road network in Manado city of Indonesia. In order to collect the record of decision maker, comprising 100 numbers of roadsides are considered, and from the comparison of 50 pairs of roadsides the record are collected. In the occasion of comparing of roadside, the evaluation characteristic conforming 10 items corresponding to the roadside environmental evaluating system.

From the results of the comparison pairs, the result of decision and evaluation value, the validity of that result is 95 %, from comparison of 50 pairs. The ranking of all roadsides from the bad environmental condition of 100 numbers of roadsides are shown in the table 3. In generally, route which have a bad roadside environmental condition have big evaluation value. The evaluation value is found from the total of each evaluation function.

5.1. Comparison of roadside pairs

The comparison of roadside pairs, for example one pair of roadside are extracted from the set of roadside by the decision maker, and decision are made for determining one of the roadside pair based on the alternative condition through the decision making. The alternatives condition such us which roadside are bad or not bad environmental condition. In this case study, comprising 100 numbers of roadsides are considered, and from the comparison 50 pairs of roadside the record are collected. The comparison of the roadside pair are collected and based on the preference of decision maker, are used for evaluating of environmental condition of each roadside. Table 1 shown the example of comparison of roadside pair in relation to the evaluating characteristic. Table 2 shows the result of comparison of 50 pairs of roadsides.

Table 1. Example of comparison of the roadside pair in relation to the evaluation characteristic

Evaluation Characteristic	Roadside		Unit
	Roadside A	Roadside B	
1. Elevated road	10	0	m
2. Number of lanes	4	4	lane
3. Control speed	60	40	km/h
4. Road width	180	270	0.1 m
5. Traffic volume	15626	10520	Veh/day
6. Noise value	70.41	64.24	dB(A)
7. NO2 density	0.06	0.05	ppm
8. Zoning Code	Industrial	Residential	%
9. Plant trees code	Non	Exist	%

10.Road structure code	Elevated	Level	%
Select one of the next condition : 1. Roadside A is bad environment condition than B 2. Roadside B is bad environment condition than A			

Table 2. Comparison result of roadsides

Comparison	Roadside	Bad condition than	Roadside
1	1 : Jalan A.A. Maramis	>	13 : Ahmad Yani XI
2	2 : Jalan Bethel	>	3 : Lengkong Wuaya
3	4 : Sam Ratulangi IX	>	6 : Sam Ratulangi X
4	5 : Sam Ratulangi V	>	7 : Sam Ratulangi XI
5	14 : Ahmad Yani VIII	>	8 : Sam Ratulangi XII
6	15 : Jalan Anugerah	>	9 : W.Z. Yohanes
7	16 : Arnold Mononutu	>	10 : Jalan 17 Agustus
8	17 : Jalan Atlantis	>	11 : Abdulrahman Wahid
9	18 : Jalan Babe Palar	>	12 : Jalan Adolf Sondakh
10	19 : Jalan Babe Palar	>	20 : Jalan Boulevard
11	22 : Jalan Boulevard	>	21 : Jalan Boulevard
12	25 : Jalan Gunung Rinjani	>	23 : Jalan Cemara
13	27 : Jalan Kartini	>	24 : Jalan Gunung Kerinci
14	28 : Jalan Kembang	>	26 : Jenderal Sudirman
15	30 : Jalan Kelabat Utara	>	29 : Jalan Kelabat Selatan
16	34 : Pogidon Raya	>	31 : Perum Ricky
17	35 : Ranomut Perkamil	>	32 : Perum Wale Manguni
18	36 : Ranotana Weru	>	33 : Perum Wale Manguni
19	37 : Ring Road Karombasan	>	40 : Jalan Sam Ratulangi
20	38 : Robert Tambahani	>	41 : Jalan Sumompo
21	39 ; Royal residence	>	42 : Ternate Baru
22	45 : Tumumpa II	>	43 : Tikala Ares
23	46 : Jalan 14 Februari	>	44 : Tumumpa II
24	47 : Jalan Sudirman VIII	>	49 : Jalan Yos Sudarso
25	48 : Jalan A. Yani	>	50 : Jalan A. Yani 23
26	52 : Jalan Tololiu Supit	>	51 : Jalan 14 Februari 17
27	54 : Bahu Lingk.5	>	53 : Bahu Lingk. 6
28	55 : Jalan B.W. Lapian	>	58 : Jalan Sudirman VIII
29	56 : Jl. Dotulolong Lasut	>	60 : Jalan 14 Februari
30	57 : Jl. Pingkan Matindas	>	61 : Jalan A. Yani
31	59 : Jl. Tololiu Supit	>	62 : Jalan A. Yani 23
32	64 : Jalan A. Yani	>	63 : Mahakeret Timur
33	65 : Malalayang I	>	66 : Malalayang I Dusun
34	67 : Jalan Manggis	>	68 ; Jalan Manguni II
35	69 : Jalan Maumbi Bawah	>	71 : Paal 4 Malvinas
36	70 : Nani Wartabone	>	72 : Jalan Paal 4
37	74 : Permata Klabat Paniki	>	73 : Perkamil
38	75 : Perum Beringin Indah	>	76 : Perum Beringin Indah
39	78 : Perum Cehate	>	77 : Perum Beringin Indah
40	79 : Perum Kawangkoan	>	81 : Perum Watutumou
41	80 : Perum Liwas Permai	>	82 : Perum PLN Bahu
42	84 : Jalan Laksda John Lie	>	83 : Perum Rizky
43	86 : Jalan Mawar 2	>	85 : Jalan Manado Koka
44	87 : Jalan Molas	>	89 : Jalan Piere Tendean
45	88 : Jalan Pomorouw	>	90 : Jalan Pomorouw 2
46	91 : Jalan Pramuka	>	94 : Jalan Wolter Monginsidi
47	92 : Jalan Paniki Atas	>	95 : Jalan Sam Ratulangi
48	93 : Jln.Wolter Monginsidi	>	96 : Jalan Santu Joseph
49	97 : Jalan Tololiu Supit	>	98 : Jalan Ahmad Yani
50	100 :Jalan 14 Februari	>	99 : Jalan 14 Februari 17

Table 3. Ranking condition of roadsides

	Roadside	Evaluation Value	Environmental condition
1	1 : Jalan A.A. Maramis	0.9131	B
2	57 : Jl. Pingkan Matindas	0.9098	a
3	54 : Bahu Lingk.5	0.9083	d
4	55 : Jalan B.W. Lapian	0.9079	
5	19 : Jalan Babe Palar	0.9052	
6	39 : Royal residence	0.9035	
7	37 : Ring Road Karombasan	0.9031	
8	38 : Robert Tambahani	0.9028	

9	56 : Jl. Dotulolong Lasut	0.8990
10	28 : Jalan Kembang	0.8984
11	59 : Jl. Tololiu Supit	0.8982
12	64 : Jalan A. Yani	0.8974
13	52 : Jalan Tololiu Supit	0.8966
14	27 : Jalan Kartini	0.8949
15	35 : Ranomut Perkamil	0.8910
16	36 : Ranotana Weru	0.8900
17	67 : Jalan Manggis	0.8889
18	25 : Jalan Gunung Rinjani	0.8867
19	97 : Jalan Tololiu Supit	0.8860
20	34 : Pogidon Raya	0.8860
21	61 : Jalan A. Yani	0.8852
22	60 : Jalan 14 Februari	0.8846
23	79 : Perum Kawangkoan	0.8826
24	22 : Jalan Boulevard	0.8825
25	48 : Jalan A. Yani	0.8819
26	4 : Sam Ratulangi IX	0.8796
27	18 : Jalan Babe Palar	0.8780
28	2 : Jalan Bethel	0.8780
29	80 : Perum Liwas Permai	0.8772
30	66 : Malalayang I Dusun	0.8759
31	65 : Malalayang I	0.8754
32	78 : Perum Cehate	0.8257
33	58 : Jalan Sudirman VIII	0.8074
34	53 : Bahu Lingk. 6	0.8030
35	96 : Jalan Santu Joseph	0.8028
36	5 : Sam Ratulangi V	0.8026
37	20 : Jalan Boulevard	0.8023
38	62 : Jalan A. Yani 23	0.8015
39	49 : Jalan Yos Sudarso	0.8010
40	16 : Arnold Mononutu	0.8000
41	26 : Jenderal Sudirman	0.7999
42	12 : Jalan Adolf Sondakh	0.7995
43	33 : Perum Wale Manguni	0.7987
44	8 : Sam Ratulangi XII	0,7982
45	24 : Jalan Gunung Kerinci	0.7890
46	89 : Jalan Piere Tendean	0.7800
47	85 : Jalan Manado Koka	0.7575
48	6 : Sam Ratulangi X	0.6997
49	10 : Jalan 17 Agustus	0.6980
50	7 : Sam Ratulangi XI	0.6955
51	21 : Jalan Boulevard	0.6578
52	23 : Jalan Cemara	0.6562
53	3 : Lengkong Wuaya	0.6378
54	11 : Abdulrahman Wahid	0.6055
55	29 : Jalan Kelabat Selatan	0.6025
56	81 : Perum Watutumou	0.6010
57	40 : Jalan Sam Ratulangi	0.5988
58	68 : Jalan Manguni II	0.5970
59	63 : Mahakeret Timur	0.5965
60	72 : Jalan Paal 4	0.5898
61	45 : Tumumpa II	0.5825
62	94 : Jalan Wolter Monginsidi	0.5799
63	92 : Jalan Paniki Atas	0.5667
64	46 : Jalan 14 Februari	0.5576
65	41 : Jalan Sumompo	0.5012
66	75 : Perum Beringin Indah	0.4875
67	77 : Perum Beringin Indah	0.4480
68	95 : Jalan Sam Ratulangi	0.4345
69	90 : Jalan Pomorouw 2	0.4315
70	93 : Jln.Wolter Monginsidi	0.3995
72	47 : Jalan Sudirman VIII	0.3854
73	42 : Ternate Baru	0.3844
74	14 : Ahmad Yani VIII	0.3812
75	15 : Jalan Anugerah	0.3776
76	98 : Jalan Ahmad Yani	0.3767
77	91 : Jalan Pramuka	0.3760

78	87 : Jalan Molas	0.3657	
78	69 : Jalan Maumbi Bawah	0.3645	
79	70 : Nani Wartabone	0.3640	
80	43 : Tikala Ares	0.3615	
81	30 : Jalan Kelabat Utara	0.3610	
82	31 : Perum Ricky	0.3575	
83	73 : Perkamil	0.3570	
84	88 : Jalan Pomorouw	0.3516	
85	9 : W.Z. Yohanes	0.3509	
86	17 : Jalan Atlantis	0.3448	
87	32 : Perum Wale Manguni	0.3445	
88	13 : Ahmad Yani XI	0.3426	
89	82 : Perum PLN Bahu	0.3276	
90	83 : Perum Rizky	0.3075	
91	84 : Jalan Laksda John Lie	0.2645	
92	44 : Tumumpa II	0.2466	
93	50 : Jalan A. Yani 23	0.2245	
94	51 : Jalan 14 Februari 17	0.2027	N
95	71 : Paal 4 Malvinas	0.2008	o
96	74 : Permata Klabat Paniki	0.1887	t
97	76 : Perum Beringin Indah	0.1835	
98	100 : Jalan 14 Februari	0.1786	B
99	86 : Jalan Mawar 2	0.1670	a
100	99 : Jalan 14 Februari 17	0.1654	d

VI. CONCLUSION

The roadside environmental will be around as long as the automobile persists as a major transportation mode. The question is how can effective decision making be achieved for actions that affect complex environmental problem. To find the best solution, its will do much to decrease the computational difficulty associated with large scale of roadside environmental problem. With the evaluating of roadside environmental conditions procedures, the potential utility of this kind of design system will be an essential part of the development of the environmental planning process. Before continuing with process establishing of its data structure must be held to provide for each road segment, and also for conveniency in managements of data is necessary. The preference analysis method is used to support the evaluating system to find the environmental condition of each roadside. It can be thought that the method as a high level real practicality and its scope of application is also very large. Environmental evaluation function can be indicated by intention of the planner, from that evaluation function, the ranking of roadside with bad environmental condition can be decided.

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