



## PROCEDURE TO PRIORITIZATION OF ROAD NETWORKS OF RURAL ROAD IMPROVEMENT

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### ABSTRACT

Rural roads are the tertiary road system of India. A methodology is developed for the prioritization of road network. This study presents procedure to prioritization of road networks of rural road improvement. Locations are selected from five rural road networks of Madhya Pradesh (India). Weightage of factors which affect rural road improvement are determined with analytical hierarchy process. Condition ratings are assigned to selected location on the basis of their actual road conditions sum of product of weightage and condition rating, of respective factors give rural road improvement index which is helpful for prioritization of rural road improvement.

**Keyword:** Rural Road, Rural Road Improvement, RRII etc.

### Introduction

This method developed a rural road improvement index (RRII), which is product of weightage of factors and condition rating. To explanation of how to calculate RRII, some road locations and their present condition are required. Data for illustrations are taken from a state of India known as Madhya Pradesh. Five road locations are selected; details of these road locations are given below.

### Procedure

The main work of this audit was to find the actual condition and give rating to these factors like signs, road markings etc., and audit was conducted for each Km. on this road sections. Condition rating is assigned on the basis of present condition of

factors. Condition ratings are assigned from 0 to 1 according to their present condition. Lower rating is assigned to excellent condition road and 1 rating is assigned to very poor condition road. Detail of assigned condition rating is given below with their respective road factor like geometric, surface etc.

Locations are as follows:-

1. NH-12 , Magardhga To Maheshwar- 12.05 Km
2. Mandideep-Polaha-Nandor Road 10.01. Km
3. NH-12, Mandideep- Via Dahod 17.75 Km
4. NH-12, Udaypura To Anghora 12 Km
5. Silwani- Udaypura Road To Chunchethiya Madhya Raoad- 10.20 Km (Raisen district road)

Table 1.1 presents details of rating to straight section. (NH-12 , Magardhga To Maheshwar- 12.05 Km)

S.No	Name of Locations	Geometric	Surfaces	Shoulder	Drainage	Street light	Road Marking	Road Sign
1.	A	0.21	0.12	1	1	1	0.35	0.2
2.	B	0.34	0.75	0.23	0.24	0.2	0.34	0.23
3.	C	0.22	0.8	0.32	0.34	0.75	0.23	0.34
4.	D	0.54	0.62	0	0.21	0.82	0.32	0.21
5.	E	0.22	0.1	0.41	0.64	0.72	0	0.63

Table 1.2 presents details of rating to curve section.( NH-12 , Magardhga To Maheshwar- 12.05 Km)

S.No	Name of Locations	Geometric	Surfaces	Shoulder	Drainage	Street light	Road Marking	Road Sign
1.	A	0.32	0	0.37	0	0.31	0.22	1
2.	B	0.74	0.34	0.76	0.23	0.34	0.75	0.28
3.	C	0.82	0.21	0.82	0.32	0.36	0.77	0.46
4.	D	0.72	0.64	0.72	0	0.64	0.55	0
5.	E	0.1	0.27	1	1	0.22	0.1	0.41

Table 1.3 presents details of rating to intersection.(NH-12 , Magardhga To Maheshwar- 12.05 Km)

S.No	Name of Locations	Geometric	Surfaces	Shoulder	Drainage	Street light	Road Marking	Road Sign
1.	A	0.21	0.29	1	0.44	0.46	0.43	0.41
2.	B	0.34	0.75	0.23	0	1	0.35	0.2
3.	C	0.21	0.78	0.32	0.12	0.26	0.34	0.23
4.	D	0.64	0.23	0	0.21	0.75	0.23	0.34
5.	E	0.22	0.11	0.41	0.11	0.82	0.32	0.21

- First stage of rural road improvement is identification of road. Straight section, curve section and intersection are the three classification of the rural road. Total seven factors are identified in each road section in this study and it resulted into twenty one factors which affect rural road.
- Second stage is determination of weightage of identified factors, which is carried out by analytical hierarchy process. Weightage of these twenty one factors are listed below with their respective table.
- Third stage is assignment of condition rating to these factors, and calculation of product of weightage and condition rating.
- And last stage is calculation of rural road improvement index of road network.

Following table presents weightage of factors and product of them with condition rating

S.No.	Factors for Rural Road Condition (RRC)	Notation	Weightage (WF)	Condition rating to factors (CF)	Product (WF)*(CF)
1.	Geometrical Condition at Straight Section	RRCG <sub>s</sub>	0.0653	0.21	0.013713
2.	Surface Condition at Straight Section	RRCS <sub>s</sub>	0.1021	0.12	0.012252
3.	Shoulder Condition at Straight Section	RRCSH <sub>s</sub>	0.017	1	0.017
4.	Drainage Condition at Straight Section	RRCDC <sub>s</sub>	0.0316	1	0.0316
5.	Street light Condition at Straight Section	RRCSL <sub>s</sub>	0.0243	1	0.0243
6.	Road Marking Condition at Straight Section	RRCRM <sub>s</sub>	0.00972	0.35	0.003402
7.	Road Sign Condition at Straight Section	RRCRS <sub>s</sub>	0.01998	0.2	0.003996
<b>Total</b>			<b>0.27</b>		<b>0.106263</b>

Weightage to factors (WF) and Condition rating to factors (CF) at curve section (NH-12 , Magardhga To Maheshwar- 12.05 Km)

S.No.	Factors for Rural Road Condition (RRC)	Notation	Weightage	Condition rating to factors	Product
				(CF)	(WF)*(CF)
1	Geometrical Condition at Intersection	RRCG <sub>i</sub>	0.099138	0.21	0.020819
2	Surface Condition at Intersection	RRCS <sub>i</sub>	0.155062	0.29	0.044968
3	Shoulder Condition at Intersection	RRCSH <sub>i</sub>	0.04797	1	0.04797
4	Drainage Condition at Intersection	RRCDC <sub>i</sub>	0.02583	0.44	0.011365
5	Street light Condition at Intersection	RRCSL <sub>i</sub>	0.0369	0.46	0.016974
6	Road Marking Condition at Intersection	RRCRM <sub>i</sub>	0.01476	0.43	0.006347
7	Road Sign Condition at Intersection	RRCR <sub>i</sub>	0.03034	0.41	0.012439
<b>Total</b>			<b>0.41</b>		<b>0.160882</b>

Weightage to factors (WF) and Condition rating to factors (CF) at Intersection (NH-12 , Magardhga To Maheshwar- 12.05 Km)

S.No.	Factors for Rural Road Condition (RRC)	Notation	Weightage	Condition rating to factors	Product
				(CF)	(WF)*(CF)
1.	Geometrical Condition at Curve Section	RRCG <sub>c</sub>	0.077376	0.32	0.02476
2.	Surface Condition at Curve Section	RRCS <sub>c</sub>	0.121024	0	0
3.	Shoulder Condition at Curve Section	RRCShc	0.03744	0.37	0.013853
4.	Drainage Condition at Curve Section	RRCDc	0.02016	0	0
5.	Street light Condition at Curve Section	RRCSLc	0.0288	0.31	0.008928
6.	Road Marking Condition at Curve Section	RRCRMc	0.01152	0.22	0.002534
7.	Road Sign Condition at Curve Section	RRCRSc	0.02368	1	0.02368
<b>Total</b>			<b>0.32</b>		<b>0.073756</b>

**Rural road improvement index (RRII) for Road Section(NH-12 , Magardhga To Maheshwar- 12.05 Km)**

Rural road improvement index for entire Road is determine by summation of given values

$$RRII_R = \sum RRII_S + RRII_C + RRII_I$$

Where,

RRII<sub>R</sub> = Rural road improvement index for entire Road

RRII<sub>S</sub> = Rural road improvement index at Straight Section

RRII<sub>C</sub> = Rural road improvement index at Curve Section

RRII<sub>I</sub> = Rural road improvement index at Intersection

Put values in above formula and calculate RRII for entire section of road

$$RRII_R = 0.106263 + 0.073756 + 0.160882$$

$$RRII_R = 0.340901 \text{ or}$$

$$RRII_R = 0.341 \text{ (NH-12 , Magardhga To Maheshwar- 12.05 Km)}$$

Just like above section, RRII calculated for each road sections

Similarly rural road improvement index is calculated for all locations. Below table presents Rural road

improvement index (RRII) for all five road locations. These are presented below with their respective location

S.No	Location	Rural road improvement index
1.	NH-12 , Magardhga To Maheshwar- 12.05 Km	0.341
2.	Mandideep-Polaha-Nandor Road 10.01. Km	0.489
3.	NH-12, Mandideep- Via Dahod 17.75 Km	0.386
4.	NH-12, Udaypura To Anghora 12 Km	0.534
5.	Silwani- Udaypura Road To Chunhethiya Madhiya Raoad- 10.20 Km (Raisen district road)	0.3

### Conclusion

Five road locations of state Madhya Pradesh (India) are selected to demonstrate the method to prioritize rural road improvement locations. Product of weightage of factors and their respective rating is used to calculate RRII. According to result and analysis Location “NH-12, Udaypura To Anghora” indicates highest Rural Road Improvement Index (RRII), it reflects into higher improvement demand. Location “Silwani- Udaypura Road To Chunhethiya” indicates lowest Rural Road Improvement Index (RRII), it reflects into better condition of road among all the road locations. It is suggested that this method is useful to prioritize rural road improvement locations and quite easy in calculation.

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